ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FOR

KANGRA T4 COAL MINING PROJECT: MINING RIGHT

Mpumalanga

DMR REF: MP 30/5/1/2/2/10175 MR

March 2021

Submitted as part of an application process for environmental authorisation in terms of the National Environmental Management Act (Act 107 of 1998) [as amended] in respect of listed activities that have been triggered by application in terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) [as amended]

DOCUMENT HISTORY

Document Control, Quality Control and Disclaimer

Report	Environmental Impact Assessment and Environmental Management Programme Report for Kangra Coal (Pty) Ltd: Kangra T4 Coal Mining Project		
Client	Kangra Coal (Pty) Ltd.		
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DOCUMENT REVIEWED BY

Responsible person	Date	Position
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Signature		
Responsible person	**Date**	**Position**
Du Toit Wilken	10 March 2021	Project Manager
Signature		

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

AND

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FOR LISTED ACTIVITIES ASSOCIATED WITH THE MINING RIGHT FOR KANGRA COAL T4 MINE PROJECT, LOCATED IN THE MPUMALANGA PROVINCE

MP 30/5/1/2/2/10175 MR

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	Kangra Coal (Pty) Ltd.
Project	Environmental Impact Assessment and Environmental Management Programme Report for Kangra Coal (Pty) Ltd: Kangra T4 Coal Mining Project
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File Reference Numbers	MP 30/5/1/2/2/10175 MR

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 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

(a) Determine the policy and legislative context within which the activity is located and document how the activity complies with and responds to the policy and legislative context;

(b) Describe the need and desirability of the activity, including the need and desirability of the activity in the context of the preferred location;

I Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) Determine the—-

(i) Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) Degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(d) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

I Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(f) Identify suitable measures to manage, avoid or mitigate identified impacts; and

(g) Identify residual risks that need to be managed and monitored.

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ABBREVIATIONS

Abbreviation	Description
BoQ	Bill of Quantities
BPEO	Best Practicable Environmental Option
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DM	District Municipality
DMR	Department of Mineral Resources
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
DHSWS	Department of Human Settlements, Water and Sanitation
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPR	Environmental Management Programme
ESMS	Environmental and Social Management System
GNR	Government Notice Regulation
I&APs	Interested and Affected Parties
IDP	Integrated Development Programme
IEM	Integrated Environmental Management
IHAS	Invertebrate Habitat Assessment System
IHIA	Intermediate Habitat Integrity Assessment
IWUL	Integrated Water Use License
IWULA	Integrated Water Use License Application
LED	Local Eonomic Development
LM	Local Municipality
LOM	Life of Mine
MAMSL	Meter Above Mean Sea Level
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
MRA	Mining Right Application
NAEIS	National Atmospheric Emission Inventory System
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act, 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)

NFA	National Forest Act (Act 84 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
NWA	National Water Act (Act 36 of 1998)
PAIA	Promotion of Access to Information Act (Act 2 of 2000)
PAJA	Promotion of Administrative Justice Act (Act 3 of 2000)
PES	Present Ecological State
PGMs	Platinum-Group Metals
PM10	Thoracic Particulate Matter
PM2.5	Inhalable Particulate Matter
POI	Points of Interest (used in Blasting Assessment)
PPP	Public Participation Process
ROM	Run of Mine
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
SASS	South African Scoring System
SIA	Social Impact Assessment
SMME	South African Small, Medium and Micro Enterprise
TPA	Tons Per Annum
TSP	Total Suspended Particulates
WUL	Water Use License
WML	Waste Management License

INTRODUCTION

Elemental Sustainability (Pty) Ltd (ELEMENTAL) was appointed by undertake the environmental authorisation process in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (as amended) and the National Environmental Management Waste Act, 2008 (Act 59 of 2008) for the proposed Kangra Coal T4 Coal Mine Project. The proposed mine is located near, Mpumalanga.

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 DETAILS

1.1.1 Details of the Environmental Assessment Practitioner

The details of the Environmental Assessment Practitioner (EAP) are provided in Table 1

Table 1: Details of the EAP

Name of the Practitioner:	Sonja van de Giessen
Tel No.:	083 388 4633
Fax No.:	None
Email address:	sonja@elemental-s.co.za
Name of the Reviewer	Du Toit Wilken
Tel No.:	08 588 2322
Fax No.:	None
Email address:	dutoit@elemental-s.co.za

1.1.2 Expertise of the EAP

1.1.2.1 The Qualifications of the EAP (With Evidence)

Please refer to Table 1 for a summary of the qualification and experience of the EAP. Refer to Appendix 1 and 2 for more details (CV).

Ms Sonja van de Giessen (EAPASA & Pri.Sci.Nat):

- University of of South Africa, BSc Hons Environmental Management – 2011
- North West University, MSc Environmental Management – 2018

Mr DuToit Wilken (Pri.Sci.Nat):

- University of Pretoria, MSc Geography – 2015
- University of Pretoria, BSc Hons Environmental Science – 2010
- University of Pretoria, BSc Environmental Science – 2009

1.1.2.2 Summary of the EAPs Past Experience (In Carrying Out the Environmental Impact Assessment Procedure)

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

Provided here is a summary of the qualification and experience of the EAP. Refer to Appendix 2 for more details (experience).

Sonja van de Giessen is an Environmental Scientist with nearly 10 years of experience in environmental management, specifically the mining industry sector, focusing on Environmental Impact Assessments, Environmental Management Programmes, Water Use Licence Applications and Integrated Water and Waste Management Plans and Environmental Auditing. Sonja has extensive experience in publc participation. She is registered as a Natural Professional Scientist (*Pr. Sci.Nat.* Number: 400084/18) with SACNASP and as an Environmental Assessment Practitioner South Africa (EAPASA Number: 2019/1496).

DuToit Wilken is an Environmental Scientist with more than 10 years of experience in applying the principles of Integrated Environmental Management, and in applying the Environmental Legislation to a number of development projects and initiatives in Southern Africa. He is registered as a Pri.Sci.Nat. (SACNASP), Natural Scientist, Registration number 118911. He has co-ordinated and managed number of diverse projects and programs related to the Environment and Mining within both the public and private sectors and for national, multi-national and international companies. His interpersonal and organisational skills have enabled him to efficiently direct these projects from initiation to implementation.

A significant element of public participation is required throughout the life cycle of an EIA process. Du Toit has successfully liaised with interested and affected parties, ensuring that all communication procedures and dialogues are open and transparent, and that capacity building is conducted where necessary. His proficient report-writing skills have been utilised for the compilation of a wide variety of reports, which include but is not limited to Basic Assessment Reports, Scoping and Environmental Impact Assessment Reports, Environmental Management Plans (Planning, Construction, Operation and Closure), Environmental Audit Reports, Opportunities and Constraints Analyses, Waste License Applications, Water-Use Application Reports and Mining Right Applications.

2 DESCRIPTION OF THE PROPERTY

1.2 SITE LOCATION

The Kangra Coal T4 Project is located 69 km south-south-east of Ermelo, 39 km west of Piet Retief, and 65 km north-east of Volksrust in the Mpumalanga Province. The Project is situated within the Piet Retief Magisterial District and the Nkangala District Municipality (refer to Table 2). The proposed project will be located on Portions 0 (remaining extent (re)) and 1 of Prospectfarm 361IT; Portions 0, 1, 2 (Re), 3 Glenfillan 362IT; portions 3(re), 16, 17, 19 and 20 of Donkerhoek 14HT; portions 0(Re), 1(Re) and 2 of Grootfontein 8HT; portions 0 and 1 of Langkloof 9HT; Portions 0(Re), 1(Re), 2(Re), 3(Re), 4(Re), 5, 6 (Re), 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 18 of Grootvallei 43HT; Portions 0 and 2 of Middelpan 42HT; Portions 1, 2, 3, 4, 5, 6, 7 and 8 of Vryheid 42HT; Portion 0(Re) of Naauwhoek 37HT; Portions 0(Re), 1(Re), 2, 3 and the servitude of Portion 3 of De Paarl 39HT; Portions 0(Re), 1(Re), 2, 3, 4(Re), 5, 6 and 7 of Spitskop 41HT; Portion 0 of Uitgedacht 56HT; Portion 0 of Zoogedacht 57HT; Portion 0 of Bovenvallei 58HT; Portion 1 of Goedgeloof 77HT; Portion0(Re) and 1 of Zondernaam and Portion 0 of Dubbeldam 60HT. The supporting surface infrastructure will include three vent shafts and an overhead powerline that will connect the vent shafts to power available at the existing Kusipongo Mine. Vent shafts 3 and 4, as well as a section of the overhead powerline is located on the farm Grootvallei 43. Vent shaft 1 and the middle section of the overhead powerline is located on farm De Paarl 39 while the most eastern section of the overhead powerline, will traverse through the farm Roodepoort 38.

Table 2: Property description

Name:	Kangra Coal (Pty) Ltd. T4 Project
Application area (Ha)	22,375.33 ha
Magisterial district:	The majority of the farm portions associated with the T4 Project MRA area are located within the Pixley Ka Seme Local Municipality, with the remainder located in the Mkhondo Local Municipality. Both local municipalities fall within the Gert Sibande District Municipality
Distance and direction from nearest town	The Kangra Coal T4 project is located 69 km south south-east of Ermelo, 39 km west of Piet Retief and 65 km north east of Volksrust in the Mpumalanga Province.
21-digit Surveyor General Code for each farm portion	Refer to Table 3 below for the farm names, portions and the 21-digit Surveyor General Code.

Table 3: Details of the farms on which the proposed Kangra Coal T4 Project will be located

FARM NAME	FARM NR	PORTION NUMBER	OWNER	TITLE DEED	EXTENT (HA)	LOCAL AUTHORITY	LPI CODE
Prospectfarm	361 IT	0 (remaining extent)	Hlanganani Communal Prop Assoc	T118165/2001	1285.515	Mkhondo Local Municipality	T0IT00000000036100000
Prospectfarm	361 IT	1	Siyasebenza Communal Property Assoc	T65364/2005	1285.874	Mkhondo Local Municipality	T0IT00000000036100001
Glenfillan	362 IT	0 (remaining extent)	O'Neill Henry John	T58944/1980	1937.801	Seme Local Municipality	T0IT00000000036200000
Glenfillan	362 IT	1	O'Neill Henry John	T58944/1980	856.532	Seme Local Municipality	T0IT00000000036200001
Glenfillan	362 IT	2 (remaining extent)	Ukuchuma Farming Pty Ltd	T13611/2013	428.266	Seme Local Municipality	T0IT00000000036200002
Glenfillan	362 IT	3	Joubert Edmund Claud	T62633/1992	428.266	Seme Local Municipality	T0IT00000000036200003
Donkerhoek	14 HT	3 (remaining extent)	Labuschagne Carla	T95601/2006	514.154	Seme Local Municipality	T0HT00000000001400003
Donkerhoek	14 HT	16	Greyling Cornelius Johannes Francois	T115479/2001	256.960	Seme Local Municipality	T0HT00000000001400016
Donkerhoek	14 HT	17	Dyason John	T9293/2008	256.960	Seme Local Municipality	T0HT00000000001400017
Donkerhoek	14 HT	19	Ndhlovu, Maseko & Vilakazi Communal Prop Association	T153817/2001	284.959	Seme Local Municipality	T0HT00000000001400019
Donkerhoek	14 HT	20	Dymastar Pty Ltd	T6854/2016	256.960	Seme Local Municipality	T0HT00000000001400020
Grootfontein	8 HT	0 (remaining extent)	Corneels Greyling Trust	T52059/1999	912.558	Seme Local Municipality	T0HT00000000000800000
Grootfontein	8 HT	1 (remaining extent)	National Government of the Republic of South Africa	T4954/2008	475.996	Seme Local Municipality	T0HT00000000000800001
Grootfontein	8 HT	2	Grazing Grounds CC	T78014/1993	543.200	Seme Local Municipality	T0HT00000000000800002
Langkloof	9 HT	0	Ukuchuma Farming Pty Ltd	T141022/2006	487.709	Seme Local Municipality	T0HT00000000000900000

FARM NAME	FARM NR	PORTION NUMBER	OWNER	TITLE DEED	EXTENT (HA)	LOCAL AUTHORITY	LPI CODE
Langkloof	9 HT	1	Ukuchuma Farming Pty Ltd	T141022/2006	487.709	Seme Local Municipality	T0HT00000000000900001
Grootvallei	43 HT	0 (remaining extent)	Corneels Greyling Trust	T78126/2003	306.526	Seme Local Municipality	T0HT00000000004300000
Grootvallei	43 HT	1 (remaining extent)	Mooibank Boerdery Pty Ltd	T1041/2016	102.200	Seme Local Municipality	T0HT00000000004300001
Grootvallei	43 HT	2 (remaining extent)	Thembalethu Vryheid Communal Prop Assoc	T63818/2006	37.822	Seme Local Municipality	T0HT00000000004300002
Grootvallei	43 HT	3 (remaining extent)	Delport Susara Jacoba	T1028/2013	232.800	Seme Local Municipality	T0HT00000000004300003
Grootvallei	43 HT	4 (remaining extent)	Labuschagne Pieter Schalk Willem	T443/1954	0.544	Seme Local Municipality	T0HT00000000004300004
Grootvallei	43 HT	5	Ben Greyling Landgoed CC	T87850/1996	58.244	Seme Local Municipality	T0HT00000000004300005
Grootvallei	43 HT	6 (remaining extent)	Ben Greyling Landgoed CC	T87850/1996	88.107	Seme Local Municipality	T0HT00000000004300006
Grootvallei	43 HT	7	Ben Greyling Landgoed CC	T87850/1996	102.915	Seme Local Municipality	T0HT00000000004300007
Grootvallei	43 HT	8	Delport Susara Jacoba	T42579/1984	102.917	Seme Local Municipality	T0HT00000000004300008
Grootvallei	43 HT	9	Delport Susara Jacoba	T42579/1984	85.920	Seme Local Municipality	T0HT00000000004300009
Grootvallei	43 HT	10	Dekker Marthina Johanna	T21084/1970	51.392	Seme Local Municipality	T0HT00000000004300010
Grootvallei	43 HT	11	Delport Susara Jacoba	T42579/1984	68.523	Seme Local Municipality	T0HT00000000004300011
Grootvallei	43 HT	12	Corneels Greyling Trust	T78126/2003	132.871	Seme Local Municipality	T0HT00000000004300012
Grootvallei	43 HT	13	Meyer Susan	T8165/2011	30.256	Seme Local Municipality	T0HT00000000004300013
Grootvallei	43 HT	14	Thembalethu Vryheid Communal Prop Assoc	T63818/2006	68.076	Seme Local Municipality	T0HT00000000004300014
Grootvallei	43 HT	15	Thembalethu Vryheid Communal Prop Assoc	T63818/2006	37.819	Seme Local Municipality	T0HT00000000004300015

FARM NAME	FARM NR	PORTION NUMBER	OWNER	TITLE DEED	EXTENT (HA)	LOCAL AUTHORITY	LPI CODE
Grootvallei	43 HT	16	Republic of South Africa	T98708/2007	274.054	Seme Local Municipality	T0HT00000000004300016
Grootvallei	43 HT	18	Hattingh Andries Lodewiekus	T34994/1971	57.852	Seme Local Municipality	T0HT00000000004300018
Middelpan	44 HT	0	Moller Michael Renier	T70794/2003	456.998	Seme Local Municipality	T0HT00000000004400000
Vryheid	42 HT	1	Kerneels Greyling Trust	T56316/1984	173.740	Seme Local Municipality	T0HT00000000004200001
Vryheid	42 HT	2	Thembalethu Vryheid Communal Prop Assoc	T63818/2006	232.598	Seme Local Municipality	T0HT00000000004200002
Vryheid	42 HT	3	Greyling Cornelius Lourens	T41880/1976	159.072	Seme Local Municipality	T0HT00000000004200003
Vryheid	42 HT	4	Kerneels Greyling Trust	T56316/1984	159.072	Seme Local Municipality	T0HT00000000004200004
Vryheid	42 HT	5	Kerneels Greyling Trust	T56316/1984	159.072	Seme Local Municipality	T0HT00000000004200005
Vryheid	42 HT	6	Boven Trust	T12833/2011	159.072	Seme Local Municipality	T0HT00000000004200006
Vryheid	42 HT	7	Boven Trust	T12833/2011	131.159	Seme Local Municipality	T0HT00000000004200007
Vryheid	42 HT	8	Boven Trust	T12771/2011	159.072	Seme Local Municipality	T0HT00000000004200008
Naauwhoek	37 HT	0 (remaining extent)	Kerneels Greyling Trust	T12202/2012	514.115	Seme Local Municipality	T0HT00000000003700000
De Paarl	39 HT	0 (remaining extent)	Greyling Cornelius Lourens	T32241/1977	206.359	Seme Local Municipality	T0HT00000000003900000
De Paarl	39 HT	1 (remaining extent)	Boven Trust	T8190/2010	172.568	Seme Local Municipality	T0HT00000000003900001
De Paarl	39 HT	2	Greyling Cornelius Lourens	T32242/1977	171.306	Seme Local Municipality	T0HT00000000003900002
De Paarl	39 HT	3	Republic of South Africa	T98708/2007	128.480	Seme Local Municipality	T0HT00000000003900003
De Paarl	39 HT	Servitude of Portion 3	Greyling Cornelius Lourens		0.017	Seme Local Municipality	

FARM NAME	FARM NR	PORTION NUMBER	OWNER	TITLE DEED	EXTENT (HA)	LOCAL AUTHORITY	LPI CODE
Spitskop	41 HT	0 (remaining extent)	Kerneels Greyling Trust	T56316/1984	146.132	Seme Local Municipality	T0HT00000000004100000
Spitskop	41 HT	1 (remaining extent)	Greyling Cornelius Lourens	T41881/1976	193.434	Seme Local Municipality	T0HT00000000004100001
Spitskop	41 HT	2	Greyling Christina Jacoba	T32238/1977	234.771	Seme Local Municipality	T0HT00000000004100002
Spitskop	41 HT	3	Greyling Christina Jacoba	T32239/1977	234.793	Seme Local Municipality	T0HT00000000004100003
Spitskop	41 HT	4 (remaining extent)	Greyling Christina Jacoba	T32240/1977	144.493	Seme Local Municipality	T0HT00000000004100004
Spitskop	41 HT	5	Human Elsie Johanna	T31650/1951	234.807	Seme Local Municipality	T0HT00000000004100005
Spitskop	41 HT	6	Kerneels Greyling Trust	T56316/1984	41.298	Seme Local Municipality	T0HT00000000004100006
Spitskop	41 HT	7	Kerneels Greyling Trust	T336/2012	90.404	Seme Local Municipality	T0HT00000000004100007
Diepdal	59 HT	0 (remaining extent)	Kerneels Greyling Trust	T336/2012	438.523	Seme Local Municipality	T0HT00000000005900000
Diepdal	59 HT	1	Kerneels Greyling Trust	T336/2012	341.115	Seme Local Municipality	T0HT00000000005900001
Uitgedacht	56 HT	0	Kerneels Greyling Trust	T945/2012	633.375	Seme Local Municipality	T0HT00000000005600000
Zoogedacht	57 HT	0	Kerneels Greyling Trust	T945/2012	1073.342	Seme Local Municipality	T0HT00000000005700000
Bovenvallei	58 HT	0	Kerneels Greyling Trust	T945/2012	951.887	Seme Local Municipality	T0HT00000000005800000
Goedegeloof	77 HT	1	Siyaphumelela Farming CC	T55901/2006	340.259	Seme Local Municipality	T0HT00000000007700001
Zondernaam	78 HT	0 (remaining extent)	Barry Wessels Trust	T25994/1989	366.648	Seme Local Municipality	T0HT00000000007800000
Zondernaam	78 HT	1	Barry Wessels Trust	T25994/1989	366.648	Seme Local Municipality	T0HT00000000007800001
Dubbeldam	60 HT	0	Kerneels Greyling Trust	T945/2012	470.675	Seme Local Municipality	T0HT00000000006000000

1.3 LOCALITY MAP (SHOW NEAREST TOWN, SCALE NOT SMALLER THAN 1:250 000)

(Show nearest town, scale not smaller than 1:250000 attached.

Please refer to Appendix 3 for the Locality Maps for the project area.

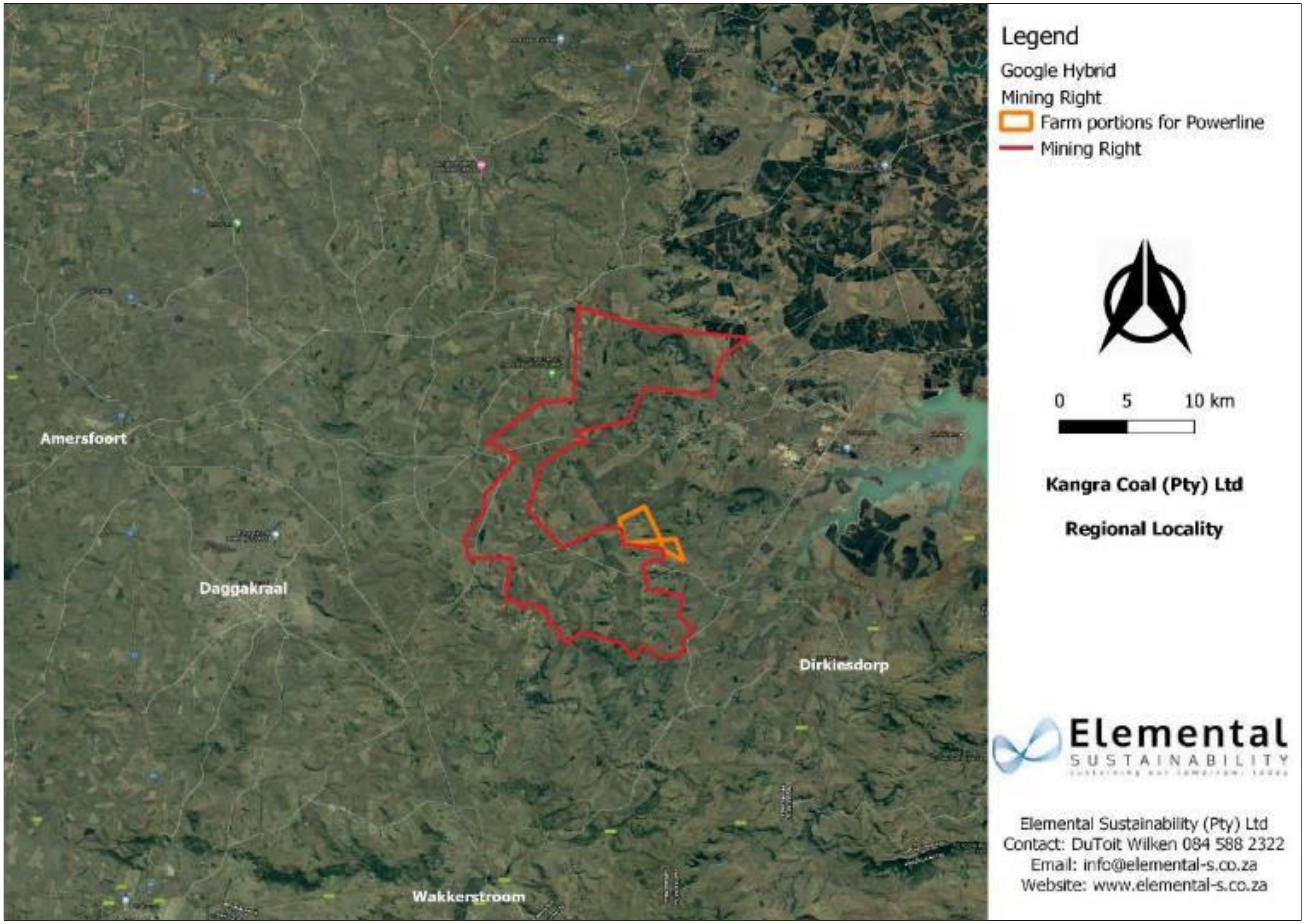

Figure 1: Regional Locality within the Mpumalanga Province

3 DESCRIPTION OF THE SCOPE OF THE OVERALL ACTIVITY

This section provides a detailed project description. The aim of the project description is to indicate the activities that are planned to take place at the Kangra T4 project area. Furthermore, the detailed mine/project description is presented to facilitate the understanding of the project related activities which result in the impacts identified and assessed and for which management measures have been proposed.

3.1 LISTED AND SPECIFIED ACTIVITIES

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

Refer to Appendix 4.

Table 4 below provides the listed and specified activities for the Kangra T4 project. Table 5 provides the description of the EIA Regulations Listed Activities.

Table 4: Listed and specified activities

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUHTORISATION
***(E.g. For prospecting to** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. for mining**, to excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)*	*Ha or m²*	*Mark with an X where applicable or affected*	*(GNR 327, GNR 325 or GNR 324) of 7 April 2017*	*(Indicate whether an authorisation is required in terms of the Waste Management Act).* ***(Mark with an X)***
Powerline	14km and 5mVA	X	Activity 19 of GNR 327 of 7 April 2017	-
Infrastructure (powerline, ventilation shafts and access roads)	14 km and 6 ha	X	Activity 28 of GNR 327 of 7 April 2017	-
Infrastructure (powerline, ventilation shafts and access roads)	14 km and 6 ha	X	Activity 30 of GNR 327 of 7 April 2017	
Mining Right Area	22,375.33 Ha	X	Activity 6 of GNR 325 of 7 April 2017	
Powerline Route	14km and 5mVA	X	Activity 9 of GNR 325 of 7 April 2017	-
Underground mining	2291 Ha	X	Activity 17 of GNR 325 of 7 April 2017	-
Ventilation Shafts	2 Ha x 3	X	Activity 4 of GNR 324 of 7 April 2017	-

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUHTORISATION
Access Roads	To be confirmed	X	Activity 12 of GNR 324 of 7 April 2017	-

Table 5: Description of the EIA Regulations Listed Activities

Legislation	Listed activities	Applicability of the activity	Competent Authority
	<u>GN 327 - Listing Notice 1:</u> • <u>Listing Notice 1 – Activity 19</u> Ventilation Shafts *The infilling or depositing of any material of more than **[5]** 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than **[5]** 10 cubic metres from **[–(i)]** a watercourse;* ***[(ii) the seashore; or (iii)the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or estuary, whichever distance is the greater—]*** *but excluding where such infilling, depositing, dredging, excavation, removal or moving—* *a) will occur behind a development setback;* *b) is for maintenance purposes undertaken in accordance with a maintenance management plan; **[or]*** *c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies*.	Ventilation Shaft	DMRE – Mpumalanga Province - DMRE – Mpumalanga Province
NEMA and the EIA Regulations, 2014, as amended (7 April 2017)	**<u>GN 327 - Listing Notice 1:</u>** • <u>Listing Notice 1 – Activity 28</u> Powerline, Ventilation Shafts and Access Road *Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.*	Powerline, Ventilation Shafts and Access Roads	
NEMA and the EIA	**<u>GNR 327 - Listing Notice 1:</u>** <u>Listing Notice 1 – Activity 30</u>	Ventilation Shafts,	

Regulations, 2014, as amended (7 April 2017)	Ventilation Shafts, powerline route and access roads are located in biomes that are threatened/vulnerable. *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).*	powerline route and access roads	
	<u>GNR 325 - Listing Notice 2:</u> • <u>Listing Notice 2 – Activity 6</u> Activities triggering a water use license application. *The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the NEM: WA 59 of 2008.*	This mining operation will require a Water Use License under the National Water Act	
NEMA and the EIA Regulations, 2014, as amended (7 April 2017)	**<u>GN 325 - Listing Notice 2:</u>** • <u>Listing Notice 2 - Activity 9</u> Powerline *The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —* *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c) within an existing transmission line servitude; and* *(d) will be removed within 18 months of the commencement of development*	Powerline	
	<u>GN 325 - Listing Notice 2:</u> • <u>Listing Notice 2 – Activity 17</u> Underground mining *Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including—* *(a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource **[,]** ; or* *(b) **[including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)]** the primary processing of a mineral resource including*	Mining	

	winning, extraction, classifying, concentrating, crushing, screening or washing; *but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.*		
	<u>GNR 324 – Listing Notice 3:</u> • <u>Listing Notice 3 – Activity 4</u> Road development in Mpumalanga within sensitive areas *The development of a road wider than 4 metres with a reserve less than 13,5 metres* ***f. Mpumalanga*** *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such areas comprise indigenous vegetation; or* • <u>Listing Notice 3 - Activity 12</u> Possible clearance of indigenous vegetation associated with the ventilation shafts or other sensitive features of the Eastern Highveld Grassland and Montane Grasslands *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.*	Access roads and ventilation shafts	
Legislation	**Listed activities**	**Applicability of the activity**	**Competent Authority**
NWA Section 21 Water Uses	<u>Water Use Activities Triggered:</u> • <u>Section21 a:</u> Abstraction of water • <u>Section 21 c:</u> Impeding or diverting the flow of water in a watercourse • <u>Section 21 i:</u>	Water Use Licence	Inkomathi Usuthu Catchment Management Agency

	Altering the bed, banks, course or characteristics of a watercourse • Section 21 j; 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.		

3.2 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

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

Refer to Appendix 4 for Master Layout

3.1.1 Background

The infrastructure at the Kangra Mine complex consists of three phases. The first is the existing infrastructure for the current mining and processing operation being conducted on the area of the 10200 MR (old ref 133 MR) Mining Right (Maquasa). The second phase infrastructure is for the mining and processing operations planned for the Kusipongo mining and processing operations. The operations will be conducted on the area for which a Mining Right has been granted on 31 March 2017 (reference number MP30/5/1/2/2/10099 MR). The third phase infrastructure will be for the T4 Project, which is included in this report.

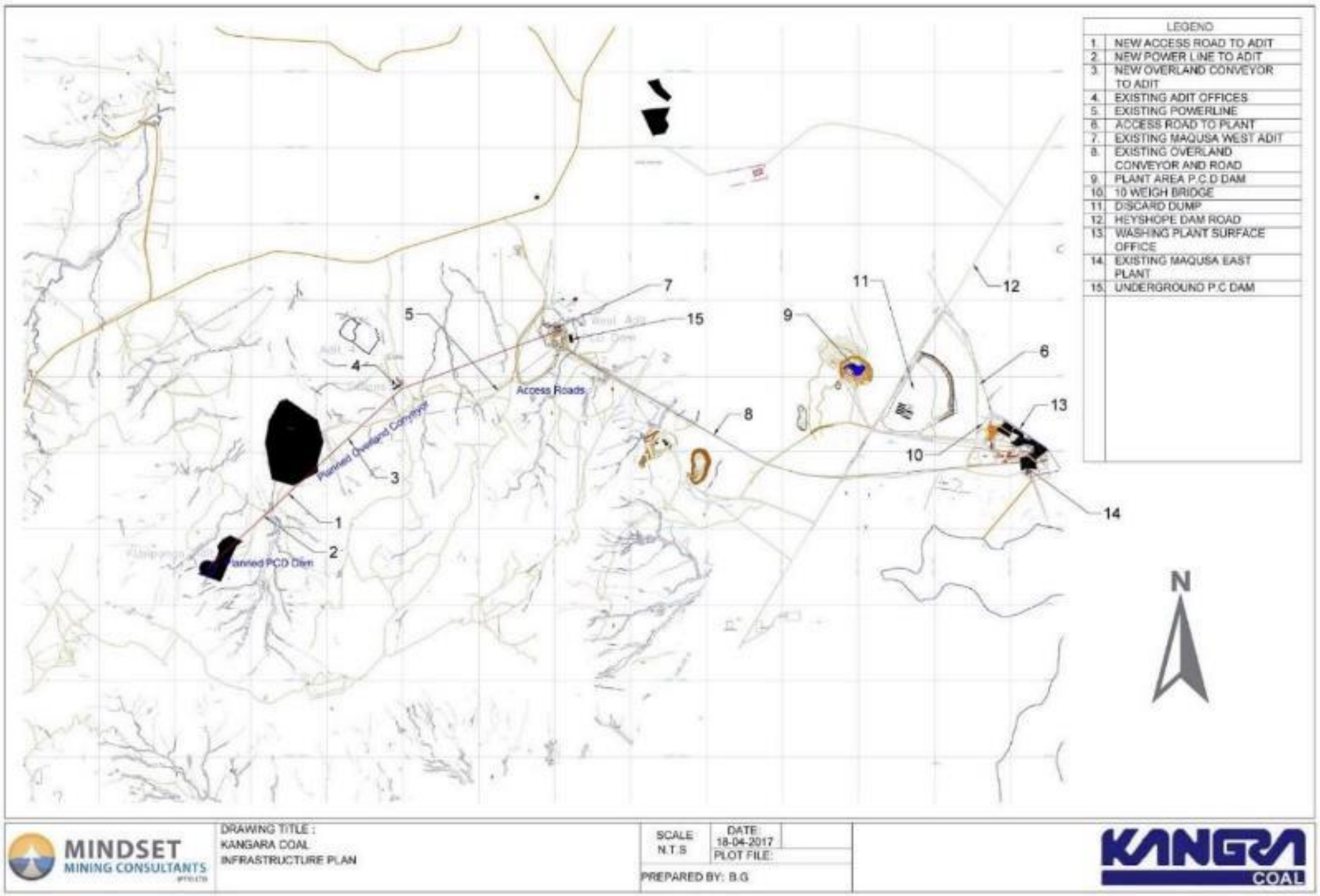

Figure 2: Kangra Mine Complex Layout

3.1.2 Mining Method

The T4 Project contains mainly an underground resource with potential for future opencast resources. The T4 Project underground resource area has high-quality coal in the Gus Seam at a seam thickness that can be mined economically by underground bord and pillar mining method. The total coal resource at the T4 Project, included in the MWP will be mined by underground mining methods, utilising continuous miners and shuttle cars.

The current Maquasa Mining Right area (10200 MR (old ref 133 MR)) will be mined up to August 2021. Mining operations will start at the Kusipongo Project (MP30/5/1/2/2/10099 MR) in March 2021, with the establishment of the access adit and related infrastructure. As the production at the Kusipongo Project ramps down, the production at the T4 Project will ramp up and by 2028, the total production will be from the T4 Project.

The T4 Project has a total underground ROM reserve of 15.69 Mt. The T4 Project underground resource to reserve conversion with the modifying factors is shown in Table 6. Based on the ROM and product production schedule, as shown in Table 9, an export product can be produced for 23 years at ~ 56,000 tpm. During the underground coal production period from the T4 Project, additional exploration work, and mine planning will be conducted, to determine the economic viability of producing opencast coal from Target Area 2B and Target Area 6. If opencast mining proves economically viable in these areas, the opencast resources could extend the life of the T4 Project up to 30 years from the current planned 23 years of underground mining. The MWP, however, only includes underground mining operations. The mining schedule for the underground was designed to allow for three production sections and a stone development section, which is considered practically for the resource area and a relatively sharp ramp-down of production at the end of the Project life.

3.1.3 Resource Conversion

The resource was converted to reserves by firstly applying cut-off parameters. These cut-off parameters were a minimum seam thickness of 1.4 m and a minimum VM of 16 % (refer to Table 6).Table 7 provides the ROM reserve qualities and Table 9 indicates the distribution of the Gus Seam in the T4 Project area before the cut-off parameters were applied. Figure 3 indicates the Gus Seam distribution after the cut-off parameters were applied.

Table 6: Project Underground Resource to Reserve Conversion

ROM Reserve Estimation										
Seam	**GTIS (Mt)**	**Cut-off Losses (Mt)**	**MTIS (Mt)**	**Layout Loss (Mt)**	**MEE (5 %) (Mt)**	**Geological Loss (15 %) (Mt)**	**Mining Loss (5 %) (Mt)**	**Dilution (5 %) (Mt)**	**Moisture (5 %) (Mt)**	**ROM Reserve (Mt)**
Gus	122,500,000	74,766,013	47,733,987	26,085,537	2,386,699	7,160,098	2,386,699	2,386,699	2,386,699	14,488,353
Total T4	**122,500,000**	**74,766,013**	**47,733,987**	**26,085,537**	**2,386,699**	**7,160,098**	**2,386,699**	**2,386,699**	**2,386,699**	**14,488,353**

Table 7: ROM Reserve Qualities

ROM Reserve Qualities						
Seam	**CV (MJ/kg)**	**IM (%)**	**Ash (%)**	**VM (%)**	**TS (%)**	**FC (%)**
Gus	24.7	2.4	20.8	20.1	0.8	55.9

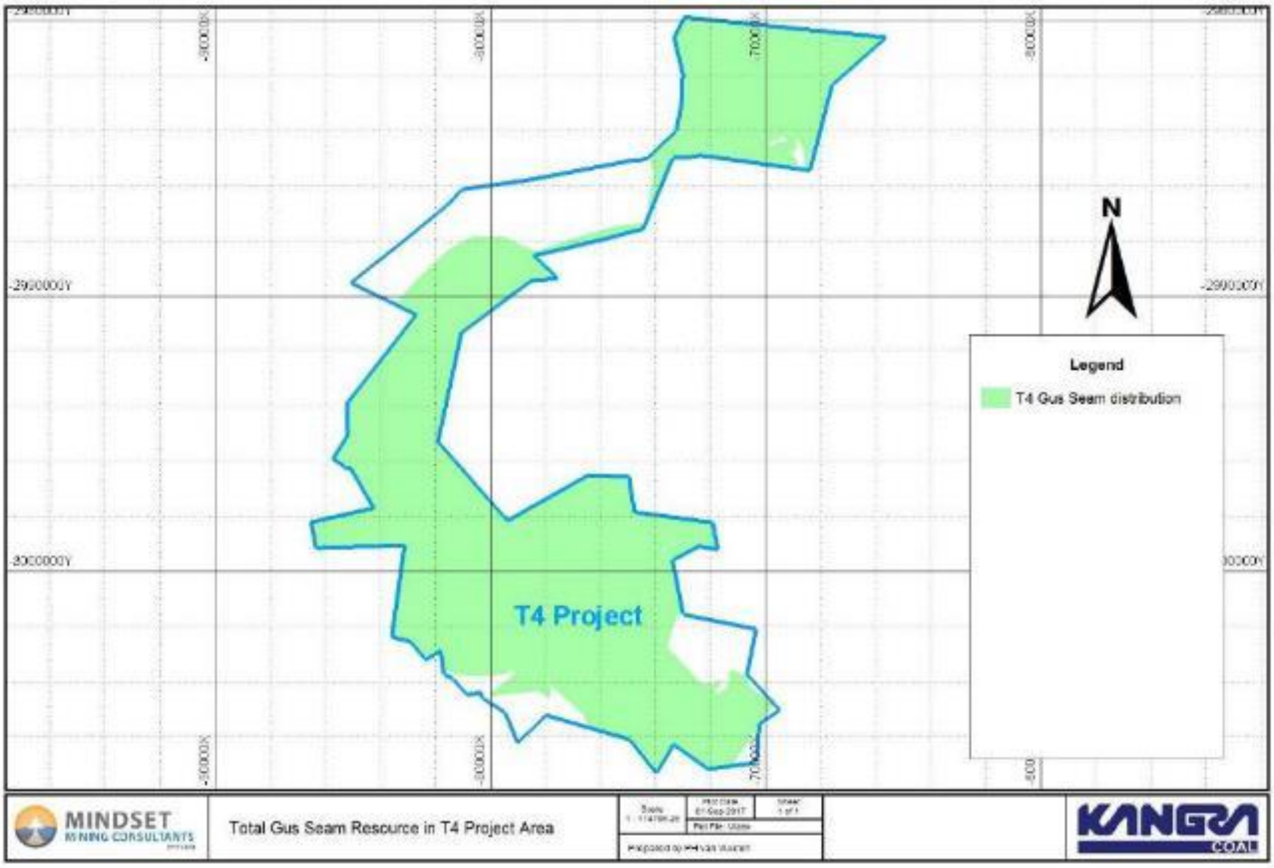

Figure 3: Gus Seam Distribution Prior to Cut-Off Parameters

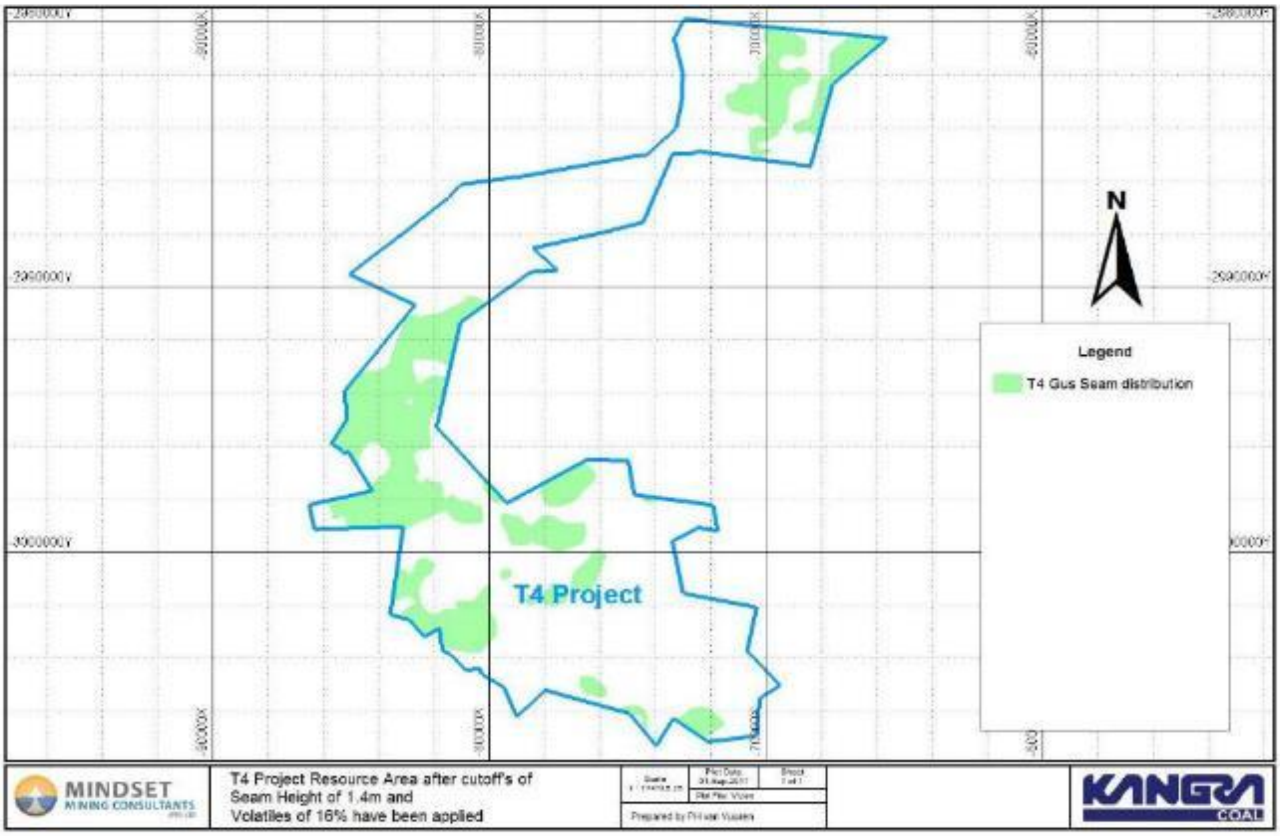

Figure 4: Gus Seam Distribution Post Cut-Off Parameters

3.1.4 Mine Design

The general arrangement of the Kangra Coal Mine complex areas is shown in Table 5. The Kangra Mine ROM coal is currently conveyed or hauled to the existing ROM stockpile at the CHPP, utilising the existing road and conveying infrastructures. This will continue ~~to~~ when the reserves at the current mining area and the Kusipongo Project are depleted, and production commences from the T4 Project. The ROM coal from the T4 Project underground mining operations will be conveyed to the existing ROM stockpile at the CHPP. For this purpose, a new overland conveyor will be constructed from the new adit, to be established at the Kusipongo Project. The newly established adit will serve the T4 Project.

The production from the T4 Project will be by underground mining board and pillar mining methods, utilising continuous miners and shuttle cars, with roof bolters for roof support. The production will be from primary advance mining and no secondary pillar extraction will be applied. The design of the underground pillars will be to a safety factor that will ensure no collapse of pillars or surface subsidence is anticipated.

No blasting will be applied in the production of coal. Blasting will only be applied when development is required through dykes and faults encountered during the mining operations. A specialised stone development section will be deployed to conduct all stone development work. The average area of the faces to be blasted during the stone development will be 5.5 m wide by 2.0 m high, with the advance per blast planned on 1.8 m. The volume of stone to be blasted per face will be ~ 20 m^3 and it is planned for one blast per day during weekdays.

3.1.5 Resource Statement

The T4 Project contains mainly an underground resource with potential for future opencast resources. The T4 Project underground resource area has high-quality coal in the Gus Seam at a seam thickness that can be mined economically by underground bord and pillar mining method. The total coal resource at the T4 Project, included in the MWP will be mined by underground mining methods, utilising continuous miners and shuttle cars.

The current Maquasa resource (MR10200 old ref MR133) will be mined up to August 2021. Mining operations will start at the Kusipongo Project in March 2021, with the establishment of the access adit and related infrastructure. As the production at the Kusipongo Project ramps down, the production at the T4 Project will ramp up and by 2028, the total production will be from the T4 Project. The T4 Project has a total underground ROM reserve of 15.69 Mt. The T4 Project underground resource to reserve conversion with the modifying factors is shown in Table 8.

Table 8: ROM Reserves Estimation

	ROM Reserve Estimation									
Seam	GTIS (Mt)	Cut-off Losses (Mt)	MTIS (Mt)	Layout Loss (Mt)	MEE (5 %) (Mt)	Geological Loss (15 %) (Mt)	Mining Loss (5 %) (Mt)	Dilution (5 %) (Mt)	Moisture (5 %) (Mt)	ROM Reserve (Mt)
Gus	122,500,0	74,766,0	47,733,9	26,085,5	2,386,6	7,160,1	2,386,7	2,386,7	2,386,7	14,488,3
Total T4	**122,500,**	**74,766,0**	**47,733,9**	**26,085,5**	**2,386,6**	**7,160,1**	**2,386,7**	**2,386,7**	**2,386,7**	**14,488,3**

Based on the ROM and product production schedule, as shown in Table 8, an export product can be produced for 23 years at ~ 56,000 tpm. During the underground coal production period from the T4 Project, additional exploration work, and mine planning will be conducted, to determine the economic viability of producing opencast coal from Target Area 2B and Target Area 6. If opencast mining proves economically viable in these areas, the opencast resources could extend the life of the T4 Project up to 30 years from the current planned 23 years of underground mining. The MWP, however, only includes underground mining operations. The mining schedule for the underground was designed to allow for three production sections and a stone development section, which is considered practically for the resource area and a relatively sharp ramp-down of production at the end of the Project life.

The above results in the period required for completion of the underground reserves of 23 years. This excludes any potential opencast mining. The annual underground coal production profile for the Gus Seam relevant to the T4 Project is shown in Figure 5. The annual sales tonnes are shown in Figure 6.

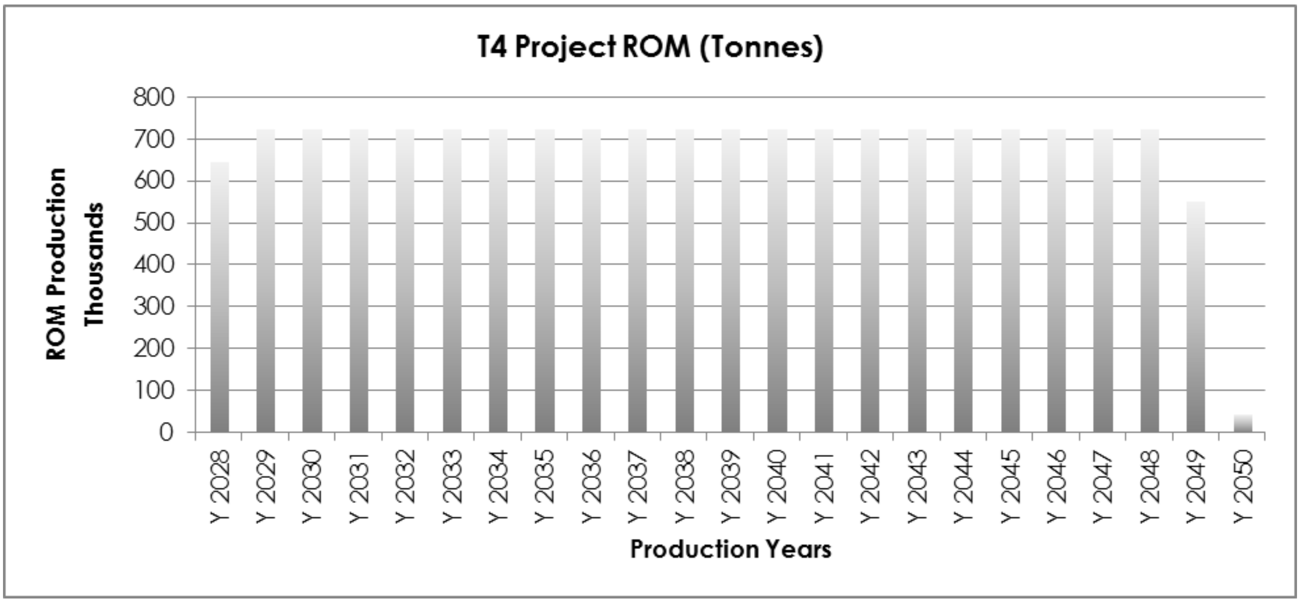

Figure 5: Annual ROM Coal Production - Gus Seam

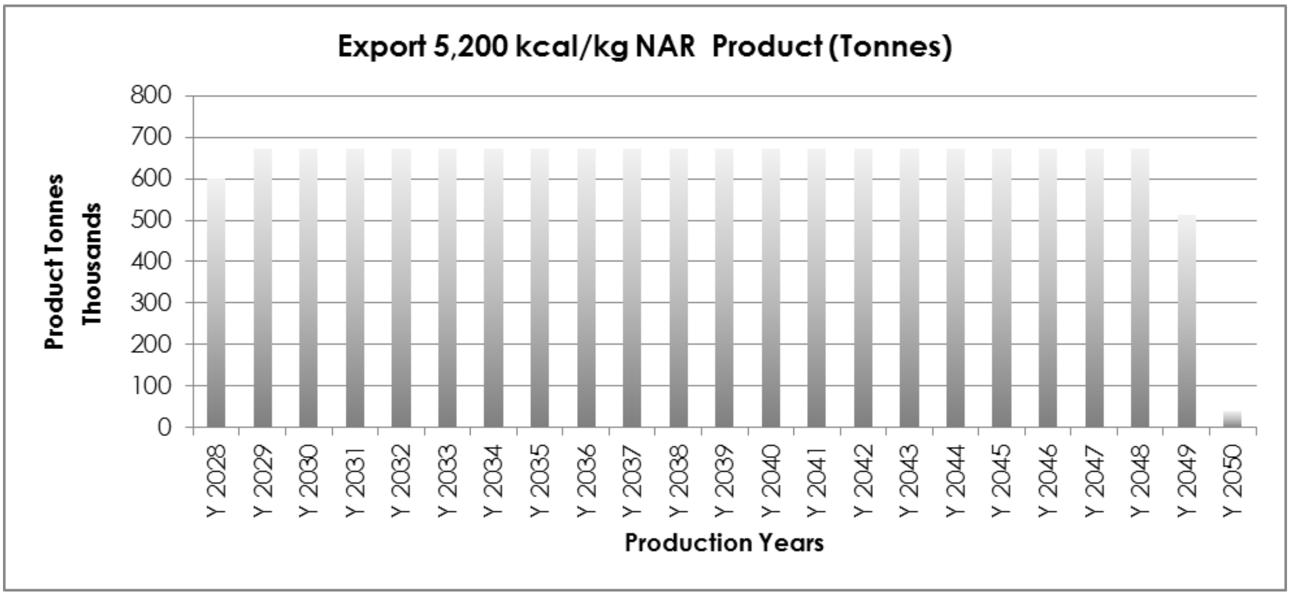

Figure 6: Annual Sales Tonnes – Gus Seam

Table 9: Mining Production Build-up and Schedule

Product	Development Year 2024-2027	Year 2028	Year 2029	Year 2030	Year 2031	Year 2032	Year 2033	Year 2034	Year 2035	Year 2036	Year 2037	Year 2038	Year 2039
T4 ROM (t)	1,432,091	645,902	722,700	722,700	722,700	722,700	722,700	722,700	722,700	722,700	722,700	722,700	722,700
Export Yield (%)	-	93	93	93	93	93	93	93	93	93	93	93	93
Middlings Yield (%)	-	-	-	-	-	-	-	-	-	-	-	-	-
Export Product (t)	-	600,689	672,111	672,111	672,111	672,111	672,111	672,111	672,111	672,111	672,111	672,111	672,111
Export Product CV (MJ/kg)		23.90	25.05	26.29	26.60	26.05	25.50	24.06	23.56	24.55	24.13	24.29	25.18
Total Middlings (Tonnes)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Product (Tonnes)	**-**	**600,689**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**

Product	Year 2040	Year 2041	Year 2042	Year 2043	Year 2044	Year 2045	Year 2046	Year 2047	Year 2048	Year 2049	Year 2050	Total
T4 ROM (t)	722,700	722,700	722,700	722,700	722,700	722,700	722,700	722,700	722,700	552,122	42,621	**15,694,645**
Export Yield (%)	93	93	93	93	93	93	93	93	93	93	93	
Middlings Yield (%)	-	-	-	-	-	-	-	-	-	-	-	
Export Product (t)	672,111	672,111	672,111	672,111	672,111	672,111	672,111	672,111	672,111	513,474	39,637	**14,596,020**
Export Product CV (MJ/kg)	25.20	24.98	24.74	24.60	24.41	24.09	23.62	23.48	23.63	23.58	23.10	
Total Middlings (Tonnes)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Total Product (Tonnes)	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**672,111**	**513,474**	**39,637**	**14,596,020**

3.1.6 Coal Handling and Processing Plant Infrastructure

There is a fully functional and licensed, Coal Handling and Processing Plant (CHPP) at the Kangra Mine (133 MR) complex, which has adequate capacity to process the coal to be produced from the Kangra Coal T4 Project. The CHPP includes the following infrastructure:

- A plant Run of Mine (ROM) stockpile with plant feed system and Product Stockpile
- A screening and crushing section;
- Dense Medium Separation (DMS) plant;
- Spiral plant;
- Discard dump;
- Pollution Control Dam (PCD); and
- Clean water cut-off canals around the CHPP area.

The coal from the T4 Project Gus Seam will be processed in the existing Kangra Mine CHPPs. Due to the high-quality of the ROM coal produced from the T4 Project; the yield for the planned 5,200 kcal/kg (NAR) product is estimated to be between 90 % and 95 %. No middling product is expected to be produced from the discard due to the high yield of the primary product. The current CHPPs have more than sufficient capacity to wash the planned ROM tonnes produced per month.

The existing Kangra Mine CHPPs consist of the following:

- A front-end ROM screening, crushing and handling plant;
- Two dense medium washing plants that are used to wash the primary product;
- A third discard retreatment plant for producing a middling product;
- Product screening and handling plant;
- Discard handling plant; and
- Product stockpiles.

The two primary product washing plants have a nominally ROM feed capacity of 320 tonnes per hour (tph) each. The washing plants will be used to produce a primary (minus) – 50 mm export product and no domestic product is planned to be produced. The 320 tph capacity of the each of the primary two plants has ample capacity to wash the ROM coal to be produced from the T4 Project.

3.1.6.1 Basic Plant Design

3.1.6.1.1 <u>Front-End Feed, Crushing and Screening</u>

The front-end crushing and screening consist of the following:

- Feeder breaker: 800 tph capacity **|** 400 mm ROM feed size **|** Delivery size 200 mm
- Primary crusher: 800 tph capacity **|** Feed size 200 mm **|** Delivery size 100 mm
- Secondary crusher: 800 tph capacity **|** Feed size 100 mm **|** Delivery size 50 mm
- Plant feed preparation double deck wet screen, 320 tph capacity that screens out:

- 15 mm to 1.0 mm size fraction
- mm size fractions
- (Plus) + 15 mm to 50 mm size fraction

The – 400 mm ROM coal is fed into the feeder breaker that feeds a – 200 mm product to the primary crusher. The coal delivery from the primary crusher is at – 100 mm, which is fed to the secondary crusher where the raw coal is reduced to – 50 mm, which is the top size fed into the washing plants.

3.1.6.1.2 DMS Plants

The two primary product washing plants and the discard retreatment plant consist of the following:

- A 900 mm DMS cyclone for washing the 15 mm by 50 mm coarse fraction
- A 800 mm DMS cyclone for washing the 1.0 mm to 15 mm size fraction
- De-sliming cyclone for separating the – 212 micron fraction producing a + 212 micron to 1.0 mm size fraction, which will be treated in the spiral plant
- Spiral plant for washing the 212 micron to 1.0 mm size fraction
- Correct medium and dilute medium circuits
- Water clarification and reticulation system
- Dense medium, dilute medium, and raw water pumps

Each of the two primary product washing plants is capable of washing the total ROM production from the T4 Project. Only one plant will be utilised to wash the ROM coal from the T4 Project.

The 15 mm to 50 mm coarse fraction, which constitutes ~ 47 % of the raw plant feed, will be fed to the 900 mm cyclone where the raw coal will be washed to produce a 5,200 kcal/kg (NAR) product. This product will be conveyed to the product stockpile. The 1.0 mm to 15 mm size fraction, which constitutes ~ 38% of the raw plant feed, is fed to the 800 mm cyclone where the raw coal will be washed to produce a 5,200 kcal/kg (NAR) product. This product will be conveyed to the same product stockpile as the coarse fraction.

3.1.6.1.3 Fine Coal Processing Plants

The – 1.0 mm size fraction will, which constitutes ~ 15 % of the raw feed, will be fed to the fines cyclone where the – 212 micron slimes fraction will be separated out. The +212 micron to 1.0 mm size fraction will be fed to the spiral plant where the raw fines will be washed to produce a 5,200 kcal/kg (NAR) product. This product will also be conveyed to the product stockpile.

The – 212 micron slimes is pumped to a tailings thickener pond from where 65 % of the underflow is dried through a hydraulic filter press into filter cake and 35 % is pumped to the discard dump. The filter cake will either be conveyed to the product stockpile or discarded together with the discard from the DMS and spiral plants. The water recovered from the filter press is reused in the washing plant. A block flow diagram of the CHPP is shown in Figure 7. The beneficiation facilities described above, that are currently in operation at the Kangra Mine site and will be utilised to wash the ROM coal described in the MWP (Refer to Appendix 19).

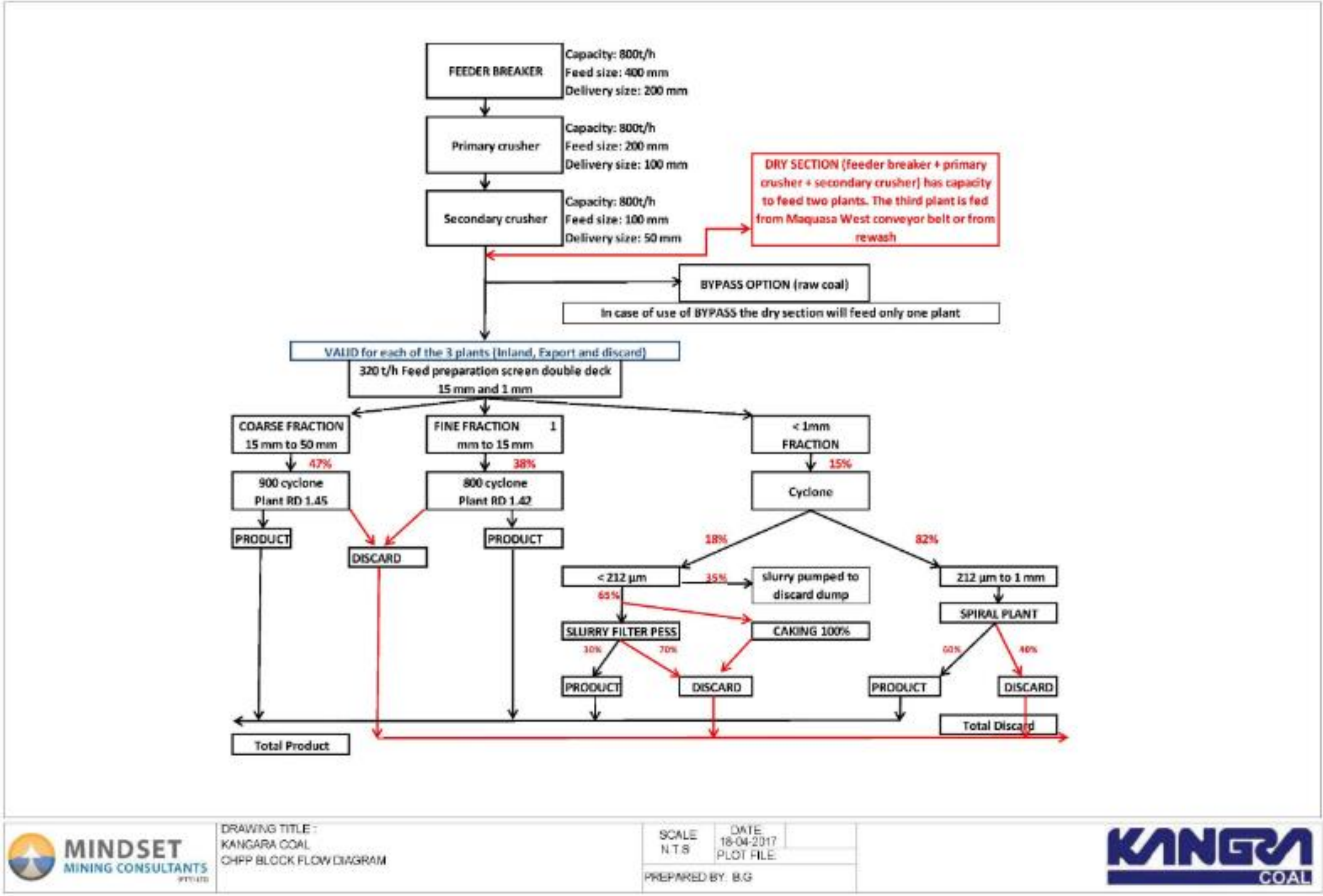

Figure 7: Kangra Processing Plant Block Flow Diagram

3.1.7 Product Handling

The product coal will be loaded onto road haul trucks at the product stockpile at the Kangra Mine CHPP and transported over a distance of 29 km to the siding at Panbult. The coal transport is conducted by a contractor (SG Coal) in 40-ton truck-trailer combinations. The transport capacity is constrained by the weighbridge capacity, which limits road hauling to 10,000 tonnes per day. The current transport schedule is to move 8,000 tonnes of duff per day (one export train) and 2,000 tonnes of peas per day (one inland train).

During the life of the T4 Project, the daily road and rail transport will be between 2,500 and 3,000 tonnes per day. The coal will be railed to the Richards Bay Coal Terminal (RBCT).

3.1.8 Efficiency of the Process

The T4 Project is based on the production and sale of coal to the export markets. The capacity for the primary two washing plants is 320 tph each. At 4,000 operating hours per annum, the two primary CHPPs at Kangra Mine can each process ~ 1.2 million ROM tpa. The current Kangra Mine CHPPs have more than sufficient capacity to wash the T4 Project coal and the designs of these plants are ideally suited to process the T4 Project coal. The practical yield is estimated to be ~ 93 %.

3.1.9 Coal Quality Control during Screening and Crushing

Coal samples are taken to monitor plant product qualities. This allows process adjustments to be made to improve quality where possible and assists in the efficient stockpiling and blending of product coal. The current coal sampling regime is as follows:

- Plant feed sample composited for 24 hours;
- Export product sample composited every two hours;
- Metallurgical product sample composited every two hours; and
- Discard samples collected every hour and composited for 24 hours.

3.1.10 On-Site Laboratory

There is an existing on-site laboratory at Kangra Coal Mine complex and will be utilised of analyses of the Kangra T4 coal. The laboratory carries out the following analyses on a continual basis during plant operations, based on the quality-sampling regime:

- Total Moisture (TM);
- CV;
- Proximate Analysis;
- Sulphur Analysis;
- Size Analysis;
- Abrasiveness Index (AI); and
- Hardgrove Grindability Index (HGI).

3.1.11 Mining Products

Kangra Coal currently sells coal to both the domestic and the international markets. The coal mined from the T4 Project will be processed to produce an export product with a CV of 5,200-kcal/kg (NAR). This product is planned to be sold to the international market through Kangra Coal's Richards Bay Coal Terminal (RBCT) shareholder allocation.

Where practical, the discard from this product will be rewashed to produce a product for the domestic market with a CV of between 19.0 MJ/kg and 20 MJ/kg. However, the washability analysis, conducted as part of the analysis of the exploration boreholes, indicated that a very high yield will be obtained from washing for a 5,200 kcal/kg (NAR) CV product. The yield, when washing for the domestic product, will be negligible. Table 10 reflects the intended market and annual product tonnes.

Table 10: Annual Product Table

Product	Tonnes per Annum (average)	Proportion (%)
Export Product	672,111	100
Total	**672,111**	**100**

Any middling product that can be economically produced will be sold locally. The following product options are planned:

- Export:
  - A 5,200 kcal/kg (NAR) CV thermal product
  - This product will only be produced from the Gus Seam
- Local Market:
  - A 19.0 MJ/kg to 20.0 MJ/kg CV product
  - This product will also only be produced from the Gus Seam

The raw coal qualities at T4 Project are good and high yields are forecast for the 5,200 kcal/kg (NAR) CV export product. However, due to the fluctuating nature of the export market thermal coal prices, some of the coal planned for the export market could be diverted and sold into the domestic market. The product CV specifications could then be adjusted.

Furthermore, the advantages for Kangra Coal producing an export product are:

- RBCT allocation of 1.6 million tonnes per annum (Mtpa);
- There is an existing siding located close to the Kangra Mine operations that is currently utilised for railing coal;
- Kangra Coal has been selling coal into the export market for an extended period;
- The product is in demand in the export market;
- The product requires a predominantly single-stage washing process;
- The option produces the highest internal rate of return (IRR) and net present value (NPV); and

- Initiation of the Project requires lower capital expenditure.

Kangra Coal currently sells coal to a number of clients, both locally and internationally. The clients that have been supplied with coal, currently and in the past, are:

- International Clients:
  - Glencore, Bulk Trading, IMR, CBB Energy and OSHO
- Domestic Clients:
  - Total Coal SA, Pongola Mill, Mondi, NAC, NTE, Flamite, SAPPI, Charka and Valley view.

3.1.12 Building Infrastructure

The following building infrastructure exists at the Kangra Mine complex:

- Offices
- Stores
- Workshops
- Security buildings and fencing
- Parking areas
- Washbays
- Change house
- Lamp room
- Sewage plant

The infrastructure listed above will be fit for use for the Kangra Coal T4 Project.

3.1.13 Main Power Supply

There is an existing power supply from Eskom at the Kangra Mine (133 MR) complex. The power is supplied at 22 kilovolt (kV) and is transformed from 22 kV to 1,000 volt (V) and 400 V through the installation of a substation. Power is distributed from the main supply to the CHPP and the underground shaft areas, as and when required.

The existing main power supply is adequate for the T4 Project. As indicated above a 5MVA powerline will be required for power to the ventilation shafts.

3.1.14 Water Supply

Potable water is already supplied to the Kangra Mine (133 MR) complex from water extracted from the Heyshope Dam and treated in the existing water treatment plant. Make-up water for the CHPP is supplied from underground water that is the result of groundwater inflow into the mining works. This water is pumped to the surface PCDs from where the CHPP draws its make-up water.

3.1.15 Surface Water Management

The current mining areas and the CHPP area each have its own water management infrastructure. Within each operational area, existing dirty water capturing drains allow dirty water to be collected in sumps and either gravitated or pumped to the PCD at the CHPP. The water captured in the PCD is used for dust suppression along the haul roads and at the ROM stockpile area. Natural evaporation takes place, which also reduces the water contained in the PCD. No dirty water is released into any natural waterway.

3.1.16 Fuel and Lube Facilities

At the Kangra Mine (133 MR) complex, the following facilities have been established:

- Diesel bay area;
- Washbay area with a silt trap and oil separator;
- Oil, gas, and chemical store; and
- Waste management slab for the placing of the necessary waste disposal bins.

These facilities were constructed in accordance with the designs as shown in

Figure 8. Each facility is designed to ensure that water contaminated with hazardous fluids (diesel and other lubricants used on site) is captured and channelled to the oil separation plant for purification prior to being pumped to the PCD. The oil recovered from the purification process will be stored in oil containers and disposed of according to the existing Waste Management Plan.

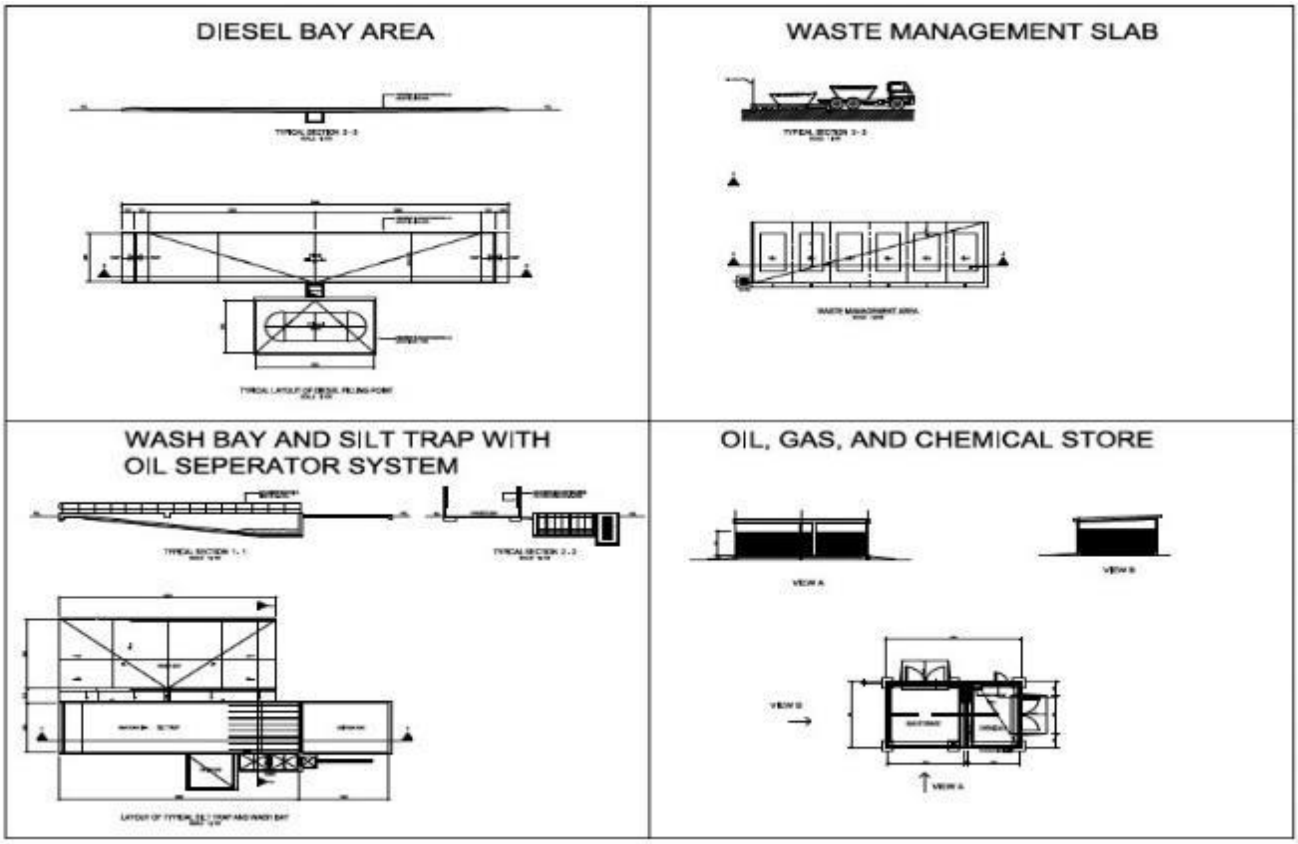

Figure 8: Fuel and Lube Facilities

3.1.17 Access Road

The Kangra Mine (133 MR) complex area is well served by paved provincial and district roads, as shown on the

Figure 9. The main road serving the area is the N2 national road that runs in a north-west to south-east direction, approximately 20 km to the north-east of the Mine complex. The paved Heyshope road links the mine complex with the N2 national road.

Based on the roads that serve the T4 Project area and the existing access road to the Kangra Mine complex, no further access roads need to be constructed. The road weighbridges, required for weighing the product coal loaded for road transport to the respective rail siding for railing to the markets, have been installed at the main gate leading into the Mine complex.

The facilities are maintained within the care and maintenance strategy of the Kangra Mine complex to ensure operational readiness for when the T4 Project commences. The fuel and lube facilities have been established at the CHPP complex.

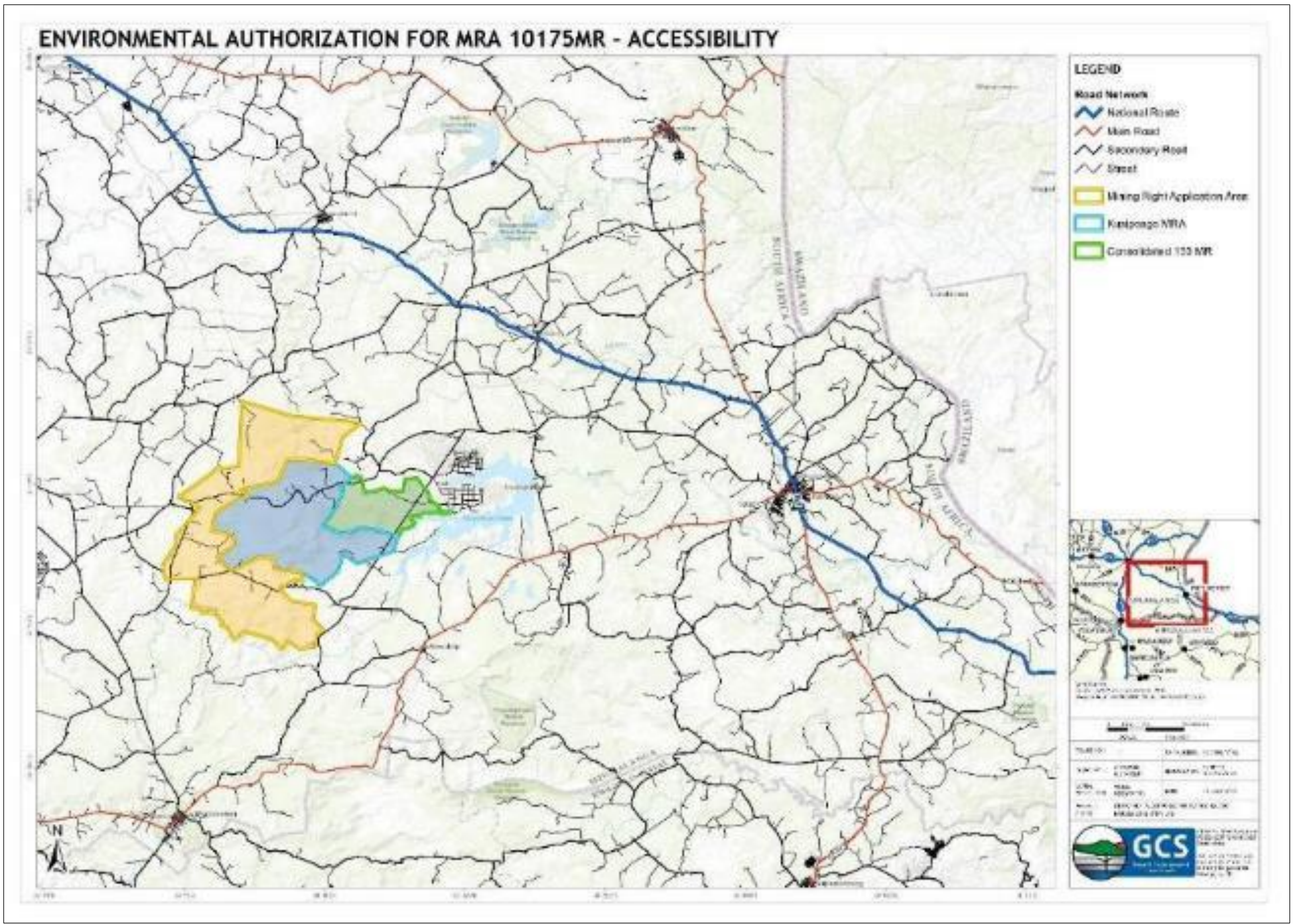

Figure 9: T4 Project Road Network

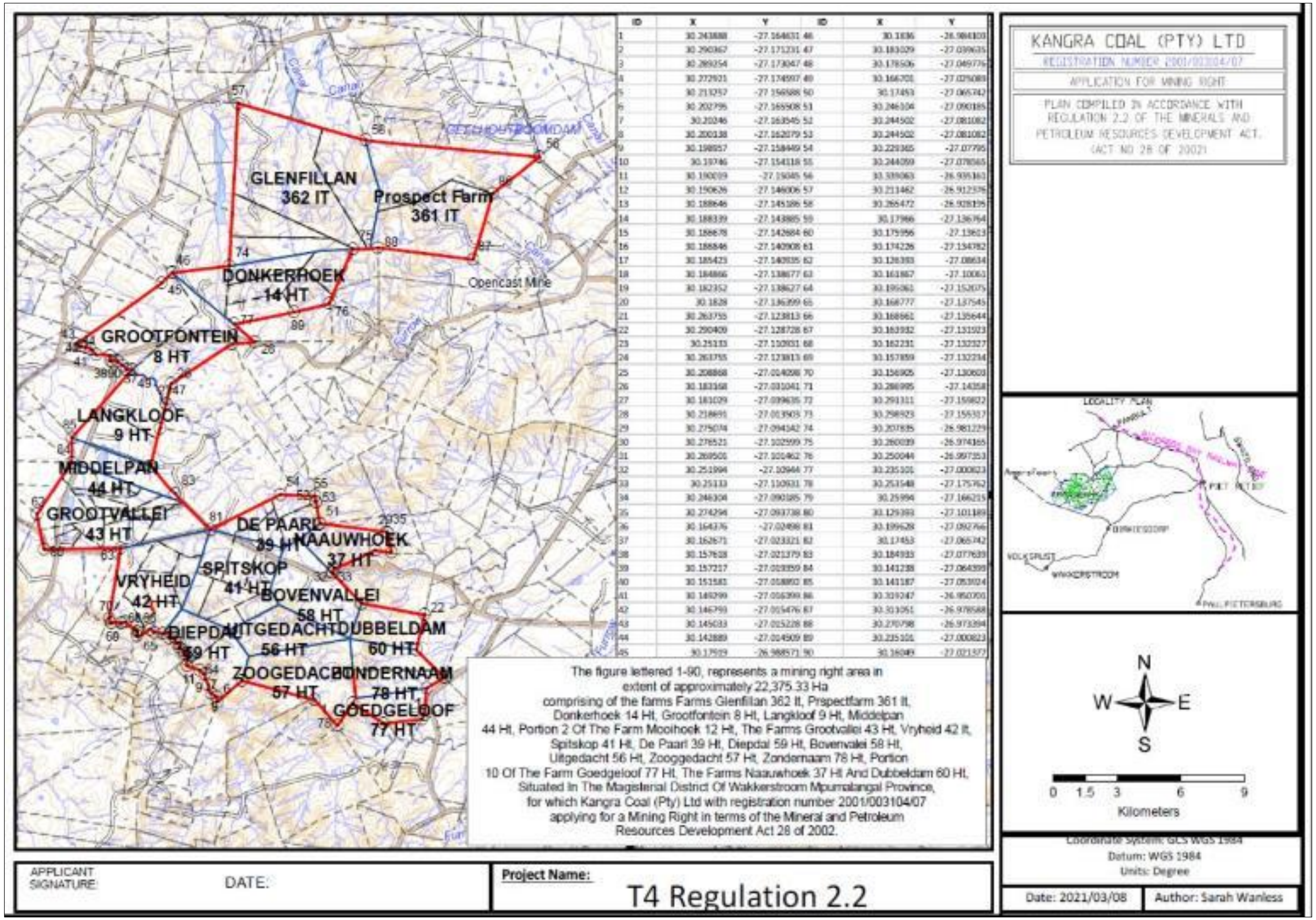

Figure 10: Regulation 2(2) Map

3.1.18 New Infrastructure for the Kangra Coal T4 Project

The T4 Project is planned as an underground mining operation only and the underground mining area will be accessed from the underground workings planned for the Kusipongo Project. The infrastructure required is therefore based on servicing an underground mine, which will be an underground extension of the Kusipongo Project underground workings. The surface infrastructure required for processing coal from the T4 Project has already been established for the current operations in the 133 MR Mining Right area and the surface infrastructure required for access to the underground mining for the Kusipongo Project will be utilised, unchanged, by the T4 Project.

The underground mining operations for the Target Area 4 will be accessed by developing a main panel from the western boundary of the Kusipongo Project underground workings. The coal mined from the T4 Project will be conveyed to the surface through the Kusipongo Project adit by means of the underground conveyor system established for the Kusipongo Project. Underground men and material transport for the T4 Project will utilise the travel roads established in the Kusipongo Project for access to and from the Kusipongo adit.

The Kusipongo Project ventilation system will be used to ventilate the underground workings of the T4 Project. Additional down cast ventilation shafts are planned for establishment on the T4 Project underground workings.

The following infrastructure will be required for the T4 Project:

- An extension of the Kusipongo Project underground main trunk conveyor into the T4 Project underground area will be required;
- Extension of the power supply system into the T4 Project underground area and a 14km 5MVA powerline above ground for the ventilation shafts;
- Extension of the water supply system into the T4 Project underground area as well as extension of the excess underground water system for pumping water out from the underground;
- An extension of the Kusipongo Project ventilation system to the T4 Project is required; and
- Underground refuge bays.

The development of the main underground access panel to the T4 Project will be completed over a four-year period. During this development, the above-mentioned infrastructure will be established on Kusipongo. The layout for the Kangra T4 coal project is provided in Figure 11.

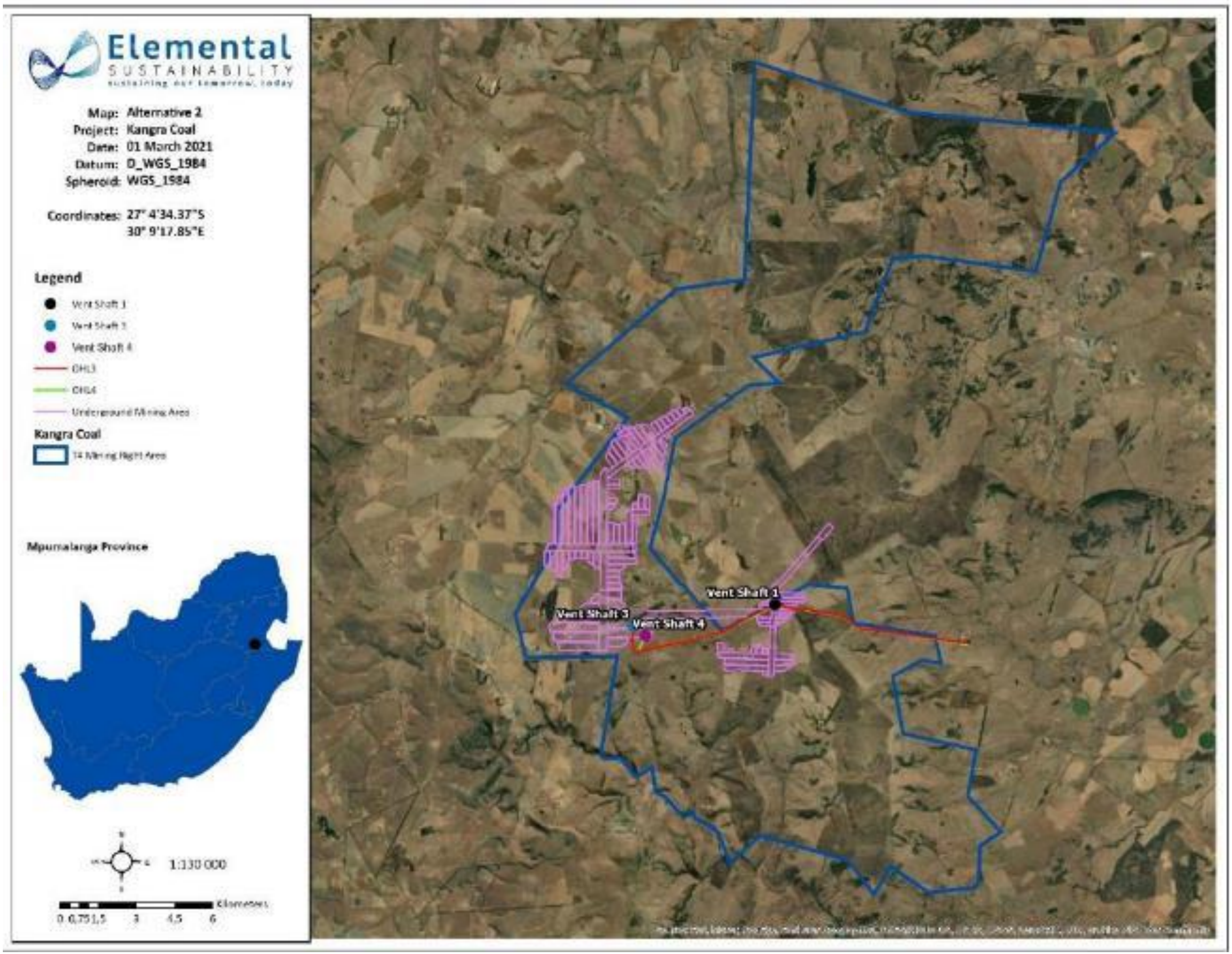

Figure 11: Proposed Kangra T4 coal mine project layout

3.3 EXISTING AND PROPOSED ACTIVITIES

Kangra Coal is the holder of the Mining Rights with the reference numbers MP 30/5/1/2/2/10200 MR (Old ref MR133) and MP30/5/1/2/2/10099 MR, granted on 31 March 2017. Kangra Coal holds the Prospecting Rights with the reference numbers MP 30/5/1/1/2/535 PR and MP 30/5/1/1/2/605 PR. Copies of the Prospecting Rights are included as Appendix 21.

The T4 Project, is part of the life extension of the Kusipongo Project (MP 30/5/1/2/2/10099 MR). The Kusipongo Project, in turn, is a life extension of the MP 30/5/1/2/2/10200 MR operations and is covered by Prospecting Rights MP 30/5/1/1/2/535 PR and MP 30/5/1/1/2/605 PR.

Proposed activities will be those as applied for with this Mining Right application and associated Environmental Authorisation (this document).

4 POLICY AND LEGISLATIVE CONTEXT

Relevant South African legislation requires various authorisations prior to the commencement and future re-opening of the project. Although cognisance of all applicable legislation is being taken, Table 11 details the relevant environmental authorisations, which are required:

Table 11: Policy and Legislative Context

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
Constitution of South Africa, 1996 (Act No. 108 of 1996) [as amended] • *Section 24* *Environment: 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-* *i) prevent pollution and ecological degradation;* *ii) promote conservation; and* *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	The proposed development has the potential to harm the environment and poses a risk to the health and wellbeing of people. The development however, also has the potential to secure sustainable development through reusing process products and thereby limiting the use of natural resources. The Applicant has the overall responsibility to ensure that the rights of people in terms of Section 24 of the Constitution is protected in terms of the proposed development activity.
National Environmental Management Act (No. 107 of 1998) [as amended] • *Section 28 (1)* *Duty of Care and responsibilities to minimise and remediate environmental degradation.*	The Applicant is the developer and overall responsibility of the mine rests with him, especially in terms of liabilities associated with the operational phase.
EIA Regulations, 2014 (Government Notices 982 -984) [as amended] *The proposed construction, operational and closure activities of the proposed development triggers listed activities that are listed in the EIA regulations for which a Scoping and Environmental Impact Assessment (EIA) process have to be conducted:* Listing Notice 1, 2 & 3 have been triggered by the Kangra T4 project. .	The proposed development requires an application for a mining right. A NEMA application has been submitted to the DMRE (This application).
EIA Regulations, 2017 (Government Notices 982 -984) *Chapter 6: Regulation 39 to 44: Public Participation;* *Chapter 4: Application for Environmental Authorisation:* *Part 3 Scoping and Environmental Impact Report (S&EIR)* *Appendix 2: Scoping Report* *Appendix 3: Environmental Impact Assessment Report* *Appendix 4: Environmental Management Programme* *Appendix 5: Closure Plan* *Appendix 6: Specialist Reports*	The EIA Regulations, 2014 [as amended in 2017] prescribes *inter alia*: the manner in which public participation needs to be conducted as well as the requirements of a scoping and environmental impact assessment process and the content of a scoping report, environmental impact assessment report and environmental management programme. The content of specialist reports, closure plans and environmental audit reports are also provided.
Mineral and Petroleum Resources Development Act, 2002 (Act. 28 of 2002) [as amended]:	A Mining Right application is launched by the applicant and this requires the full EIA/EMPr process for Environmental Authorisation as well.

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] • *Section 16* *General duty in respect of waste management;* • *Section 17;* *Reduction, re-use, recycling and recovery of waste;* • *Section 18; and* *Extended producer responsibility; and* • *Section 21* *General requirements for storage of hazardous and general waste.*	The Kangra T4 project will produce general and hazardous waste which need to be managed and disposed of according to best practices such as recycling, safe storage, etc. A NEMA application has been launched with the DMRE (this application).
National Water Act, 1998 (Act No. 36 of 1998) [as amended] • *Section 3* *Regulation of flow and control of all water* • *Section 19* *Prevention of pollution to watercourses* • *Section 21* *The water use activities associated with the proposed development requires compliance with the requirements of the NWA as listed under GN No. 19182. An application for an integrated water use license is lodged in terms of Section 21 of the National Water Act, 1998 (Act 36 of 1998) [as amended] to undertake the following activity:* *Section 21: (g) disposing of waste in a manner which may detrimentally impact on a water resource.* *Section 21(j); Removing, discharge or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people*	The mine has to apply for a Water Use License for the following Section 21 water uses: - Section 21(a) Use of water from the underground workings - Section 21(c): Impeding or diverting the flow of water in a watercourse - Section 21(i): Altering the bed, banks, course or characteristics of a watercourse. - Section 21(j): Removing, discharging or disposing of water found underground. Water management on the mine to be in line with the requirements of the site specific WUL and GN R704 National Water Act, 1998 (Act No. 36 of 1998). The mine will need to apply for GN704 exemption for 4*(b) "except in relation to a matter contemplated in regulation 10, 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;"* - undermining a water resource: Several wetlands and watercourses occur over the underground mining area.
Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals published in terms of NWA in Government Notice 267 of March 2017	The Regulations will be taken into consideration during the Water Use Licence Application process and will be utilised by the Wetland specialist to determine the impact of the mine on the wetland and pan areas. The C&I risk assessment will be in the format as required by the regulations.
Several General Authorisations have been published in terms of Section 39 of the NWA (various dates)	
Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [as amended] and associated regulations • *Chapter 2, Sections 2 – 4* *Responsibilities of owner* • *Chapter 2, Sections 5 – 13* *Responsibilities of manager;* • *Chapter 2, Sections 14 – 18;* *Documentation requirements;*	The development activities may create an environment that is not safe and healthy for workers on and visitors to the site (if not managed correctly). The act provides for measures to prevent threats to the health and safety of humans in the development area.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
• *Chapter 2, Section 19 – 20 and 22 to 24* *Employee's rights and duties; and* • *Chapter 2, Section 21* *Manufacturer's and supplier's duty for health and safety*.	
National Heritage Resources Act, 1999 (Act No. 25 of 1999) • *Section 44 (1);* *Preservation and protection of heritage resources;* • *Section 3 Types and ranges of heritage resources (i) (i);* *Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens*.	Protection of indigenous heritage resources on the property. A Heritage assessment has been undertaken for the project and the documents will be distributed to SAHRA for comments during the onset of the PPP Phase. The recommendations, mitigation and management measures from the Heritage specialist report have been included in the EIA and EMPr.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) [as amended] • *Section 32* *Control of dust* • *Section 34* *Control of noise*	Impacts on surrounding landowners need to be managed through dust and noise mitigation measures. A Noise Impact Assessment has been completed during the onset of the project. The recommendations, mitigation and management measures from Noise specialist have been included in the EIA and EMPr.
List of Activities which Result in Atmospheric Emissions, published in terms of NEM:AQA in Government Notice 893 of 2013 (as amended)	The proposed mining activities will not trigger any of the activities. However, as part of the mandatory requirements the mine will register for GHG reporting during the operational phase.
National Dust Control Regulations, 2013 (Government Notice 827 of 2013) • *Section 3* *Dust fall standard* • *Section 4* *Dust fall monitoring program* • *Section 6* *Measures for control of dust* • *Section 7* *Ambient air quality monitoring (PM10)* • *Section 8* *Offences* • *Section 9* *Penalties*	Dust fallout needs to be monitored in accordance with the standards set out in the monitoring programme with the specified measures due to the Applicant being liable to offences and penalties associated with non-conformance to dust which may influence employees and surrounding landowners.
National Greenhouse Gas Emission Reporting Regulations, published in terms of NEM:AQA in Government Notice of July 2017	During operational phase the mine will be required to report in the prescribed format. As an underground mine the mine will registered to report on the GHG emissions.
Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended] • *Section 12 (1)* *Duty of the landowner to prevent fire from spreading to neighbouring properties.*	Cautionary steps in avoiding the spread of fires to and from neighbouring properties.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended] • *Section 9* *Norms and standards* • *Section 27* *Delegation of power and duties* • *Section 30* *Financial accountability* • *Section 43* *Biodiversity management plans.*	Indigenous vegetation needs to be protected and managed in accordance with management measures set out in the management plans developed for the mine and the Applicant need to ensure he is aware of and covers his liabilities. An Activity for removing and clearing of vegetation has been applied for within this application and no other vegetation clearance will be permitted other than that approved in terms of the EA when/if the Competent Authority makes its decision. A biodiversity assessment (Fuana and Flora) was undertaken and the recommendation, mitigation and management measures as identified by the specialist have been included in the EIA and EMPr.
Alien and Invasive Species Regulations (Government Notice 598 of 2014) and Alien and Invasive Species List, 2014 in terms of NEMBA (Government Notice 599 of 2014) • *Notice 2* *Exempted Alien Species in terms of Section 66 (1)* • *Notice 3* *National Lists of Invasive Species in terms of Section 70(1) – List 1, 3-9 & 11* • *Notice 4* *Prohibited Alien Species in terms of Section 67 (1) – List 1, 3-7, 9-10 & 12*	It is the responsibility of the Applicant to ensure that all prohibited plant and animal species are eradicated as far as possible. Alien and Invasive species need to be managed and prevented throughout the Life of Mine and closure phase.
Conservation of Agricultural Resources Act (no. 43 of 1983) • *Section 5* *Prohibition of spreading of weeds* • *Section 12* *Maintenance of soil conservation works and maintenance of certain states of affairs* • *Section 16* *Regional Conservation Committees*	Listed invader/alien plants occurring on site which require management measures to be implemented to strive to maintain the status quo environment, especially through the guidelines provided by the Regional Conservation Committee.
Mining and Biodiversity Guideline (2013)	The Act, regulation and guideline have informed project planning and will be taken into account in the assessment and mitigation of impacts.
Draft National Biodiversity Offset Policy, 2017	No biodiversity offset is required for the project.
Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • *Section 2* *Declaration of grouped hazardous substances;* • *Section 4* *Licensing;* • *Section 16*	The Applicant must ensure the safety of people working with hazardous chemicals (specifically fuels), as well as safe storage, use and disposal of containers during the on-site operational phase together with the associated liability should non-compliance be at the order of the day.

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
Liability of employer or principle • *Section 9 (1)* *Storage and handling of hazardous chemical substances* • *Section 18* *Offences*	
Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995) • *Section 4* *Duties of persons who may be exposed to hazardous chemical substances* • *Section 9A (1)* *Penalties*	Hazardous substances will be stored and utilised on the site and non-compliance to management measures will result in prosecution of the Applicant in terms of his liabilities to the socio-economic environment.
Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; and Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)	The new mining area will produce general and hazardous waste which need to be managed and disposed of according to best practices such as recycling, safe storage, etc. Disposal will take place on an existing approved waste disposal facility. Waste Classification have been undertaken and is included in this report. The Kangra T4 project will make use of the infrastructure at the Kusipongo mine and, therefore, no Waste License is required for the mine.
National Norms and Standards for the Storage of Waste, published in terms of NEM:WA in Government Notice 926 of 2013	The purpose of the norms and standards is to – a. Provide a uniform national approach relating to the management of waste storage facilities. b. Ensure best practice in the management of waste storage facilities; and c. Provide minimum standards for the design and operation of ne waste storage facilities. Management of the waste storage facility will be in line with the requirements.
National Norms and Standards for the Sorting, Shredding, Grinding, Crushing, Screening or Baling of General Waste, published in terms of NEM:WA in Government Notice 1093 of 2017	The purpose of this Norms and Standards is to provide a uniform national approach relating to the management of waste facilities that sort, shred, grind, crush, screen, chip or bale general waste. The waste rock dump is not regulated under this Norms and Standards. No general waste will be processed in terms of these norms and standards on the mining area.
Guideline on the Need and Desirability, Department of Environmental Affairs, 2017	This guideline has been taken into account as part of project planning. The 2017 Guideline has been used within this process. The Need and Desirability of the project is motivated based on the requirements of the guideline.
NEMA: Government Notice. 805 Companion Guideline on the Implantation of the Environmental Impact Assessment Regulations, 2010, October 2012.	The application for Environmental Authorisation is submitted in terms of the EIA Regulations.
NEMA: GN. 807 Public Participation Guideline, October 2012.	Consultation with Interested and Affected Parties and Communities.
Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, 2017	This guideline has informed the public participation process for the project. Public Participation for the project has been

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
	undertaken in terms of the guideline and other relevant requirements.
Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, 2015 (Notice 1147 of 2015): • *Regulation 5: Scope of financial provision* • *Regulation 6: Method for determining financial provision* • *Regulation 12: Preparation and submission of plans and reports*	An applicant must determine the financial provision through a detailed itemisation of all activities and cost, calculated based on the actual cost of implementation of the measures required. A closure report that conplies with the requirements of GNR 1147 has been undertaken by a specialist.
Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources, 1999 (Notice 704 of 1999): • *Regulation 4: Restrictions on location of mining activities* • *Regulation 7: Protection of water resources* • *Regulation 12: Technical investigation and monitoring.*	Every person in control of a mine or activity must take measures to manage water in an effective manner as prescribe by the regulation.
Noise Control Regulations (The Republic of South Africa, 1992) published in terms of Section 25 of the Environment Conservation Act (Act no. 73 of 1989)	The regulations define the following • Controlled areas; and • Disturbing noise Limits are provided for rating levels for outdoor noise. To be utilised by the Noise specialist to determine the impact and mitigation measures.
NEM:AQA: GNR 283. National Atmospheric Emissions Reporting Regulations, 2015. *For purposes of these Regulations, emission sources and data providers are classified according to groups A to D listed in Annexure 1 to these Regulations.* Section 5(3): *For purposes of these Regulations, emission sources and data providers are classified according to groups A to D listed in Annexure 1 to these Regulations.*	Any person, that holds a mining right or permit in terms of the MPRDA. Emissions report must be made in the format required for National Atmospheric Emission Inventory System (NAEIS) to the relevant air quality officer.
National Guideline on minimum information requirements for preparing Environmental Impact Assessments for mining activities that require environmental authorisation, published in terms of NEMA in Government Notice 86 of 2018	This guideline has been taken into account as part of project planning.
Restitution of Land Rights Amendment Act, 2014 (Act 15 of 2014). The act deals with Land claims.	The validity of the amendment Act was challenged in the Constitutional Court. The Constitutional Court found the Amendment Act to be invalid because of the failure of Parliament to facilitate public involvement as required by the Constitution. The Amendment Act ceased to be law on 28 July 2018. The Constitutional Court ordered that the claims that were lodged between 1 July 2014 and 27 July 2016 are validly lodge, but it interdicted the Commission from processing those claims until the Commission has finalised the claims lodged by 31 December 1998 or until Parliament passes a new law providing for the re-opening of lodgement

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
	of land claims. It is important to note that the provisions of section 11(7) of the Restitution of land Rights Amendment Act, 1994 do not apply until after the Commission has accepted the claim for investigation and published its details in the Government Gazette. Where section 11(7) of Restitution of land Rights Amendment Act, 1994 applies, the land claim commission will be informed a month before any activity is undertake on the property.
Deeds Registries, 1937 (Act No. 47 of 1937) [as amended]	The Registration of servitudes and deed titles for any project which may require servitude registration.
South African Mining Charter	Focus on sustainable transformation of the mining industry. Kangra Coal T4 Mine Project as indicated in the introduction is compliant with the BEE requirements. Social management and mitigation measures, developed as part of the SIA, will be aligned to the Mining Charter.
National Strategy for Sustainable Development and Action Plan 2011 – 2014 (NSSD 1) (2011)	The Strategy for Sustainable Development and Action Plan (NSSD1) is a proactive strategy that regards sustainable development as a long-term commitment, which combines environmental protection, social equity and economic efficiency with the vision and values of the country. It is a milestone in an ongoing process of developing support, and initiating and up-scaling actions to achieve sustainable development in South Africa (DEA, 2011) and has outlined the following strategic objectives: • enhance systems for integrated planning and implementation; • sustain ecosystems and use natural resources efficiently; • move towards a green economy; • build sustainable communities; and • respond effectively to climate change. The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
National Spatial Development Perspectives (NSDP)	The NSDP (2006) provides a framework for a focused intervention by the State in equitable and sustainable development. It represents a key instrument in the State's drive towards ensuring greater economic growth, buoyant and sustained job creation and the eradication of poverty. It provides: • a set of principles and mechanisms for guiding infrastructure investment and development decisions; • a description of the spatial manifestations of the main social, economic and environmental trends that should form the basis for a shared understanding of the national space economy; and

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
	• an interpretation of the spatial realities and the implications for government intervention. The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
National Development Plan 2030 (2010)	The National Development Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality by 2030. The core elements of a decent standard of living identified in the plan are: • housing, water, electricity and sanitation; • safe and reliable public transport; • quality education and skills development; • safety and security; • quality health care; • social protection; • employment; • recreation and leisure; • clean environment; and • adequate nutrition The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts.
New Growth Path (2010) Recent draft placed out for comment – not yet promulgated	South Africa has embarked on a new economic growth path in a bid to create 5 million jobs and reduce unemployment from 25% to 15% over the next ten (10) years. The plan aims to address unemployment, inequality and poverty by unlocking employment opportunities in South Africa's private sector and identifies seven job drivers. These job drivers have the responsibility to create jobs on a large scale. The seven key economic sectors or “job drivers” for job creation are listed below: • infrastructure development and extension: Public works and housing projects; • agricultural development with a focus on rural development and specifically • “Agro-Processing”; • mining value chains; • manufacturing and industrial development (IPAP); • knowledge and green economy; • tourism and services; and • informal sector of economy The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
	The Minister of Economic Development presented on the New Growth Path preliminary medium-term review. He stated that prior to the adoption of the NGP employment stood at 13 638 000 jobs, after the NGP the statistics showed 15 545 000 jobs that have been created thus far. Therefore, since the adoption of the NGP the net jobs created were 1.9 million. Of the number of new jobs created the private sector contributed 1 146 000 and government and its utilities contributed just about 749 000 jobs. The NGP focused on channelling growth in various sectors in the economy, infrastructure absorbing a significant amount of funding to secure jobs and create new ones. Through the investment funding of R109.1 billion 200 000 direct jobs in projects monitored by the PICC resulted. In the agricultural sector, R1.2 billion was invested by DRDLR last year to recapitalise 414 land reform farms and support 1 357 poor farmers. Drought relief was provided by government to 53 607 smallholders farmers (R795 million) and 78 863 farmers, Coca-Cola also set up a fund for emerging farmers to procure at least 80% apples, pears and grapes for fruit used to make Appletizer. In Mining, 56% increase in investment was made for the six-year period post the NGP compared to pre-GDP in real terms, therefore, the total jobs in mining increased by 118 000 to 329 000. Steel production fell by 33% between 2008 and 2015 due to the slow global growth rate and strained labour relations. In the manufacturing sector jobs declined by 293 000 between 2008 and 2010 as the result of the 2008 financial crisis, but the sector has been growing slowly linked to the global market recovery. However, the release of the StatsSA's Quarterly Labour Force Survey today revealed that the South African official unemployment rate has increased to 27.6%, and the expanded unemployment rate increased to 38%, translating to 9.9 million unemployed people in South Africa. While the increase is marginal, it is indicative of an economy which is stagnant and shedding jobs at an alarming rate. This is compounded by a National Government that is devoid of a credible, long-term plan for jobs and the economy
National Framework for Sustainable Development (2008)	The purpose of the National Framework on Sustainable Development is to enunciate South Africa's national vision for sustainable development and indicate strategic interventions to re-orientate South Africa's development path in a more sustainable direction. It proposes a national vision, principles and areas for strategic intervention that will enable and guide the development of the national strategy and action plan.
National Spatial Development Perspective (2006)	The NSDP 2006 provides a framework for a focused intervention by the State in equitable and sustainable development. It represents a key instrument in the State's drive towards ensuring greater economic growth, buoyant and sustained job creation and the eradication of poverty. Employment opportunities, direct and in-direct will be provide by the proposed mine.

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
Mpumalanga Economic Growth & Development Path, October 2011	The framework has informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
Mpumalanga Spatial Development framework, January 2019.	Mining, especially coal mining remains one of the provinces key economic sectors, realising the contestation of resources through mining the negative impacts requires management and positive mitigation interventions – environment, water, air pollution and agricultural land. The development frameworks have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
Gert Sibande District Municipality IDP (2019-2020 Draft)	The Municipality is currently characterized by an increase in coal mining and related activities. Other important sectors in this area are agriculture, agricultural product processing, industrial and manufacturing. Natural resources make a significant and direct contribution to the Municipalities economy. The development frameworks have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
All other relevant national, provincial, district and local municipality legislation and guidelines that may be applicable to the application. Some of these are discussed in the next sections or have been included in the specialist studies.	

5 NEED AND DESIRABILITY OF THE 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).

This section will examine the need and desirability of the proposed expansion project and will examine the importance of coal as a resource, as well as the desirability of continuing coal mining operations at the mine.

5.1 THE IMPORTANCE OF COAL AS A RESOURCE

Coal, because of its strategic importance, is one of the five minerals selected by the DMRE for local beneficiation as it is considered critical to the on-going development of South Africa (Beneficiation Strategy for the Minerals Industry, June 2011). The driving force behind the emphasis of the importance of coal, coal mining and local beneficiation is primarily due to concerns voiced by Eskom over the future security of supply in both the medium and long term of the mineral to its coal fired electricity generating power stations.

South Africa's energy is predominately coal fuelled. Eskom's existing coal fired power stations are critical in terms of electricity production and in meeting the growing energy requirements of South Africa as a whole. Coal and coal supply are consequently seen as critical and its importance is detailed in the Eskom Transmission Ten Year Development Plan 2011 to 2020 (Eskom, 2011). Without steady, secure supply of the mineral, it is unlikely that Eskom will be able to meet the energy demands of the country. As a result, coal mining, beneficiation and supply is of paramount importance to South Africa for continued electricity generation in order to meet the energy demands of the country in the short, medium and long term.

Coal produced is used locally within the region and is also exported. Eskom is the largest local buyer while China is the major export buyer. Demand for coal is generally very high for both market segments. Selling prices are generally regarded as stable both currently and in the foreseeable future.

The South African Integrated Energy Plan highlights that coal should continue to play a role in electricity generation. In addition to this, the Integrated Resource Plan (2010-2030) identifies new coal fired power stations as a means to meet the future energy demands. These plans are in the process of being revisited however, in the absence of revised plans, the base case for energy from coal as it currently stands provides further impetus for planning for future coal production.

5.2 UNDERGROUND EXTENSION

The proposed amendment to the Kangra Coal T4 Project mining works programme and associated environmental authorisations are required in order to extend the life of the Maquasa and Kusipongo operations. The current coal resources at Maquasa will be depleted in August 2021 and mining at Kusipongo must commence in 2021 in order to prevent significant financial and job losses. On depletion at the Kusipongo operation, the mining operations are planned to be moved to the Kangra Coal T4 Project area.

Should the coal resources at Kangra Coal T4 Project not be mined, it would potentially result in following socio-economic impacts:

- Loss of employment for 745 employees that are currently working at the Maquasa and approximately 900 direct jobs (contractors);
- Additional construction related jobs would not be created, as would be the case if the project is approved;
- It would impact on the local community that indirectly rely on Kangra Coal; and
- It would negatively affect the supply of coal to both international and local markets.

The project is aligned with the objectives of the MPRDA (Act 28 of 2002)

- To promote economic growth and mineral development in the Republic;
- To promote employment and advance the social and economic welfare of all South Africans;
- To ensure that the nation's mineral resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- To ensure that mining developments contribute towards the social-economic development of the area in which they are operating.

The then Department of Environmental Affairs (DEA) published a Guideline on Need and Desirability (2017) in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended). The key components are listed and discussed below:

- Securing ecological sustainable development and use of natural resources; and
- Promoting justifiable economic and social development.

According to DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs, to describe the need for a development, it must be determined whether it is the right time for locating the type of land use and/or activity being proposed. To describe the desirability for a development, it must be determined, whether it is the right place for locating the type of land use and/or activity being proposed. Need and desirability can be equated to the concept of wise use of land which can be determined through asking the question: "what is the most sustainable use of land?"

Considering the above, the need and desirability of an application must be addressed separately and in detail answering *inter alia* the questions as indicated in Table 12.

Table 12: Need and desirability considerations

Securing ecological sustainable development and use of natural resources		
1. 1.1	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area? How were the following ecological integrity considerations taken into account? 1.1.1 Threatened Ecosystems, 1.1.2 Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure, 1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4 Conservation targets, 1.1.5 Ecological drivers of the ecosystem, 1.1.6 Environmental Management Framework, 1.1.7 Spatial Development Framework, and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	Areas range between Critical Biodiversity Areas for the proposed development site as per, Heavily or moderately modified areas and other "Other Natural Areas" within the Mpumalanga Conservation Plan. As mentioned, coal mining and prospecting is already a known land use on the property and in the area. Mpumalanga is also known for its coal resources and coal mines. The continuing of this land use in the vicinity will bring additional socio-economic benefits such as increased work opportunities for this specific skill-type. It will also aid by mining the known resource within a beneficent timeframe, specifically since it is known that Eskom is dependent on reliable coal resources. The Mining Right falls within the Threatened Ecosystem; Wakkerstroom/Luneburg Grasslands (MP11), which has an Endangered status (NBA 2011). The most northern point of the Mining Right Application area also falls within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA 2011 and NBA 2018). The area falls within sections listed as Threatened Ecosystems in terms of the National Biodiversity Assessment, 2011. This was included as a listed activity, and it has been included – Activity 30 (Listing Notice 1). It should be noted that the current land uses are grazing, cultivation of various crops and natural areas. The mine is an underground mine with very limited surface infrastructure and the impact on the surface land-use will be minimal.
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Impacts predicted for the development is Medium to Low without mitigation and Low to Very Low with mitigation. This is largely due to the fact that the Kangra T4 project is a proposed underground mine with limited surface infrastructure. The wetlands identified as located within 500 m from the ventilation shafts and powerline route by the specialist investigations have been delineated and these will be licensed with the National Water Act, 1998 (Act No.36 of 1998) (WUL Application) and thereby be regulated by additional rehabilitation and monitoring features to ensure that mitigation and management measures will be implemented for these sensitive systems.

		General impacts, such as dust, noise, etc. have been covered within the Environmental management programme Report (EMPr) proposed for the Mine activities. Several mitigation and management measures and monitoring features have be included in the EMPr to ensure minimal and managed operation of the footprint area designed for the Mining area.
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Mitigation and Management measures prescribed will aid to avoid and lower any possible impacts that may result from the development. Surface infrastructure for the Kangra T4 project is limited. Final rehabilitation will restore Land capability and Land use to a pre-mining state where possible and in accordance with the final approved Land use. The Section 21(c) and (i) wetlands to be authorised (within 500m bufferzone) will require a rehabilitation and monitoring programme for the wetlands. These may include Alien and Invasive Monitoring and vegetation establishment along areas requiring rehabilitation. The prevention and repair of eroded site, etc. All of these may have positive impacts on the ecological environment. The Life of Mine is proposed for the period of 23 years and therefore, a period of 30 years is proposed for in this document. This will include active mining, as well as the post-closure monitoring and rehabilitation required to obtain a Closure certificate.
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	General waste, Hazardous waste and litter will be generated during the life of the mine and these should be kept in designated areas and disposed of to a licensed landfill facility. Other wastes that may cause soil contamination are from the use of vehicles and loaders during the mining process, which may lead to hydrocarbon spills. Regulations for soil clean-up and management have been prescribed in the EMPr. Portable toilets during construction are recommended for the operation and a contractor will be required for the maintenance and service of these systems. A septic tank has been included to handle the sewerage and effluent during the remained of the phases.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	A specialist heritage study was conducted for the project and these findings have been included in the application. The findings have resulted in an alternative route for the powerline. All other relevant specialist investigations have been incorporated
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the	It is noted that due to the nature of this project (mining of coal), a non-renewable resource will be depleted. Coal mining does, however, contribute significantly to the country's economy and power generation needs, and therefore, at the current stage

	depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	mining of coal is still needed within South Africa. Through implementing good practice environmental management measures and mitigation measures, it will ensure that both human and environment are not negatively affected by the development.
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life). 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	Renewable natural resources may include the use of underground water to a limited amount on-site. Water requirements have been described above and all water uses will be licensed in terms of the National Water Act. Stormwater management infrastructure at the Kusipongo mine will be used. No discharges into the environment will be applied for the Kangra T4 project. Also refer to the impact assessment and mitigation methods in Section 15 of this report. The proposed project will extend the “life of the mine” in an area where coal reserves have already been identified and are already being mined. As the Kangra T4 project will make use of existing infrastructure at the Kusipongo mine, minimal additional / new infrastructure will be required to mine the additional coal and to enhance the quality of the product.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts? 1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2 What is the level of risk associated with the limits of current knowledge? 1.8.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The Environmental risk assessment for all environmental features has been included within Section 10 and Section 11. Ecological (Fauna, Flora and Avifaunal), Wetland and Heritage specialist study (including many other specialist investigations as incorporated within this document) was completed for the project to ensure the impacts of these aspects have been properly assessed and will be catered for within the Environmental Management Programme (EMP). Other specialist investigations were also undertaken and these are relevant for the specific project and adherence to these management measures will

		mitigate and manage impacts predicted. The level of risk has been informed by these specialist studies and feedback from the I&AP's to date. A section regarding limitations of the studies has been included in the EIA/EMP format and will be available for the competent authorities to consider as well.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following. 1.9.1 Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2 Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	Noise, dust and visual pollution can increase if not managed correctly. Possibly water pollution, if impacts are not managed effectively, but with the proper mitigation and good practice environmental management measures, it will result in minimal impacts. These impacts have been assessed and detailed prevention and mitigation measures have been recommended (refer to Section 15.2, Section 15.7 and Table 138 of this report).
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Ecological aspects and specialist impact assessments have been included in the document and risk assessments utilised to guide the Environmental Management Program.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	The Environmental risk assessment for all environmental features has been assessed and included in the EIA/EMPr.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Ecological (Fauna, Flora and Avifaunal), Wetland, Hydropedological, Geohydrological, Aquatic Ecology, Surface Water, Noise Assessment, Social Impact Assessment, Agricultural Assessment, Paleontological, Blasting and Vibration, Closure Plan and, Heritage specialist studies have been undertkane for the project to ensure the impacts of these aspects have been properly assessed and have been catered for within the Environmental Management Programme (EMP). The studies have assisted with the development of a management plan to secure ecological integrity and a healthy biophysical environment.
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Cumulative impacts may be the accumulation of all the existing, historic and proposed mining activities within the project area, which may result in negative impacts. However, if the Kangra Coal T4 Mine implements the mitigation measures and management measures correctly, cumulative negative impacts as a result of the combined coal mining of the area will be managed optimally.
"Promoting justifiable economic and social development"		
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	The project is aligned with the objectives as coal mining is already an ongoing and historic activity within the area and within Mpumalanga and therefore should not

	2.1.1 The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area, 2.1.2 Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.), 2.1.3 Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and 2.1.4 Municipal Economic Development Strategy ("LED Strategy").	compromise the integrity of the surrounding land uses and neighbouring properties. The Kangra Coal T4 project is an underground mine with limited surface infrastructure. As per the Mpumalanga Conservation Plan, the areas within the proposed mining boundary range between Critical Biodiversity Areas, Heavily or moderately modified areas and other "Other Natural Areas." Furthermore, coal mining within the local area is prevalent and aligned with current developments found within the local vicinity.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	Also refer to the comments made above. The proposed project will benefit society and the surrounding communities both directly and indirectly by providing job security for the existing workforce at the proposed operation and through the extraction of coal reserves within the Mpumalanga Province. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees. The project will make use of local workers and service providers and this must be kept record of to ensure the local economic development (as prescribed in the EMPR). Furthermore, a Social Labour Plan, is in place which supports various project within the municipalities and are in line with the LED initiatives. The proposed project will promote and support the sustainability of existing business; and assist in increasing local beneficiation and shared economic growth, through extending the life of the mine. Please also refer to the Social Economic Assessment attached as Appendix 16.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Refer to comments made above. All aspects and comments received from I&APs during the process will be reasonably addressed and incorporated into the final EIA/EMPr submitted to the DMRE. Local economic growth and work opportunities will be main benefits from the project if approved and may address some of the physical, psychological, development, cultural and social needs. Main benefits from the mining, which may possibly address community needs are mentioned below (also refer next comment) and is in-line with the local municipality and national goals of development and transformation.

<table>
<tr><td>2.4</td><td>Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?</td><td>The main benefits of the proposed mining operation are:
Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the continued spending power of employees;
Implementation of the proposed project will result in continuedskills development associated with coal mining;
It contributes to the economic welfare of the surrounding community by creating working opportunities;
It contributes to the upliftment of living standards and the health and safety of the local community;
The project will result in economic mining of a known resource;
The net benefit to South Africa is a product produced for the world and specifically the local commodity market, as it is noted in background information that the coal will be utilised by Eskom and exported.
The project is aligned with the objectives of the MPRDA (Act 28 of 2002)
To promote economic growth and mineral development in the Republic
To promote employment and advance the social and economic welfare of all South Africans.</td></tr>
<tr><td>2.5</td><td>In terms of location, describe how the placement of the proposed development will;
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,
2.5.2. reduce the need for transport of people and goods,
2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),
2.5.4. compliment other uses in the area,
2.5.5. be in line with the planning for the area,
2.5.6. for urban related development, make use of underutilised land available with the urban edge,
2.5.7. optimise the use of existing resources and infrastructure,
2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),
2.5.9. discourage "urban sprawl" and contribute to compaction/densification,</td><td>Alternatives have been assessed during the EIA phase, the findings of the specialist studies, comments from I&AP's to date and resources studies have been taking into consideration to determine alternatives for the proposed project. All additional comments from I&APs will be taken into consideration in the final report to be submitted to the competenat authority for adjudication.</td></tr>
</table>

	2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs, 2.5.11. encourage environmentally sustainable land development practices and processes 2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), 2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential), 2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and 2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	
2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts? 2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? 2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Gaps and limits in knowledge have been given within the EIA/EMPR document and where appropriate a pre-cautionary approach has been applied. Gaps and limitations have been properly assessed and addressed. Limitations as described by the specialists have also been included within Section 13. The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions. In fact, the underground mine would have a positive impact in terms of employment security for the years to come and support various community iniatives through the Social Labour Plan. The gaps in knowledge related to fine tuning of water requirements and balancing will need to be addressed once the WUL process is undertaken and therefore the risk may be argued as Medium – Low (with implementation of mitigation measures).
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: 2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	Refer to all other aspects regarding the Socio-Economic environment, benefits and disadvantages. All of the relevant aspects have also been addressed within the EIA/EMPR and may be viewed within the Impact Assessment, Management and Mitigation tables as contained within this document.

2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	The area where the mining right is proposed, is currently utilised for agriculture and grazing. The Land Use and Capability has been described within this document. Refer to the baseline environment section (Section 10).
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Health and Safety considerations have been included in the measures taken to pursue the best practicable environmental options in terms of socio-economic considerations, such as implementation of the mitigation measures such as dust, noise and visual management and mitigation. No other socio-economic considerations are relevant, except for work creation for local communities within the area, but these will be same for any footprint chosen on the farms. The environmental features and impacts, known resource and financial restraints associated with mining (specific resource) were the deciding factors concerning the best suited option. Also refer to the impact assessment and mitigation measures in Section 15
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to the impact assessment and mitigation measures in Section 15 of this EIAR. The mine will be in line with the regulatory requirements, provide financial provision to ensure that the mitigation measures proposed can be carried out. All alternative scenarios have been discussed in this EIAR and EMPR.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	The main benefits of the proposed mining operation are: • Direct economic benefits will be derived from wages, taxes and profits; • Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees; • Implementation of the proposed project will result in skills development associated with coal mining; • It contributes to the economic welfare of the surrounding community by creating working opportunities; • It contributes to the upliftment of living standards and the health and safety of the local community; • The project will result in economic mining of a known resource; • The net benefit to South Africa is a product produced for the world and specifically the local commodity market, as it is noted in background information that the coal will be utilised by Eskom and exported. (

		The project is aligned with the objectives of the MPRDA (Act 28 of 2002) • To promote economic growth and mineral development in the Republic; and • To promote employment and advance the social and economic welfare of all South Africans. By conducting a Scoping and Environmental Impact Assessment Process, the applicant ensures that equitable access has been considered. Refer to the impact assessment and mitigation measures in Section 15 of this EIA and EMPR.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Disturbances in terms of Noise, Dust, Waste and Health and Safety have been assessed according to a Risk Matrix and included within this report. Mitigation and Management measures are prescribed for every possible impact which may result from the Mining right being granted.
2.13	What measures were taken to: 2.13.1. ensure the participation of all interested and affected parties, 2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, 2.13.3. ensure participation by vulnerable and disadvantaged persons, 2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, 2.13.5. ensure openness and transparency, and access to information in terms of the process, 2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and 2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were promoted?	Public Participation will be and has been conducted in accordance with the guidelines and regulations. All comments received during the Scoping phase have been included in the Final Scoping. Comments for this phase have been included in this report and also in the Comments and Response report attached as Appendix 6. The Comments and Response report will be updated for the Final EIA. Another round of Public participation will be done for the Draft EIA/EMPr and the Final EIA/EMPR will contain all the comments received during the entire project. This will inform the Competent Authority of all aspects and concerns from the public and other commenting authorities.
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Refer to comments made above and Refer to Section **Error! Reference source not found.** of this EIAR, describing the public participation process that has been implemented for the proposed project.
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human	The Mining Right holder will need to draft an Environmental Policy and a Health and Safety Policy, along with Standard Operational Procedures (SOPs) which will regulate

	health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	activities on the coal mining area. All workers and contractors will need to abide to the policies and framework as specified. It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period of time.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects: 2.16.1. the number of temporary versus permanent jobs that will be created, 2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), 2.16.3. the distance from where labourers will have to travel, 2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and 2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	Refer to comments made above. As the application is for a Mining Right, it is a long-term project and the appropriate areas will be rehabilitated afterwards to match the pre-mining land use (or alternatively the approved land use). The current workers travel from the local area to the mine and back and as such, this aspect is an existing aspect with no new impacts.
2.17	What measures were taken to ensure: 2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and 2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	The applicant is in the process of applying for the following aspects across different legislation requirements: • Mining Right (this application – Environmental Authorisation); • WUL (Department of Water and Sanitation –DHSWS – this will be applied for before mining commences). • All legislation which has been incorporated within these processed were discussed within Section regarding Policy and Legislative Content above.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Refer to comment above as these aspects have already been addressed within previous discussions.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Yes, for a sensitive environment (which is almost always associated with coal mining) all impacts have been addressed optimally as best possible.
2.20	What measures were taken to ensure that he 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 will be paid for by those responsible for harming the environment?	Mitigation and management measures have been described for all environmental aspects identified and is incorporated into the EMPr.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts	Alternatives and analysis have already been addressed above, refer to comments made.

	being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to comments made above regarding positive and negative socio-economic impacts. Other projects in relation/adjacent to the application footprint also include coal mining and historic prospecting right on the properties which is also held by the applicant. Cumulative impacts have been discussed where relevant and are not easily accurately quantifiable.

6 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

Production from the Kangra Coal T4 Project area will be from 2028 to 2050, when the T4 Project underground reserves are projected to be depleted. Upon receipt of the EA and issuance and execution of the MR, as well as receipt of the Water Use Licence, the T4 Project development will proceed as detailed in Table 13.

Table 13: Timeframes for the Kangra Coal T4 project

ACTIVITY		TIMEFRAME	COMMENTS
1	**Regulatory Authorisations**		
1.1	Submission of the Environmental Impact Assessment (EIA) and Environmental Management Programme report (EMPr)	Currently underway	The EIA and EMPr for the T4 Project will be initiated after acceptance of the Scoping Report (this document). All surface structures such as the access road, adit, ROM stockpile, power and water supplies, and the surface water management structures established for existing Kangra Mine (10200 MR) and the Kusipongo MR area (10099 MR) will be utilised by the underground mining operations in the T4 Project areas.
1.2	Water Use License (WUL) application	Currently underway	The T4 Project may require a WUL for the removal of underground water to undertake mining operations. This can only be confirmed following the groundwater assessment and, if required, will be applied for on approval of the EA.
1.3	Waste licences	Section 102 Submitted	A Section 102 application for the new discard dump in the 133 MR area has been submitted for approval. The discard dump will be utilised for the T4 Project discard.
1.4	Social and Labour Plan (SLP)	Completed	Kangra Mine has an approved SLP for the current Kangra Mine (133 MR). Kangra Coal has also submitted a revised SLP for the Kusipongo MR area (10099 MR). Whilst the T4 Project is considered as the life extension of the current Kangra Mine operations and Kusipongo, a new SLP was developed and require authourisation for the T4 Project.

ACTIVITY		TIMEFRAME	COMMENTS
2	**Infrastructure**		
2.1	Access to the T4 Project areas will be through the adit developed into the Kusipongo mining area	Year 1	An access road will be constructed to the new adit for the Kusipongo shaft. The underground mining operations in the T4 Project will be an extension from the Kusipongo underground workings and will therefore utilise the access road and shaft established for the Kusipongo area.
2.2	Power supply to the T4 Project underground areas will be through the extension of the current underground power reticulation system	Year 3	Kangra Mine has an existing power supply that feeds all the underground operations. This power supply will be extended to the Kusipongo shaft and underground areas. The power supply at the Kusipongo mining area will be extended to the T4 Project area as the underground development into this area advances. There will be no need for a new power supply to the T4 Project mining areas.
3	**Underground Mining**		
3.1	Site establishment	Year 1	Kangra is currently mining in terms of the renewed mining right (10200 MR). Once the coal reserves are depleted, mining operations will move to the Kusipongo MR area (10099 MR). A new access shaft for Kusipongo will be established to provide underground access to this area. On depletion of the resources in the Kusipongo MR area, the mining operations are planned to be moved to the T4 Project area (10175 MR). Access to the T4 Project MR area will be through the Kusipongo shaft and the trunk conveyors, shaft conveyor, main fans, power and water reticulation, and the travel roads from the Kusipongo area will be utilised for mining in the T4 Project MR area. A main five to seven road panel is planned to be mined from the Kusipongo area to the T4 Project area to provide access area. This is planned to

ACTIVITY		TIMEFRAME	COMMENTS
			take four years, as there are faults and dykes to be developed through.
3.2	Establishment of underground infrastructure	Year 3	The main trunk conveyors, ventilation infrastructure, power and water services, and a travel road will be installed to service the T4 Project.
3.3	First coal production	Year 4	-
3.4	Steady-state underground production	Year 4	-
4	**CHPP**		
4.1	The existing CHPP at Kangra Mine (currently processing coal from the existing underground operations) has an existing Mining Right, environmental authorisations, and approved WUL	Completed	The coal produced from the T4 Project will be processed in the existing CHPP.
4.2	The ROM coal from the T4 Project will be conveyed to the existing Kangra Mine CHPP for processing	Year 4	The coal from the T4 Project underground mining areas will be conveyed through the underground and surface conveyor systems to be established for the Kusipongo area, which will convey the ROM coal to the Kangra Mine CHPP for processing.

7 MOTIVATION FOR THE OVERALL PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVE

NB!! to 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.

This section presents all alternatives considered, identifies those which are considered for scoping, and comparatively assesses those carried through into EIA phase. The identification of alternatives is a key aspect of the success of the scoping and EIA process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider and assess. There are however some significant constraints that must be taken into account when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental 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. As mentioned in Section 5, the need for the proposed project includes the following key drivers:

- The importance of coal as a resource; and
- The continued livelihood of community members working at the mine.

The alternatives are described, and the advantages and disadvantages are presented. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective. The no-go option is also assessed herein.

7.1 MOTIVATION FOR THE PREFERRED SITE, ACTIVITIES AND ALTERNATIVES

The details of the alternatives considered are described in the sections below. The main motivation for all alternatives is based on the fact that a mining right is applied for on the same areas where the prospecting right was awarded and where minerals have been verified. No alternative properties were considered for this mining right application as Kangra Coal currently holds prospecting rights on the proposed Kangra Coal T4 Project area.

7.2 DETAILS OF THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED

With reference to the site plan provided as Appendix 28 and the location of the individual activities on site, provide details of the alternatives considered with respect to:
(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

According to DEA (2017), Guideline on Need and Desirability and Guidelines on Assessment of Alternatives and Impacts, Department of Environmental Affairs, feasible and reasonable alternatives must be identified for a development as required by the NEMA EIA Regulations and applicable to EIA. Each alternative is to be accompanied by a description and comparative assessment of the advantages and disadvantages that such development and activities will pose on the environment and socio-economy. Alternatives form a vital part of the initial assessment process through the consideration of modifications to prevent and/or mitigate environmental impacts associated with a particular development. Alternatives are to be amended when the development's scope of work is amended. It is vital that original as well as amended alternative identification, investigation and assessment together with the generation and consideration of modifications and changes to the development and activities are documented.

Although an array of alternatives could be investigated for each project, such alternatives will not necessarily be applicable to each project and/or project phase. However, there must always be strived to seek alternatives that maximises efficient and sustainable resource utilisation and minimise any negative impacts on the bio-physical and socio-economic environments.

7.1.1 Feasible alternatives

The following alternatives were investigated as feasible alternatives:

- *The site on which the mining sections are to be located (site and layout alternatives);*
- *The mining method including other technology alternatives;*
- *Activity alternatives;*
- *Design alternatives; and*
- *Not implementing the mining activities (No – Go alternative).*

7.1.2 Site Alternatives

7.1.2.1 Suitable Mining Areas

The sites for the underground mine were determined based on the prospecting results and described within the Mining Works Programme (MWP). Minerals can only be mined where identified and verified, therefore, it was not practical to select any other sites. In a mining right application the investigation into alternative sites are preformed during the prospecting phase of the process.

7.1.2.2 Powerline Route and Location of Ventilation Shafts

As part of the EIA process, two powerline routes were assessed, namely Powerline Route 1 and Powerline Route 2, as indicated in Figure 13 and Figure 14 below. Kangra originally applied for Mooihoek to be included within the Kangra T4 project boundary as indicated in Figure 12. However, the DMRE excluded Mooihoek during the acceptance of the Scoping Report (refer to Appendix 20). This resulted in a change of the overland powerline route, the underground access route from Kusipongo and the location of the ventilation shafts (refer to Figure 13). During the heritage assessment, it was determined that Powerline Route 1 (indicated in Figure 13) crossed several heritage sites and, therefore, Powerline Route 2 (indicated in Figure 14) is recommended and considered to be the preferred alternative.

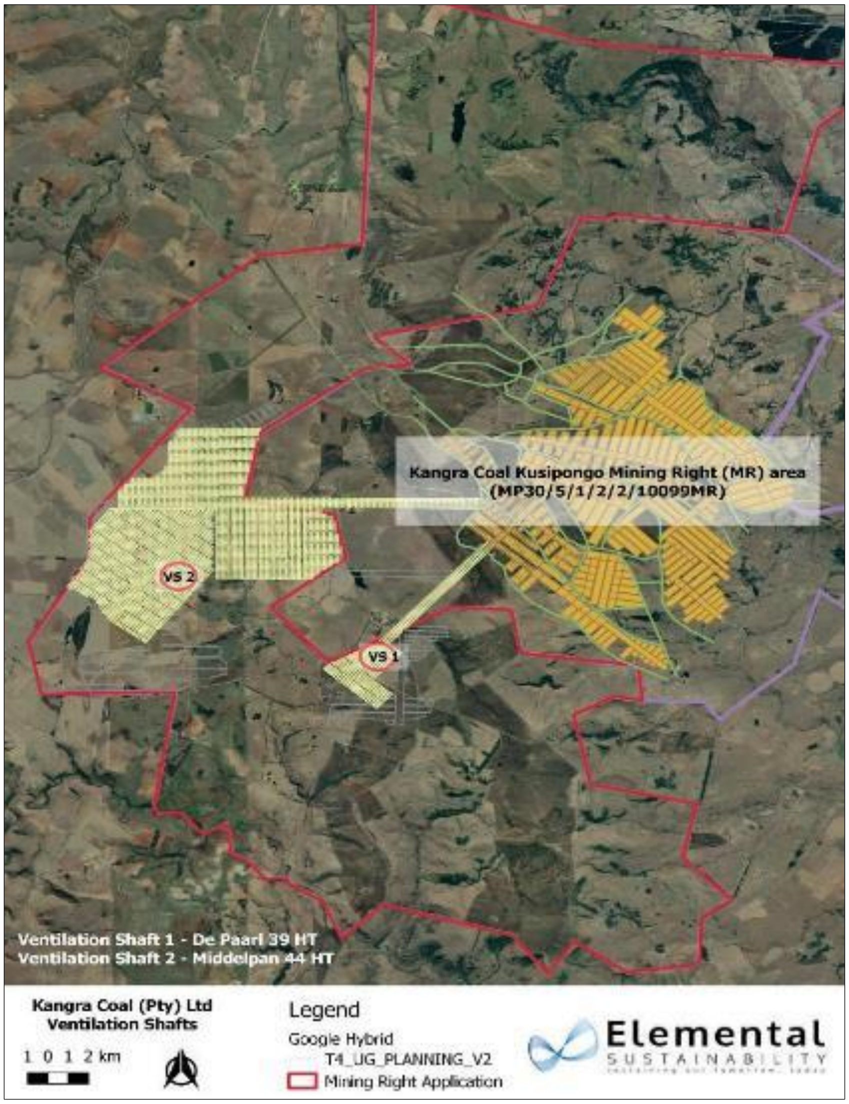

Figure 12: Kangra T4 original layout with Mooihoek included

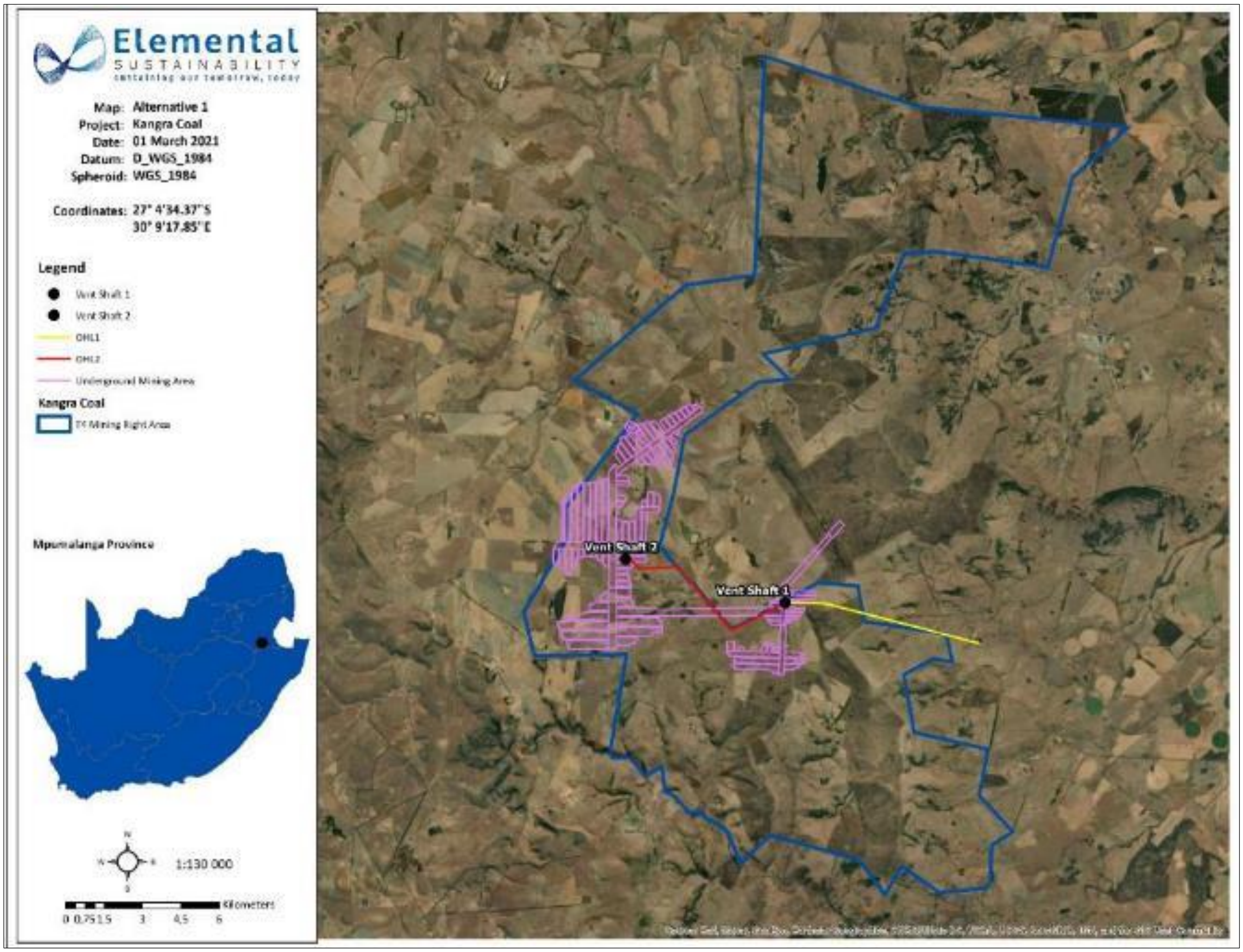

Figure 13: Powerline Route 1 and ventilation shaft alternatives 1

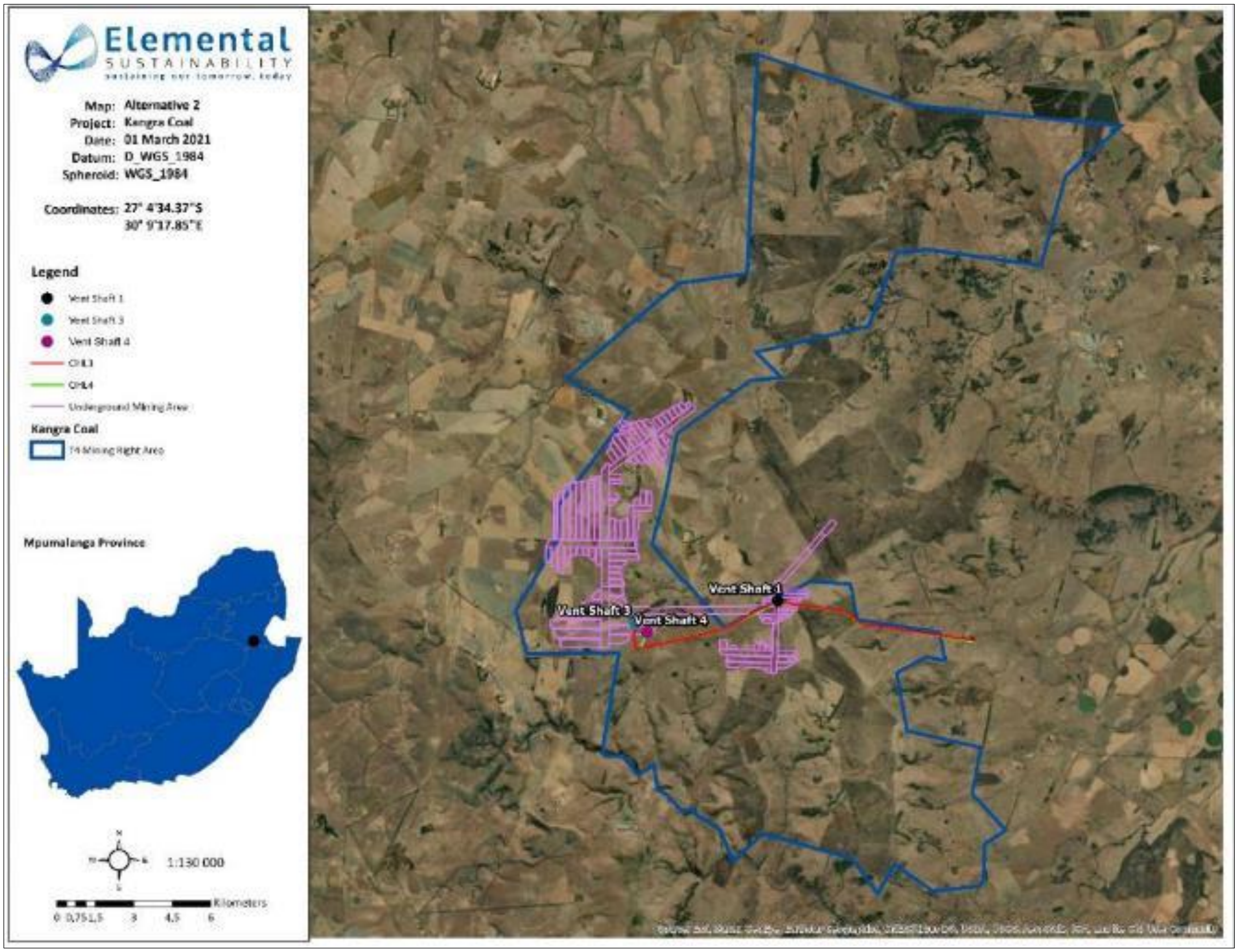

Figure 14: Alternative 2 for the powerline route

7.1.3 Activity Alternatives

The land use of the Kangra T4 mining project consists predominantly of agricultural land (grazing and crop land) which is adjacent to the current mining and related activities. Kangra Coal currently holds a prospecting right over the proposed area and, therefore, there is a practical development alternative for the future mining area. The proposed project has taken into consideration economic viability and practicality, as well as the location of the coal resource.

7.1.3.1 Mining

Mining is one of the predominant land uses within the surrounding area. Several active mines, predominantly coal mines, are located within 60 km of the project area and include Taaiboschspruit, Old Leiden, Kusipongo, Saymore, Mooiplaats, Ferreira and Penumbra. The mining operations located in the surrounding area can be categorised as open cast and underground operations with surface access nodes. Additional supporting infrastructure is also present and includes mineral processing plants, slurry and co-disposal facilities, conveyor routes, haul roads, offices, pipelines and powerlines. The exploration work to date forms the basis for the current evaluation. Between 2006 and 2017, a total of 88 boreholes have been drilled. The Kangra Coal T4 project will allow for the optimum mining and usage of mineral resources which still remain within the project area and supply of coal to the international markets. As such, mining can be considered a feasible land use alternative within both the application area and surrounding area.

7.1.3.2 Agriculture and livestock farming

Agriculture is one of the dominant land uses within the surrounding area, comprising of monocultures such as soja, maize cultivation, sheep and cattle farming and other small-scale subsistence farming practises. As such, agricultural potential, based exclusively on soils, indicates that agriculture is a feasible alternative. It is also important to note that the agricultural potential of the soils can be returned to conditions suitable for cultivation and grazing so long as basic fertilisation and liming is undertaken, but only at considerable time and cost.

Livestock grazing is one of the most common and widespread land uses occurring within the immediate and surrounding area of the Kangra Coal T4 project. Large scale livestock (cattle and sheep) grazing occurs on site. The long-term grazing capacity of the area derived from the DAFF data layer (DAFF, 2018). Indicates that almost the entire area has grazing capacity of 4ha/LSU and this includes all areas where the proposed project infrastructure (ventilation shaft and powerline) will be located. Only a small section of land, east of the Klein-Vaal River, has a grazing capacity of 4.5ha/LSU. With grazing capacity of 4 ha/LSU and good climate capability that includes high rainfall and cooler temperatures, the project area is highly suitable for livestock farming. The proposed minining activity consist of only underground mining with limited surface infrastructure, for this reason the mining activities will not change the surface land use and the current surface activities (agriculture) can remain as discussed in Section 7.1.3.3

7.1.3.3 Mixed Land Use (Mining and Agriculture, including grazing)

Mining and agriculture have been identified as the predominant land uses within the immediate and surrounding area. The character of the application area confirms this finding, with agriculture being the dominant land use on site and historic mining also having been undertaken by Kangra Coal. As a land use, mining is often viewed as directly competing and eventually replacing existing land uses. However, the nature of the proposed Kangra Coal T4 Project (underground) provides an opportunity in which both feasible land uses, namely agriculture, including grazing and mining can potentially be conducted concurrently. The proposed Kangra Coal T4 Project already has an easy access into the mine from Kusipongo and the underground coal seams will be extracted at a depth of between 200 m and 300 m. Due to the existing infrastructure on Maquasa and the infrastructure (to still be constructed) at Kusipongo, and with the vast majority of mining taking place deep underground, relatively little surface disturbance is expected to take place which will allow for the potential continuation of agriculture and grazing as a land use while mining activities are underway. Furthermore, due to the expected depth of mining the risk of subsidence is also greatly reduced as it is anticipated that 22m range will be a very small percentage of the range. The surface area required for mine infrastructure is also greatly reduced as there will be no mineral processing facilities or Tailings Dam on the site. The practicalities of undertaking two concurrent, demanding land uses such as agriculture and mining are likely to require detailed management of operations to ensure the feasibility of both land uses, but it is potentially possible. As such, a mixed land use of mining and forestry can be considered a feasible land use alternative within both the application area and, possibly, the surrounding area.

7.1.4 Details of Mining Method Alternatives

Longwall mining and bord-and-pillar mining are two of the basic methods of mining coal underground and both methods are well suited to extracting the relatively flat coalbeds (or coal seams). These two mining methods have been considered and assessed for the underground mining at the Kangra Coal T4 Project.

7.1.4.1 Long Wall Mining

In the longwall mining method, mine development is carried out in such a manner that large blocks of coal, usually 100 to 300 metres wide and 1,000 to 3,000 metres long, are available for complete extraction. A block of coal is extracted in slices, the dimensions of which are fixed by the height of coal extracted, the width of the longwall face, and the thickness of the slice (ranging from 0.6 to 1.2 metres). In manual or semi-mechanized operations, the coal is undercut along the width of the panel to the depth of the intended slice. It is then drilled and blasted, and the broken coal is loaded onto a conveyor at the face. The sequence of operations continues with support of the roof at the face and shifting of the conveyor forward. The cycle of cutting, drilling, blasting, loading, roof supporting, and conveyor shifting is repeated until the entire block is mined out. Due to the high capital cost and its suitability for much deeper coal fields, longwall mining has not been considered and assessed further in the EIA Phase.

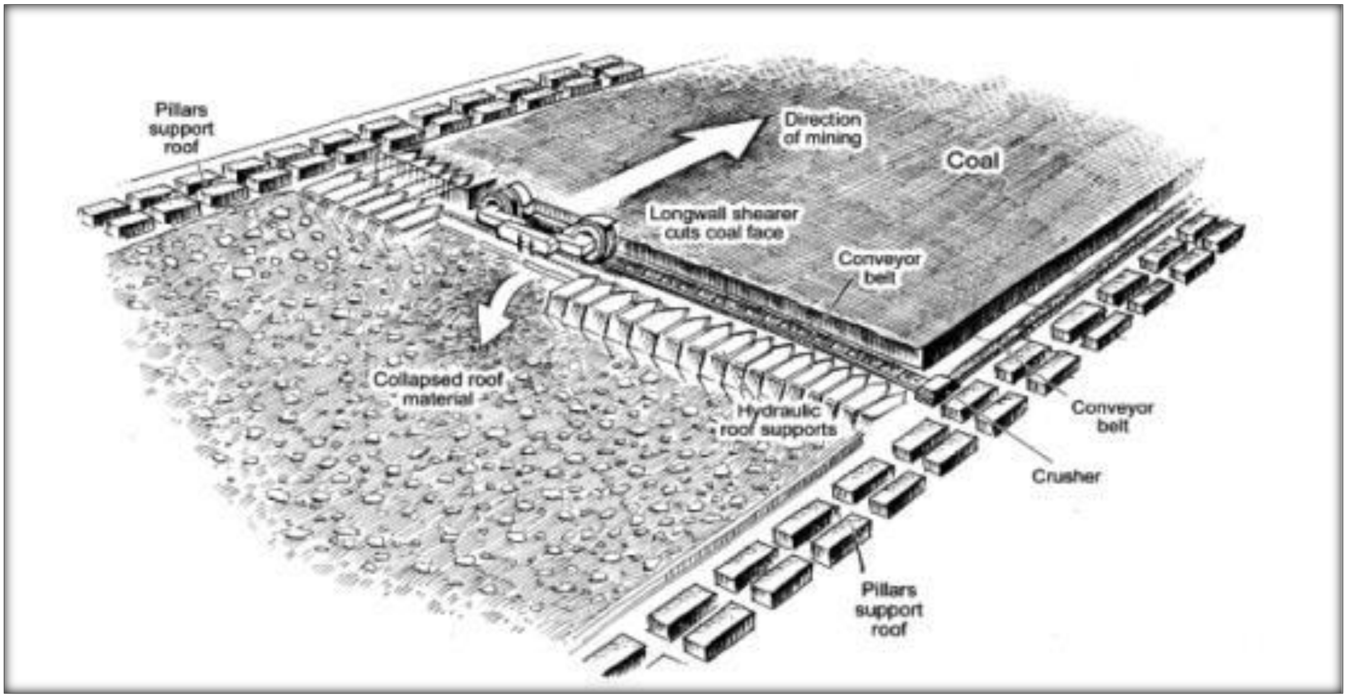

Figure 15: Illustration of long wall mining

7.1.4.2 Bord and Pillar Mining

Bord and Pillar mining, also referred to as room and pillar mining, this method is a mining system in which the mined material is taken out across a horizontal plane while leaving "pillars" of unscathed material to support the overstrain leaving open regions or "rooms" underground. The key to bord and pillar mining is optimising the pillar size. If the pillars are too small the mine will fall down. If the pillars are too big then significant quantities of valuable material will be left behind reducing the profitability of the mine. Bord and pillar mines are developed on a grid basis apart from where geological traits such as faults require the basic template to be customized. The optimum pillar size is determined by a calculation based on the weight bearing capability of the material above and below the coal seam and the strength of the coal itself. Within this EIA, this alternative is identified as follows:

- Underground Mining (Alternative 1).

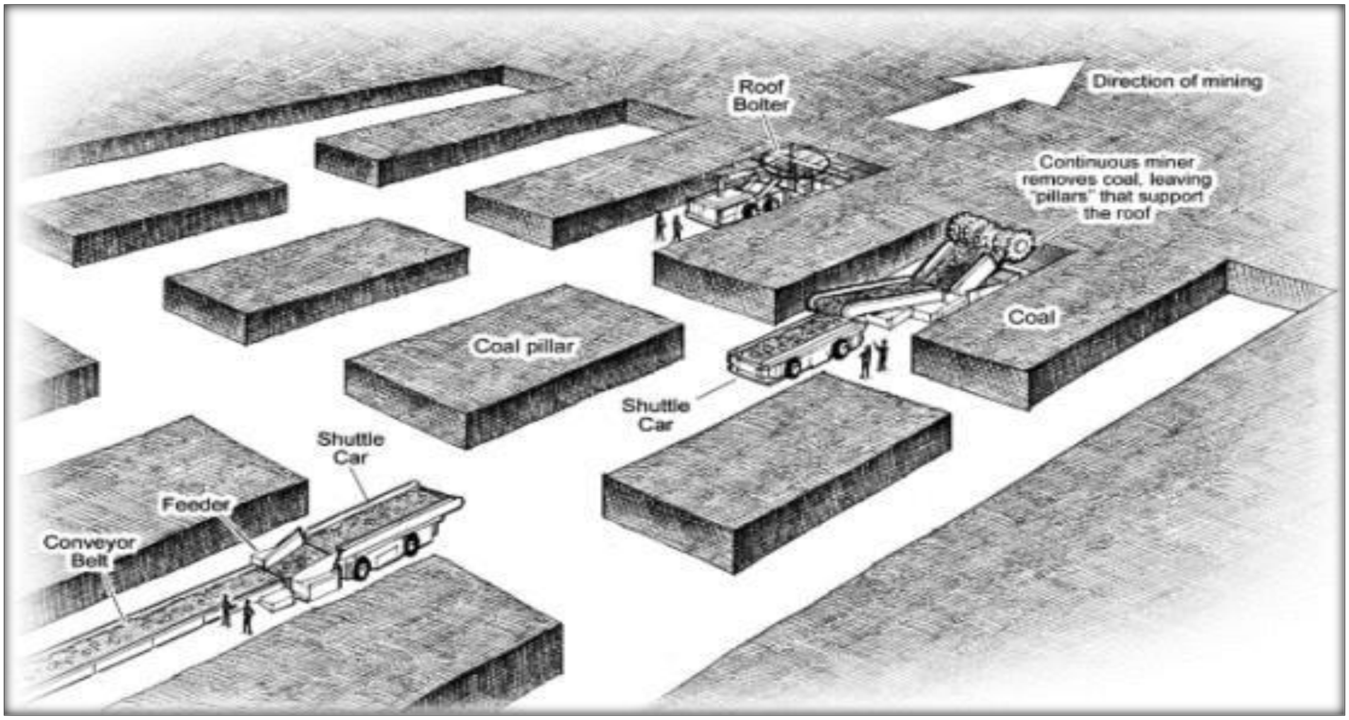

Figure 16: : Illustration of bord and pillar mining

7.1.5 Designs and Layout Alternatives

Please refer to Section 3 and Section 7.1.2.1 where the site alternatives for the mining infrastructure in relation to the reserves have been discussed.

7.1.6 Details of Technology Alternatives

As the Kangra T4 coal mining project will make use of existing infrastructure at the Kusipongo mine, no technological alternatives have been considered in this EIAr.

7.1.7 Details of Activity Alternatives

The alternatives considered and discussed in the above sections, including land use, location, mining method and site access alternatives have culminated into the identification of three feasible development alternatives. These three feasible development alternatives are discussed below and have been assessed, in detail during the EIA Phase.

7.1.7.1 Alternative 1: No Go Alternative

This alternative will imply that no development takes place and that the environment remains unchanged and unaltered. The proposed development site for the Kangra Coal T4 Project area comprises a mixture of "undisturbed" natural vegetation and land used for cultivation. The proposed project area is located in areas dominated by agriculture, however, a fairly overall biodiversity remains. If the development should not take place, no additional socio-economic benefits will be created by mining activities in the area as the no community project would be implemented by the mining company and there would not be an opportunity for additional job spin-offs that would be created, the mineral resource will be lost, and the additional GDP from the coal export will be compromised. Further implications of the No-Go alternative include the loss of economic input into the area and a loss of regional socio-economic benefit.

7.1.7.2 Alternative 2: Maximum Mine Production

In this alternative, the mining and production of coal is emphasised. Maximum underground mining would result in subsidence as pillars are stooped. This approach will increase the financial viability of the proposed Kangra T4 coal mine at the potential cost of impacting more severely on environmental features. This alternative is likely to impact more on aspects such as hydrology, air quality and the isolated pockets of biodiversity, as mining operations will likely move through these sensitive environmental features.

7.1.7.3 Alternative 3: Sensitivity Planning Approach

This alternative will emphasise resource protection and use stringent mitigation measures to minimise identified adverse impacts. This alternative will use specialist planning and evaluation of the following in order to avoid impacting on consolidated sensitive environmental features:

- Mining footprint;
- Mining methodology (Long Wall Mining vs Bord and Pillar Mining);
- Pipeline placement;
- Pollution control dam and return water dam placement;
- Bulk water supply requirements;
- Transport; and
- General infrastructure requirements.

This alternative will allow for the proposed development of the Kangra Coal T4 Project whilst protecting identified consolidated sensitive environmental features as indicated in the consolidated sensitivity map. The concept of *in-sit*u conservation and biodiversity off-sets to account for significant residual impacts may also be explored. In addition, this alternative will consider the continuation of agricultural activities (grazing and cultivation) on the surface and use the consolidated sensitivity map to assist in the design, layout, and planning of the proposed Kangra Coal T4 Project.

Table 14 and Table 15 below contain the analysis of alternatives identified.

Table 14: Summary of advantages and disadvantages of alternative land uses

Feasible Land Use Alternative	Advantages	Disadvantages
Mining	• A commercial mining operation with a sustainable life of mine; • Provision of sustainable employment and employment retention; • On-going economic input into the immediate and surrounding area; • Improvement of existing infrastructure; • Local economic development through the implementation of the SLP; • Economic injection into the region in terms of small business enterprise development; • On-going supply of both export quality coal and coal for the domestic South African market.	• Numerous potential significant negative social and environmental impacts; • Limited (17 years) duration of socio-economic benefits; • Additional water use requirements; • Rezoning of land required; • Changes to existing land use and land character; • Long-term environmental liability; and • Residual/latent environmental impacts that requiring management and monitoring post mining;
Mixed (Agriculture & Mining)	• A commercial mining operation with a sustainable life of mine; • Provision of sustainable employment and employment retention; • On-going economic input into the immediate and surrounding area; • Improvement of existing infrastructure; • Local economic development through the implementation of the SLP; • Economic injection into the region in terms of small business enterprise development; • On-going supply of both export quality coal; • Continuation of agriculture and associated based economic benefits; • Reduced disruption of existing land use; • Reduced disruption of landscape character; and • Better, more effective use of land	• Potentially compounded significant negative social and environmental impacts; • Increased water use requirements; • Rezoning of sections of land required; • Long-term environmental liability; and • Residual/latent environmental impacts that requiring management and monitoring post mining;

Table 15: Summary of advantages and disadvantages of underground mining alternatives

Mining Method Alternative	Advantages	Disadvantages
Long Wall Mining	• High Efficiency; • Higher coal recovery; • Fewer workers required; • Safety improved through better roof control and a reduction in the use of moving equipment;	• Numerous potential significant negative social and environmental impacts; • Limited (17 years) duration of socio-economic benefits; • Additional water use requirements;

	• Minimizes the need for dusting mine passages with inert material to prevent coal dust explosions. • Involves no blasting (safer); • Coal haulage system is simpler; • Ventilation is better controlled; • Subsidence of the surface is more predictable; • Overall offers more opportunities for automation; and • Well suited to deep coalbeds. Suitable for coalbeds deeper than 1000 feet. •	• Rezoning of land required; • Changes to existing land use and land character; • Long-term environmental liability; and • Residual/latent environmental impacts that requiring management and monitoring post mining; • High risk of subsidence
Bord and Pillar Mining	• Fast, simple, and requires very little equipment; • Relatively low capital cost; • Coal production can start much more quickly, which equals faster return on investment. • High safety factor of pillars and stability of undergound area • Low risk of subsidence	• Limited socio-economic benefits; • Sterilization of the mineral resource through low abstraction rates; and • Loss of potential economic injection into the region.

8 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 describes the public participation process (PPP) undertaken for the project in line with Chapter 6 of the EIA Regulations (2014) [as amended]. The process is undertaken to ensure compliance with the requirements in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended] (MPRDA) and the Environmental Impact Assessment Regulations (2014) [as amended]. The intention of the PPP was to inform I&APs, in sufficient detail, of the EIA/EMPR in order that I&APs may contribute meaningfully to the EIA process.

The PPP to date has included notification of I&APs through distribution of a Background Information Document (BID), placement of newspaper advertisement and placement of site. A key aspect of public consultation is the notification of landowners, occupier and users within and adjacent to the application area. Further information with regards to the PPP is provided below. All proof of public participation undertaken by during the scoping phase is included in Appendix 5.

8.1 INTERESTED AND AFFECTED PARTY (I&AP) DATABASE

As part of the PPP and I&AP database (See Appendix 6-i) has been developed for the project. I&APs identified for the project include:

- Surrounding landowners, land users, adjacent landowners and communities;

- Non-Governmental Organisations (NGOs) and associations;
- Parastatals; and
- Government Authorities

8.1.1 Commenting Authorities

The following, but not limited to, Government Authorities were notified and consulted with regards to the proposed Kangra Coal T4 Project:

- South Africa Heritage Resource Agency (SAHRA) including Provincial Heritage Authority;
- Department of Roads and Transport;
- Mpumalanga Economic Development & Tourism which provides oversight role on the work of three agencies which are: Mpumalanga Economic Growth Agency (MEGA), Mpumalanga Economic Regulator (MER) and Mpumalanga Tourism and Parks Agency (MTPA);
- Mpumalanga Department: Agriculture, Rural Development, Land and Environmental Affairs;
- Department of Agriculture, Forestry and Fisheries (DAFF); and
- Department of Rural Development and Land Reform (DRDLR): Land Claims Commissioner;

8.1.2 Decision Making Authorities

- Department of Mineral Resources and Energy (DMRE); and
- Inkomati-Usuthu Catchment Management Area (IUCMA).

8.1.3 Local Authorities

- Pixley Ka Seme Local Municipality;
- Mkhondo Local Municipality;
- Nkangala District Municipality (DC31); and
- Ward Councillors.

I&APs who attended meetings and /or submitted contact details have been registered on the I&AP database. The latest copy of the database, including the update for the EIA phase is included in Appendix 6-i. The database will be updated on an on-going basis throughout the process.

8.2 INITIAL NOTIFICATIONS

The PPP commenced on 20 June 2018 with an initial notification and call to register for a period of 20 days, ending on the 10 July 2018. These initial notifications were given in the following manner:

8.2.1 Advertisements and Site Notices

An advertisement announcing the Project Initiation/Commencement was placed in the "Excelsior" newspaper on the 25th May 2017, and the "Volksrust Recorder" on the 26th May 2017 by GCS Environmental. A copy of the advertisements placed are included in Appendix 5-i.

Site notices, introducing the Kangra Coal T4 Project, were placed at appropriate accessible locations around the T4 Project area. Proof of the site notices placement is presented in Appendix 5-ii.

8.2.2 Background Information Document (BID)

A Background Information Document (BID), which contains the basic facts about the T4 Project, was provided to identified stakeholders and I&APs during the Scoping Phase. The BID included, as a minimum, the following information:

- A project description;
- A locality map;
- An outline of the environmental process being followed;
- The details of the public participation process; and
- The contact details of the appointed EAP.

The BID and distribution of the BID's are presented in Appendix 5-iii. Due to the change of EAP, a BID will be redistributed during the onset of the EIA/EMPR commenting phase.

8.2.3 Public Meetings

No public meeting or public open day were hosted by GCS (the EAP) and the applicant during the Scoping phase in order to present the Kangra Coal T4 Project and any identified environmental and social impacts to all registered stakeholders and I&APs.

Due to the current COVID regulations, an open day may be held during the EIA public review period, depending on request from I&APs. Landowners/ stakeholders and registered I&APs will be encouraged to rather request online meetings through Project Teams/Zoom or Skype. The discussions held will be noted and included in the final EIAR.

8.3 DETAILS REGARDING THE REVIEW OF THE DRAFT SCOPING

8.3.1 I&AP review of Scoping Report

The Scoping Report was released for a period of 30 days from the 19th of May to 19th June 2017. Hard copies of the Scoping Report were submitted to all organs of state and relevant authorities. All comments received from I&AP's and organs of state; as well as the responses sent were included in the final Scoping Report submitted to the Competent Authority (CA).

8.3.2 DMRE review of Scoping Report

On completion of the 30-day review period, a Final Scoping Report was compiled which included comments received during the I&AP review period. The report was submitted to the DMRE for review on 22 June 2017. The Final Scoping was rejected by the DMRE on 30 Augst 2017. Kangra Coal submitted an appeal aginst the decision in terms of the National Appeal regulation of 2014.

On 18 February 2020, the High Court of South Africa (Case number: 59815/2018) ordered the DMRE to accept the applicant's final scoping report and order the EA application to be reopened and proceed with the second phase of the EA application within 30 court days. Subsequently to the court order, as a result of the spread of COVID-19, President Ramaphosa announced a National State of Disaster with lockdown conditions coming into effect on the of 26th of March 2020 for a period of 21 days. This was further extended to the 30th April 2020, with the lockdown conditions being lifted over a period two different levels.

The Department of Environment, Forestry and Fisheries published Government Notice 439 (31 March 2020) under Regulation 10(8) of the Regulations issued in terms of section 27(2) of the Disaster Management Act, 2002 (Act No. 57 of 2002) published under Government Notice No. 318 in Government Gazette No. 43107 of 18 March 2020, as amended, in order to issue directions measures to address, prevent and combat the spread of COVID-19.

The purpose of these directions is to curtail the threat posed by the COVID-19 pandemic and to alleviate, contain and minimise the effects of the national state of disaster, and to ensure fair processes, especially relating to licensing processes, public participation processes, appeals processes, reporting requirements and the provision of waste management services during the lockdown period, which are not possible due to the restrictions placed on the movement of people.

These directions are issued pursuant to regulation 10(8) of the Disaster Management Regulations, 2020 to provide for measures necessary to manage COVID-19 and are valid for the duration of the declared national state of disaster.

5.1 Directions relating to licences and environmental authorisations as contemplated in the National Environmental Management Act, 1998, the National Environmental Management: Waste Act, 2008 and the National Environmental Management: Air Quality Act, 2004

- *(a) The following timeframes are hereby extended, or deemed to be extended, by the number of days of the duration of the lockdown period of the national state of disaster declared for the COVID-19 pandemic, including any extensions to such duration, with effect from 27 March 2020 until the termination of the lockdown period:*
  - *(i) Timeframes prescribed in terms of the Environmental Impact Assessment Regulations 2014, published in terms of section 24(5) of the National Environmental Management Act, 1998 , or as contained in any environmental authorisation issued in terms of the Environmental Impact Assessment Regulations, 2014, including any condition contained in an environmental authorisation relating to the period of validity of an environmental*

authorisation, the period relating to an extension of the validity period of an environmental authorisation and the requirement to submit an environmental audit report, which periods lapses or falls within the period of the duration of the lockdown period of the national state of disaster;

As a result of the above, some delay in the Environmental Impact Assessment (EIA) process has taken place.

8.3.3 Specialist studies

As part of the EIA phase for the proposed Kangra Coal T4 Project mining right, the following specialist studies were undertaken and are included within the Appendices of this report:

- Ecological Assessment (Fauna, Flora and Avifauna);
- Heritage Assessment;
- Paleontological Assessment
- Agriculture, Soil and Land Capability Impact Assessment;
- Geohydrological Assessment;
- Water Balance (part of DWS WUL application);
- Surface Water Assessment;
- Aqatic Ecological Assessment;
- Wetland Assessments;
- Noise Impacts Assessment;
- Vibration and Blasting Impact Assessment;
- Social Impact Assessment;
- Closure & Financial provision; and
- Hydro-pedological Assessment.

8.4 PUBLIC REVIEW OF ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGENT REPORT – FIRST DRAFT REPORT

This section describes the PPP undertaken to date in line with Chapter 6 of the EIA Regulations (2014) (as amended). The process is undertaken to ensure compliance with the requirements in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended] (MPRDA) and the Environmental Impact Assessment Regulations (2014) [as amended]. The intention of the PPP was to inform I&APs, in sufficient detail, of the proposed project in order that I&APs may contribute meaningfully to the EIA process.

The PPP to date has included notification of I&APs through distribution of a Background Information Document (BID), placement of newspaper advertisement and placement of site. A key aspect of public consultation is the notification of landowners, occupier and users within and adjacent to the application area. More detail in this regard to the process followed is provided below.

All proof of public participation undertaken during the scoping phase is included in Appendix 6. The new process PPP is provided (and updated during the process) in Appendix 7.

The following section will be set out according to the Chapter 6 NEMA Regulations (Government Gazette No. 326 of 7 April 2017):

8.5 SECTION 41: PUBLIC PARTICIPATION PROCESS

The public participation process that was undertkane for the EIA phase is described in the following sections. The public participation plan is attached in Appendix 6(v).

1) This regulation only applies in instances where adherence to the provisions of this regulation is specifically required.

8.5.1 Section 41, Subregulation 2 (a) – Site Notices

2) *The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by—*
   a) *fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of—*
      i. *the site where the activity to which the application or proposed application*
      ii. *relates is or is to be undertaken; and*
      iii. *any alternative site.*

Seven site notices, three in English and three in isiZulu, with the required information, as set out in Regulation 41(2), were erected within and surrounding the proposed Kangra Coal T4 Project area in February 2021. The site notices were placed in conspicuous areas that are accessible by the public at the boundary. The site notice included a short background to the proposed project, the locality of the project, information on the activities that are being applied for and details of how the Environmental Assessment Practitioner (EAP) can be contacted to provide any comments.

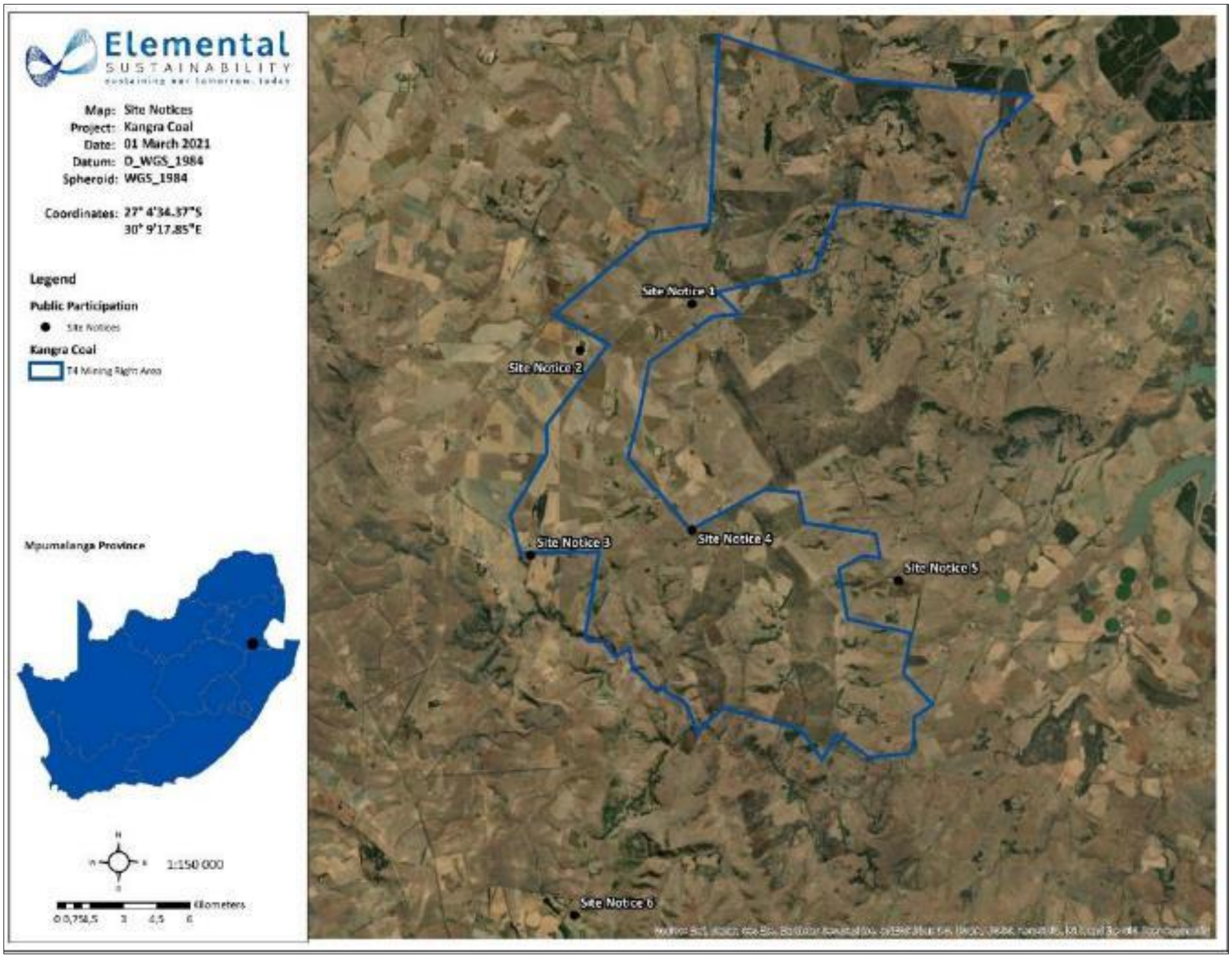

Figure 17: Placement of site notices during EIA phase

8.5.2 Section 41, Subregulation 2 (b) – Written Notice

b) giving written notice, in any of the manners provided for in section 47D of the Act, to—

- *i. the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;*
- *ii. owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;*
- *iii. the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area;*
- *iv. the municipality which has jurisdiction in the area;*
- *v. any organ of state having jurisdiction in respect of any aspect of the activity; and*
- *vi. any other party as required by the competent authority;*

8.5.2.1 Details of Background Information Document (BID)

Written notices have been provided to landowners in and around the adjacent mining right area. Written notices have also been sent to the municipality that has jurisdiction in the area and all organs of state as identified within the EIA phase of the project.

A Background Information Document (BID), in English and isiZulu has been distributed in and around the Kangra Coal T4 Project boundary. The BID has been distributed electronically to all I&APs that have provided an email address and hardcopies have been disturbed in the communities. All I&APs registered during the scoping phase were sent an SMS, advising them of the availability of the BID and an electronic link to the BID was also provided.

8.5.3 Section 41, Subregulation 2 (c), (d) & (e) – Advertisements

c) placing an advertisement in—
   i. one local newspaper; or
   ii. any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and

e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to—
   i. illiteracy;
   ii. disability; or
   iii. any other disadvantage.

As the boundary of the proposed Kangra Coal T4 Project is located south of Ermelo, an advertisement was placed in the local newspaper at the start of the EIA phase, 3 June 2020, of the project containing the following information:

- Project name;
- Applicant name;
- Project location;
- Nature of the activity; and
- Relevant EAP contact person for the project.

An advertisement, in English, has been placed in the local newspaper advising all interested and affected parties and stakeholders that the project has entered the EIA phase and that there has been a change in EAP. An advertisement, in English and isiZulu, will be placed in the local newspaper to advise I&APs of the availability of the Draft Environmental Impact Assessment Report for public review. Information in these adverts will include a short project background (including project and applicant name), project location, nature of the activity, information regarding the availability of the reports for review and contact details for the relevant EAP where I&APs can send comments/concerns.

Copies of all adverts placed to date have been included in Appendix 6(ii) of this Environmental Impact Assessment Report.

Section 41, Subregulation 3

3) A notice, notice board or advertisement referred to in subregulation (2) must—

a) give details of the application or proposed application which is subjected to public participation; and

b) state—

i. whether basic assessment or S&EIR procedures are being applied to the application;

ii. the nature and location of the activity to which the application relates;

iii. where further information on the application or proposed application can be obtained; and

iv. the manner in which and the person to whom representations in respect of the application or proposed application may be made.

As indicated in above, both the site notice and the adverts will include all information as per the requirements of Section 41, subregulation 3.

Site notices, in English and isiZulu, have been erected around the boundary of the proposed Kangra Coal T4 Project in February 2021. A2 posters in English will be placed at publicly accessible places in town near the study area (Ermelo). These posters will allow I&APs the opportunity to register for the project, as well as to submit their issues/queries/concerns, and indicate the contact details of any other potential I&APs that should be contacted.

The EAP's contact number and email address will be stated on the posters. Comments/concerns and queries will be encouraged to be submitted in either of the following manners:

- Electronically (email);
- Telephonically; and/or
- Written letters.

8.5.4 Section 41, Subregulation 4

4) A notice board referred to in subregulation (2) must—

a) be of a size of at least 60cm by 42cm; and

b) display the required information in lettering and in a format as may be determined by the competent authority.

The site notices have been erected around the boundary of the proposed Kangra Coal T4 Project, and were at least 60cm by 42 cm (A2). A locality map has been included on the site notice. Refer to Appendix 6(iii) for the site notice placements and a copy of the site notice that have been placed.

8.5.5 Section 41, Subregulation 5, 6 & 7

5) Where public participation is conducted in terms of this regulation for an application or proposed application, subregulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that—

- *a) such process has been preceded by a public participation process which included compliance with subregulation (2)(a), (b), (c) and (d); and*
- *b) written notice is given to registered interested and affected parties regarding where the—*
  - *i. revised basic assessment report or, EMPr or closure plan, as contemplated in regulation 19(1)(b);*
  - *ii. revised environmental impact assessment report or EMPr as contemplated in regulation 23(1)(b); or*
  - *iii. environmental impact assessment report and EMPr as contemplated in regulation 21(2)(d);*

  may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.

Subregulation 5 is not applicable to the Kangra Coal T4 Project, as the Application is a new Application for the proposed project and does not include any revised reports.

6) When complying with this regulation, the person conducting the public participation process must ensure that—

- *a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and*
- *b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are provided with a reasonable opportunity to comment on the application or proposed application.*

All relevant facts in respect of the proposed application, will be made available to registered I&APs. The Environmental Impact Assessment Report with the Environmental Management Programme Report, including specialist work will be made available for public review and comment for a period of 30 days each. One (1) hard copy of report will be submitted to the local community representative (i.e. Kangra Coal community liaison officer) where members of the public can view the report.

A hard copy of the report will also be placed at the current mine entrance of Kangra Coal. Due consideration and notification will be given to the risks associated with hard copies of the report and sanitiser will be provided with the report for use by members of the public.

The report will also be made available on Dropbox, an electronic format and the link will be sent to I&APs who have indicated that they can access data electronically.

7) Where an environmental authorisation is required in terms of these Regulations and an authorisation, permit or licence is required in terms of a specific environmental management Act, the public participation process contemplated in this Chapter may be combined with any public participation processes prescribed in terms of a specific environmental management Act, on condition that all relevant authorities agree to such combination of processes.

When the WUL process is undertaken, the process will be undertaken as per the requirements of the regulations in terms of the NWA and I&APs will have an opportunity to comment on the documentation.

8.6 SECTION 42: REGISTER OF INTERESTED AND AFFECTED PARTIES

8.6.1 Interested and affected party (I&AP) database

A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of—

a) all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;

b) all persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and

c) all organs of state which have jurisdiction in respect of the activity to which the application relates.

As part of the PPP the I&AP database which has been developed in the scoping phase has been continuously updated for the project. A copy of the updated database is included as Appendix 6(i) in the Environmental Impact Assessment Report.

8.7 SECTION 43: REGISTERED INTERESTED AND AFFECTED PARTIES ENTITLED TO COMMENT ON REPORTS AND PLANS

8.7.1 I&APs and Commenting Authorities

Stakeholders who were captured/registered on the database for the project included:

- The owners or persons in control of the land where the proposed mining is to be undertaken (if different than applicant);
- The occupiers of the property where the development is to be undertaken;
- The owners and occupiers of land adjacent to the mining area;
- Provincial and local government (relevant local and district municipalities);

- Organs of state, other than the authorising authority, such as the Department of Agriculture, Forestry and Fisheries (DAFF – now grouped with Environmental Affairs, forming DEFF since 2019) or Department of Roads, having jurisdiction in respect of any aspect of the proposed project;
- Relevant residents' associations, rates payers' organisations, community-based organisations and NGOs;
- Environmental and water bodies, forums, groups and associations; and
- Private sector (business, industries) in the vicinity.

8.7.2 Decision Making Authorities

- Department of Mineral Resources and Energy (DMRE); and
- Inkomati-Usuthu Catchment Management Area (IUCMA) – (Water Use License).

I&APs who submitted contact details have been registered on the I&AP database. The database has been updated on an on-going basis throughout the process and included as an appendix (Appendix 6 (i) to the the Environmental Impact Assessment Report.

8.8 ENVIRONMENTAL AUTHORISATION AND MINING RIGHT APPLICATION

- Notification:

  All potential I&APs will be notified in English by means of and advertisement, site notices and/or notification letter and be requested to register as an I&AP for the proposed Kangra Coal T4 Project.

- Environmental Impact Assessment Phase:

  1) The draft EIAR/ EMPR inclusive of all the specialist studies, will be made available for public review for 30 days. Registered I&APs will be notified of the availability of the EIAR. The report will be made available electronically via a downloadable link and a hard copy of the report may be made available in the town of Ermelo, Wakkerstroom and the current Kangra Coal Mine; (Please note that the availability of hard copies of the EIAR/EMPR is dependent on the Level of the National State of Disaster, which came into effect on the of 26th of March 2020.
  2) Copies of the EIAR will be submitted to stakeholders and government departments for review.
  3) All communication received during the environmental impact assessment phase will be included as an Appendix in the Final EIAr to be submitted to the DMRE.

8.9 SECTION 44: COMMENTS OF INTERESTED AND AFFECTED PARTIES TO BE RECORDED IN REPORTS SUBMITTED TO COMPETENT AUTHORITY

8.9.1 Public Meetings and Open days

It is proposed to hold a public open day (outdoor venue with the location to be confirmed) to provide a further opportunity for I&APs to review available documentation for the project. Posters will be made available to provide information to I&APs and any questions can also be directed to the EAP. The number of people at the venue for the open day will be limited to ten people at any one time. Strict protocols with regards to the requirements of the Disaster Management Act (Act 57 of 2002), and all regulations thereunder, including a complete register, santisation of hands etc. Posters containign information about the project will be made available for I&APs to view, BIDs will be distributed and questions with regards to the project can be directed to the EAP. Zoom or Skype, and/or phone calls with landowners and other I&AP's will be undertaken.

During the EIA phase, the purpose of the open day will be to provide the findings of the specialist reports to the public and to address any concerns that I&APs may have with regards to the project.

It must be noted that there are currently restrictions in place in terms of meetings and gatherings during the COVID-19 period and, therefore, there is possibility that no public meetings will form part of the EIA phases.

As per GNR 43412 (5 June 2020), the EAP and Applicant will ensure that all reasonable measures are taken to identify potential I&APs for purposes of conducting public participation on the application; and - ensure that, as far as is reasonably possible, taking into account the specific aspects of the application-

(a) information containing all relevant facts in respect of the application or proposed application is made available to potential I&APs; and

(b) participation by potential or registered I&APs has been facilitated in such a manner that all potential or registered I&APs are provided with a reasonable opportunity to comment on the application or proposed application.

The applicant and EAPs, in addition to the methods contained in Chapter 6 of the EIA Regulations, or as part of reasonable alternative methods proposed in terms of regulation 41(2)(e) of the EIA Regulations, may make use of the following non-exhaustive list of methods:

- emails, websites, Cloud Based Services, or similar platforms, direct telephone calls, virtual meetings, newspaper notices, community representatives, distribution of notices at places that are accessible to potential I&APs.

Hard copies or electronic versions of reports may be made accessible through any of the following nonexhaustive list of methods:

- websites, Zero Data Portals, community or traditional authorities, Cloud Based Services, provided that all registered I&APs have access to the reports.

As indicated above hard copies of the report may be made available electronically and at the Kangra Mine Entrance. A hard copy will be provided to the Kangra Coal liaison officer and/or ward councillor (Due consideration and notification will be given to the risks associated with hard copies of the report and sanitiser will be provided with the report for use by members of the public) Please note that this is dependent on the Level of the National State of Disaster, which came into effect on the of 26th of March 2020.

8.9.2 Summary of Issues Raised By I&APs From Public Participation

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

Salient points may be summarised (but are not limited) to the following (Initial commenting period):

- Impact of mining on groundwater;
- Impact of mining on surface water;
- Impact of mining on the ecological system; and
- Impact of mining on agriculture.

Comments received until the compilation of the Draft EIA report are listed below and have been discussed in this section. Please see ***Appendix 6*** *for a full comments and responses report. A summary of comments received during the public participation process is presented below* Table 16*).*

A summary of salient points may be summarised (but are not limited) to the following (Follow-up PPP period):

- *To be provided here as received (and included within* Table 16*).*

The Draft Environmental Impact Assessment and Environmental Management Report have been compiled. The document will be distributed for Public Review from the 19 March 2021 to 20 April 2021 (this document).

8.10 WAY FORWARD

All comments received from I&APs and organs of state and responses will be addressed in a transparent manner and included in the Public Participation Report (Appendix 6), in the final Environmental Impact Assessment Report to be submitted to the Competent Authority (CA). Any additional comments received after submission will be forwarded to the DMRE (if received after commenting period).

8.10.1 DMRE review of Environmental Impact Assessment and Environmental Managent Report – Finalised Report

The Department of Mineral Resources and Energy will make a decision and approve or reject the Environmental Authorisation based on the contents of the final report submitted.

8.11 ISSUES RAISED BY I&APS

8.11.1 Summary of Issues Raised By I&APs From Public Participation

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

Comments received until the compilation of the Draft EIA report are listed below and have been discussed in this section. Please see ***Appendix 6*** *for a full comments and responses report. A summary of comments received during the public participation process is presented in* Table 16 *below.*

Table 16: Summary of issues raised by I&APs

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
AFFECTED PARTIES					
Landowner/s					
Hlanganani Communal Prop Association	X	NO	A telephone call was made to Mr Thulasizwe Zungu regarding the proposed project and an email address was provided to which a copy of the BID was sent.	Good day Sarah, Please would you give this information to Mr. Thulasizwe Zungu. As part of the above project, specialist studies need to be undertaken to study the environment (groundwater, surface water, animals and plants, the heritage – buildings and other features, noise assessments). The reports from these specialist studies are then included in the Environmental Impact Assessment Report that is submitted to the Department of Mineral resources and Energy and the Department of Human Settlements, Water and Sanitation in order for them to make a decision on the proposed environmental authorisation applications. Kindly refer to the Background Information Document that refers to the various specialist studies that need to be undertaken for the Kangra T4 project. Kindly find attached a document, with the proposed site visits from the specialists, as well as the work that will be undertaken by each of the specialists. Elemental would hereby like to request access for the specialists as per the attached document to the farm: Hlanganani Communal Prop Assoc Ptn 0 Prospectfarm 361 IT Please advise if this will be in order. Should you have further queries, please do not hesitate to contact me. Kind regards, Sonja	Appendix 6
Siyasebenza Communal Property Association	X	-	No comments received to date.	A BID was sent to the person regiserted for the Commuhnal Association as a contact person/	Appendix 6
Ms. Carina and Mr	X	Yes	Stuur asseblief 'n Engelse dokument aan na	Good day Mr. Joubert,	Appendix 6

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
Edmund Joubert			hierdie epos adres. Groete Edmund Joubert English Translation: Please send an English document to this email address. Regards	Please find attached a copy of the English Background Information Document. Kangra Coal T4 Underground Coal Mining Project Elemental Sustainability (Pty) Ltd. has been appointed by Kangra Coal (Pty) Ltd. to assist with undertaking the necessary environmental authorisation for the proposed Kangra Coal T4 project. APPLICANT, BACKGROUND AND PROJECT LOCATION: Kangra Coal (Pty) Ltd is in the process of applying for a mining right in terms of the Mineral and Petroleum Recourses Development Act 2002 (Act No. 28 of 2002), and an environmental authorisation in terms of Regulation GN R. 325 in Gazette no. 40772 of 7 April 2017 (Listing Notice 2), under the National Environmental Management Act (Act No. 107 of 1998) as amended, for an underground coal mine on Portions 0 (remaining extent (re)) and 1 of Prospectfarm 361IT; Portions 0, 1, 2 (Re), 3 Glenfillan 362IT; portions 3(re), 16, 17, 19 and 20 of Donkerhoek 14HT; portions 0(Re), 1(Re) and 2 of Grootfontein 8HT; portions 0 and 1 of Langkloof 9HT; Portions 0(Re), 1(Re), 2(Re), 3(Re), 4(Re), 5, 6 (Re), 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 18 of Grootvallei 43HT; Portions 0 and 2 of Middelpan 42HT; Portions 1, 2, 3, 4, 5, 6, 7 and 8 of Vryheid 42HT; Portion 0 (Re) of Naauwhoek 37HT; Portions 0(Re), 1(Re), 2, 3 and the servitude of Portion 3 of De Paarl 39HT; Portions 0(Re), 1(Re), 2, 3, 4(Re), 5, 6 and 7 of Spitskop 41HT; Portion 0 of Uitgedacht 56HT; Portion 0 of Zoogedacht 57HT; Portion 0 of Bovenvallei 58HT; Portion 1 of Goedgeloof 77HT; Portion 0(Re) and 1 of Zondernaam and Portion 0 of Dubbeldam 60HT. The Scoping Phase of the project was undertaken in 2017 by GSC Water and Environmental Consultants, and following an appeal in the High Court of South Africa, the Scoping Report was accepted by the Department of Mineral Resources and Energy in February 2020, permitting Kangra Coal to continue with the Environmental Impact Assessment process. PROJECT DESCRIPTION: The Kangra Coal T4 Project area is adjacent to the Kangra Coal Kusipongo Mining Right (MR) area (MP30/5/1/2/2/10099MR), which in turn is adjacent to the consolidated Maquasa MR area (MP30/5/1/2/2/133MR). The Maquasa East and West operations have been in operation since 1996	

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
				and currently produce ~ 2.2 million tonnes of coal per annum (Mtpa) from underground and opencast operations. The proposed Kangra Coal T4 Project, extends from the south-eastern corner of the Ermelo Coalfield in the north, to the northern parts of the KwaZulu-Natal Coalfield in the south. The Kangra Coal T4 project will entail the underground mining of the Gus seam at a depth of approximately 200 – 300 m below surface. Infrastructure planned will include ventilation shafts (Ventilation Shaft 1 - De Paarl 39 HT Portion 4, Ventilation Shafts 3 and 4 – Grootvallei 43 HT Portion 3), a powerline (located Roodepoort 38 HT (Portion 1, 2), Kikvorschfontein 35 HT (Portion 3), Grootvallei 43 HT (Portion 3, 16) and De Paarl 39 HT (Portions Re, 1, 3, 4 and 5) and access roads. . LEGISLATION: Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended; Regulation GN R. 324, 325 and 327 in Gazette no. 40772 of 7 April 2017 (Listing Notice 1, 2 and 3), under the National Environmental Management Act (Act No. 107 of 1998) as amended; and National Environmental Waste Management Act (Act 59 0f 2008). REGISTRATION AND COMMENT: As a potential I&AP, you are invited to register and comment on the proposed application and associated reports. Should you have any comments or concerns regarding the project, or should you require any additional information, please contact Elemental Sustainability telephonically, or in writing using the contact details below. Please include the project reference number (Kangra_2020_MR) in all correspondence. Opportunities for further public participation will be communicated with I&AP's. All comments must be directed to: Elemental Sustainability REF NUMBER: Kangra_2020_MR For the attention of: DuToit Wilken or Sonja van de Giessen	

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
				Postal address: PO Box 39080, Moreletapark Pretoria 0044 E-mail: dutoit@elemental-s.co.za; sonja@elemental-s.co.za Nr: 083 388 4633 / 084 588 2322 Kindly find attached the Background Information Document, which provides further information for the project. Should you have any queries, then please do not hesitate to contact me. Kind regards Sonja	
Labuschagne Carla	X	-	No comments received to date.	A Background Information Document has been sent.	Appendix 6
Greyling Cornelius Johannes Francois/ Corneels Greyling Trust/ Dymaster/ Ukuchuma Farming/ Mooibank Boerdery Pty Ltd/ Ben Greyling Landgoed CC	X X	8 March 2021	Refer to letter and response from Scholes Attorneys below.	The landowner refused access to the specialists and went to court to appeal the decisions made by the judges. The various judements and appeals submitted by the laywers representing the landowner are included in the EIAR and EMPR appendices.	Appendix 6
Malan Scholes representing Greyling Cornelius Johannes Francois/ Corneels Greyling Trust/ Dymaster/ Ukuchuma Farming/ Mooibank Boerdery Pty Ltd/ Ben Greyling	X	8 March 2021	Dear Sir / Madam **REGISTRATION AS INTERESTED AND AFFECTED PARTIES ("I&APs") IN RESPECT OF THE MINING RIGHT, ENVIRONMENTAL AUTHORISATION ("EA") AND WATER USE LICENCE ("WUL") APPLICATIONS BY KANGRA COAL PROPRIETARY LIMITED ("Kangra Coal")** 1 We act for Cornelius Johannes Francois Greyling ("**Greyling**"), Jan Christoffel Greyling, the Ben Greyling Landgoed Close Corporation, the	Good day Marga We acknolwegde your letter (L Bolz / M van der Merwe / MAT2882) as received on 08 March 2021 and will register the I&AP's as quested in Paragraph 5 of the letter. In terms of the demands made in paragraph 7, we will provide the required	Appendix 6

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
Landgoed CC			Mooibank Boerdery Proprietary Limited, Dymastar Proprietary Limited as well as the trustees for the time being of the Corneels Greyling Trust (collectively, "**our clients**") and refer to the background information document ("**BID**") and invitation to comment, received by Greyling on 16 February 2021. 2 As is evident from the BID, Kangra Coal is in the process of applying for a Mining Right, EA and WUL over farms owned by our clients, being – 2.1 the farm Grootfontein 8 HT; 2.2 the farm Grootvallei 43 HT; 2.3 the farm Langkloof 9 HT; 2.4 the farm Glenfillan 326 HT; 2.5 the farm Mooihoek 12 HT; and 2.6 the farm Donkerhoek 14 HT, collectively, the "**Properties**". 3 Our clients are, furthermore, the registered owners of several farms surrounding the proposed mining area and which farms will be impacted on by the proposed mining by Kangra Coal. Our clients have been farming in the area for several generations and for at least 140 years, and have established commercial farming operations. 4 The exact farm portions which will be affected by the proposed Mining Operation will be set out in detail in our clients' objections/comments, to be submitted in accordance with regulation 43 of the Environmental Impact Assessment Regulations (GNR 982 of 8 December 2014) ("**EIA Regulations**"), published in terms of the National	information during the 30 day public review period of the Draft EIA and EMPr. The documents will be made available for a 30 day public review period as required by Regulation 23(1). Regards ***DuToit***	

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties		**Date**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
List the names of persons consulted in this column, and		**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.					
			Environmental Management Act, 107 of 1998, as amended ("**NEMA**"). 5 Due to our clients' established rights on, *inter alia,* the Properties, the purpose of this letter is to request that you register our clients as I&APs in accordance with regulation 42(b) of the EIA Regulations. All correspondence and documents should be addressed to Greyling at cjfgrey@gmail.com as well as to Malan Scholes Incorporated at LBolz@malanscholes.co.za and Mvandermerwe@malanscholes.co.za. 6 For the purpose of providing objections/comments in respect of Kangra Coal's intended Mining Operation, we request that you provide us with the following documents – 6.1 proof that our clients, as referred to in paragraph 1 above, and the contact details as referred to in paragraph 5 above, are captured on the I&AP database; 6.2 a copy of the Kangra Coal Mining Right application; 6.3 the decision to accept the Kangra Coal Mining Right application; 6.4 the EA application; 6.5 the draft environmental impact assessment report ("**EIAR**") and all specialist studies referred to in the EAIR; 6.6 the draft environmental management programme and all supporting documents referred to therein; 6.7 a copy of the WUL application and all supporting documents, as referred to in the BID; and		

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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List the names of persons consulted in this column, and		**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.					
			6.8 copies of the Kangra Coal mining work programme and social and labour plan in redacted form, in accordance with the High Court Judgment *Duduzile Baleni & Others v Regional Manager: Eastern Cape Department of Mineral Resources and Others* (96628/2015) [2020] ZAGPPHC 485; [2020] 4 All SA 374 (GP); 2021 (1) SA 110 (GP) (11 September 2020), read with the Department of Mineral Resources and Energy PAIA Manual 2020, compiled in accordance with section 14 of the Promotion of Access to Information Act, 2 of 2000, as amended. 7 Please furnish us with the requested information/documents by no later than close of business on Tuesday, 9 March 2021. 8 All of our clients' rights are reserved. Yours faithfully *[Sent electronically without a signature]* **MALAN SCHOLES INCORPORATED**		
Greyling Cornelius Johannes Francois/ Corneels Greyling Trust/ Dymaster/ Ukuchuma Farming/ Mooibank Boerdery Pty Ltd/ Ben Greyling Landgoed CC	X	17 February 2021	The Social Impact Assessment Specialist held a discussion with Mr Greling and the following points were brought up: - Generations on these farms. - 6 500 ha of his farms are already impacted by a mining right. - This project will affect an additional 5 300 ha. - Cattle (5 000); Sheep (25 000) - Concerned about water quality and quantity.	Various specialist studies have been undertaken for the proposed Kangra T4 project, including surface water study, wetlands study, groundwater assessment,agricultural and soil assessment and the social impact assessment. The results of these studies have been included in EIAR and EMPR.	Refer to Section 10 of the EIAR, Section 15 and Section 28, as well as Appendix 9 to 16.

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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			- How will he then be able to continue farming economically? - Fountains on farms used for livestock. These will run dry. He says that the prospecting boreholes of 50m depth even indicated that groundwater could drain. - Currently surface / stormwater fills his dams – uses it for irrigation purposes. - His farm is on the edge of 2 catchments – (i) Upper reaches of the Vaal (Klein Vaal that supplies Greater Vaal); and (ii) the Umhlelo River (to Indian Ocean) - Has experience in Brits with his wife's family farms. Platinum mines – groundwater drains away, boreholes dry – Need to pump water from somewhere else. - Where will mine pump water to? Umhlelo River? - Workers: 120 permanent - Pays R6 million in salaries. - Workers live on his farm or on neighbouring properties. - Also concerned that some of his best workers / drivers will leave to work for the mine as Farmers cannot compete with salaries paid by the mine. This happened when the mine in Dirkiesdorp / Kiepersol opened.		

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	X		- Access roads: control on farms are less as people will move over properties ('kort pad') - Stock theft is a concern. Currently put collars on sheep, count them every day, patrol the area themselves, do own investigations – Farmers have been able to control crime relatively well up to now. - Syndicate that operates the area – awaiting trail. - Estimates land values at R30 000 to R50 000 per ha. Recently 4 000/5 000 ha farms in the vicinity sold for this amount. - Previous years only grazing - now also crops, which increased land values. - Mealies – 9 tonnes; Soya – 3 tonnes - Rainfall very high in the area. - Last 'misoes' was in 1994. - Previous mine owners made promises that Kangra is now not aware of and cannot commit to it (i.e. pay a portion of the RoM to landowner).		
Ndhlovu, Maseko & Vilakazi Communal Prop Association	X	-	No comments received to date.	A Background Information Document has been sent.	Appendix 6
National Government of the Republic of South Africa	X	-	No comments received to date.	A Background Information Document has been sent.	Appendix 6
Johan Delport	X	4 February	Mr Delport advised telephonically that no	Goeie dag Mnr. Delport,	Appendix 6

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		2021	specialists would be allowed on site. No further comments received from Mr Delport to date.	Elemental Sustainability het u laas jaar in Oktober gekontak inverband met die spesialiste se werk wat vir die voorgestelde Kangra Coal T4 Projek onderneem moet word. Vind asseblief aangeheg 'n lys van spesialiste wat hulle studies moet onderneem vir die projek, sowel as die datums wat hulle graag sal wil die werk doen en 'n kort opsomming van die werk wat onderneem moet word. Hiermee 'n opsomming van die datums en die spesialis werk: 5 February 2021: Ms Corlien Lambrechts (fauna and flora specialist) and Ms. Nicole Upton (hydrologist); 8 February 2021: Mr Tobias Coetzee (heritage specialist); 9 Februarie 2021: Mr. Morne Burger (groundwater specialist); 9 -11 February 2021: Mr Marchelle Terblanche (Social Impact Specialist); 10 February 2021: Ms. Marine Pienaar (Soil and Agricultural Specialist); and 16 -18 February 2021: Mr. Ryan Edwards (wetland specialist). Hiermee is ook 'n kort opsomming vir die projek: APPLICANT, BACKGROUND AND PROJECT LOCATION: Kangra Coal (Pty) Ltd is in the process of applying for a mining right in terms of the Mineral and Petroleum Recourses Development Act 2002 (Act No. 28 of 2002), and an environmental authorisation in terms of Regulation GN R. 325 in Gazette no. 40772 of 7 April 2017 (Listing Notice 2), under the National Environmental Management Act (Act No. 107 of 1998) as amended, for an underground coal mine on Portions 0 (remaining extent (re)) and 1 of Prospectfarm 361IT; Portions 0, 1, 2 (Re), 3 Glenfillan 362IT; portions 3(re), 16, 17, 19 and 20 of Donkerhoek 14HT; portions 0(Re), 1(Re) and 2 of Grootfontein 8HT; portions 0 and 1 of Langkloof 9HT; Portions 0(Re), 1(Re), 2(Re), 3(Re), 4(Re), 5, 6 (Re), 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 18 of Grootvallei 43HT; Portions 0 and 2 of Middelpan 42HT; Portions 1, 2, 3, 4, 5, 6, 7 and 8 of Vryheid 42HT; Portion 0 (Re) of Naauwhoek 37HT; Portions 0(Re), 1(Re), 2, 3 and the servitude of Portion 3 of De Paarl 39HT; Portions 0(Re), 1(Re), 2, 3, 4(Re), 5, 6 and 7 of Spitskop 41HT; Portion 0 of Uitgedacht 56HT; Portion 0 of Zoogedacht 57HT; Portion 0 of Bovenvallei 58HT; Portion 1 of Goedgeloof 77HT;	

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				Portion0(Re) and 1 of Zondernaam and Portion 0 of Dubbeldam 60HT. The Scoping Phase of the project was undertaken in 2017 by GSC Water and Environmental Consultants, and following an appeal in the High Court of South Africa, the Scoping Report was accepted by the Department of Mineral Resources and Energy in February 2020, permitting Kangra Coal to continue with the Environmental Impact Assessment process. PROJECT DESCRIPTION: The Kangra Coal T4 Project area is adjacent to the Kangra Coal Kusipongo Mining Right (MR) area (MP30/5/1/2/2/10099MR), which in turn is adjacent to the consolidated Maquasa MR area (MP30/5/1/2/2/133MR). Kangra's Maquasa East and West operations have been in operation since 1996 and currently produce ~ 2.2 million tonnes of coal per annum (Mtpa) from underground and opencast operations. 2 The proposed Kangra Coal T4 Project, extends from the south-eastern corner of the Ermelo Coalfield in the north, to the northern parts of the KwaZulu-Natal Coalfield in the south. The Kangra Coal T4 project will entail the underground mining of the Gus seam at a depth of approximately 200 – 300 m below surface. Infrastructure planned will include ventilation shafts (Ventilation Shaft 1 - De Paarl 39 HT Portion 4, Ventilation Shafts 3 and 4 – Grootvallei 43 HT Portion 3), a powerline (located Roodepoort 38 HT (Portion 1, 2), Kikvorschfontein 35 HT (Portion 3), Grootvallei 43 HT (Portion 3, 16) and De Paarl 39 HT (Portions Re, 1, 3, 4 and 5) and access roads. . LEGISLATION: Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended; Regulation GN R. 324, 325 and 327 in Gazette no. 40772 of 7 April 2017 (Listing Notice 1, 2 and 3), under the National Environmental Management Act (Act No. 107 of 1998) as amended; and	

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				National Environmental Waste Management Act (Act 59 0f 2008); and REGISTRATION AND COMMENT: As a potential I&AP, you are invited to register and comment on the proposed application and associated reports. Should you have any comments or concerns regarding the project, or should you require any additional information, please contact Elemental Sustainability telephonically, or in writing using the contact details below. Please include the project reference number (Kangra_2020_MR) in all correspondence. Opportunities for further public participation will be communicated with I&AP's. All comments must be directed to: Elemental Sustainability REF NUMBER: Kangra_2020_MR For the attention of: DuToit Wilken or Sonja van de Giessen Postal address: PO Box 39080, Morelletapark Pretoria 0044 E-mail: dutoit@elemental-s.co.za; sonja@elemental-s.co.za Nr: 083 388 4633 Kindly find attached the Background Information Document, which provides further information for the project. Vind asseblief ook aangeheg die "Background Information Document" wat meer inligting oor die projek gee. Kind regards, Sonja	
Mr Johan Delport	X	12 February 2021	No comments received to date.	Goeie dag Mnr. Delport, Soos gistermiddag telefonies bespreek, het Elemental Sustainability u tussen 09:00 en 10:00 vandag geskakel om uit te vind oor die spesialiste se werk wat vir volgende week geskudeleer is: 15 Februarie 2021: Ms Corlien Lambrechts (fauna and flora specialist) and Ms. Nicole Upton (hydrologist); 15 Februarie 2021: Mr Tobias Coetzee (heritage specialist); 15 Februarie 2021: Mr. Morne Burger (groundwater specialist);	Appendix 6

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				16 -17 Februarie 2021: Mr Marchelle Terblanche (Social Impact Specialist); 15 Februarie 2021: Ms. Marine Pienaar (Soil and Agricultural Specialist); and 16 -18 Februarie 2021: Mr. Ryan Edwards (wetland specialist). Vind asseblief aangeheg die volledige tabel met die spesialiste se besonderhede, insluitend kontak nommers. Kind regards, Sonja Good day Mr Delport, As discussed yesterday afternoon, Elemental Sustainability tried phoning you between 09:00 and 10:00 to confirm that the specialists can come to site as scheduled for next week: 15 Februarie 2021: Ms Corlien Lambrechts (fauna and flora specialist) and Ms. Nicole Upton (hydrologist); 15 Februarie 2021: Mr Tobias Coetzee (heritage specialist); 15 Februarie 2021: Mr. Morne Burger (groundwater specialist); 16 -17 February 2021: Mr Marchelle Terblanche (Social Impact Specialist); 15 February 2021: Ms. Marine Pienaar (Soil and Agricultural Specialist); and 16 -18 February 2021: Mr. Ryan Edwards (wetland specialist). Please find attached the complete table with the specialists contact detail, including contact numbers.	
Thembalethu Vryheid Communal Prop Assoc	X	No	No comment received to date.	A Backgound Information Document was given to the chairperson of the Association.	Appendix 6
Mr R Moller		12 February 2021	The Social Impact Assessment Specialist held a meeting with Mr Moller, who brought up the following concerns: - Been farming 23 years on this farm. - Appr. 400 ha - Underground mine impacts almost the whole of his property.	Various specialist studies have been undertaken for the proposed Kangra T4 project, including surface water study, wetlands study, groundwater assessment,agricultural and soil assessment and the social impact assessment. The results of these studies have been included in EIAR and EMPR.	Refer to Section 10, Section 15, Section 28 and Section 30 of the EIAR, as well as Appendix 9 to 16.

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			- Employs 4 permanent people. - Dependent on 3x boreholes on the farm. The stream is not 'perrenial' - Farms with cattle, sheep, crops - Harvests 10 tonnes - House on farm is empty – used to rent it out. - Has a friend in Kriel – mines impacted water negatively, cattle gets illnesses. Who will compensate him if the same happens here? - Cattle has never had any illnesses here. - This farm is his main source of income. Still has a bond on the property – does not have the cashflow to buy implements etc. cash.		
Mr R Moller and Ms. Y van Biljoen (lawyer of Mr Moller)	X	12 February 2021	A telephone call was received from Ms van Biljoen advising that the specialists would be allowed to go to site and that a summary of the dates and the specialist names and work be sent to Mr Moller.	Goeiedag Mnr. Moller Soos gereël met Mev. Van Biljoen vind asseblief Hiermee die opsomming vir die spesialiste se werk vir volgende week: 15 Februarie 2021: Ms Corlien Lambrechts (fauna and flora specialist) and Ms. Nicole Upton (hydrologist); 15 Februarie 2021: Mr Tobias Coetzee (heritage specialist); 15 Februarie 2021: Mr. Morne Burger (groundwater specialist); 16 -17 Februarie 2021: Mr Marchelle Terblanche (Social Impact Specialist); 15 Februarie 2021: Ms. Marine Pienaar (Soil and Agricultural Specialist); and 16 -18 Februarie 2021: Mr. Ryan Edwards (wetland specialist). Vind asseblief aangeheg die volledige tabel met die spesialiste se besonderhede, insluitend kontak nommers. U kontak nommer is vir die spesialiste gegee sodat hulle u kan kontak oor 'n tyd. As daar enige vrae is, kontak asseblief vir my. Dankie.	Appendix 6

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				Kind regards, Sonja English translation: Good day Mr Moller, As arranged with Ms van Biljoen, please find herewith a summary of the specialist work for next week: 15 February 2021: Ms Corlien Lambrechts (fauna and flora specialist) and Ms. Nicole Upton (hydrologist); 15 February 2021: Mr Tobias Coetzee (heritage specialist); 15 February 2021: Mr. Morne Burger (groundwater specialist); 16 -17 February 2021: Mr Marchelle Terblanche (Social Impact Specialist); 15 February 2021: Ms. Marine Pienaar (Soil and Agricultural Specialist); and 16 -18 February 2021: Mr. Ryan Edwards (wetland specialist). Please find attached a table with full contact details and further information of the specialists. Kind regards Sonja	
Mr Renier Moller	X	4 February	Received via Telephone call and WhatsApp (Also refer to comments from Ms. Biljoen – lawyer representing Mr. Moller): More soos bespreek het gee ek geen person toestemming om my grond te betree en so ook vir geen toets of navorsing nie Groete Renier Moller English Translation: As discussed, I do not give any person permission to access my property or undertaken any tests for research. Regards Renier Moller	Good day Mr. Moller, Elemental Sustainability (Pty) Ltd. has been appointed by Kangra Coal (Pty) Ltd. to assist with undertaking the necessary environmental authorisation for the proposed Kangra T4 project. APPLICANT, BACKGROUND AND PROJECT LOCATION: Kangra Coal (Pty) Ltd is in the process of applying for a mining right in terms of the Mineral and Petroleum Recourses Development Act 2002 (Act No. 28 of 2002), and an environmental authorisation in terms of Regulation GN R. 325 in Gazette no. 40772 of 7 April 2017 (Listing Notice 2), under the National Environmental Management Act (Act No. 107 of 1998) as amended, for an underground coal mine on Portions 0 (remaining extent (re)) and 1 of Prospectfarm 361IT; Portions 0, 1, 2 (Re), 3 Glenfillan 362IT; portions 3(re), 16, 17, 19 and 20 of Donkerhoek 14HT; portions 0(Re), 1(Re) and 2 of	

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				Grootfontein 8HT; portions 0 and 1 of Langkloof 9HT; Portions 0(Re), 1(Re), 2(Re), 3(Re), 4(Re), 5, 6 (Re), 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 18 of Grootvallei 43HT; Portions 0 and 2 of Middelpan 42HT; Portions 1, 2, 3, 4, 5, 6, 7 and 8 of Vryheid 42HT; Portion 0 (Re) of Naauwhoek 37HT; Portions 0(Re), 1(Re), 2, 3 and the servitude of Portion 3 of De Paarl 39HT; Portions 0(Re), 1(Re), 2, 3, 4(Re), 5, 6 and 7 of Spitskop 41HT; Portion 0 of Uitgedacht 56HT; Portion 0 of Zoogedacht 57HT; Portion 0 of Bovenvallei 58HT; Portion 1 of Goedgeloof 77HT; Portion0(Re) and 1 of Zondernaam and Portion 0 of Dubbeldam 60HT. The Scoping Phase of the project was undertaken in 2017 by GSC Water and Environmental Consultants, and following an appeal in the High Court of South Africa, the Scoping Report was accepted by the Department of Mineral Resources and Energy in February 2020, permitting Kangra Coal to continue with the Environmental Impact Assessment process. PROJECT DESCRIPTION: The Kangra Coal T4 Project area is adjacent to the Kangra Coal Kusipongo Mining Right (MR) area (MP30/5/1/2/2/10099MR), which in turn is adjacent to the consolidated Maquasa MR area (MP30/5/1/2/2/133MR). Kangra's Maquasa East and West operations have been in operation since 1996 and currently produce ~ 2.2 million tonnes of coal per annum (Mtpa) from underground and opencast operations. The proposed Kangra Coal T4 Project, extends from the south-eastern corner of the Ermelo Coalfield in the north, to the northern parts of the KwaZulu-Natal Coalfield in the south. The Kangra Coal T4 project will entail the underground mining of the Gus seam at a depth of approximately 200 – 300 m below surface. Infrastructure planned will include ventilation shafts (Ventilation Shaft 1 - De Paarl 39 HT Portion 4, Ventilation Shafts 3 and 4 – Grootvallei 43 HT Portion 3), a powerline (located Roodepoort 38 HT (Portion 1, 2), Kikvorschfontein 35 HT (Portion 3), Grootvallei 43 HT (Portion 3, 16) and De Paarl 39 HT (Portions Re, 1, 3, 4 and 5) and access roads. .	

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				LEGISLATION: Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended; Regulation GN R. 324, 325 and 327 in Gazette no. 40772 of 7 April 2017 (Listing Notice 1, 2 and 3), under the National Environmental Management Act (Act No. 107 of 1998) as amended REGISTRATION AND COMMENT: As a potential I&AP, you are invited to register and comment on the proposed application and associated reports. Should you have any comments or concerns regarding the project, or should you require any additional information, please contact Elemental Sustainability telephonically, or in writing using the contact details below. Please include the project reference number (Kangra_2020_MR) in all correspondence. Opportunities for further public participation will be communicated with I&AP's. All comments must be directed to: Elemental Sustainability REF NUMBER: Kangra_2020_MR For the attention of: DuToit Wilken or Sonja van de Giessen Postal address: PO Box 39080, Morelletapark Pretoria 0044 E-mail: dutoit@elemental-s.co.za; sonja@elemental-s.co.za Nr: 083 388 4633 Kindly find attached the Background Information Document, which provides further information for the project. Furthermore, attached is a letter which indicates the specialist visits that need to be undertaken for the project. A summary of the specialist site visits is provided below: 5 February 2021: Ms Corlien Lambrechts (fauna and flora specialist) and Ms. Nicole Upton (hydrologist); 8 February 2021: Mr Tobias Coetzee (heritage specialist);	

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				9 -11 February 2021: Mr Marchelle Terblanche (Social Impact Specialist); 10 February 2021: Ms. Marine Pienaar (Soil and Agricultural Specialist); and 16 -18 February 2021: Mr. Ryan Edwards (wetland specialist). Should you have further queries, please do not hesitate to contact me. Kind regards, Sonja	
Yolanda van Biljoen Attorneys (Representing Mr Renier Moller)	X	4 February 2021	Beste Sonja, ek verwys na die epos wat u op 4 deser aan ons kliënt gestuur het tesame met die aanhangsels daartoe. Ek bevestig dat dit my kliënt se instruksies is dat hy GEEN toestemming verleen dat die persone, soos uiteengesit in u voormelde e-pos, of enige ander persone sy plaas [MIDDELPAN] mag betree nie. Ek bevestig dat my kliënt u ook per whattsapp skriftelik van sy instruksies meegedeel het, en vertrou ons dat u dit aan die onderskeie spesialiste sal deurgee. Vriendelike Groete, Yolanda English Translation Dear Sonja, I refer to the email sent to my clint on 4 February together with the attachment. I hereby confirm that my clients instructions are not to allow any person on his property (Middelpan) as discussed in a previous email. I confirm that my client also instructed you via Whatsapp regarding his instructions and trust that the message will be given as such to the specialists.	Good day Ms. van Biljon, Elemental Sustainability has received the below email and takes note of its contents. All communication will be included in the Environmental Impact Assessment Report and in the Public Participation Report, which will be submitted to the Department of Mineral Resources and Energy for adjudication. Please be advised that you have been added to the Interested and Affected Parties database for the Kangra Coal T4 project. Should you have any further queries, then please do not hesitate to contact me. Kind regards, Sonja	Appendix 6
Mr Werner Potgieter	X	No	-	A BID has been sent to Mr Potgieter, but no comments have been sent to the EAP.	Appendix 6

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(Kerneels Greyling Trust)					
Mr Werner Potgieter (Kerneels Greyling Trust)	X	12 February 2021	The Social Impact Assessment Specialist held a meeting with Mr Potgieter who brought up the following concerns: - His farms are located in the southern T4 mining right area. - Farms with mealies, soya, cattle (10 000) and sheep (20 000) (sheep farming is very profitable, and does sheep farming for the last 70 years already) - Irrigates mealies. - Rent various farms from Kangra (towards the east) also and has experience with the mine. - Current workers: 180 permanent + 100 temporary. - Each has appr. 4 dependents. - Mentioned that he provides more employment than necessary because unemployment in the area is so high. (needs 80 workers, but employs 180). Without sufficient water this cannot be done. - Most workers live on his farm. Go home on weekends - Driefontein, Dirkiesdorp etc. - Impacts on livelihoods – his own, and the workers. - Access and movement is an issue – increase in crime – influx of people.	Various specialist studies have been undertaken for the proposed Kangra T4 project, including surface water study, wetlands study, groundwater assessment,agricultural and soil assessment and the social impact assessment. The results of these studies have been included in EIAR and EMPR.	Refer to Section 10 of the EIAR, Section 15 and Section 28, as well as Appendix 9 to 16.

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Mark with an X where those who must be consulted were in fact consulted.					
			- Current crime: usually criminals come from Diefontein, Daggakraal, Dirkiesdorp areas. Crime levels not too bad yet., although increasing. They do not receive cooperation from SAPS and farmers do their own investigations and then hand evidence to the police for arrests. (SAPS Dirkiesdorp, Wakkerstroom). - Impacts of trucks on gravel roads. - Dust – impacts on grazing, surface water, and dust on implements in sheds. - Concerned about surface water that will “disappear” – water holding capacity of soil is lost / soil becomes like a sieve. - Klein Vaal River runs through his farm – feeds the Greater Vaal River. - Impacts on Land Values – if water quality and quantity reduces, land value will decrease. - Impacts on irrigation equipment – acidic water etc. - Legacy of a mine not good. Legacy of a farm much better. - Agriculture’s contribution to the GGP much larger the last 3 years. - Farmers are the people that carry the risk and are affected adversely. - Want the mine to provide assurance with regards to water. Assurance of lifelong provision of water.		

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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			- Mine should make it worth for them to sell and move somewhere else if required. - Mine needs to buy the properties so that he is able to farm somewhere else. - Willing to go to court.		
Mr John Dyason	X	18 February 2021	Good day Attached please find the completed registration form. Regards John Dyason 083 304 7498 The greatest concern I have is the impact of the mine on the groundwater	Good day My Dyason, Thank you for the email and for completing the registration form. An underground and surface water assessment is being undertaken for the project and the results thereof will be made available to all stakeholders, interested and affected parties and landowners when the Environmental Impact Assessment Report is made available for public review. All registered interested and affected parties will be advised when the report is available and project teams/ zoom meetings can be arranged on request. Should you have further queries, then please do not hesitate to contact me. Kind regards, Sonja	Appendix 6
Lawful occupier/s of the land					
No comments received to date					
Landowners or lawful occupiers on adjacent properties					
Gerda van Wyk	X	19 February 2021	A SMS was sent advising the adjacent landowner of the Kangra T4 project with a link to the BID for downloading. A Whattsapp was received from Ms van WYk requesting that an English BID be emailed to Ms van Wyk.	Goeie dag Charlene/Gerda Vind asseblief aangeheg die Engelse dokument. **Kangra Coal T4 Underground Coal Mining Project** Elemental Sustainability (Pty) Ltd. has been appointed by Kangra Coal (Pty) Ltd. to assist with undertaking the necessary environmental authorisation for the proposed Kangra Coal T4 project. **APPLICANT, BACKGROUND AND PROJECT LOCATION:** Kangra Coal (Pty) Ltd is in the process of applying for a mining right in terms of the Mineral and Petroleum Recourses Development Act 2002 (Act No. 28	Appendix 6

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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				of 2002), and an environmental authorisation in terms of Regulation GN R. 325 in Gazette no. 40772 of 7 April 2017 (Listing Notice 2), under the National Environmental Management Act (Act No. 107 of 1998) as amended, for an underground coal mine on Portions 0 (remaining extent (re)) and 1 of Prospectfarm 361IT; Portions 0, 1, 2 (Re), 3 Glenfillan 362IT; portions 3(re), 16, 17, 19 and 20 of Donkerhoek 14HT; portions 0(Re), 1(Re) and 2 of Grootfontein 8HT; portions 0 and 1 of Langkloof 9HT; Portions 0(Re), 1(Re), 2(Re), 3(Re), 4(Re), 5, 6 (Re), 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 18 of Grootvallei 43HT; Portions 0 and 2 of Middelpan 42HT; Portions 1, 2, 3, 4, 5, 6, 7 and 8 of Vryheid 42HT; Portion 0 (Re) of Naauwhoek 37HT; Portions 0(Re), 1(Re), 2, 3 and the servitude of Portion 3 of De Paarl 39HT; Portions 0(Re), 1(Re), 2, 3, 4(Re), 5, 6 and 7 of Spitskop 41HT; Portion 0 of Uitgedacht 56HT; Portion 0 of Zoogedacht 57HT; Portion 0 of Bovenvallei 58HT; Portion 1 of Goedgeloof 77HT; Portion 0(Re) and 1 of Zondernaam and Portion 0 of Dubbeldam 60HT. The Scoping Phase of the project was undertaken in 2017 by GSC Water and Environmental Consultants and following an appeal in the High Court of South Africa, the Scoping Report was accepted by the Department of Mineral Resources and Energy in February 2020, permitting Kangra Coal to continue with the Environmental Impact Assessment process. **PROJECT DESCRIPTION:** The Kangra Coal T4 Project area is adjacent to the Kangra Coal Kusipongo Mining Right (MR) area (MP30/5/1/2/2/10099MR), which in turn is adjacent to the consolidated Maquasa MR area (MP30/5/1/2/2/133MR). Kangra's Maquasa East and West operations have been in operation since 1996 and currently produce ~ 2.2 million tonnes of coal per annum (Mtpa) from underground and opencast operations. The proposed Kangra Coal T4 Project, extends from the south-eastern corner of the Ermelo Coalfield in the north, to the northern parts of the KwaZulu-Natal Coalfield in the south. The Kangra Coal T4 project will entail the underground mining of the Gus seam at a depth of approximately 200 – 300 m below surface.	

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
				Infrastructure planned will include ventilation shafts (Ventilation Shaft 1 - De Paarl 39 HT Portion 4, Ventilation Shafts 3 and 4 – Grootvallei 43 HT Portion 3), a powerline (located Roodepoort 38 HT (Portion 1, 2), Kikvorschfontein 35 HT (Portion 3), Grootvallei 43 HT (Portion 3, 16) and De Paarl 39 HT (Portions Re, 1, 3, 4 and 5) and access roads. **LEGISLATION:** • Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended; • Regulation GN R. 324, 325 and 327 in Gazette no. 40772 of 7 April 2017 (Listing Notice 1, 2 and 3), under the National Environmental Management Act (Act No. 107 of 1998) as amended; and • National Environmental Waste Management Act (Act 59 0f 2008). **REGISTRATION AND COMMENT:** As a potential I&AP, you are invited to register and comment on the proposed application and associated reports**.** Should you have any comments or concerns regarding the project, or should you require any additional information, please contact Elemental Sustainability telephonically, or in writing using the contact details below. Please include the project reference number (Kangra_2020_MR) in all correspondence. Opportunities for further public participation will be communicated with I&AP's. All comments must be directed to: **Elemental Sustainability** **REF NUMBER:** Kangra_2020_MR For the attention of: DuToit Wilken or Sonja van de Giessen Postal address: PO Box 39080, Moreletapark Pretoria 0044 E-mail: dutoit@elemental-s.co.za; sonja@elemental-s.co.za Nr: 083 388 4633 / 084 588 2322	

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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				Kindly find attached the Background Information Document, which provides further information for the project. Should you have any queries, then please do not hesitate to contact me.	
Mr Riaan Bester	X	18 February 2021	Hi Sonja, Ek het n boodskap ontvang van jou aangaande die steenkool projek te Ermelo omgewing. Die dokument is slegs in Zulu en ek is glad nie zulu magtig nie, kan jy dit groot asb vir my mail. My plaas se naam is Geelhoutboom . Dankie Riaan Bester 0832718710 English Translation Hi Sonja I received a message from you regarding a coal project in the Ermleo region. The document is only in isiZulu and I cannot speak the language. Please email me the document. My farm's name is Geelhoutboom. Thank you	Goeie dag Mnr. Bester, Vind asseblief aangeheg die Engelse dokument. **Kangra Coal T4 Underground Coal Mining Project** Elemental Sustainability (Pty) Ltd. has been appointed by Kangra Coal (Pty) Ltd. to assist with undertaking the necessary environmental authorisation for the proposed Kangra Coal T4 project. **APPLICANT, BACKGROUND AND PROJECT LOCATION:** Kangra Coal (Pty) Ltd is in the process of applying for a mining right in terms of the Mineral and Petroleum Recourses Development Act 2002 (Act No. 28 of 2002), and an environmental authorisation in terms of Regulation GN R. 325 in Gazette no. 40772 of 7 April 2017 (Listing Notice 2), under the National Environmental Management Act (Act No. 107 of 1998) as amended, for an underground coal mine on Portions 0 (remaining extent (re)) and 1 of Prospectfarm 361IT; Portions 0, 1, 2 (Re), 3 Glenfillan 362IT; portions 3(re), 16, 17, 19 and 20 of Donkerhoek 14HT; portions 0(Re), 1(Re) and 2 of Grootfontein 8HT; portions 0 and 1 of Langkloof 9HT; Portions 0(Re), 1(Re), 2(Re), 3(Re), 4(Re), 5, 6 (Re), 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 18 of Grootvallei 43HT; Portions 0 and 2 of Middelpan 42HT; Portions 1, 2, 3, 4, 5, 6, 7 and 8 of Vryheid 42HT; Portion 0 (Re) of Naauwhoek 37HT; Portions 0(Re), 1(Re), 2, 3 and the servitude of Portion 3 of De Paarl 39HT; Portions 0(Re), 1(Re), 2, 3, 4(Re), 5, 6 and 7 of Spitskop 41HT; Portion 0 of Uitgedacht 56HT; Portion 0 of Zoogedacht 57HT; Portion 0 of Bovenvallei 58HT; Portion 1 of Goedgeloof 77HT; Portion 0(Re) and 1 of Zondernaam and Portion 0 of Dubbeldam 60HT. The Scoping Phase of the project was undertaken in 2017 by GSC Water and Environmental Consultants, and following an appeal in the High Court of South Africa, the Scoping Report was accepted by the Department of Mineral Resources and Energy in February 2020, permitting Kangra Coal to continue	Appendix 6

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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				with the Environmental Impact Assessment process. **PROJECT DESCRIPTION:** The Kangra Coal T4 Project area is adjacent to the Kangra Coal Kusipongo Mining Right (MR) area (MP30/5/1/2/2/10099MR), which in turn is adjacent to the consolidated Maquasa MR area (MP30/5/1/2/2/133MR). Kangra's Maquasa East and West operations have been in operation since 1996 and currently produce ~ 2.2 million tonnes of coal per annum (Mtpa) from underground and opencast operations. The proposed Kangra Coal T4 Project, extends from the south-eastern corner of the Ermelo Coalfield in the north, to the northern parts of the KwaZulu-Natal Coalfield in the south. The Kangra Coal T4 project will entail the underground mining of the Gus seam at a depth of approximately 200 – 300 m below surface. Infrastructure planned will include ventilation shafts (Ventilation Shaft 1 - De Paarl 39 HT Portion 4, Ventilation Shafts 3 and 4 – Grootvallei 43 HT Portion 3), a powerline (located Roodepoort 38 HT (Portion 1, 2), Kikvorschfontein 35 HT (Portion 3), Grootvallei 43 HT (Portion 3, 16) and De Paarl 39 HT (Portions Re, 1, 3, 4 and 5) and access roads. **LEGISLATION:** • Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended; • Regulation GN R. 324, 325 and 327 in Gazette no. 40772 of 7 April 2017 (Listing Notice 1, 2 and 3), under the National Environmental Management Act (Act No. 107 of 1998) as amended; and • National Environmental Waste Management Act (Act 59 0f 2008). **REGISTRATION AND COMMENT:** As a potential I&AP, you are invited to register and comment on the proposed application and associated reports**.** Should you have any comments or concerns regarding the project, or should you require any additional information, please contact Elemental Sustainability telephonically, or in writing using the contact details below. Please include the project reference number (Kangra_2020_MR) in all correspondence. Opportunities for further	

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
				public participation will be communicated with I&AP's. All comments must be directed to: **Elemental Sustainability** **REF NUMBER:** Kangra_2020_MR For the attention of: DuToit Wilken or Sonja van de Giessen Postal address: PO Box 39080, Moreletapark Pretoria 0044 E-mail: dutoit@elemental-s.co.za; sonja@elemental-s.co.za Nr: 083 388 4633 / 084 588 2322 Kindly find attached the Background Information Document, which provides further information for the project. Should you have any queries, then please do not hesitate to contact me.	
Mr Paul (KRC Farming)	X	Yes	BID Registration Form Completed: Comment: We would like to get information on the Hlehlo River Catchment area that will be affected by the mining operation.	Good day Paul, Thank you for your email and for taking the time to complete the registration form. The proposed Kangra Coal T4 undermining project will be located towards the south of the mining boundary (see attached): As per the surface water assessment, the Kangra T4 Mining Project surface infrastructure and underground mining are not situated in the Hlelo River catchment (W52A). No impacts to surface water resources are expected in the Hlelo River catchment due to the proposed T4 Mining Project. Please be advised that Elemental will inform you of the availability of the Environmental Impact Assessment Report and all the specialist studies undertaken for the Kangra T4 Coal mine project for review by all interested and affected parties. Should you have any further queries, then please do not hesitate to contact me. Kind regards,	Appendix 6 and Appendix 8, as well as Section 15 and Section 31 of the EIAR and EMPR.

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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List the names of persons consulted in this column, and		**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.					
				Sonja	
Municipality					
Emails have been sent to the municipalities but no comments received. Telephone calls to the municipalities have not been answered	X	No	No comments received to date.	Emails have been sent to various people working within the muncipalities (both local and District) with a copy of the BID attached.	Appendix 6
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWS					
Emails were sent to Eskom, Mpumalanga Roads Department, Eskom and Telkom but no comments received to date	X	-	No comments received to date.	Emails have been sent to these entities with a copy of the BID attached.	Appendix 6
Communities					
Refer to Communal Property Assocations who are registered as owners and adjacent landowners.	X				
Dept. Land Affairs					
No comment received to date	**X**	-	No comments received to date.	Emails have been sent to these entities with a copy of the BID attached.	
Traditional Leaders					
Refer to		-			

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT					
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List the names of persons consulted in this column, and		**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.					
Communities					
Dept. Environmental Affairs					
No comment received to date			No comments received to date.	Emails have been sent to these entities with a copy of the BID attached.	Appendix 6
Competent Authorities affected					
IUCMA	**X**	-	No comments received to date.	Emails have been sent to these entities with a copy of the BID attached.	Appendix 6
OTHER AFFECTED PARTIES					
Mpumalanga Parks and Tourism Agency		X	Hi Sonja Please forward a hardcopy to Phumla Nkosi at Mataffin Mbombela. Kind Regards Frans Krige LUAS	Good day Franz, A hard copy of the documentation will be sent to the MPTA. Kind regards Sonja	Appendix 6
SAHRIS		X	Good morning, Please note that all development applications are processed via our online portal, the South African Heritage Resources Information System (SAHRIS) found at the following link: http://sahra.org.za/sahris/. We do not accept emailed, posted, hardcopy, faxed, website links or DropBox links as official submissions. Please create an application on SAHRIS and upload all documents pertaining to the Environmental Authorisation Amendment Application Process. As per section 38(8) of the National Heritage Resources Act, Act 25 of 1999 (NHRA), an assessment of heritage resources must form part of the process and the assessment must comply with section 38(3) of the NHRA. Once all documents including all appendices are uploaded to the case application, please ensure that the status of the case is changed from DRAFT to SUBMITTED. Please ensure that all documents	A hard copy has been loaded onto SAHRIS.	Appendix 6

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT				
Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**	**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
		produced as part of the EA process are submitted as part of the application. Kind Regards, Nokukhanya Khumalo		
OTHER				
Mr Brian Guerin (Wakkerstroom Bird Club)	5 March 2021	Good morning, Attached is our Registration Form as an IAP in the matter of the Kangra coal T4 project. Could you both please acknowledge receipt of this document? Sincerely, Brian Guerin BID Registration Form was completed: WE STRONGLY OBJECT TO THIS MINING ACTIVITY IN SUCH AN ECOLOGICALLY SENSITIVE AREA.	Good day Brian, Thank you for the email. You have been registered as an Interested and Affected Party and will be advised of further opportunities for public participation. Kind regards, Sonja	Appendix 6, Appendix 8, Appendix 10 and Section 10, Section 15, and Section 31 of this report.
Mr. Andre Badenhorst (TWK Agri)	3 March 2021	A telephone call was received from Mr Badenhorst from TWK Agri, requesting that he be registered for the Kangra Coal T4 project and an English BID.	Good day Mr Badenhorst, Thank you for the telephone call earlier. This email is to confirm that you have been registered as and Interested and Affected Party for the above project. Kindly find attached the Background Information Document. Further opportunities for consultation will be sent through to all registered interested and affected parties. Should you have any queries, then please do not hesitate to contact me.	Appendix 6
Prof Mary Scholes (University of Witwatersrand)	2 March 2021	Hi Sonja I would like to register as an I&AP in the Kangra Coal project. I have expertise in the area and in soil, water and biodiversity studies. Please acknowledge receipt of this email and that I have been registered. Regards Prof Mary Scholes:	Good day Prof Scholes, Thank you for the email. You have been registered ad an Interested and Affected Party for the Kangra Coal project. Should you have any queries, then please do not hesitate to contact me. Kind regards, Sonja	Appendix 6. Also refer to Section 10, Section 15, Section 31 and Appendices 7, 8, 9, 10 and 11 of the report.

COMMENTS AND RESPONSE REPORT FOR THE BIRMINGHAM MINING PROJECT				
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List the names of persons consulted in this column, and	**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.				
Mr Rupert Lawley (Wakkerstroom Natural Heritage Association (WNHA))	1 March 2021	Dear Mr DuToit Wilken, Kangra Coal T4 Project On behalf of Wakkerstroom Natural Heritage Association (WNHA), we hereby request that we be registered as an Interested and Affected Party (IAP). Look forward to receiving your confirmation by return. Kind Regards Rupert Lawlor	Good day Rupert Sonja the EAP on the project will registered WNHA as an I&AP on the project. Regards DuToit	Appendix 6. Also refer to Section 10, Section 15, Section 31 and Appendices 8, 9, 10 of the report.
Birdlife Africa	25 February 2021	Good day Sonja, BirdLife South Africa hereby confirms receipt of the BID for the Kangra Coal T4 Project EIA. Kindly register BirdLife South Africa as an I&AP in this matter. BirdLife South Africa notes that the entirety of the proposed coal mine falls into the Grasslands Important Birding Area (IBA) of Global significance, and furthermore is rated as the Highest Risk Category under the Mining and Biodiversity Guidelines of 2013. Thank you. Kind regards, Lindsey Smith RCP & P&A Admin Assistant	Good day Lindsey, Thank you for your email. BirdLife South Africa has been registered as an I&AP for the Kangra Coal T4 Project. A biodiversity specialist study has been undertaken for the project and the results thereof will be included in the Environmental Impact Assessment. Should you have any further queries, please do not hesitate to contact me. Kind regards, Sonja	Section 10.9, Section 15, Section, Section 31 and Appendix 10 of this report.

9 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES

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

No alternatives changes have been found which will influence the general baseline environmental conditions experienced. The baseline environment as described below, are the Environmental attributes as associated for the proposed development.

The powerline route was amended to ensure that the heritage resources are not impacted on.

10 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES: BASELINE ENVIRONMENT

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

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area, as well as specialist reports undertaken for the Kangra Coal T4 Project.

10.1 GRADIENT AND LANDSCAPE CONTEXT

The regional topography around the area is in general mountainous with mild to steep slopes and varying in elevation roughly from 1 500 mamsl in the south (Balgarthen area) to 1 700 mamsl in the north (Donkerhoek & Twyfelhoek areas). Refer to Figure 18 below or the topography of the study area.

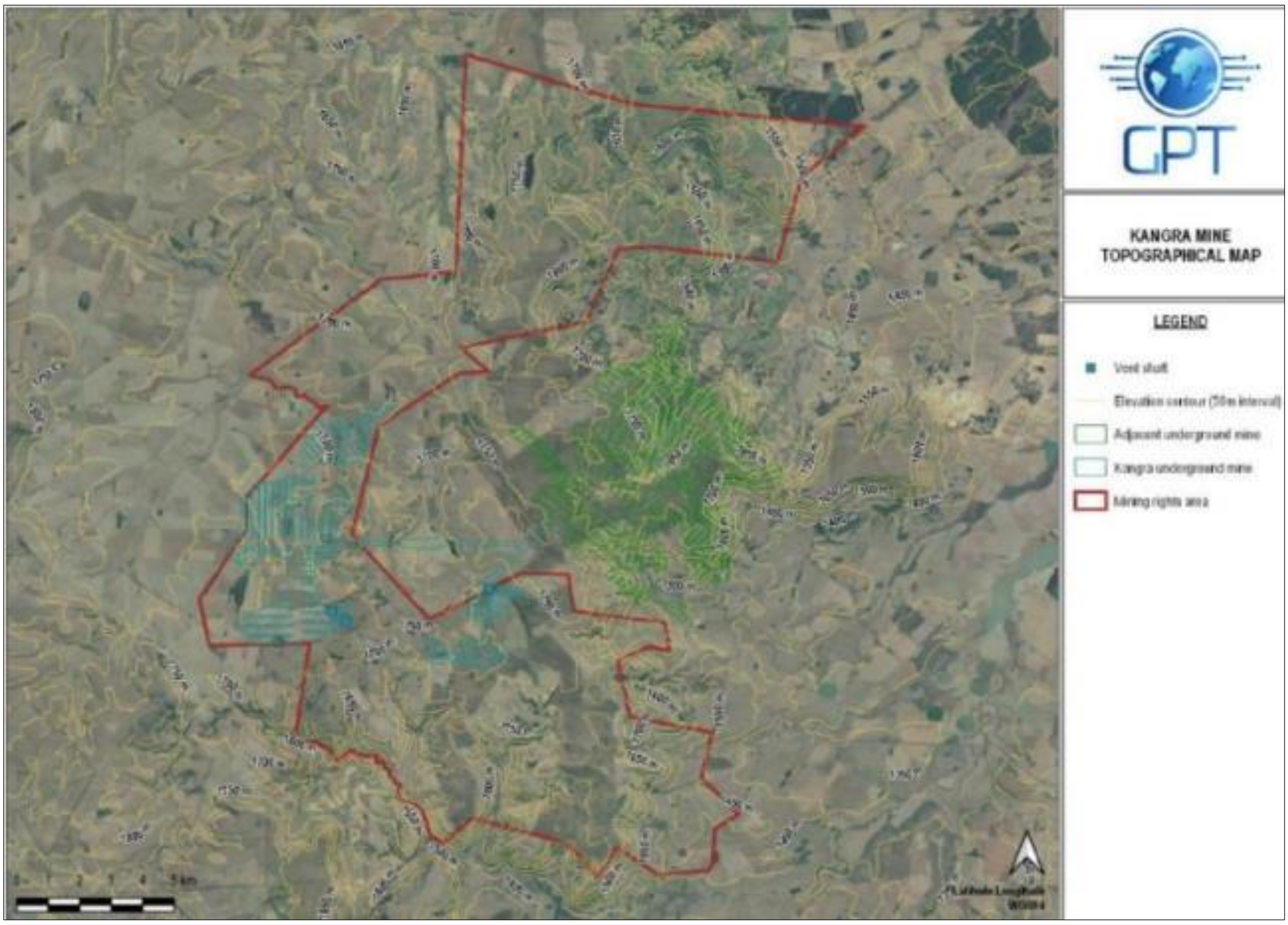

Figure 18: Site Topography

10.2 GEOLOGY

Reference is made to the Hydrogeological Assessment undertaken by Geo Pollution Technology, 2020, which was used to also inform the Geological baseline assessment (refer to Appendix 7) and the Mine Works Programme (refer to Appendix19).

10.2.1 Local Geology

The T4 Project is subdivided into three target areas (Figure 19):

- Target area 2B (T2B);
- Target area 4 (T4); and
- Target area 6 (T6).

The T2B area has the potential for opencast mining. The Gus and Dundas Seams appear to be potentially viable for mining. Some faults were interpreted in the area, which will probably determine the opencast mining areas. Displacements tend to be small but could have some effect on mining. The Alfred Seam is not well developed and is thin at only 0.5 m on average. Despite its thickness, the coal qualities are good and the VM content is on average 24.5 %. In an opencast mine, it could be possible to utilise this thin coal.

The Gus Seam is the best developed, with an average thickness of 1.5 m. Coal qualities are generally good.

However, the VM content of the coal is on average quite low (14.98 %). Indications are that the coal in the potential opencast mining areas have a higher than average VM content and the highest yields at a Relative Density (RD) of 1.5 grams per cubic centimetres (g/cm3).

The Dundas Seam is on average 1.0 m thick. The coal qualities in general are quite good. The coal in the Dundas Seam is devolatilised, with an average VM content of 14.63 %. It appears, however, that most of the coal in the potential open mining areas has a higher VM content.

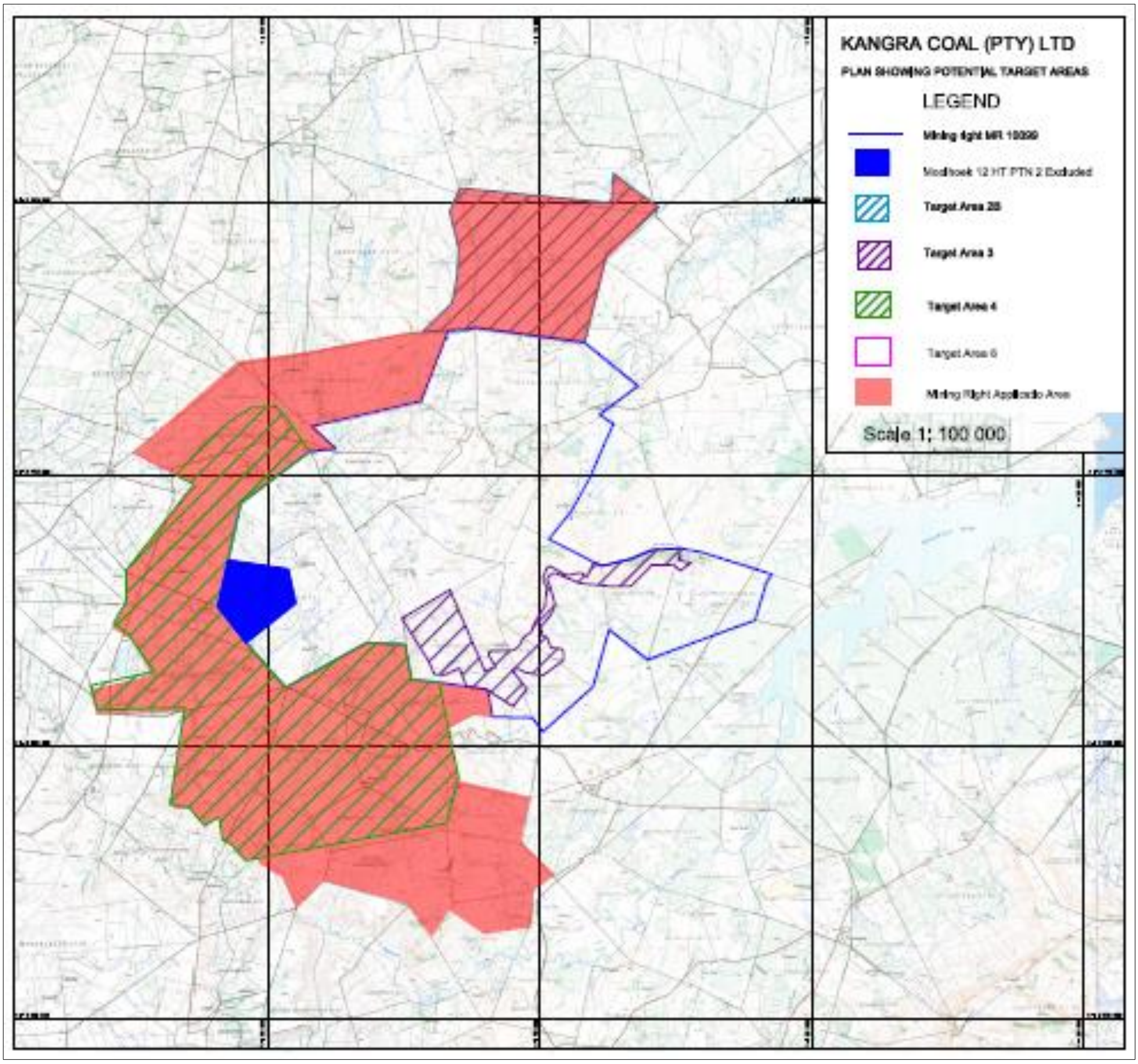

Figure 19: Project Target Areas

The Target Area 4 is the largest of the target areas. There are clear indications that faulting took place in this area. The coal seams are generally quite deep, between 200 m and 300 m. At these depths, only underground mining methods were considered. The Gus Seam is the thickest seam, with the Alfred Seam following, and the Dundas Seam the thinnest. Large areas of coal are devolatilised.

The Alfred Seam is on average 1.2 m thick, which will be a challenge for underground mining, depending on the value of the product produced from this Seam. The qualities appear good, with the exception of the VM content, which is on average 17 %. The larger part of the area is devolatilised. The average product yield at a 1.5 RD wash is almost 29 %. At this yield, the Alfred Seam will not be economic to mine by underground mining methods.

The Gus Seam is on average 1.5 m thick. A large percentage of the coal is devolatilised, with an average of almost 18 %. The MWP and the mine design are based on mining the T4 area Gus Seam by underground mining methods.

The Dundas Seam is on average 0.96 m thick and because of the thickness; the Seam would not be a viable option for underground mining. Although most of the coal is devolatilised, a somewhat larger portion has higher volatile content coal than the Gus and Alfred Seam, which improves the average VM content to 19 %. The product yields are, however, much lower than the yields in the Gus Seam and average at almost 38 %.

The coal seams form part of the Vryheid Formation of the Karoo Sequence. Typically, four coal seams are developed and named from top to bottom, namely the Fritz, Alfred, Gus, and Dundas. These seams are interbedded with sandstone sequences with minor siltstone development.

The main seams developed in the T4 Project area are the Alfred, Gus, and Dundas Seams. The Gus Seam is best developed and the most extensive, while the Alfred Seam has the poorest development. From the borehole logs, it is clear that the Gus Seam in the T4 Project area can be divided into two sum-seams:

- The Lower Gus with mainly bright coal
- The Upper Gus with mainly dull shaly coal and carbonaceous shale

The contact between the Upper and Lower Gus is a very prominent thin sandstone band. The Alfred Seam in the T4 Project area is on average 0.91 m thick, while the Gus Seam is 1.67 m. and the Dundas Seam is 1.01 m thick. In the T4 Project area, there are indications of major faulting as well as dolerite dykes and sills. The dolerite intrusions burnt and devolatilised the coal seams in some areas. Dolerites as well as faulting displaced the coal seams in certain areas. This, in combination with weathering and erosion, caused the coal seams to be absent in certain locations.

10.2.2 Regional Geology

A large proportion of the coal is devolatilised. The devolatilisation is caused mainly by dolerite sills either cutting through the coal seams or being in close proximity to the coal seams. To a lesser extent, the devolatilisation is caused by dolerite dyke intrusions.

There are indications of a number of faults in the Project area. A fault interpretation was undertaken, which is used in the modelling of the seam data. It is not clear from the data how many of the faults identified could actually be dolerite intrusions. Three prominent dolerite sills are present, with the top two more extensively developed and thicker than the bottom sill. There are indications that some of these sills cut through the seams in some areas. This will require more in-depth study with possibly more drilling to evaluate the full extent of this phenomenon.

The mined-out areas indicate that a number of dolerite dykes could be expected in the future mining areas. It is impossible to determine the extent of dolerite intrusions from the vertical boreholes. The generalised stratigraphic section of the expected lithologies in the area is shown Figure 21.

The Project area extends from the south-eastern corner of the Ermelo Coalfield in the north, to the northern parts of the Kwazulu-Natal Coalfields in the south and contains features of both coalfields. The coal deposit that occurs on the Project area can be classified, according to the South African National Standards (SANS) 10320:2004's definition, as a multiple seam deposit type.

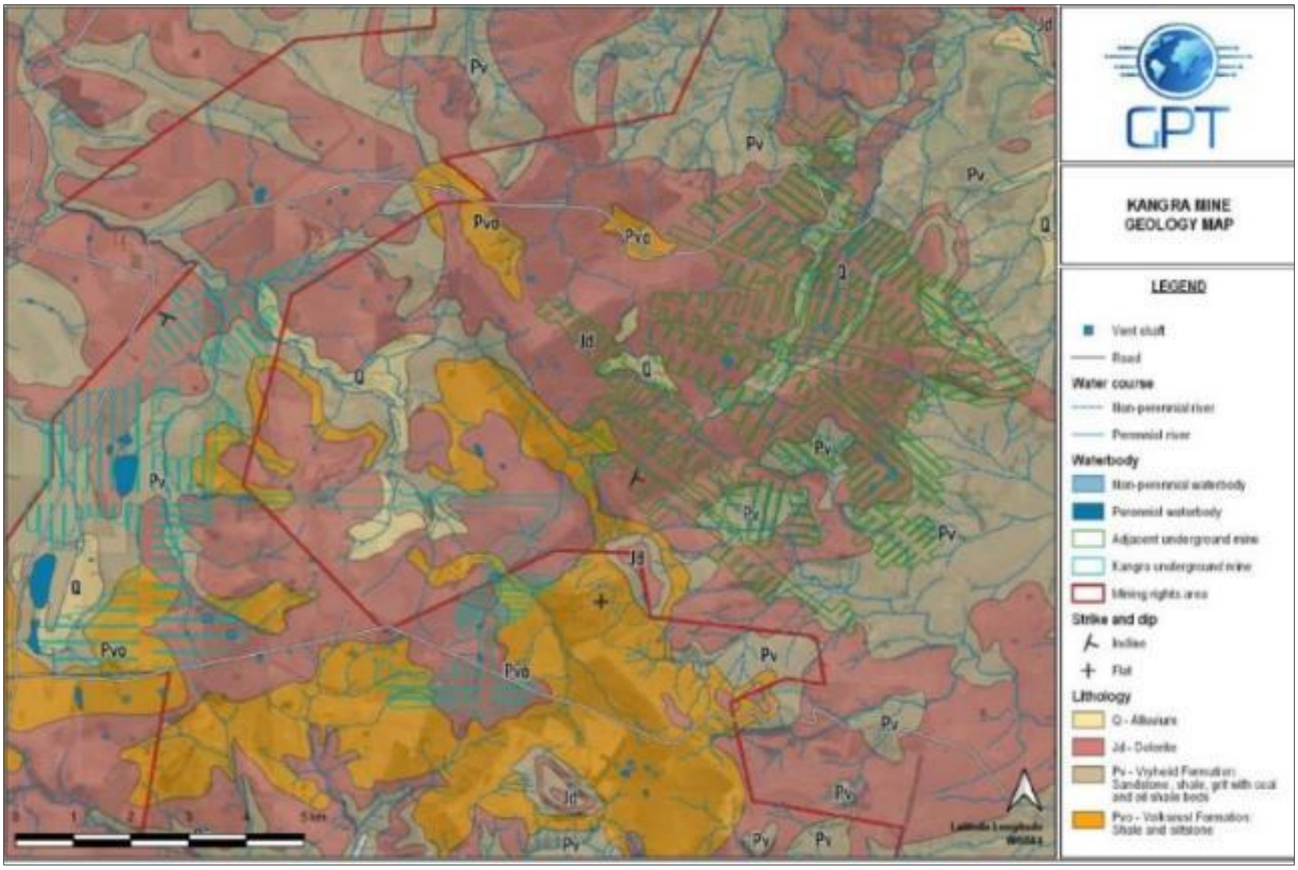

Figure 20: Regional Geology Map (1:250 000 geology series map))

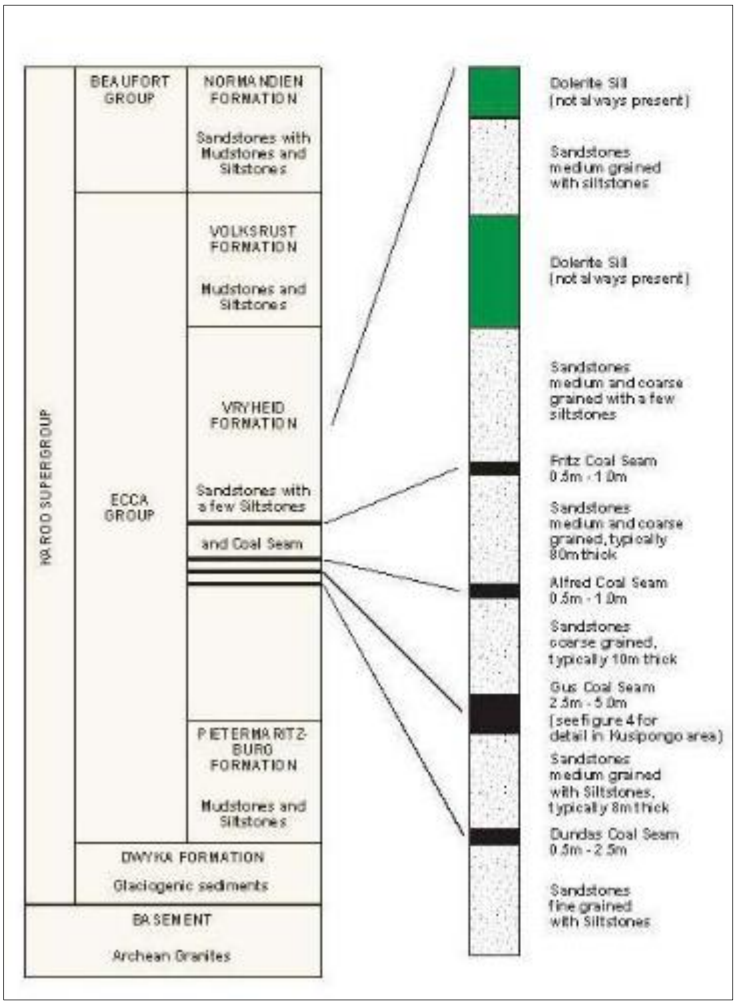

Figure 21: Project Area General Stratigraphy

10.3 CLIMATE

The proposed T4 Project area is located on the border of two climatic zones, based on the Köppen-Geiger classification for South Africa (Van Dyk and Kumirai 2012), namely the 'Warm Temperate Hot Summer Dry Winter' (Cwa) to the east and the 'Warm Temperate Warm Summer Dry Winter' (Cwb) to the west. The higher elevation to the west towards the Vaal River catchment area leads to cooler temperatures. During the warm summer months of December and January the average daily temperature is between 20 – 26 degrees Celsius (°C), while the minimum temperatures in winter drop as low as 4°C.

The T4 Project area is within a summer rainfall region, with more than 80% of the rainfall falling between the months of October and March. Annual rainfall varies between 573 - 1,314 millimetres (mm) over the record period. The annual average rainfall over the record period is 877 mm, however, rainfall is highly variable, particularly during the summer months.

The eastern part of Mpumalanga is part of the landmass in Southern Africa that is affected by cyclones, and in January 1984 Cyclone Domoina resulted in the highest observed rainfall in the area. This was the first cyclone centre to penetrate the country (and the only one to date) (Kovaćz et al., 1985). In Piet Retief, Domoina caused a maximum daily rainfall of 186 mm, with a total rainfall over three days of 511 mm. The risk of large rainfall and flood events occurring in the area is higher than regions in the moderate central parts of the country.

This closest South African Weather Station is in Piet Retief, located approximately 50 km east of the proposed T4 Project area. The predominant wind direction is from the north-east with a frequency of occurrence of 16%. Winds from the northern sector are also predominant, occurring 10% of the total period. During day-time, strong winds from the north and north-easterly sectors occur frequently (9% and 10% of the time, respectively). There is an increase in north easterly flow with a decrease in westerly and north-westerly air flow during the night-time. The annual mean temperature for Piet Retief is 16.6°C.

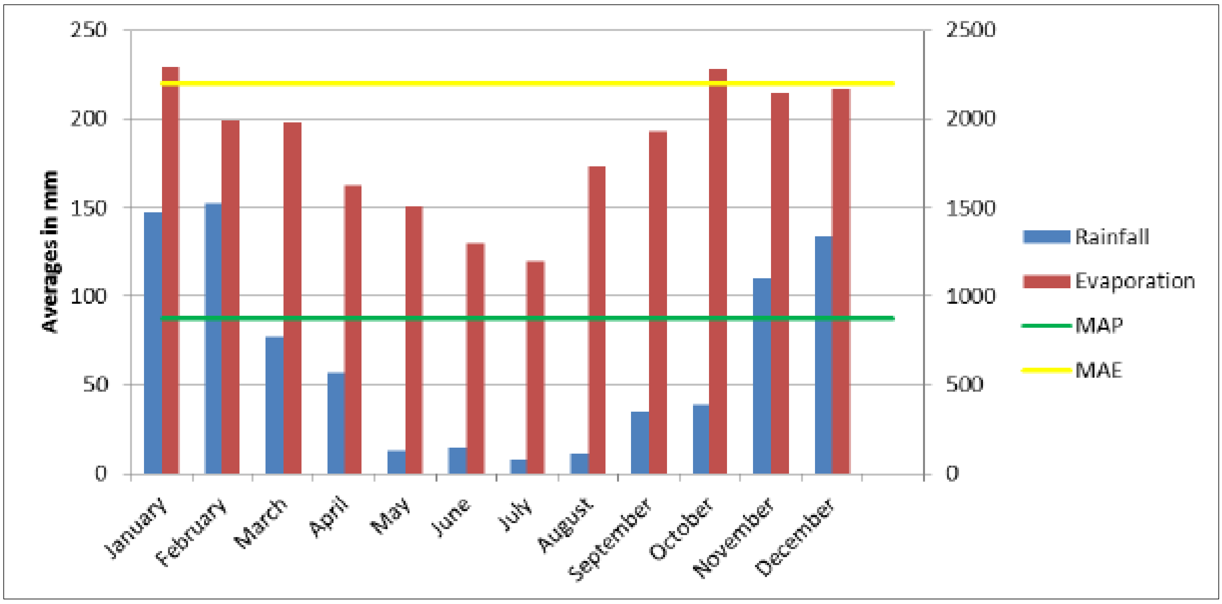

Figure 22: Average rainfall, evaporation, MAP and MAE

10.3.1 Temperature

According to the WR2012 database the mean annual S-pan evaporation for Quaternary Catchment W52A and W51B is 1400 mm per annum. The mining areas are within a summer rainfall region, with more than 80% of the rainfall falling between the months of October and March. Annual rainfall varied between 573mm and 1,314mm over a 30-year record period. The annual average rainfall over the record period is 794mm, however, rainfall is highly variable, particularly during the summer months.

10.3.2 Mean monthly precipitation

Annual rainfall varied between 573mm and 1,314mm over a 30-year record period. The annual average rainfall over the record period is 794mm, however, rainfall is highly variable, particularly during the summer months. Table 17 provides the average monthly rainfall and evaporation.

Table 17: Average monthly rainfall and evaporation

Month	Average monthly rainfall (mm)	Mean monthly evaporation
January	140.5	229.6

February	114.6	198.7
March	93.6	198.1
April	46.4	162.4
May	17.8	151.2
June	11	129.7
July	11.3	119.8
August	14.5	173.2
September	36.8	192.7
October	91.7	228.1
November	129.8	215
December	147.1	216.9
Annual	794.17	2201.5

10.4 GROUNDWATER (HYDROGEOLOGY)

A hydrogeological assessment was undertaken for the Kangra T4 project. A copy of the report is included in Appendix 7.

10.4.1 Hydrogeology

According to the 1:500 000 General Hydrogeological Map1 the main water bearing strata (d3 in map) in the area is an intergranular and fractured aquifer made of predominantly arenaceous rocks (sandstone and conglomerate) and mudstones (shale and siltstone) of the Ecca Group.

Groundwater resources are generally limited, with sustainable borehole yields ranging from 0.5 – 2L/s. The borehole yield of the tested boreholes at Kusipongo were mostly well below 1 L/s with the exception of the downstream borehole at Balgarthen and as such the aquifers classified as non-aquifer systems (Parsons, 1995) event though the groundwater quality was reasonably good. Three aquifers are typically present in the greater project area. These are:

- A shallow perched aquifer mainly consisting of alluvium and transported hill wash material on top of a pebble marker and ferricretes in the low-lying areas, valleys and paleo channels. Depth 0 – 3 m;
- A weathered aquifer, which extends to depths of approximately 12 mbgl, depending on the extent of weathering. In the project area, this aquifer has comparatively low aquifer parameters. This aquifer is therefore not considered to be a major aquifer, although it plays a role in recharge to the deeper hard-rock aquifers and baseflow to streams. It also feeds many springs in the study area. Depth 6 – 12 m; and
- A deeper fractured rock aquifer, which is characterised by fractures, faults and groundwater. These conduits can also serve as connections between the above-mentioned aquifers This aquifer in the study area was also low yielding. Depths > 12 m.

10.4.2 Acid Generation Capacity

For the material to be classified in terms of their acid-rock drainage potential, the ABA results can be screened in terms of its NNP, %S and NP:AP ratio as follows:

- A rock with NNP < 0 kg $CaCO_3$/t will theoretically have a net potential for acidic drainage.
- A rock with NNP > 0 kg $CaCO_3$/t rock will have a net potential for the neutralization of acidic drainage.

Due to uncertainty related to the exposure of the carbonate minerals or the pyrite for reaction, the interpretation of whether a rock will be net acid generating or neutralizing is more complex. Research has shown that a range from -20 kg $CaCO_3$/t to 20 kg $CaCO_3$/t exists that is defined as a "grey" area in determining the net acid generation or neutralization potential of a rock. Material with an NNP above this range is classified as Rock Type IV - No Potential for Acid Generation, and material with an NNP below this range as Rock Type I - Likely Acid Generating. summarises the deduced acid generating potential based on the net neutralising potential (NNP).

Based on available data (Waste assessment, 2019) it is evident that the hanging wall sandstone and siltstone (mudstone) samples has a very low to no potential for acid generation whereas the coal samples suggest low to medium acid generation capacity, however due to the low sulphide concentrations observed, there exist insufficient oxidisable sulphides to sustain long term acid generation.

10.4.3 Hydrocensus

The hydrocensus was done as a site familiarisation exercise and the collection of data from the study area and surrounding environments. It comprised a census of key boreholes, wells, springs and any other groundwater related information.

10.4.4 Borehole Drilling and Siting

This information was obtained from previous work.[1]

10.4.5 Aquifer Tests

This information was obtained from previous work.

10.4.6 Groundwater Recharge Calculations

Recharge to the shallow, unconfined aquifer was calculated using the RECHARGE program developed by the Institute for Groundwater Studies at the University of the Free State, South Africa. The calculated recharge percentage equates to approximately 3%.

10.4.7 Groundwater Levels

During the hydrocensus, 41 boreholes were available for groundwater level measurement. The groundwater levels varied between a minimum of 0 m and a maximum of 75.5 m below ground level (Table 18). The relationship, using the boreholes from the hydrocensus, is shown in Figure 23 below.

This general relationship is useful to make a quick calculation of expected groundwater levels at selected elevations, or to calculate the depth of to the groundwater level (unsaturated zone):

- Groundwater level = Elevation x gradient + intercept

[1] EXM Environmental Advisory Services (Pty) Ltd – October 2019 - Kangra Coal Kusipongo Extension Hydrogeological Assessment.

- Groundwater depth = Elevation – Calculated Groundwater Level

In general, a good relationship should exist 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. 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.

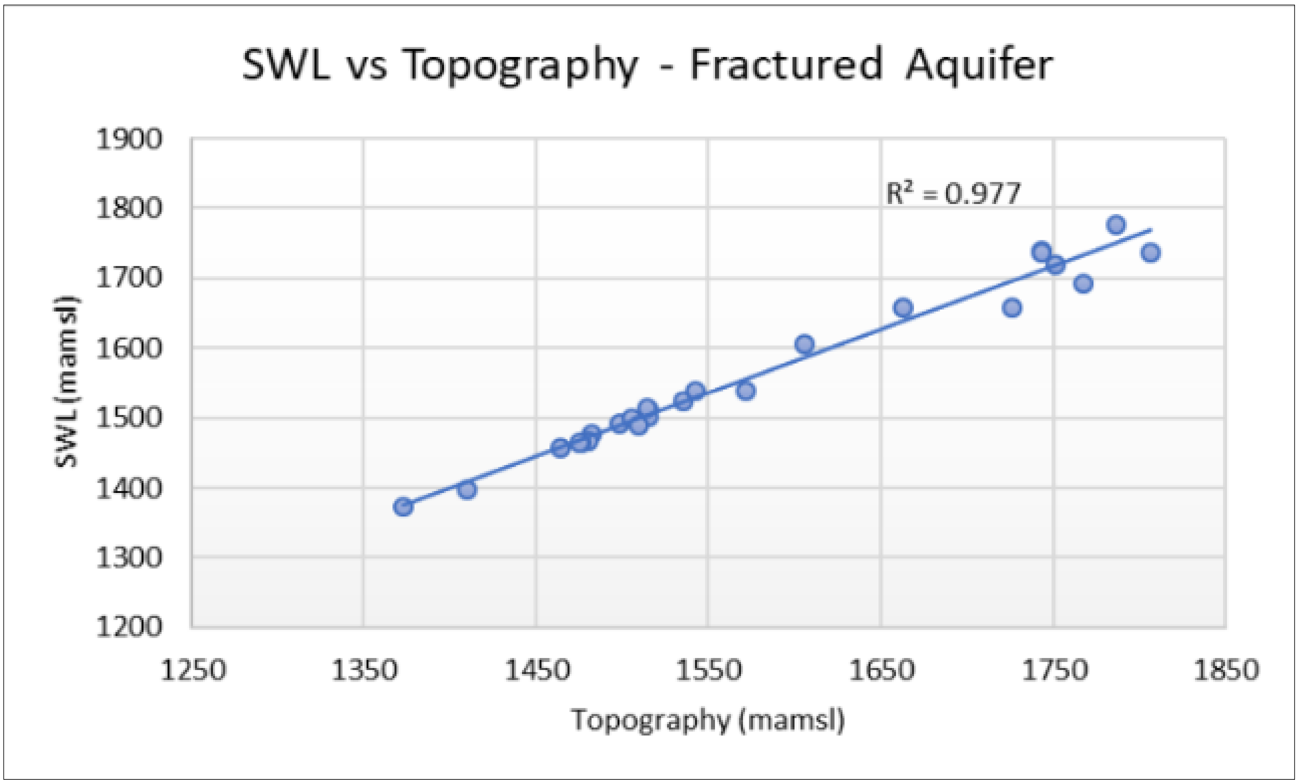

Figure 23: Correlation Graph of topography versus available groundwater levels

Table 18: Available groundwater level statistics

Groundwater level Statistics	
Number of boreholes available	41
Number of boreholes with anomalous water levels	5
Min water level (mbgl)	0
Max water level (mbgl)	75.5
Mean water level (mbgl)	15.2

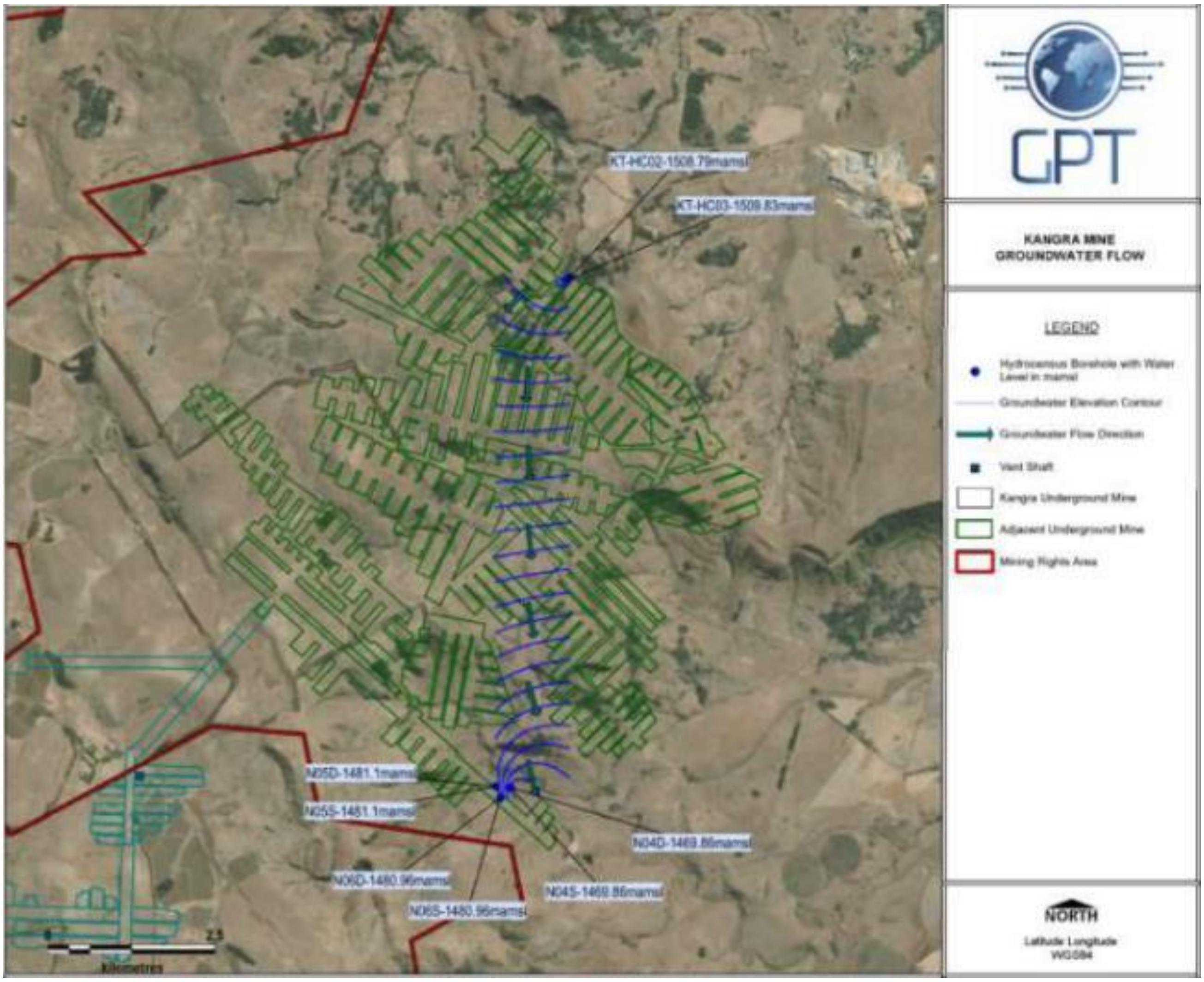

Figure 24: Contoured water levels of the water table aquifer (unconfined aquifer)

10.4.8 Groundwater Potential Contaminants

In terms of Acid Mine Drainage (AMD) Potential, AMD potential per lithology evaluated. It is evident that the hangingwall sandstone and mudstone samples have a very low to no potential for acid generation whereas the coal sample suggest low to medium potential to acid generation capacity, however due to the low sulphide concentrations observed, there exist insufficient oxidisable sulphides to sustain long term acid generation. The waste assessment conducted resulted in all samples being classed as Type 3 wastes. It is noted that the coal has the potential to generate AMD, therefore, this aspect needs to be taken into account when designing mitigation measures.

Table 19: Acid base accounting

Acid – Base Accounting Modified Sobek (EPA-600)	**KB01 (Sandstone)**	**KB02 (Carbonaceous shale)**	**KD01 (Carbonaceous shale)**	**KD02 (Sandstone)**	**KT01 (Coal)**	**KT02 (Sanstone)**
Paste pH	7.27	7.96	7.06	8.3	8.05	7.6
Total sulphur (%)	0.14	0.11	0.06	0.01	0.64	0.16
Total Sulfide (%)	0.11	0.04	0.03	0.01	0.27	0.09
Acid Potential (AP) (kg/t)	4.34	3.41	2.02	0.41	19.9	4.94
Neutralization Potential (NP) (kg/t)	28	10.5	1.91	12.7	4.81	3.52
Nett Neutralization Potential (NNP) (kg/t)	23.7	7.1	-0.1	12.3	-15.1	-1.4
Neutralising Potential Ratio (NPR) (NP :AP)	6.45	3.07	0.95	31.1	0.24	0.71

10.4.9 Groundwater Quality

Groundwater from mining areas (old void & PCD's) indicates sodium sulphate type water as a result of mining related impacts. The remainder of the samples seem to plot reasonably close together as unpolluted bicarbonate waters with some sodium enrichment in some of the fractured aquifer samples. This may be an indication of older saline waters.

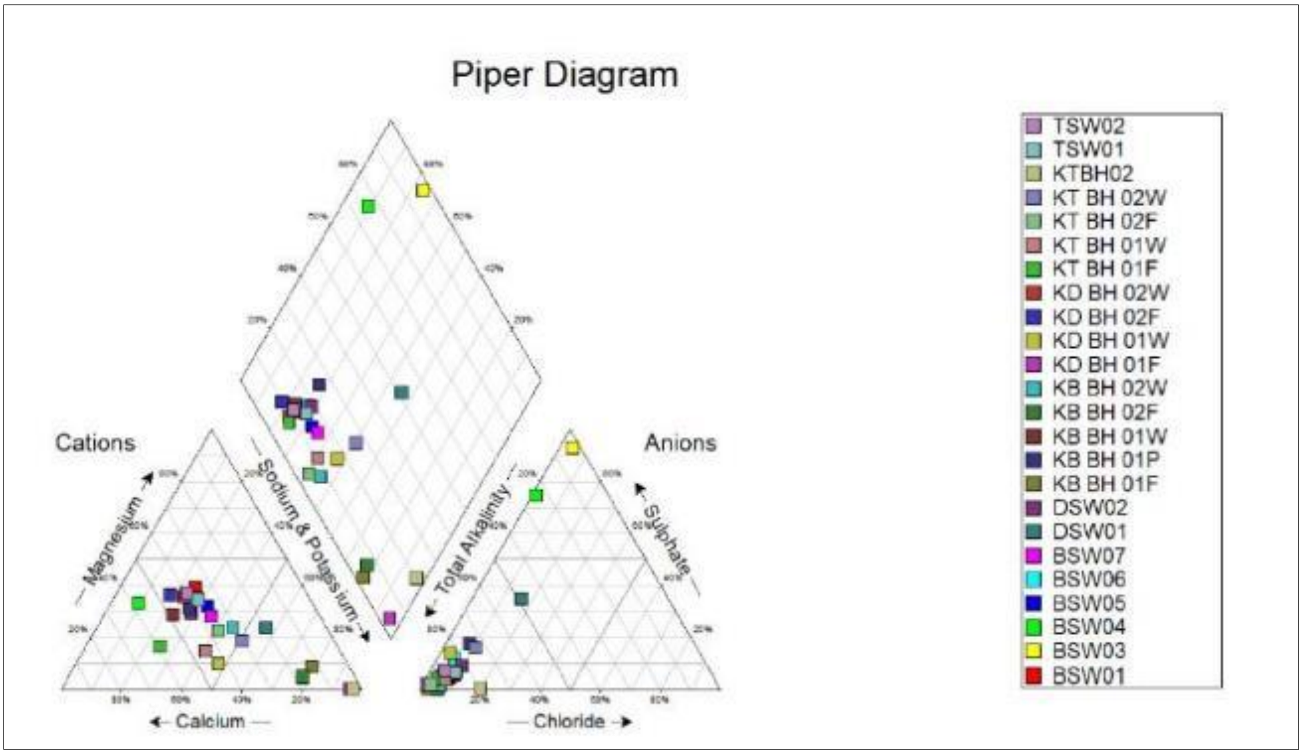

Figure 25: Piper Diagram

10.4.10 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 during the hydrocensus inferred to be at mean of ~15 mbgl;
- Groundwater recharge of ~25 mm/a (3.5% recharge),
- Sandy clay soil vadose zone; and
- Gradient of 20% 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; and

- The GDT calculated a vulnerability value of 51%, which is medium.

10.4.11 Aquifer Classification

The aquifer(s) underlying the project area were classified in accordance with "A South African Aquifer System Management Classification, December 1995." The main aquifers underlying the area were classified in accordance with the Aquifer System Management Classification document. The aquifers were classified by using the following definitions:

- Sole Aquifer System: An aquifer which is used to supply 50% or more of domestic water for a given area, and for which there is no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial;
- Major Aquifer System: Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (Electrical Conductivity of less than 150 mS/m);
- Minor Aquifer System: These can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers; and
- Non-Aquifer System: These are formations with negligible permeability that are regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks, although imperceptible, does take place, and needs to be considered when assessing the risk associated with persistent pollutants.

Based on information collected during the hydrocensus it can be concluded that the aquifer system in the study area can be classified as a "Minor Aquifer System", due to the low permeability and limited aquifer extent. In order to achieve the Aquifer System Management and Second Variable Classifications, as well as the Groundwater Quality Management Index, a points scoring system as presented in Table 20 and Table 21 was used.

Table 20:Ratings – Aquifer System Management and Second Variable Classifications

Aquifer System Management Classification		
Class	Points	Study area
Sole Source Aquifer System:	6	
Major Aquifer System:	4	
Minor Aquifer System:	2	2
Special Aquifer System:	0 – 6	
Second Variable Classification (Weathering/Fracturing)		
Class	**Points**	**Study area**
High:	3	
Medium:	2	
Low:	1	

Table 21: Ratings - Groundwater Quality Management (GQM) Classification System

Aquifer System Management Classification		
Class	Points	Study area
Sole Source Aquifer System:	6	
Major Aquifer System:	4	
Minor Aquifer System:	2	2
Non-Aquifer System:	0	
Special Aquifer System:	0 – 6	
Second Variable Classification (Weathering/Fracturing)		
Class	**Points**	**Study area**
High:	3	
Medium:	2	2
Low:	1	

As part of the aquifer classification, a Groundwater Quality Management (GQM) Index is used to define the level of groundwater protection required. The GQM Index is obtained by multiplying the rating of the aquifer system management and the aquifer vulnerability. The GQM index for the Kangra T4 is presented in Table 22.

The vulnerability, or the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer, in terms of the above, is classified as medium.

The level of groundwater protection based on the Groundwater Quality Management Classification:

GQM Index = Aquifer System Management x Aquifer Vulnerability

= 2 x 2 = 4

Table 22:GQM Index for Kangra T4

GQM Index	**Level of Protection**	**Study Area**
<1	Limited	
1 - 3	Low Level	
3 - 6	Medium Level	4
6 - 10	High Level	
>10	Strictly Non-degradation	

10.4.12 Aquifer Protection Classification

A Groundwater Quality Management Index of 4 was estimated for the study area from the ratings for the Aquifer System Management Classification. According to this estimate a medium level groundwater protection is required for the aquifer. Reasonable and sound groundwater protection measures based on the modelling will therefore be recommended to ensure that no cumulative pollution affects the aquifer, even in the long term.

DWA's water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that measures must be taken to limit the risk to the following environments:

- The protection of the underlying aquifer; and
- The numerous wetlands situated within and outside the mining rights area.

The groundwater modelling has been undertaken and is discussed in Section 14.5.13 of this report.

10.5 HYDROPEDOLOGY

The proposed underground could impact on the flow drivers of the wetland systems through interception systems such as berms, increased recharge and quality changes. The wetland flow systems within a 500 m radius from the underground is seen as one wetland flow system. Refer to Appendix 7 of this report.

10.5.1 Wetland catchment flow reduction

The SANBI Biodiversity Series 22, (2013) Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems was consulted in determining the estimated flow losses to the specific wetland catchment systems due to mining.

Many wetlands are hydrologically and ecologically linked to adjacent groundwater bodies, but the degree of interaction can vary greatly. Some wetlands may be completely dependent on groundwater discharge under all climatic conditions, whilst others may have very limited dependence such as only under very dry conditions – and some may have no connection with groundwater at all. Some aquifers are dependent almost entirely on recharge.

Section 10.8 provides the baseline information with regards to the wetlands within the project area, while Section 14.5.14 provides a discussion of the impacts of hydropedology within the project area.

10.6 SURFACE WATER (HYDROLOGY)

Reference is made to the Surface water Assessment undertaken by Redkite Environmental Solutions and was used to inform the baseline regarding the surface water environment. Refer to Appendix 8 for a copy of the report.

10.6.1 Methodology

The study included a desktop study which provided the majority of the surface water and climate baseline information, water quality data comparison, a site survey to assess the condition of the watercourses and associated riparian vegetation on site and the application of rating criteria to assess the impacts of the proposed project on the surface water system.

A field survey was conducted on the 15th of February 2021. The field survey was conducted supplementary to the desktop analysis and served as a fatal flaw analysis to determine whether there are any major ecological concerns with regard to the project.

10.6.2 Water Quality

All water samples collected during the assessment were submitted to an accredited SANAS laboratory for analyses.

Water samples were collected at sites considered to be representative of potential impacts related to the proposed project and to minimise as far as practical the inclusion of impacts related to water uses and users not associated with the applicant. Monitoring points were located in the Klein-Vaal River catchment as most of the surface water impact related to the proposed project are expected to occur in this catchment.

Table 23: Water quality monitoring points

Monitoring point	Description	Coordinates
T4/US	Monitoring point located upstream of the proposed project footprint. Tributary of Klein-Vaal River.	27° 6'21.19"S, 30°13'52.69"E
T4/DS	Monitoring point located downstream of the proposed T4 mining footprint. Klein-Vaal River.	27° 1'19.11"S, 30° 9'30.61"E

Parameters to be analysed were based on the type of mining (coal), the receiving environment and the potential impacts from the proposed project to the surface water environment.

Water quality analysis results were compared to the Resources Quality Objectives (RQO) set out for the applicable catchment as well as to the Target Water Quality Ranges, where available, as set out in South African Water Quality Guidelines (Volume 7): Aquatic Ecosystems (Department of Water Affairs and Forestry, 1996).

10.6.3 Catchments

The project site (footprints of Vent shafts) falls within the Vaal Major Water Management Area (WMA) within Drainage Region C. Major rivers include the Wilge, Liebenbergsvlei, Mooi, Renoster, Vals, Sand, Vet, Harts, Molopo and Vaal (Department of Water and Sanitation, 2016).

The size of this catchment is 81 856 ha and the Vaal River flows from this water source area. The Vaal flows eastwards through to its confluence with the Orange River, forming the boundary between the Free State and Gauteng.

The project falls across four (4) separate catchments (C11C, W51A, W51B and W52A). However, the activity is largely focussed within C11C.

10.6.4 Surface Water Quality

The project footprint is situated over a watershed, with north-western section falling in the Vaal WMA (Upper Vaal) and the eastern section of the project footprint falling within the Inkomati-Usuthu WMA.

The north-western section is located in the catchment of the Klein-Vaal River and quaternary catchment C11C. The eastern section of the project footprint is located in the Heyshope Dam catchment and quaternary catchment W51B. A small section of the proposed powerline route falls within the Assegaai River catchment located in quaternary catchment W51A.

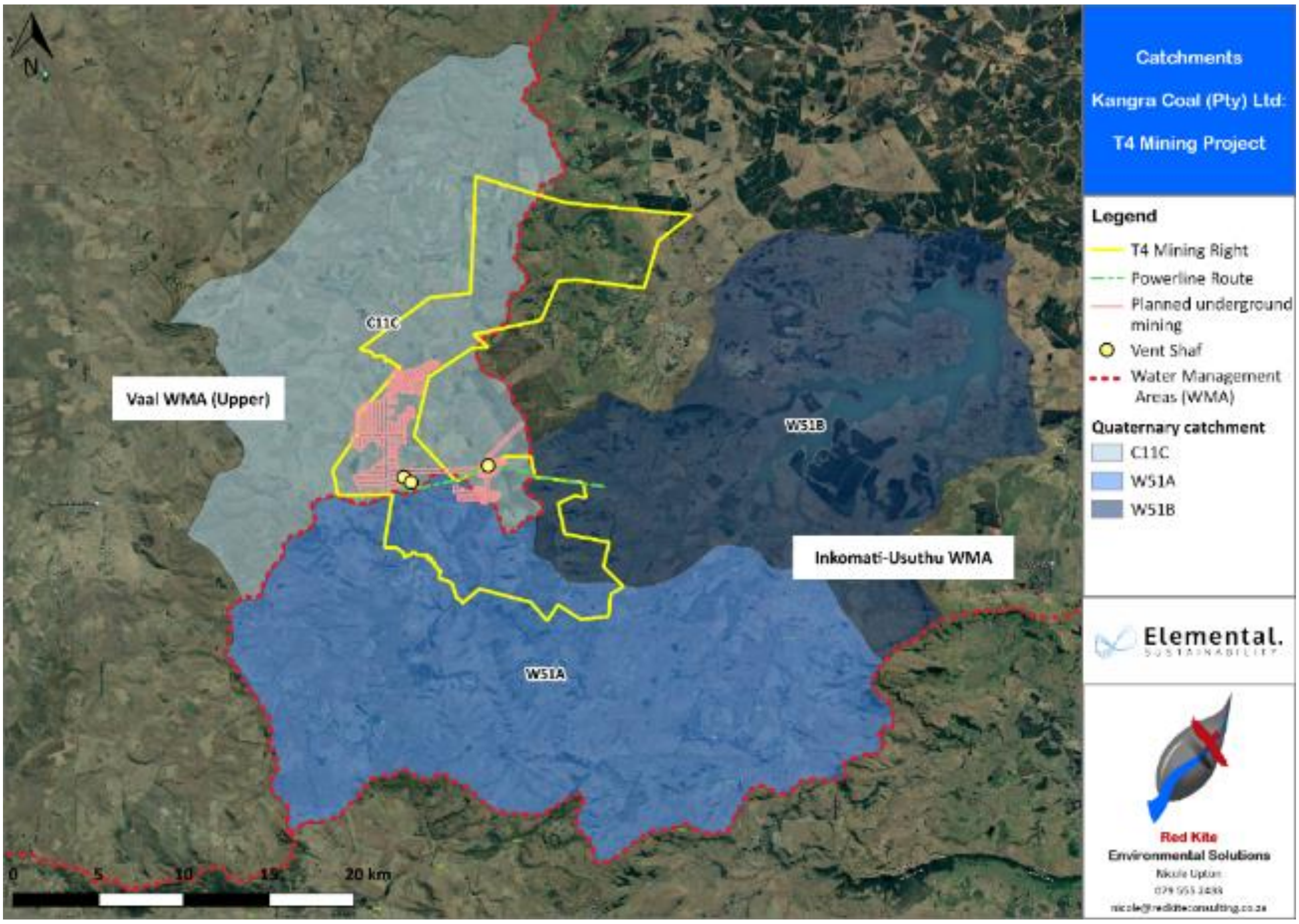

Figure 26: Catchments

10.6.5 Klein-Vaal River Catchment

The majority of the project footprint is located in the Upper Vaal WMA and the Klein-Vaal River catchment and quaternary catchment C11C. The site is located in the headwaters of the Klein-Vaal catchment and the catchment generally drains north-west toward the Klein-Vaal River which confluences with the Vaal River.

The Klein Vaal River is one of at least nine well defined tributaries of the Vaal River feeding into the Grootdraai Dam near Standerton. Vent shaft 1 is located 200 m west of the Klein-Vaal River and Vent shaft 3 and Vent shaft 4 are located approximately 250 m south-west of a tributary of the Klein-Vaal River. The overhead powerline route crosses the Klein-Vaal River and various of its tributaries.

According to the DWS Resource Quality Objectives for the Upper-Vaal WMA (GN468 of 22 April 2016), the Klein-Vaal River has a PES of C and REC of C. Refer to Table 24.

Table 24: Klein-Vaal River (C11C) Resource Class

Catchment	River	PES	EI	ES	REC
C11C	Klein-Vaal	Moderately Modified - C	Moderate	High	Moderately Modified - C

10.6.6 Assegaai River and Heyshope Dam Catchment

The eastern section of the powerline route and a small section toward the centre of the route are located in the Inkomati-Usuthu WMA. The eastern section of the power line is located in the Heyshope Dam catchment (W51B) and a smaller section toward the centre of the powerline is located in the Assegaai River catchment (W51A).

Heyshope dam is located on the Assegaai River, which is a tributary of the Usutu River. The Heyshope Dam catchment drains in a generally north-easterly direction. The powerline route crosses a number of smaller tributaries of the Assegaai River, which drain generally in a north-eastern direction. No RQO's have been published for the Usuthu WMA. Therefore, data from the DWS River Health Programme was extracted and presented in Table 25 below.

Table 25: Assegaai River (W51A and W51B) Resource Class

Catchment	River	PES	EI	ES	REC
W51A	Assegaai	Moderately Modified - C	High	Very High	Not available
W51B	Assegaai (Heyshope Dam)	Moderately Modified - C	Moderate	Very High	Not available

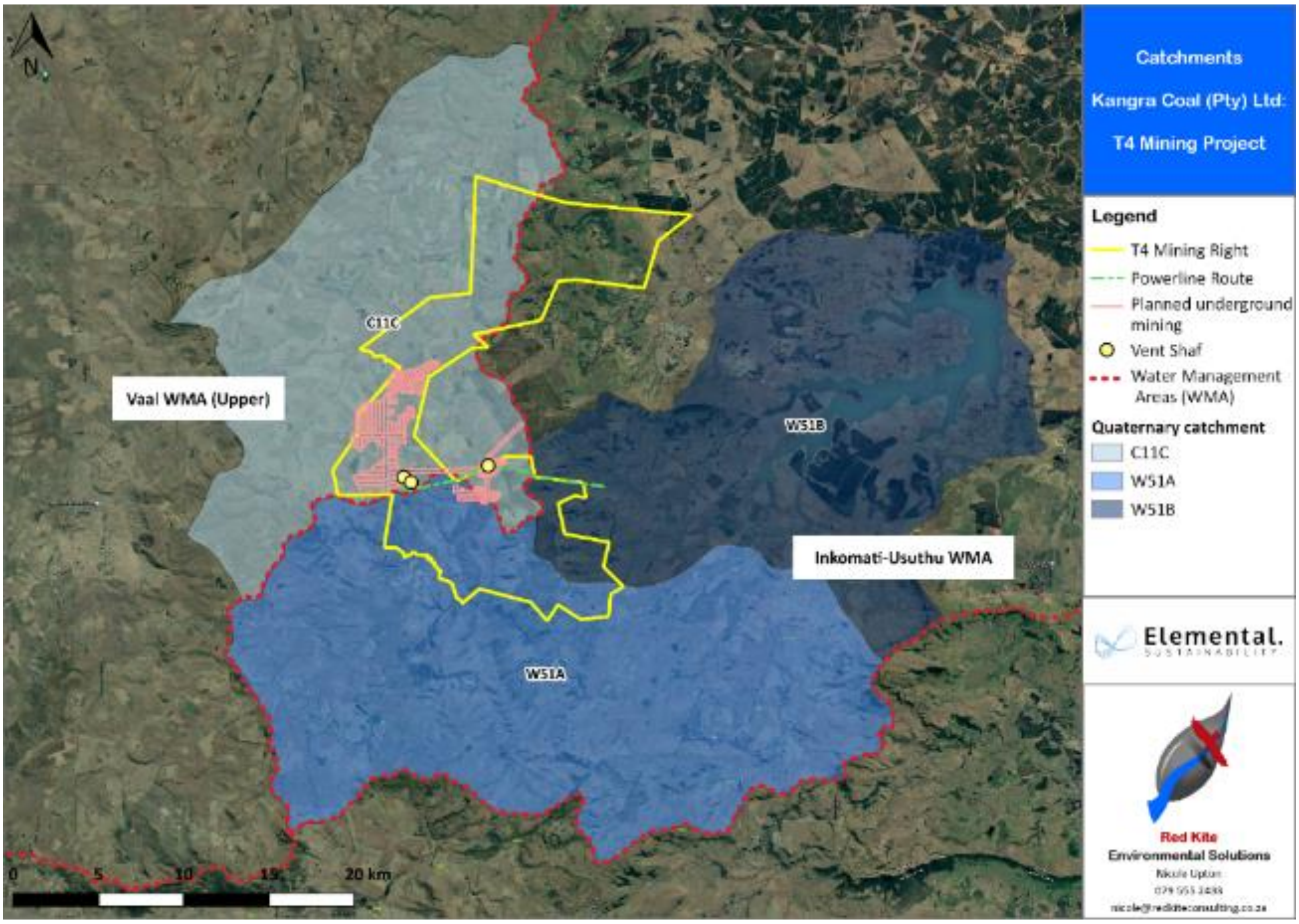

Figure 27: WMAs and Quaternary catchments

10.6.7 Riparian Vegetation

Riparian areas refer to watercourses, rivers or streams and does not specifically cater for wetland zones. For aspects related to wetlands, the Wetland Delineation Report will need to be referred to.

The vegetation structure of riparian areas / zones exhibits moderate to low disturbance through human movement, impacts from adjacent crop cultivation, roads and livestock grazing.

Various obligate and facultative wetland species occur in the riparian zones associated with the rivers and streams on the study site. Dominant species include: *Cyperus digitatus, Arundinella nepalensis, Bulbostylis hispidula, Cyperus congestus, Cyperus esculentus, Leersia hexandra, Paspalum dilatatum, Schoenoplectus brachyceras and Typha capensis*.

Four species protected in terms of the MNCA were identified to occur in the riparian zones surveyed, namely *Brunsvigia natalensis, Kniphofia albescens, Hesperantha coccinea, and Watsonia watsonioides*. These species are listed as Least Concern on the SANBI red List. No Species of Conservation Concern (SCC) were identified to occur on the project footprint.

Riparian areas associated with the study site are also considered to be suitable habitat for the SCC, *Aloe kniphofioide*s (Red list: Vulnerable, Merwilla plumbea (Red list: Near Threatened; ToPS: Vulnerable) and *Nerine platypetala* (Red list: Vulnerable (refer to Ecology Report). None of these species were identified to occur on the project footprint but are considered to have a moderate likelihood of occurrence.

Figure 28: Riparian areas

The table below list the flora species identified in riparian zones during the site survey in conjunction with their conservation status.

A total of 66 plant species were recorded in the studied area during the site survey. Of this number six have medicinal uses and 18 are exotic, eight of which are categorised as an AIP in terms NEMBA. Exotic species were not found to occur within riparian zones in high densities, but rather as scattered individuals.

Brunsvigia natalensis, Gladiolus crassifolius, Kniphofia albescens, Hesperantha coccinea and Watsonia *watsonioides* were observed to occur on the project footprint, all of which are protected in terms of the MNCA.

None of the floral species recorded during the site survey are listed in the ToPS list or the NFA. No SCC were identified during the site survey.

Table 26: Plant species identified to occur in riparian areas during the site survey

Species	Common name	Wetland Indicator Status	Conservation
Acacia decurrens	Green Wattle		NEMBA: Category 2 AIP
Acacia dealbata	Silver Wattle		NEMBA: Category 2 AIP
Alectra sessilifolia	Yellow Witchweed		
Andropogon eucomus	Snowflake grass	Obligate	
Aristida bipartita	Rolling grass		
Arundinella nepalensis	River grass	Facultative wetland	
Berkheya setifera	Buffalo-tongue		
Bidens pilosa	Common Black jack		Exotic
Brachiaria serrata	Velvet signal grass		
Brunsvigia natalensis	Natal Candelabra Flower		MNCA Protected
Bulbostylis hispidula	Slender sedge	Facultative wetland	
Cheilanthes viridis	Common Lip Fern		
Cirsium vulgare	Scotch Thistle		NEMBA: Category 1b AIP
Cosmos bipinnatus	Cosmos		Exotic
Cucumis zeyheri	Wild cucumber		
Cynodon dactylon	Couch grass		Exotic
Cyperus congestus		Facultative wetland	
Cyperus digitatus		Obligate	
Cyperus esculentus	Earth Almond	Facultative wetland	
Diospyros lycioides	Bushveld Bluebush		Medicinal
Eleocharis dregeana	Finger sedge	Obligate	
Eleusine coracana	Goose grass	Facultative upland	
Eragrostis curvula	Weeping love grass	Facultative upland	
Eragrostis gummiflua	Gum grass	Facultative wetland	
Eragrostis plana	Tough love grass		
Eucalyptus sp.			NEMBA: Category 1b AIP
Festuca scabra	Munnik fescue	Facultative wetland	
Habenaria ciliosa			
Helichrysum mundtii			
Helictotrichon turgidulum	Small oats grass	Facultative wetland	
Hemarthria altissima	Swamp couch	Obligate	
Heteropogon contortus	Spear grass		
Hibiscus trionum	Bladder hibiscus		Exotic
Hirpicium armerioides	Mountain Gerbera		
Hyparrhenia hirta	Common thatching grass		Medicinal
Hyparrhenia tamba	Blue thatching grass	Obligate	
Kniphofia albescens			MNCA Protected
Leersia hexandra	Rice grass	Obligate	
Leonotis leonurus	Rock lion's paw		Medicinal
Oxalis obliquifolia	Oblique-leaved Sorrel		
Paspalum dilatatum	Dallis grass	Facultative wetland	Exotic
Pennisetum sphacelatum	Bull grass	Facultative wetland	
Persicaria lapathifolia	Pale persicaria	Facultative wetland	Exotic
Plantago lanceolata	Narrowleaf plantain		
Plantago virginica	Virginia Plantain		
Prunus persica	Peach tree		Exotic
Pteridium aquilinum	Bracken fern		
Pyracantha angustifolia	Yellow fire-thorn		NEMBA: Category 1b AIP

Species	Common name	Wetland Indicator Status	Conservation
Salix babylonica	Weeping Willow	Facultative wetland	Exotic
Hesperantha coccinea	Scarlet river lily	Obligate	MNCA Protected
Schkuhria pinnata	Dwarf marigold		Exotic
Schoenoplectus brachyceras		Obligate	
Searsia dentata	Nanaberry		Medicinal
Sebaea grandis	Large-Flowered Sebaea		
Selago densiflorus			
Setaria pumila	Garden bristle grass	Facultative upland	
Sida rhombifolia	Arrow-leaf sida		
Solanum sisymbrifolium	Dense-thorned bitter apple		NEMBA: Category 1b
Sporobolus africanus	Rat's-tail dropseed	Facultative	
Tagetes minuta	Tall khaki weed		Exotic
Typha capensis	Bulrush	Obligate	Medicinal
Verbena bonariensis	Purple top		NEMBA: Category 1b
Wahlenbergia undulata	African bluebell		
Watsonia watsonioides			MNCA Protected
Xanthium spinosum	Spiny cocklebur		NEMBA: Category 1b AIP
Xysmalobium undulatum	Milkwort		Medicinal

10.6.8 Current Surface Water Users

Based on observation during the site assessment, the dominant land uses within the study area are wilderness, wetlands, plantations, small-scale and commercial farming, including livestock grazing and residences in a rural setting. The area was found to be largely natural and impacted areas (such as agricultural fields) well managed. The landscape had rural character and roads from Amersfoort was dirt roads across the footprint in all directions.

The surface water use within the affected sub-catchments takes place in the form of impoundments such as farm dams. Surface water within the sub-catchments, is mainly used for agricultural purposes, such as crop irrigation and livestock watering. A number of impoundments have been erected within the affected streams, which are in the form of farm dams and mined out opencast pits. The C11C catchment falls within the Grootdraai catchment which is part of the integrated system of water supply to Eskom Power Stations and the Sasol Secunda Complex. There are three large dams in the Upper Vaal WMA: Grootdraai Dam, Vaal Dam and Sterkfontein Dam.

Four major dams have been constructed in the Usutu River and its major tributaries. These dams include the Westoe, Jericho, Morgenstond and Heyshope Dams. The main purpose of the first three dams is to supply bulk water to the Eskom power stations in the Upper Olifants River catchment and Camden power station in the Upper Vaal River catchment. Heyshope Dam was primarily constructed to augment the water supply of Grootdraai Dam which supplies water mainly to Sasol and Eskom power stations. The Camden, Kriel, Matla and Kendal power stations obtain water from the Usutu Sub-system. Refer to Figure 29 which provides an overview of surface hydrology within the project area.

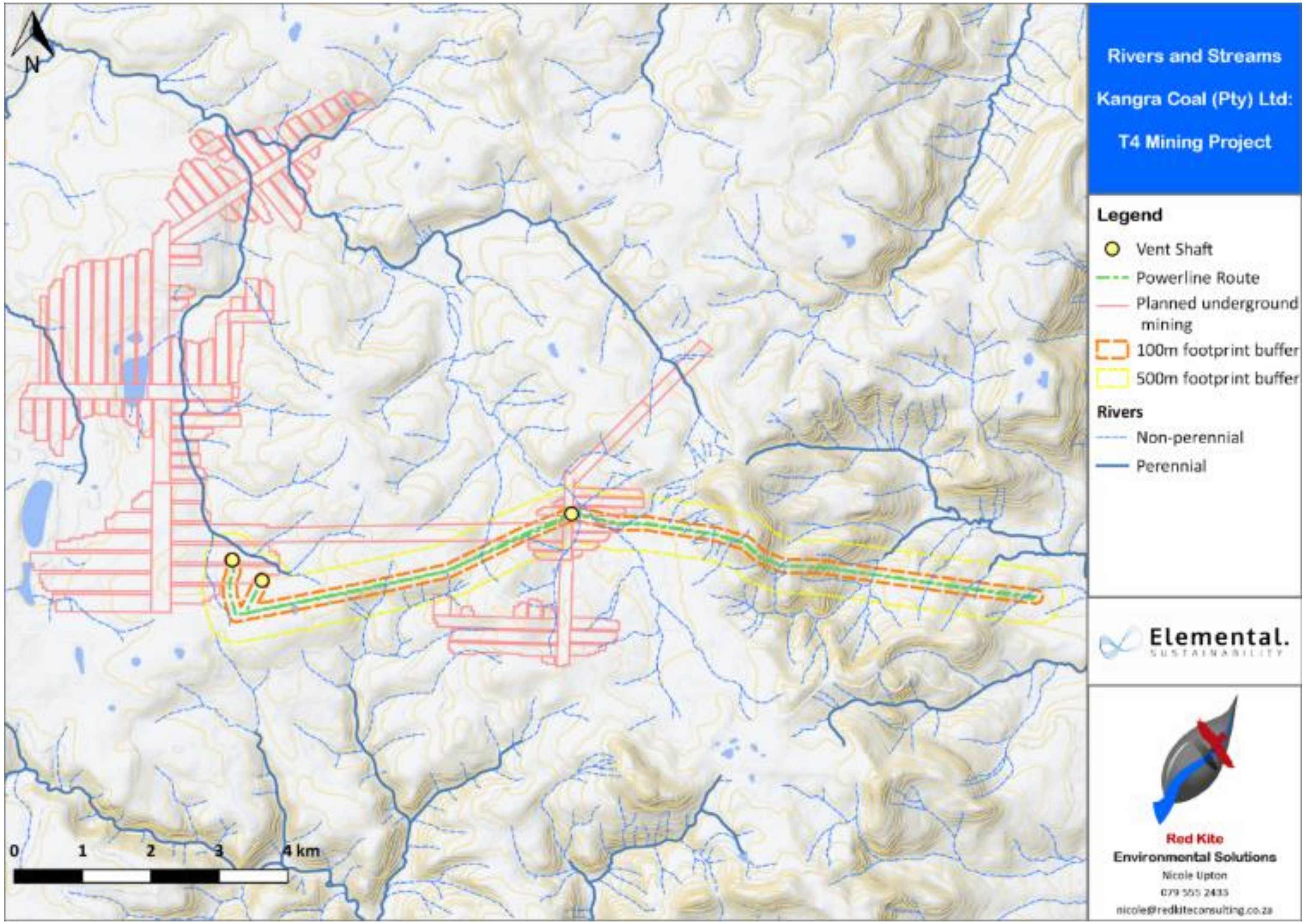

Figure 29: Rivers and stream

10.6.9 Surface Water Quality

The water quality data obtained from the samples taken upstream and downstream of the project site, in the Klein-Vaal River, were compared to the Target Water Quality Ranges, where available, as set out in South African Water Quality Guidelines (Volume 7): Aquatic Ecosystems (Department of Water Affairs and Forestry, 1996), as well as the DWS Resource Quality Objectives for the Upper-Vaal WMA (GN468 of 22 April 2016).

Refer to Table 23 for the location of the water quality sampling points. Sampling points were located in the Klein-Vaal River catchment as most of the surface water impact related to the proposed project are expected to occur in this catchment.

Table 27: Results of water quality analysis

Analyses in mg/ℓ (Unless specified otherwise)	**T4/US**	**T4/DS**	**TWQR**	**C11C (Klein-Vaal River RQO (2016)**
pH – Value at 25°C	7.1	7.4	6.5-9	-
Electrical Conductivity in mS/m at 25°C	6.1	9.2	-	≤ 70 mS/m
Total Dissolved Solids at 180°C	74	76	-	-
Nitrate (N)	<0.1	<0.1	<10	≤ 0.85 mg/L
Nitrite (N)	<0.05	<0.05	<10	≤ 0.85 mg/L
Dissolved Oxygen (O_2)	9.3	9.3	-	≥ 7 mg/L
Aluminium (Al)	0.474	0.362	<5	≤ 0.150 mg/L
Arsenic (As)	<0.001	<0.001	<0.01	≤ 0.130 mg/L
Iron (Fe)	0.779	2.02	<10% variation	-
Manganese (Mn)	<0.025	0.090	<0.18	≤ 1.3 mg/L

From the above water quality analysis results it is event that the Klein-Vaal River has good water quality. Two of the analysed constituents were found to exceed target ranges, i.e., aluminium and iron.

Aluminium concentrations in both samples are within acceptable ranges of the RQO set for the catchment. However, the concentrations exceed the TWQR set out for aquatic ecosystems. The solubility of aluminium in water is strongly pH dependent. At intermediate pH values, it is partially soluble and probably occurs as hydroxy- and polyhydroxo- complexes. Elevated concentrations of bio-available aluminium in water are toxic to a wide variety of organisms.

Iron concentrations showed a 260% increase from the upstream to the downstream sampling point. Iron is the fourth most abundant element in the earth's crust and may be present in natural waters in varying quantities depending on the geology of the area and other chemical properties of the water body. Streams may be negatively impacted by high levels of iron in acid mine drainage.

Table 28 below summarises the water quality objectives for the C11C catchment, as set out in DWS Resource Quality Objectives for the Upper-Vaal WMA (GN468 of 22 April 2016). No RQO has been published for the Usuthu WMA.

Table 28: Resource Water Quality Objectives (RQOs): Quaternary Catchment C11C

Indicator/ measure	**Numerical Limits**
Phosphate (PO_4)	≤ 0.020 mg/L P

Indicator/ measure	Numerical Limits
Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N
Phosphate (PO_4)	≤ 0.020 mg/L P
Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N
Electrical conductivity*	≤ 70 mS/m
Electrical conductivity*	≤ 70 mS/m
Temperature *	≤ abs(dev from ambient) abs(dev from ambient) 1 deg C
Dissolved oxygen *	≥ 7 mg/L O_2
Temperature *	≤ abs (dev from ambient) abs (dev from ambient) 1 deg C
Dissolved oxygen *	≥ 7 mg/L O_2

10.6.10 Surface Water Quantity

10.6.10.1 Resource Quality Objectives: Quantity

RQOs (quantity) provides an indication of the hydrological RQOs for rivers expressed in terms of flow at the ecological water requirement (EWR) sites. These summarised statistics are representative of the required flow regime in the river where the variability is dependent on the seasonal and temporal pattern of natural flow conditions. The mean monthly flows represent low flow requirements for all the months.

Table 29: Surface Water Quantity Resource Quality Objectives for C11C catchment

RQO	Indicator/ measure	Numerical Limits		
		Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
Low flows need to be Maintained in a healthy condition for the ecosystem and for users.	EWR maintenance low and drought flows: Vaal EWR1 in C11J VMAR = 332.3x$10^6$$m^3$ REC=B/C category (equivalent to EcoClassification score 70-80)	Oct	2.9 (50)	0.2 (99)
		Nov	3.7 (70)	0.22 (99)
		Dec	4 (50)	0.25 (99)
		Jan	4.3 (50)	0.26 (99)
		Feb	5.2 (50)	0.265 (99)
		Mar	3.7 (30)	0.04 (99)
		Apr	3 (40)	0.08 (99)
		May	2.6 (50)	0.03 (90)
		Jun	2.5 (50)	0.15 (99)
		Jul	2.4 (50)	0.15 (99)
		Aug	2.4 (50)	0.15 (99)
		Sep	2.6 (50)	0.16 (99)

10.6.10.2 Mean Annual Runoff

The MAR for the catchment area was sourced from the Water Research Commission database (WR2005). Table 30 below provides activity-based MAR for the five catchments associated with the study area and region.

Table 30: Mean Annual Runoff (MAR)

Catchment	Catchment area (km^2)	Catchment MAR (mcm/annum)
C11C	450	36.86
W51A	624	79.45
W51B	496	51.37

10.6.11 Wetlands

Various wetlands are situated on and in close proximity to the project footprint. Refer to Section **Error! Reference source not found.** for the wetland delineation that was undertkane for the project.

10.6.12 Aquatic Ecology

Refer to Section 10.7 for the Aquatic Ecology Report compiled by Enviridi Environmental Consultants.

10.6.13 Sensitivity

Buffer zones have been shown to perform a wide range of functions and have therefore been widely proposed as a standard measure to protect water resources and their associated biodiversity. These include (i) maintaining basic hydrological processes; (ii) reducing impacts on water resources from upstream activities and adjoining land uses; (iii) providing habitat for various aspects of biodiversity.

The buffer zone identified in this report serves to highlight an ecologically sensitive area in which activities should be conducted with this sensitivity in mind.

Various site-specific factors were considered in the calculation of the buffer zone for the water resources associated (within 500 m) of the Kangra T4 Mining Project surface infrastructure, as per the methodology of “Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries. Consolidated Report” by the WRC (Macfarlane et al 2015). Consequently, a 20 m operational buffer is recommended for the surface footprint (refer to sensitivity map, Figure 30 and Figure 31 below).

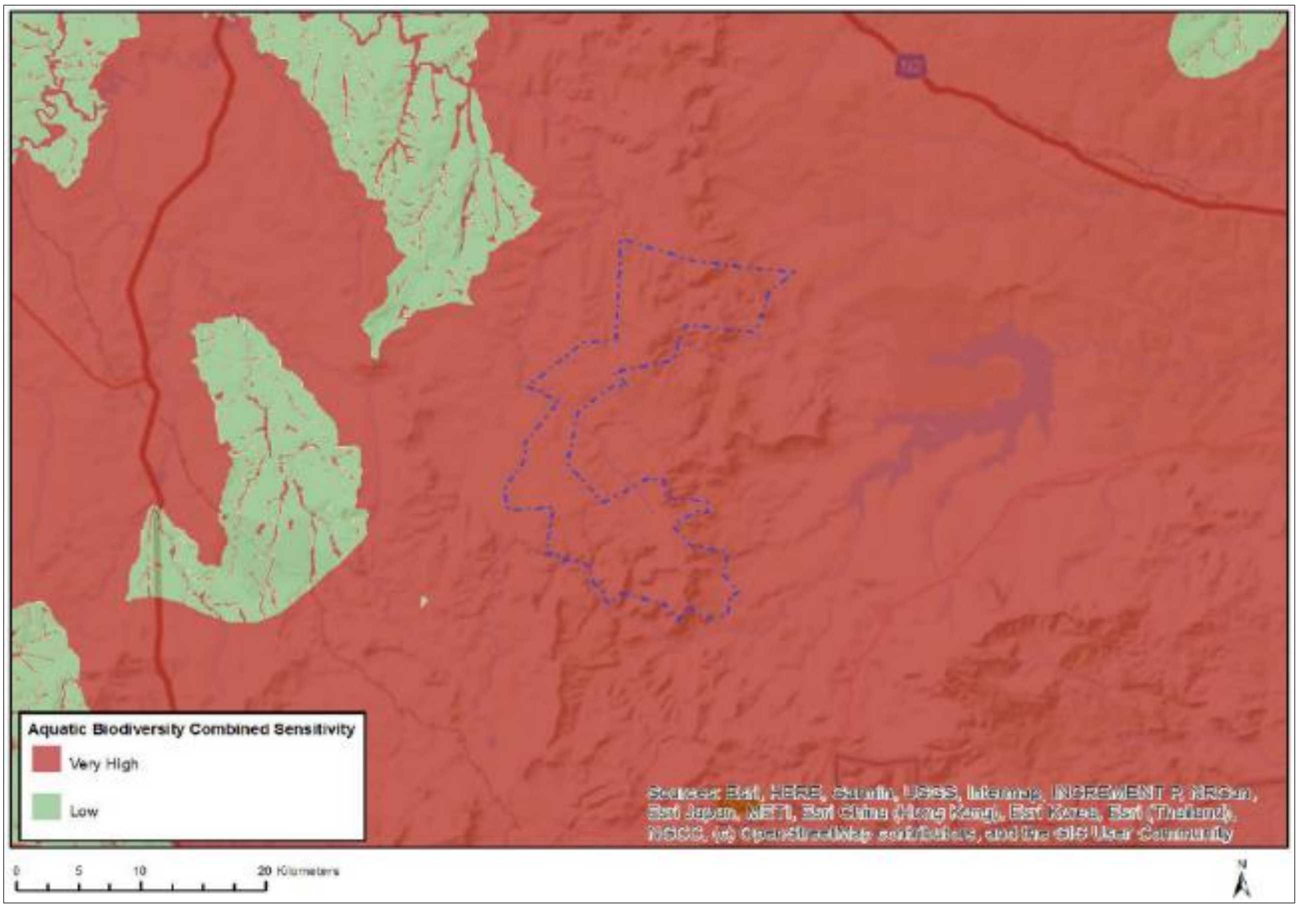

Figure 30: Aquatic Biodiversity Sensitivity as per Screening Tool Report for the specific section of River – Required to be included based on new GN 320 Regulations (March 2020)

Figure 31: Surface water features sensitivity map within a 500 m of the project footprint

10.7 AQUATIC ECOLOGY

The Aquatic Ecological Assessment was undertaken by Enviridi Environmental Consultants and is attached as Appendix 8b.

10.7.1 Methodology

10.7.1.1 Data Gathering and Site Selection

A holistic approach was followed and an attempt was made to link local hydrological, water quality and environmental studies to regional and national concerns, regulations and management strategies.

A site visit was conducted in order to obtain information on normal flow rates, river health and potential factors that could influence the surface water environment and thereby the aquatic ecology:

- To obtain an impression of the study area and surroundings;
- To define the characteristics of all the drainage patterns and containment of surface water in the area;
- To obtain an impression of the catchment i.e. the size, shape and slope and baseline conditions;
- To obtain the baseline aquatic ecological baseline for the river system and feasibility of future monitoring; and
- To obtain an impression of the practical implications of managing the surface water environment.

10.7.1.2 Desktop assessment

A desktop assessment was done using existing GIS database information and Google EarthTM imagery. Data available for the Water Management Area, the catchment, the promulgated Resource Quality Objectives (RQOs) and data as sourced from the Department of Human Settlements, Water and Sanitation (DHSWS) were utilised to gain an understanding of the background baseline against which the field data could be compared. These will all be in the hydrological surface water report and study conducted (Red Kite Environmental Solutions (Pty) Ltd, 2020) for which this report will be an appendix.

10.7.1.3 GIS Information sourced and used

This assessment was conducted to determine which water resources are available in and around the proposed development areas.

The desktop assessment looked at the Screening tool reports generated for the areas and the sensitivity was confirmed during the filed visit. In addition, the Geographical Information Systems (GIS) data sets as indicated in Table 31 were used throughout this document.

Table 31: GIS data sets used in the desktop assessment and age of data utilised

Data Set	Provider	Date
Location of infrastructure, footprint of Mining Right	Client	September 2020
1:50 000 Topographic map	Surveyor general	2008
Water Resources of Southern Africa 2012 Study (WR2012 (Baily & Pitman, 2015)): Various .shp files	Water Research Commission	2015
NFEPA: River_FEPA.shp	SANBI/CSIR	July 2011
NFEPA: NFEPA_Rivers.shp	SANBI/CSIR	July 2011
NFEPA: Fishsanc.shp	SANBI/CSIR	July 2011
NFEPA: Fishsanc_All_Spp.shp	SANBI/CSIR	July 2011
NFEPA: ESA_FishSupportAreas.shp	SANBI	2011 & 2014
National Freshwater Ecosystem Priority Areas: FEPA_subWMA.shp	SANBI	July 2011
National Freshwater Ecosystem Priority Areas: FEPA_WMA.shp	SANBI	July 2011
NFEPA: NFEPA_Wetlands.shp	SANBI	July 2011
River Ecosystem threat status (NBA 2018)	(CSIR, 2018)	2018 – Directly obtained from CSIR in October 2020
National wetland 5 and Confidence map	(CSIR, 2018)	2018 – Directly obtained from CSIR in October 2020
Artificial wetlands	(CSIR, 2018)	2018 – Directly obtained from CSIR in October 2020
DHSWS web site for information on Water quality data and rainfall data.	DHSWS	Refer to Tables where information is provided in this report. Climate.org has also been utilised
FBIS Data	DHSWS	2020 – updated continuously
Various internet information sources as referenced in the document		

10.7.1.4 Site visit

A site visit was conducted in February 2021 which could be described as a wet season assessment. The field assessments had been cancelled various times due to landowner disputes on the project since May 2020. Watercourses were assessed, including Upstream and Downstream points for both streams present were traversed by foot and assessed. Water quality sampling and biomonitoring protocols formed part of the assessments. As stated, it should be kept in mind that Hurricane Eloise has been active since January 2021 and 4-5 weeks of rain had been received by the date of the field assessment, which should be noted as a limitation of the assessment.

10.7.2 Data Obtained and Results

10.7.2.1.1 *Highveld (Ecoregion 11)*

Several large rivers have their sources in the region, e.g., Vet, Modder, Riet, Vaal, Olifants, Steelpoort, Marico, Crocodile (west), Crocodile (east) and the Great Usutu (DHSWS, 2005).

Other general characteristics are as follows:

- Mean annual precipitation: Rainfall varies from low to moderately high, with an increase from west to east.
- Coefficient of variation of annual precipitation: Moderately high in the west, decreasing to low in the east.
- Drainage density: Mostly low, but medium in some areas.
- Stream frequency: Low to medium.
- Slopes <5%: >80%, but 20-50% in a few hilly areas.
- Median annual simulated runoff: Moderately low to moderate.
- Mean annual temperature: Hot in the west and moderate in the east.
- Size = 163615.1 km2

Table 32 provides the ecoregion attributes for the Highveld Ecoregion.

Table 32: Ecoregion attributes for Highveld Ecoregion (Department of Water Affairs, 2005)

Main attributes	Highveld Ecoregion
Terrain Morphology: Broad division	Plains; Low Relief; Plains; Moderate Relief; Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to high Relief Closed Hills. Mountains; Moderate and High Relief
Vegetation types (Primary)	Mixed Bushveld (limited); Rocky Highveld Grassland; Dry Sandy Highveld Grassland; Dry Clay Highveld Grassland; Moist Cool Highveld Grassland; Moist Cold Highveld Grassland; North Eastern Mountain Grassland; Moist Sandy Highveld Grassland; Wet Cold Highveld Grassland (limited); Moist Clay Highveld Grassland; Patches Afromontane Forest (very limited)
Altitude (mamsl)	1100-2100, 2100-2300 (very limited)
MAP (mm)	400 to 1000
Coefficient of variation (% of annual precipitation)	<20 to 35
Rainfall concentration index	45 to 65
Rainfall seasonality	Early to Late summer
Mean annual temp (°C)	12 to20
Mean daily max temp (°C) February	20 to 32
Mean daily max temp (°C) July	14 to 22
Mean daily min temp (°C) February	10 to 18
Mean daily min temp (°C) July	-2 to 4
Median annual simulated runoff (mm) for quaternary catchment	5 to >250

10.7.2.1.2 Eastern Escarpment Mountains (Ecoregion 15)

The vegetation consists of a range of grassland types with Afro Mountain and Alti Mountain Grassland being the defining types. Several major South African rivers have their sources in this region, e.g., Orange, Caledon, Wilge, Thukela, Buffalo, Mooi, Mzimkulu, Mzimvubu, Mgeni and Mkomazi,

Other general characteristics are as follows:

- Mean annual precipitation: Moderate to very high.
- Coefficient of variation of annual precipitation: Very low to moderate.
- Drainage density: Medium.
- Stream frequency: Medium high.
- Slopes Size = 66504.8 km2

Refer to Table 33 below for the ecoregion attributes.

Table 33: Ecoregion attributes for Eastern Escarpment (Department of Water Affairs, 2005)

Main attributes	Highveld Ecoregion
Terrain Morphology: Broad division	Plains; Moderate Relief (limited); Lowlands, Hills and Mountains; Moderate and High Relief, Open Hills; Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief
Vegetation types (Primary)	South Eastern Mountain Grassland; AltiMountain Grassland; AfroMountain Grassland; Moist Upland Grassland; North Eastern Mountain Grassland; Moist Cold Highveld Grassland; Moist Cool Highveld Grassland; Moist Sandy Highveld Grassland; Dry Sandy Highveld Grassland Natal Central Bushveld (limited); Patches Afromontane Forest.
Altitude (mamsl)	1100-3100; 3100-3500 (very limited)
MAP (mm)	400 to 1000
Coefficient of variation (% of annual precipitation)	<20 to 35
Rainfall concentration index	30 to 65
Rainfall seasonality	Early to Late summer
Mean annual temp (°C)	< 8 to 18
Mean daily max temp (°C) February	< 10 to 28
Mean daily max temp (°C) July	<10 to 22
Mean daily min temp (°C) February	<6 to 16
Mean daily min temp (°C) July	<-2 to 4
Median annual simulated runoff (mm) for quaternary catchment	10 to >250

For an investigation, aquatic macro invertebrates are sampled using the SASS5 (South African Scoring System) method (refer to Table 34). As previously mentioned, this method is not designed for use in wetland habitats; this method is used to determine river health by sampling aquatic macro invertebrates and calculating a score based on the taxa found and their related sensitivity towards pollution.

Table 34: Reference scores applicable to a study area

EC	Ecological Category	Description
A	Natural	Unmodified natural
B	Good	Largely natural with few modifications
C	Fair	Moderately modified
D	Poor	Largely modified
E	Seriously modified	Seriously modified
F	Critically modified	Critically or extremely modified

10.7.2.2 Integrated Unit of Analysis and Resource Quality Objectives

The section under investigation falls within the UA Integrated Unit of Analysis (Figure 32) and UA5 (Figure 33) showing EWR1RE.

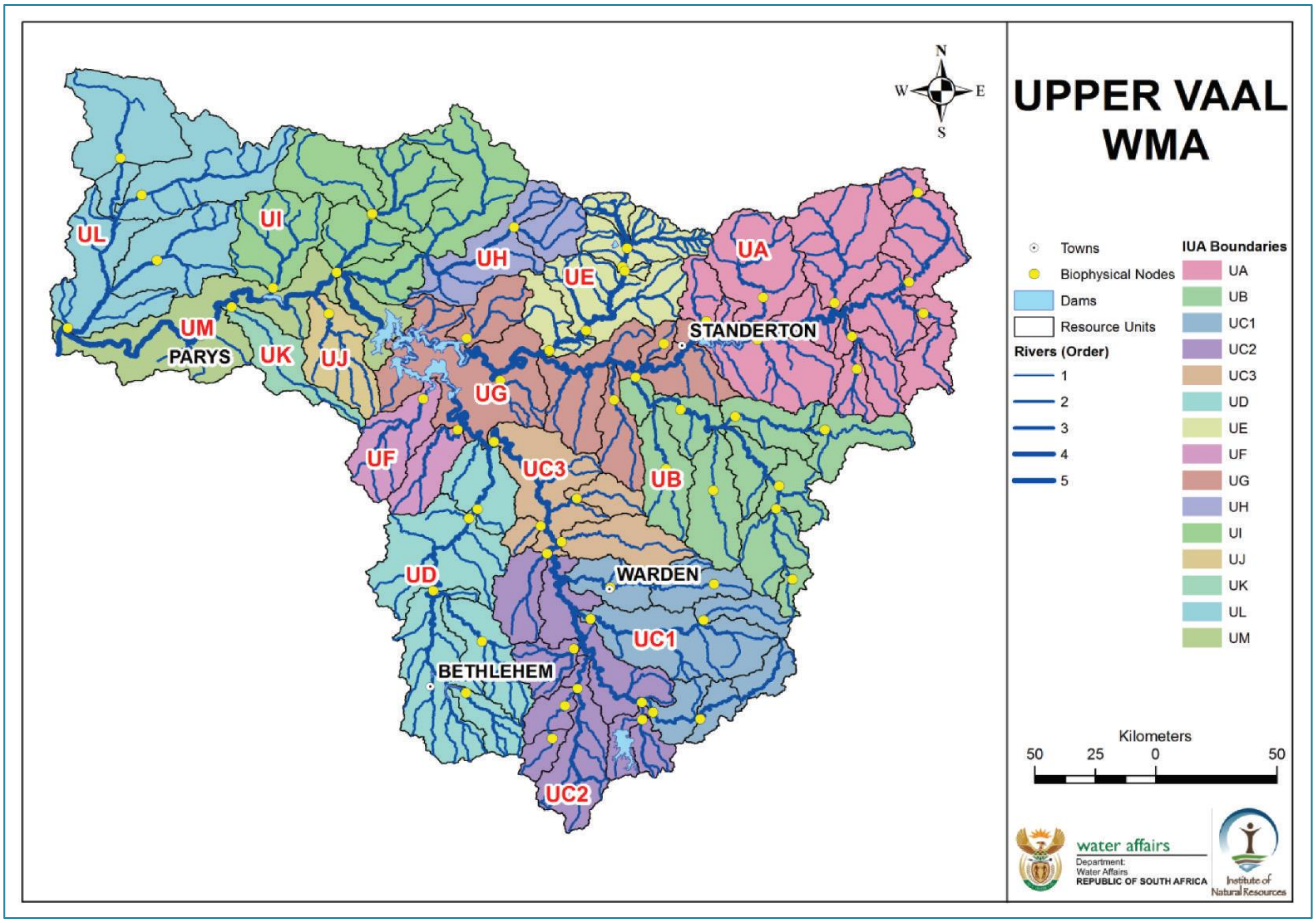

Figure 32: Integrated Unit of Analysis – showing area in UA5 (Upper Vaal)

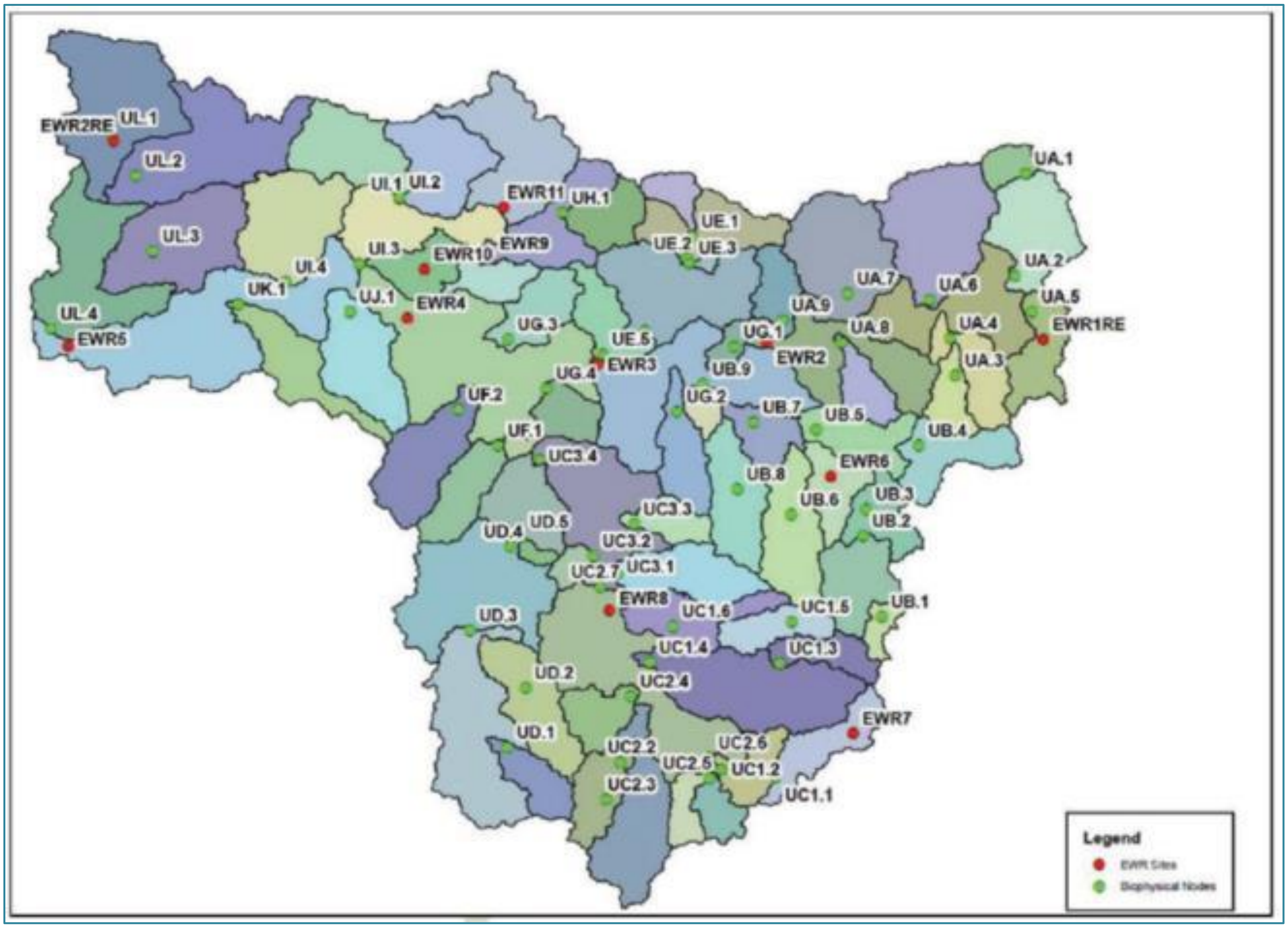

Figure 33: Resource Units (Hydro Nodes) in the Upper Vaal

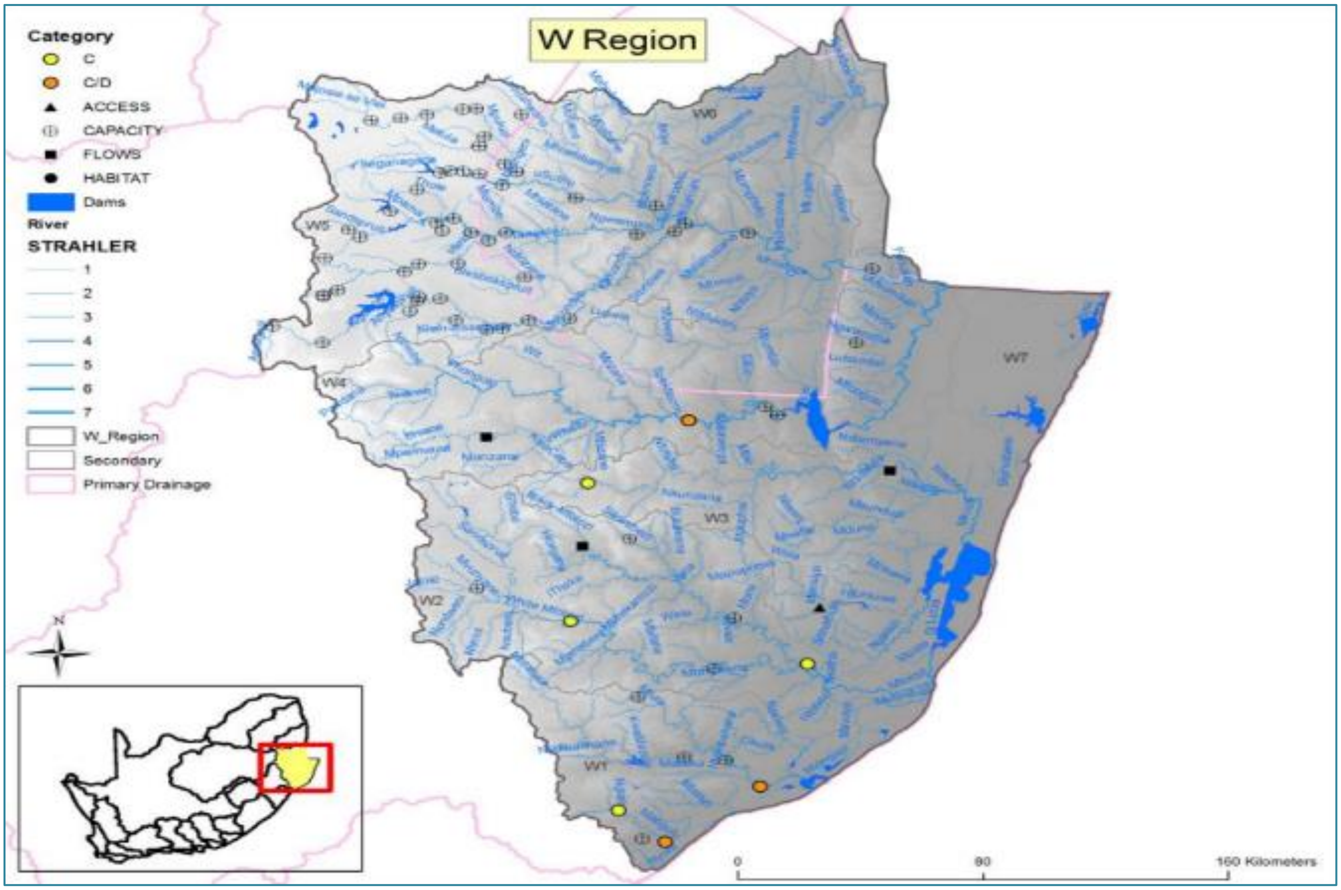

Figure 34: W-Region showing Assegaai river as most north-western border

The source of the Usuthu is in the Mpumalanga Highveld near the town of Amsterdam. The main impacts in this drainage region are due to Forestry, Mining, agricultural activites as well as municipal Wastewater Treatment Works. Another large impact is related to Interbasin transfers to the Vaal and Olifants catchments mostly to provide cooling water to ESKOM power stations (Diedericks et al. 2017). In 2015 the Usuthu catchment was mostly in a moderately modified (C) condition. Nine percent of the sites were in a C category while 24% were in a C/D and 27% in a D category (Diedericks et al 2016). The Nwempisi and the main stem Usuthu rivers were generally in a largely modified condition (Resource Quality Information Services, 2018).

10.7.2.3 Resource Quality Objectives

According to Government Notice 468 of 22 April 2016 (Department of Water and Sanitation, 2016), Classes and Resource Quality Objectives of Water Resources for Catchments of the Upper Vaal has been formally promulgated. RQOs applicable for the W51 Management areas (if applicable) will be included in the Surface water assessment based on the merit of inclusion (Red Kite Environmental Solutions (Pty) Ltd, 2020). According to legislation, the information as indicated in Table 35 to Table 38 for the specific Quaternary Catchments (Upper Vaal where the impacts will likely be focussed) has been provided:

Table 35: Integrated Unit of Analysis (IUAs) and Resource Quality Objectives (RQOs) as per Quaternary Catchment (EC, MAR & EWR)

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km²)	Natural MAR (million m³/a)	Present Ecological State	Recommended Ecological Category
Vaal River upstream of Grootdraai Dam (UA)	II	UA.1	C11A	Vaal		197	13.27	B/C	B
		UA.2	C11B	Vaal		1073	69.33	C	C
		UA.3	C11E	Rietspruit	Skulpspruit	215	12.03	C	C
		UA.4	C11E	Vaal	Rietspruit	746	41.73	C	C
		UA.5	C11D	Vaal	Klein Vaal	533	41.66	C/D	C/D
		UA.6	C11G	Vaal	Drinkwaterspruit	1331	66.07	C/D	C/D
		UA.7	C11H	Vaal	Blesbokspruit	1084	70.66	C/D	C/D
		UA.8	C11K	Vaal	Kaalspruit	355	18.62	B/C	B/C
		UA.9	C11K	Vaal	Leeuspruit	340	18.07	C	C
		EWR1RE	C11C	Vaal	Klein Vaal	318	26.09	C	C
		EWR1	C11J	Vaal		4984	288.8	B/C	B/C

Table 36: Integrated Unit of Analysis (IUAs) and Resource Quality Objectives (RQOs) as per Quaternary Catchment (Quality)

RIVER WATER QUALITY											
IUA	**Class**	**River**	**RU**	**Node**	**REC**	**Component**	**Sub Component**	**RQO**	**Indicator/ measure**	**Numerical Limits**	**95th Percentile**
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	Nutrients	The nutrient condition must be improved to provide for users and the ecosystem.	Phosphate (PO_4)	≤ 0.020 mg/L P	0.121
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	0.858
			RU10	UA.8	B/C				Phosphate (PO_4)	≤ 0.020 mg/L P	0.0085
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	0.099
			RU8	EWR1	B/C (B)	Quality	Salts	Salt concentrations need to be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing.	Electrical conductivity*	≤ 70 mS/m	51.
			RU10	UA.8	B/C	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 70 mS/m	29.4.
			RU8	EWR1	B/C (B)	Quality	System Variables	Temperature and oxygen should be improved to support the ecosystem.	Temperature *	≤ abs(dev from ambient) abs(dev from ambient) 1 deg C	No data
									Dissolved oxygen *	≥ 7 mg/L O_2	No data

			RU10	UA.8	B/C				Temperature *	≤ abs (dev from ambient) abs (dev from ambient) 1 deg C	No data
									Dissolved oxygen *	≥ 7 mg/L O_2	No data

Table 37: Resource Quality Objectives for River Riparian zone habitat for IUA

IUA	Class	River	RU	REC	RQO	Numerical Limits
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	1	B	The riparian zone must be in a largely natural condition. Riparian vegetation must be in a largely natural condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B (≥ 82) Riparian ecostatus category: ≥ B (≥ 82) Hydrological category ≥ B (≥ 82)
			8	B/C	The riparian zone must be in a better than moderately modified condition and must support property and recreational values. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecostatus category: ≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)
			10	B/C	The riparian zone must be in a better than moderately modified condition. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecostatus category: ≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)

Table 38: Resource Quality Objectives for River Instream Habitat and Biota in the Vaal Catchment (Specific IUA)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	1	B	Instream habitat must be in a largely natural condition to support the ecosystem. Instream biota must be in a largely condition and at sustainable levels. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: Salt concentrations must be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing.	• Instream Habitat Integrity category ≥ B (≥ 82) • Fish ecological category: ≥ B (≥ 82) • Macro-invertebrate ecological category: ≥ B (≥ 82) • Instream Ecostatus category ≥ B (≥ 82) • Hydrological category ≥ B (≥ 82) • Water Quality category: ≥ B (≥ 82)
			8	B/C	Instream habitat must be in a better than moderately modified condition to support the ecosystem and for property values and recreation. Instream biota must be in a better than moderately modified condition and at sustainable levels. The requirements of ecologically important fish species must be provided for. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users.	• Instream Habitat Integrity category ≥ B/C (≥ 78) • Fish ecological category: ≥ B/C (≥ 78) • Macro-invertebrate ecological category: ≥ B/C (≥ 78) • Instream Ecostatus category ≥ B/C (≥ 78) • Hydrological category ≥ B/C (≥ 78) • Water Quality category: ≥ B/C (≥ 78)
			10	B/C	Instream habitat must be in a better than moderately modified condition to support the ecosystem and for property values and recreation. Instream biota must be in a better than moderately modified condition and at sustainable levels. The requirements of ecologically important fish species must be provided for. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users.	• Instream Habitat Integrity category ≥ B/C (≥ 78) • Fish ecological category: ≥ B/C (≥ 78) • Macro-invertebrate ecological category: ≥ B/C (≥ 78) • Instream Ecostatus category ≥ B/C (≥ 78) Hydrological category ≥ B/C (≥ 78) • Water Quality category: ≥ B/C (≥ 78)

10.7.2.4 Freshwater Biodiversity Information System - Background Water Quality

Freshwater Biodiversity data as available on the Freshwater Biodiversity Information System (FBIS) for the Klein Vaal River and surrounds by DHSWS, and the following background regional data is provided.

Two (2) points gave historic recorded data in the Klein Vaal River:

- C1KLEI-00006 (Upstream); and
- C1KLEI-UPPEr (Downstream)

Seventy-one different (71) Invertebrate species have been historically recorded within the Upstream site, while Twenty-six (26) aquatic invertebrates were found associated with the Downstream regions. No fish species have been recorded in either the Up- or Downstream points with both points falling in the Highveld Ecological Region (Ecoregion).

The Assegaai River point W5ASSE-00018 (also within the Highveld Ecoregion) has been monitored and data recorded on FBIS. Twenty-two (22) aquatic invertebrates were captured within this systemSurface Water Quantity

Surface water quantity Resource Quality Objectives have been published in the Government Gazette Notice for the Vaal Water Management Area as indicated in Table 39.

Table 39: Surface Water Quantity Resource Quality Objectives

RIVER WATER QUANTITY												
IUA	**Class**	**River**	**RU**	**Node**	**REC**	**Component**	**Sub Component**	**RQO**	**Indicator/ measure**	**Numerical Limits**		
UA	II	Vaal	RU8	EWR1	B/C (B)	Quantity	Low Flows	Low flows need to be Maintained in a healthy condition for the ecosystem and for users.	EWR maintenance low and drought flows: Vaal EWR1 in C11J VMAR = 332.3x10⁶m³ REC=B/C category (equivalent to EcoClassification score 70-80)	Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
										Oct	2.9 (50)	0.2 (99)
										Nov	3.7 (70)	0.22 (99)
										Dec	4 (50)	0.25 (99)
										Jan	4.3 (50)	0.26 (99)
										Feb	5.2 (50)	0.265 (99)
										Mar	3.7 (30)	0.04 (99)
										Apr	3 (40)	0.08 (99)
										May	2.6 (50)	0.03 (90)
										Jun	2.5 (50)	0.15 (99)
										Jul	2.4 (50)	0.15 (99)
										Aug	2.4 (50)	0.15 (99)
										Sep	2.6 (50)	0.16 (99)

10.7.2.5 Resource Quality Objectives: Quantity

Resource Quality Objectives (RQOs) are defined for each prioritised RU for every IUA in terms of water quantity, habitat and biota, and water quality. Refer to Table 35 and Table 39 above showing Quantity, Mean Annual Run-off statistics and Requirements.

Resource Quality Objectives for each Resource Unit (RU) are applicable from the date signed off, unless otherwise specified by the Minister. RQOs (quantity) provides an indication of the hydrological RQOs for rivers expressed in terms of flow at the ecological water requirement (EWR) sites. These summarised statistics are representative of the required flow regime in the river where the variability is dependent on the seasonal and temporal pattern of natural flow conditions. The mean monthly flows represent low flow requirements for all the months.

10.7.2.6 Normal Dry Weather Flow

The site was visited in February 2021 high-flow season after 4-5 weeks of rain associated with the hurricane Eloise in South Africa and the Klein Vaal river had ample flow and some areas were completely submerged in seemingly wetland conditions. Other areas had fast flowing deep water. Care was taken during sampling to avoid flood conditions as this will likely provide skewed results which is not representative. Only two (2) sites were found to be suitable for SASS during current conditions, and these results have been calculated and scored in terms of SASS.

Follow up studies during the bi-annual monitoring programme (once MR is approved) will need to establish long term trend and data for the rivers based on seasonal variation to increase confidence of data obtained during the baseline assessment.

10.7.2.7 Groundwater within the Catchment

The groundwater resource directed measures is provided in Table 40 below.

Table 40: Resource Quality Objectives for the Groundwater in the Upper Vaal catchment

GROUNDWATER					
IUA	**RU**	**Component**	**RQO**	**Indicator/ measure**	**Numerical Limits**
All	All Prioritised RUs	Quantity	Where water use is higher than requirements for Reserve, Schedule 1 and General Authorizations, abstraction rates should not exceed the average recharge values of the aquifer based on the area.	Abstraction Volume (Q) per hectare > Reserve, Schedule and General Authorizations.	Q < Average recharge per hectare
All	RU1 RU2 RU3 RU5 RU6 RU7 RU10 RU11 RU33 RU35 RU40 RU42 RU44 RU43, RU46 RU47 RU59 RU60 RU74	Aquifer	Medium to long-term water trends should not show negative decline or deviation from the natural trend	Depth to Groundwater Level according to Groundwater Monitoring Guidelines.	At least one NGwQl MP monitoring site that is representative of the aquifer. Water level fluctuations in Dolomitic aquifers[6] should not exceed 6m.
	RU69				Water level fluctuations around the average site water level should not exceed 4.05 m
	RU63				Water level fluctuations around the average site water level should not exceed 15.3 m
	RU71				Water level fluctuations around the average site water level should not exceed 13.8 m
	RU64				Water level fluctuations around the average site water level should not exceed 14.8 m
	RU66				Water level fluctuations around the average site water level should not exceed 23.6 m
	RU75				Water level fluctuations around the average site water level should not exceed 9.8 m
	RU70				Water level fluctuations around the average site water

					level should not exceed 15.4 m
	RU62				Water level fluctuations around the average site water level should not exceed 11.8 m
	RU73				Water level fluctuations around the average site water level should not exceed 4.2 m
	RU65				Water level fluctuations around the average site water level should not exceed 22.9 m
	RU72				Water level fluctuations around the average site water level should not exceed 7.16 m

10.7.2.8 Surrounding Surface Water Uses/Users

The area is mainly utilised by large scale farming and community land. The area was found to be largely natural and impacted areas (such as agricultural fields) well managed. The landscape had rural character and roads from Amersfoort was dirt roads across the footprint in all directions, which means sedimentation and erosion will be a big impact to aquatic ecology in the region.

10.7.2.9 Characteristics of the Sub-Quaternary Reach

The following data of the catchment forms part of the literature available for the specific streams utilised for SASS5 monitoring. The Sub-Reach falls within the Upper Vaal Sub water management area, within the Klein-Vaal River and associated tributaries. The main river was not always suitable for sampling at the upstream and downstream points; therefore, data was gathered across the many representative smaller tributaries as well.

A watershed between the Klein Vaal and the Assegaai river was identified and areas were visited to assess conditions of both these systems as applicable. Table 41 provids information on the river health programme for the sub-quaternary reach.

Table 41: Information provided on River Health Programme for the Sub Quaternary Reach (SQR)

SQ Reach	PES Category Median	Mean EI Class	Mean ES Class	Length Km	Stream Order	Default EC
C11C010000 (DS Point)						
C11C010000	Moderately Modified - C	Moderate	High	67.28	1	B

The reach is characterized by the following:

- The Reach spans an area of 67.28 km;
- The Present Ecological State (PES) has been rated Moderately Modified (Class C);
- The Ecological Importance of the reach has been rated Moderate; 9 species of fish are expected in the reach;
- The Ecological sensitivity is rated High with very high invertebrate responses to changes in physico-chemical parameters;
- The reach fall into a FEPA– Refer Figure 36;
- Moderate instream modifications have been recorded in the reach;
- Historic anthropogenic impacts recorded in the reach include:
  - Mostly Agricultural impacts

Fish species recorded within this reach:

- *Labeobarbus aeneus* (Smallmouth yellowfish) – Least Concern;
- *Barbus Anoplus* (Chubbyhead barb) – Least Concern;
- *Barbus pallidus* (Goldie barb) – Least Concern;
- *Barbus Paludinosus* (Straightfin barb) – Least Concern;
- *Clarias Gariepinus* (African sharptooth catfish) – Least Concern;
- *Labeo capensis* (Orange River mudfish) – Least Concern;

- *Labeo umbratus* (Moggel) – Least Concern;
- *Pseudocrenilabrus Philander* (Southern mouth-brooder) – Least Concern;
- *Tilapia Sparrmanii* (Banded tilapia) – Least Concern.

SQ Reach	PES Category Median	Mean EI Class	Mean ES Class	Length Km	Stream Order	Default EC
C11C-01846						
C11C-01846 (Both US & DS Point in Klein - Vaal)	Moderately Modified - C	Moderate	High	67.28	1	B

The reach is characterized by the following:

- The Reach spans an area of 67.28 km;
- The Present Ecological State (PES) has been rated Moderately Modified (Class C);
- The Ecological Importance of the reach has been rated Moderate; 9 species of fish are expected in the reach;
- The Ecological sensitivity is rated High with very high invertebrate responses to changes in physico-chemical parameters;
- The reach fall into a FEPA– Refer Figure 36;
- Moderate instream modifications have been recorded in the reach;
- Historic anthropogenic impacts recorded in the reach include:
    - Mostly Agricultural impacts

Fish species recorded within this reach:

- *Labeobarbus aeneus* (Smallmouth yellowfish) – Least Concern;
- *Barbus Anoplus* (Chubbyhead barb) – Least Concern;
- *Barbus pallidus* (Goldie barb) – Least Concern;
- *Barbus Paludinosus* (Straightfin barb) – Least Concern;
- *Clarias Gariepinus* (African sharptooth catfish) – Least Concern;
- *Labeo capensis* (Orange River mudfish) – Least Concern;
- *Labeo umbratus* (Moggel) – Least Concern;
- *Pseudocrenilabrus Philander* (Southern mouth-brooder) – Least Concern;
- *Tilapia Sparrmanii* (Banded tilapia) – Least Concern

SQ Reach	PES Category Median	Mean EI Class	Mean ES Class	Length Km	Stream Order	Default EC
W51A-02082						
W51A-02082 – Assegaai River	Moderately Modified - C	High	Very High	84,9	1,0	A

The reach is characterized by the following:

- The Reach spans an area of 84.47 km;
- The Present Ecological State (PES) has been rated Moderately Modified (Class C);
- The Ecological Importance of the reach has been rated Moderate; 11 species of fish are expected in the reach;
- The Ecological sensitivity is rated High with very high invertebrate responses to changes in physico-chemical parameters;

- The reach fall into a FEPA– Refer Figure 36;
- Small/Little instream modifications have been recorded in the reach;
- Moderate Riparian and Wetland Zone Continuity impacts and zone modifications
- Historic anthropogenic impacts recorded in the reach include:
  - Mostly Agricultural impacts
  - Wetlands, damming of wetlands, irrigation, dams in tributaries, roads, AIP, coal mining - some decanting of mines into wetlands and river, lower reach in Heyshope Dam. Top of reach data not available at time of study (reported as not digitized by DHSWS).

Fish species recorded within this reach:

- Anguilla mossambica
- Amphilius uranoscopus
- *Barbus Anoplus* (Chubbyhead barb) – Least Concern;
- Barbus argenteus
- Labeobarbus marequensis
- Labeobarbus polylepis
- Chiloglanis anoterus
- Chiloglanis emarginatus
- *Clarias Gariepinus* (African sharptooth catfish) – Least Concern;
- *Pseudocrenilabrus Philander* (Southern mouth-brooder) – Least Concern;
- *Tilapia Sparrmanii* (Banded tilapia) – Least Concern.

According to the NBA2018 data, the following has been provided within Table 42 for the SQR:

Table 42: National Biodiversity Assessment (2018) Data for the SQR(s):

Field Name	Description	Data Applicable for Klein-Vaal River (NBA 2018)		
Representative Points		**Upper Reach**	**Mid Reach**	**Lower Reach**
Order	River order	1	1	2
Mainstem	Mainstem = 1 is a quaternary mainstem; the rest of the 1:500,000 rivers are tributaries that are nested within quaternary catchments	1	1	1
Flow	Flow variability	Permanent	Permanent	Permanent
River Type	River type used by NFEPA which comprises the level 1 ecoregion number followed by the flow	Permanent (D) Upper Foothills	Permanent (E) Lower Foothills	Permanent (E) Lower Foothills
PES 1999	Present ecological state 1999 with desktop modification	Class D: Largely Modified	Class D: Largely Modified	Class D: Largely Modified
River Condition	River condition used by NFEPA A or B is considered intact and able to contribute towards river ecosystem biodiversity targets.	AB	AB	AB

FFRREGION	The lumped ecoregion into which free-flowing rivers fall, used to achieve representation of free-flowing rivers across the country	N/A	N/A	N/A
Flagship Status	Flagship free-flowing rivers as identified through an expert review process	Not marked as a Flagship River	Not marked as a Flagship River	Not marked as a Flagship River
PES 2018	NBA 2018 Ecological condition category. The process involved using the Department of Water and Sanitation (DWS, 2014) Present Ecological State/Ecological Importance/Ecological Sensitivity (PES/EI/ES), also referred to as PES/EIS data, which included mainstems and tributaries at a sub-quaternary level. This desktop data was updated with data that became available between 2011 and 2017 from Reserve or Ecological Water Requirement (EWR) and Water Resource Classification System (WRCS) studies.	Class C: Moderately Modified PES as per NBA 2018 Assessment	Class C: Moderately Modified PES as per NBA 2018 Assessment	Class C: Moderately Modified PES as per NBA 2018 Assessment
NBA 2018 ETS	Ecosystem threat status (ETS) of river ecosystem types: this was based on the extent to which each river ecosystem type had been altered from its natural condition.	Critically endangered (CR) Ecosystem threat status (ETS)	Critically endangered (CR) Ecosystem threat status (ETS)	Critically endangered (CR) Ecosystem threat status (ETS)
NBA 2018 EPL	Ecosystem protection level (EPL) of river ecosystem types: river ecosystem types in protected areas needed to be in good condition rivers (A or B ecological category) to be considered as protected.	Poorly Protected	Poorly Protected	Poorly Protected
Field Name	**Description**	**Data Applicable for Assegaai River (NBA 2018)**		
Representative Points		**Upper Reach**	**Mid Reach**	**Lower Reach**
Order	River order	1	1	1
Mainstem	Mainstem = 1 is a quaternary mainstem; the rest of the 1:500,000 rivers are tributaries that are nested within quaternary catchments	1	1	1
Flow	Flow variability	Permanent	Permanent	Permanent
River Type	River type used by NFEPA which comprises the level 1 ecoregion number followed by the flow	Permanent (C) Transitional zone	Permanent (D) Upper Foothills	Permanent (D) Upper Foothills
PES 1999	Present ecological state 1999 with desktop modification	Class C: Moderately Modified	Class C: Moderately Modified	Class C: Moderately Modified

River Condition	River condition used by NFEPA A or B is considered intact and able to contribute towards river ecosystem biodiversity targets.	B	B	B
FFRREGION	The lumped ecoregion into which free-flowing rivers fall, used to achieve representation of free-flowing rivers across the country	N/A	N/A	N/A
Flagship Status	Flagship free-flowing rivers as identified through an expert review process	Not marked as a Flagship River	Not marked as a Flagship River	Not marked as a Flagship River
PES 2018	NBA 2018 Ecological condition category. The process involved using the Department of Water and Sanitation (DWS, 2014) Present Ecological State/Ecological Importance/Ecological Sensitivity (PES/EI/ES), also referred to as PES/EIS data, which included mainstems and tributaries at a sub-quaternary level. This desktop data was updated with data that became available between 2011 and 2017 from Reserve or Ecological Water Requirement (EWR) and Water Resource Classification System (WRCS) studies.	Class C: Moderately Modified PES as per NBA 2018 Assessment	Class C: Moderately Modified PES as per NBA 2018 Assessment	Class C: Moderately Modified PES as per NBA 2018 Assessment
NBA 2018 ETS	Ecosystem threat status (ETS) of river ecosystem types: this was based on the extent to which each river ecosystem type had been altered from its natural condition.	Critically endangered (CR) Ecosystem threat status (ETS)	Critically endangered (CR) Ecosystem threat status (ETS)	Critically endangered (CR) Ecosystem threat status (ETS)
NBA 2018 EPL	Ecosystem protection level (EPL) of river ecosystem types: river ecosystem types in protected areas needed to be in good condition rivers (A or B ecological category) to be considered as protected.	Poorly Protected	Poorly Protected	Poorly Protected

The majority of activity occurs in C11C, which is associated with the Klein Vaal river, however, data from the Assegaai river in the Imkomati Usuthu Catchment had also been included were relevant since sections of the powerline cross over the catchment border into the adjacent W51A catchment.

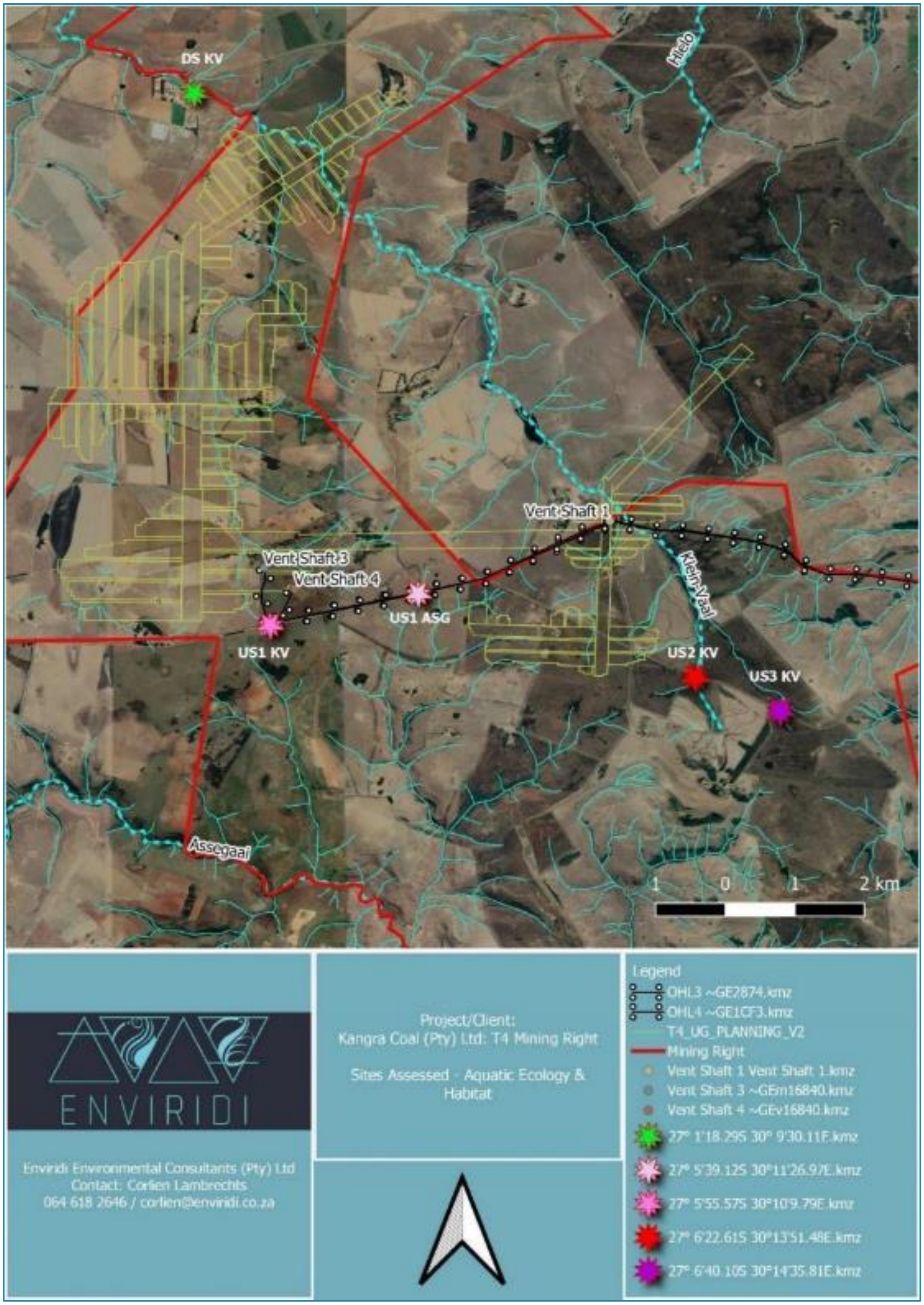

Figure 35: Sites surveyed during site assessment and to be included in the monitoring framework

10.7.2.10 Freshwater Ecosystem priority areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project is a multi-partner project between the CSIR, the Water Research Commission, the South African National Biodiversity Institute, the Department of Environmental Affairs, the South African Institute of Aquatic Biodiversity and South African National Parks. The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities for conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development (Nel, et al., 2011).

The project has three inter-related components:

- A technical component to identify a national network of freshwater conservation areas;
- A national governance component to align DEA and DWA policies and approaches for conserving freshwater ecosystems; and
- A sub-national governance and management component that conducts case studies to demonstrate how NFEPA outcomes can be implemented (Nell et al, 2011).

The relevant sections of river do intercept with FEPA areas, and both the Klein-Vaal River and Assegaai River is shown as is a FEPA River. Refer to Figure 36.

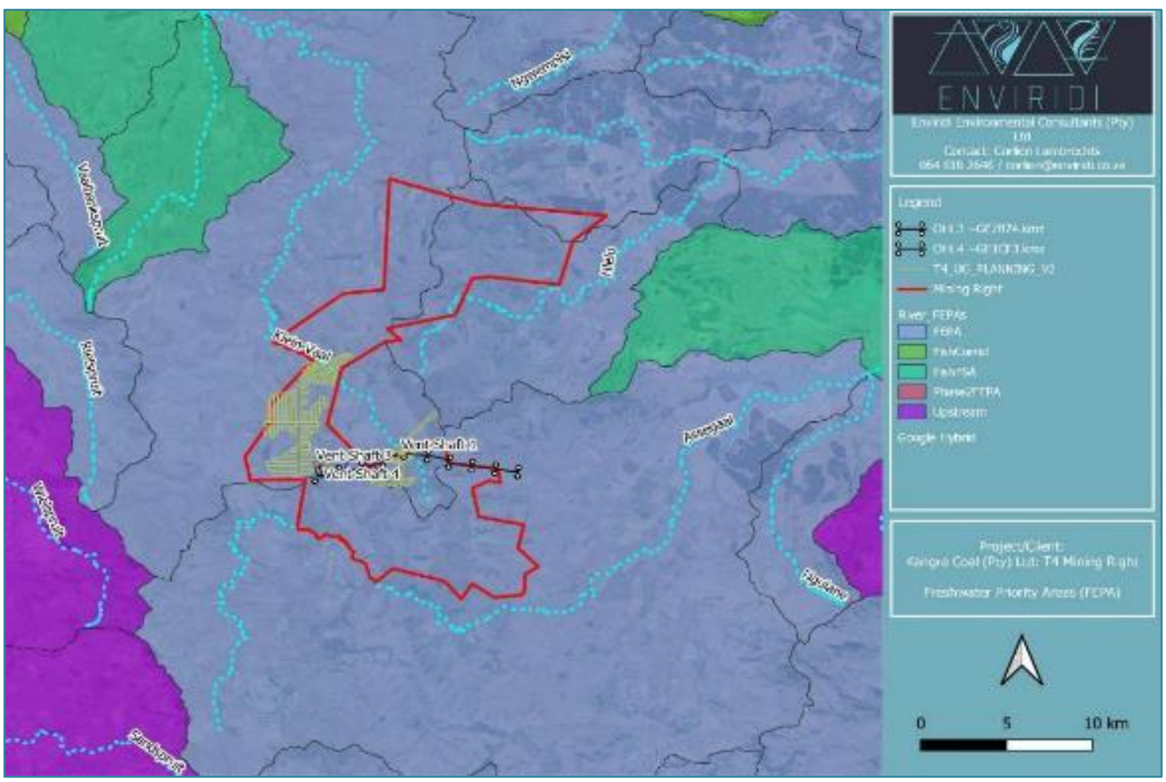

Figure 36: River Freshwater Ecosystem Priority Areas

10.7.2.11 Vegetation Groups

The project area is located within four (4) Vegetation Groups. Smaller sections overlap with the Eastern Highveld Grassland, Northern Afrotemperate Forest and the Paulpietersburg Moist Grassland (Figure 37). However, the bulk of the mining right falls, including the areas where the ventilation shafts are proposed fall within the Wakkerstroom Montane Grassland.

The powerline intercepts with sections of Wakkerstroom Montane Grassland, Northern Afrotemperate Forest and the Paulpietersburg Moist Grassland.

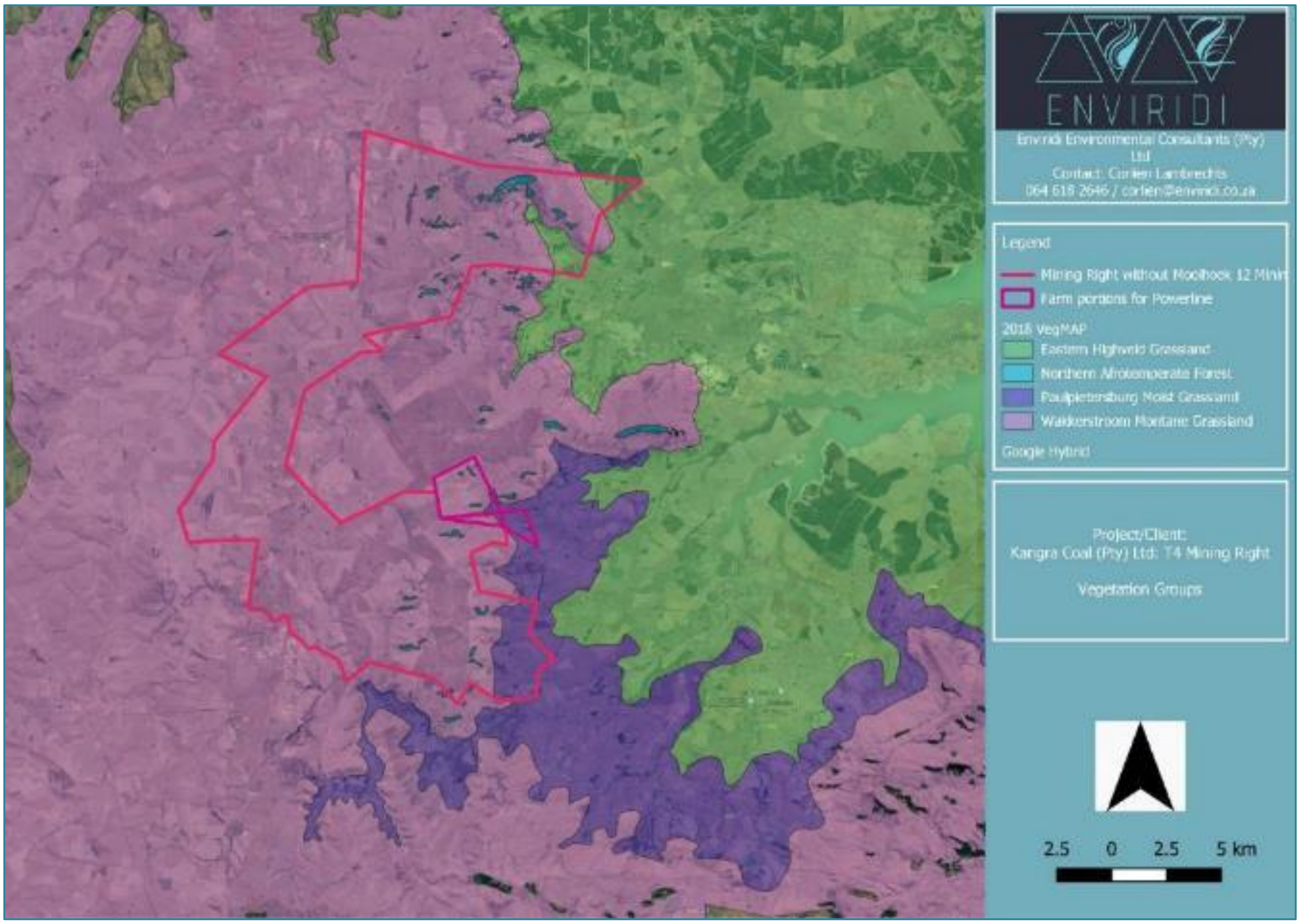

Figure 37: Vegetation Groups applicable to the Kangra T4 Mining Right Application

The applicable river system and assessed sites falls within the Wakkerstroom Montane Grassland (Gm14).

10.7.2.11.1 <u>Wakkerstroom Montane Grassland (Gm14)</u>

The bulk of the Mining Right as well as the location of the shafts are located within this Vegetation Unit specifically. This unit is a less obvious continuation of the Escarpment that links the southern and northern Drakensberg escarpments. It straddles this divide and is comprised of low mountains and undulating plains. The vegetation comprises predominantly short montane grasslands on the plateaus and the relatively flat areas, with short forest and Leucosidea thickets occurring along steep, mainly east-facing slopes and drainage areas. *L. sericea* is the dominant woody pioneer species that invades areas as a result of grazing mismanagement.

Important Taxa include:

- Small Trees: *Canthium ciliatum*, *Protea subvestita*.
- Tall Shrubs: *Buddleja salviifolia* (d), *Leucosidea sericea* (d), *Buddleja auriculata*, *Diospyros lycioides* subsp. *guerkei*, *Euclea crispa* subsp. *crispa*, *Rhus montana*, *R. rehmanniana*, *R. transvaalensis*.
- Low Shrubs: *Asparagus devenishii* (d), *Cliffortia linearifolia* (d), *Helichrysum melanacme* (d), *H. splendidum* (d), *Anthospermum rigidum* subsp. *pumilum*, *Clutia natalensis*, *Erica oatesii*, *Felicia filifolia* subsp. *filifolia*, *Gymnosporia heterophylla*, *Helichrysum hypoleucum*, *Hermannia geniculata*, *Inulanthera dregeana*, *Metalasia densa*, *Printzia pyrifolia*, *Rhus discolor*, *Rubus ludwigii* subsp. *ludwigii*.
- Graminoids: *Andropogon schirensis* (d), *Ctenium concinnum* (d), *Cymbopogon caesius* (d), *Digitaria tricholaenoides* (d), *Diheteropogon amplectens* (d), *Eragrostis chloromelas* (d), *E. plana* (d), *E. racemosa* (d), *Harpochloa falx* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Microchloa caffra* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Aristida junciformis* subsp. *galpinii*, *Brachiaria serrata*, *Diheteropogon filifolius*, *Elionurus muticus*, *Eragrostis capensis*, *Eulalia villosa*, *Festuca scabra*, *Loudetia simplex*, *Rendlia altera*, *Setaria nigrirostris*. Herbs: *Berkheya onopordifolia* var. *glabra* (d), *Cephalaria natalensis* (d), *Pelargonium luridum* (d), *Acalypha depressinerva*, *A. peduncularis*, *A. wilmsii*, *Aster bakerianus*, *Berkheya setifera*, *Euryops transvaalensis* subsp. *setilobus*, *Galium thunbergianum* var. *thunbergianum*, *Geranium ornithopodioides*, *Helichrysum cephaloideum*, *H. cooperi*, *H. monticola*, *H. nudifolium* var. *nudifolium*, *H. oreophilum*, *H. simillimum*, *Pentanisia prunelloides* subsp. *latifolia*, *Plectranthus laxiflorus*, *Sebaea leiostyla*, *S. sedoides* var. *sedoides*, *Selago densiflora*, *Vernonia hirsuta*, *V. natalensis*, *Wahlenbergia cuspidata*.
- Geophytic Herbs: *Hypoxis costata* (d), *Agapanthus inapertus* subsp. *intermedius*, *Asclepias aurea*, *Cheilanthes hirta*, *Corycium dracomontanum*, *C. nigrescens*, *Cyrtanthus tuckii* var. *transvaalensis*, *Disa versicolor*, *Eriospermum cooperi* var. *cooperi*, *Eucomis bicolor*, *Geum capense*, *Gladiolus ecklonii*, *G. sericeovillosus* subsp. *sericeovillosus*, *Hesperantha coccinea*, *Hypoxis rigidula* var. *pilosissima*, *Moraea brevistyla*, *Rhodohypoxis baurii* var. *confecta*. Semiparasitic Herb: *Striga bilabiata* subsp. *bilabiata*.

Biogeographically Important Taxa ([L]Low Escarpment endemic, [N]Northern sourveld endemic):

- Low Shrubs: *Bowkeria citrina*[L], *Lotononis amajubica*[L], *Protea parvula*[N]
- Succulent Herb: *Aloe modesta*[N].

Endemic Taxa:

- Herbs: *Helichrysum aureum* var. *argenteum*, *Selago longicalyx*.
- Geophytic Herbs: *Kniphofia* sp. nov. (‘*laxiflora* Form C’), *Nerine platypetala*.

- Woody Climber: *Asparagus fractiflexus*.

Conservation Least threatened. Conservation target 27%, less than 1% is statutorily protected in the Paardeplaats Nature Reserve. There are 10 South African Natural Heritage Sites in this unit, although very little of it is formally protected. Land use pressures from agriculture are low (5% cultivated) probably owing to the colder climate and shallower soils. The area is also suited to afforestation, with more than 1% under Acacia mearnsii and Eucalyptus plantations. The black wattle (Acacia mearnsii) is an aggressive invader of riparian areas. Erosion very low (78%) and low (19%).

10.7.2.11.2 Threatened Ecosystems and Status

The Mining Right falls within the Threatened Ecosystem; Wakkerstroom/Luneburg Grasslands (MP11), which has an Endangered status. The most Northern point of the Mining Right Application area also falls within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA 2011 and NBA 2018).

The NBA 2011 does not correspond with the latest NBA 2018 in all aspects, which lists the Wakkerstroom Montane Grassland (previously included in Wakkerstroom/Luneburg Grasslands) as Poorly Protected, but Least Concern, but separated and made distinction for Paulpietersburg Moist Grassland (previously also included in Wakkerstroom/Luneburg Grasslands) and issued it a status of Poorly Protected and Endangered. Northern Afrotemperate Forest (also previously included in Wakkerstroom/Luneburg Grasslands) has a status of Well protected and Least Concern (Skowno, Raimondo, Poole, Fizzotti, & Slingsby, 2019).

10.7.2.11.3 Geozones

Upper sites in Ecoregion 1 include those in the Source zone, Mountain Headwater Stream, Transitional and Upper Foothill (Class A- D), while lowland sites include Lower foothill and Lowland zones (Class E-F) (Table 43). The sampling points are located within Lower foothills.

Table 43: Geozones in accordance with RQIS

A	High gradient mountain stream
B	Mountain stream
C	Transitional zone
D	Upper foothills (*US Point)*
E	Lower foothills (*DS Points)*
F	Lowland river

10.7.2.12 Integrated Habitat Assessment System (IHAS)

The integrated IHAS results for the sites assessed for the Vaal and its tributaries are provided in Table 44 andTable 45.

Table 44: Integrated Habitat Assessment Survey - IHAS Results

SURVEY	FEBRUARY 2020 – HIGH FLOW	
Sites Assessed	**Suitability**	**Flow**
US 1 KV (west)	Adequate	Moderate Flow
US 2 KV (east)	Not suitable (currently Inadequate)	Only wetland seepage present during assessment
US 3 KV (east)	Not suitable (currently Inadequate)	Flooded dam structures and unidirectional flow due to recent floods
DS - KV	Adequate	Moderate Flow – but very deep during assessment

Table 45: Macroinvertebrate Habitat Assessment and Biotype Availability Results

Biotope	Upstream Points			Downstream
High Flow - 2020	**US 1 KV**	**US 2 KV**	**US 3 KV**	**DS KV**
Stones in current (SIC)	4	N/A	N/A	0
Stones out of current (SOOC)	0	N/A	N/A	0
Bedrock	3	N/A	N/A	2
Aquatic vegetation	3	N/A	N/A	1
Marginal vegetation in current	3	N/A	N/A	5
Marginal vegetation out of current	0	N/A	N/A	0
Gravel	0	N/A	N/A	0
Sand	2	N/A	N/A	0
Mud	4	N/A	N/A	4
Total	19	N/A	N/A	12
Total Score – Biotope Adequacy (%)	42%	N/A	N/A	26%

The integrated IHAS results for the sites assessed that are associated with the Asegaai River and its tributaries are provided in Table 46 and

Table **47**.

Table 46: Integrated Habitat Assessment Survey - IHAS Results

SURVEY	FEBRUARY 2021 – HIGH FLOW

Sites Assessed	Score	Suitability	Flow
US 1 ASG	N/A	Not suitable (currently Inadequate)	Only wetland seepage present during assessment
DS areas of ASG	N/A	To be included in future monitoring once access has been sorted out	To be included in future monitoring once access has been sorted out

Table 47: Macroinvertebrate Habitat Assessment and Biotype Availability Results

Biotope	Upstream	DS points
High Flow - 2020	**US1 ASG**	**DS ASG**
Stones in current (SIC)	N/A	N/A – Could be assessed in future monitoring programmes
Stones out of current (SOOC)	N/A	
Bedrock	N/A	
Aquatic vegetation	N/A	
Marginal vegetation in current	N/A	
Marginal vegetation out of current	N/A	
Gravel	N/A	
Sand	N/A	
Mud	N/A	
Total	N/A	
Total Score – Biotope Adequacy (%)	N/A	

10.7.2.13 Interpretation of Results

Different points could be utilized for the purpose of the baseline condition:

- US 1 KV, US 2 KV and US3 KV could be compared to DS 1 KV only;
- US 1 ASG and DS ASG can also be compared if viable in future sampling events.

Table 48 to

Table **52** provides the results for the assessments.

Table 48: Upstream Point US of the Klein-Vaal river (Western Tributaries) – US1-KV

Sampling Area – Upstream	
DHSWS corresponding name	C11C-01846 – Highveld EcoRegion
Site Name	Western Upstream Point (February 2021)
Upstream Photograph	Downstream Photograph

 **Figure 38: Upstream photograph at sampling point**		 **Figure 39: Downstream photograph of sampling point**	
Site Description		Upstream point of the Klein Vaal river. Associated with the Ventilations shaft 3 & 4 footprint areas and located within the same vicinity (stream found slightly to the north). Flow moderate and channel defined with suitable habitat types, however, mud was prevalent.	
Impacts on the water environment observed		Impacts such as erosion visible, but likely based on recent rainfall.	
GPS		27° 5'55.57"S 30°10'9.79"E	
Reference PES as per SQR		Class C: Moderately Modified	
High Flow 2021	SASS Score	No of Taxa	ASPT
SASS 5 Results	62	11	5.63
2021 Result		Class A: Natural	

Table 49: Upstream Point US of the Klein-Vaal river (Eastern Tributaries) – US2-KV

Sampling Area – Upstream	
DHSWS corresponding name	C11C-01846 – Eastern Escarpment Mountain

	EcoRegion
Site Name	Eastern Upstream Point (February 2021)
Upstream Photograph	Downstream Photograph
 **Figure 40: Upstream photograph at sampling point**	 **Figure 41: Downstream photograph of sampling point**
Site Description	Wetland dominated tributary with minimal open sections. Conditions currently not ideal for Aquatic sampling.
Impacts on the water environment observed	Anthropogenic disturbances associated with easy access and dam just below sampling point
GPS	27° 6'22.61"S 30°13'51.48"E
Reference PES as per SQR	Class C: Moderately Modified

High Flow 2021	SASS Score	No of Taxa	ASPT
SASS 5 Results	N/A	N/A	N/A

Table 50: Upstream Point US of the Klein-Vaal river (Eastern Tributaries) – US 3-KV

Sampling Area – Upstream	
DHSWS corresponding name	C11C-01846 – Eastern Escarpment Mountain EcoRegion

Site Name		Eastern Upstream Point (February 2021)	
Upstream Photograph		Downstream Photograph	
 **Figure 42: Upstream photograph at sampling point**		 **Figure 43: Downstream photograph of sampling point**	
Site Description		Shallow sheet flow and erosion prevalent. No wading possible at present.	
Impacts on the water environment observed		Anthropogenic disturbances associated with easy access and cluster of dams just upstream of sampling point.	
GPS		27° 6'40.10"S 30°14'35.81"E	
Reference PES as per SQR		Class C: Moderately Modified	
High Flow 2021	SASS Score	No of Taxa	ASPT
SASS 5 Results	N/A	N/A	N/A

Table 51: Downstream Points in Klein Vaal River

Sampling Area – Downstream	
DHSWS corresponding name	C11C-01846 – Highveld EcoRegion
Site Name	Downstream Point (February 2021)

Upstream Photograph		Downstream Photograph	
 **Figure 44: Upstream photograph at sampling point**		 **Figure 45: Downstream photograph of sampling point**	
Site Description		Well defined channel to the north of development representing downstream point within the Klein Vaal river.	
Impacts on the water environment observed		Motor vehicle waste related substances and spills. Erosion levels fairly high, but likely based on recent rainfall. Freshwater shrimps, frogs and fish sighted.	
GPS		27° 1'18.50"S 30° 9'29.49"E	
Reference PES as per SQR		Class C: Moderately Modified	
High Flow 2021	SASS Score	No of Taxa	ASPT
SASS 5 Results	70	11	6.36
2021 Result		Class A: Natural	

Table 52: Upstream Point US located in the western tributary of the Klein-Vaal river (Western Tributaries)

Sampling Area – Upstream

<table>
<tr><td colspan="2">DHSWS corresponding name</td><td colspan="2">W51A-02082 – Assegaai River– Highveld EcoRegion</td></tr>
<tr><td colspan="2">Site Name</td><td colspan="2">Eastern Upstream Point (February 2020)</td></tr>
<tr><td colspan="2">Upstream Photograph</td><td colspan="2">Downstream Photograph</td></tr>
<tr><td colspan="2">
Figure 46: Upstream photograph at sampling point</td><td colspan="2">
Figure 47: Downstream photograph of sampling point</td></tr>
<tr><td colspan="2">Site Description</td><td colspan="2">Wetland orientated channel – no flow available for sampling</td></tr>
<tr><td colspan="2">Impacts on the water environment observed</td><td colspan="2">Anthropogenic disturbances associated with easy access and dam just below sampling point</td></tr>
<tr><td colspan="2">GPS</td><td colspan="2">27° 5'39.12"S
30°11'26.97"E</td></tr>
<tr><td colspan="2">Reference PES as per SQR</td><td colspan="2">Class C: Moderately Modified</td></tr>
<tr><td>High Flow 2020</td><td>SASS Score</td><td>No of Taxa</td><td>ASPT</td></tr>
<tr><td>SASS 5 Results</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
</table>

According to the River Health Programme: South African Scoring System (SASS) Data interpretation guidelines of 2007, the project forms part of the Highveld bioregion – combined biological zone, data within each spatial group was plotted with ASPT as a function of the SASS score. This is based on a relationship whereby SASS score and number of taxa were positively correlated with the number of biotopes sampled (Dallas, 2007).

This method allows natural variation in the SASS biotopes sampled to be taken into account. The section below categorises the different biological bands within each spatial group and provides the ecological categories.

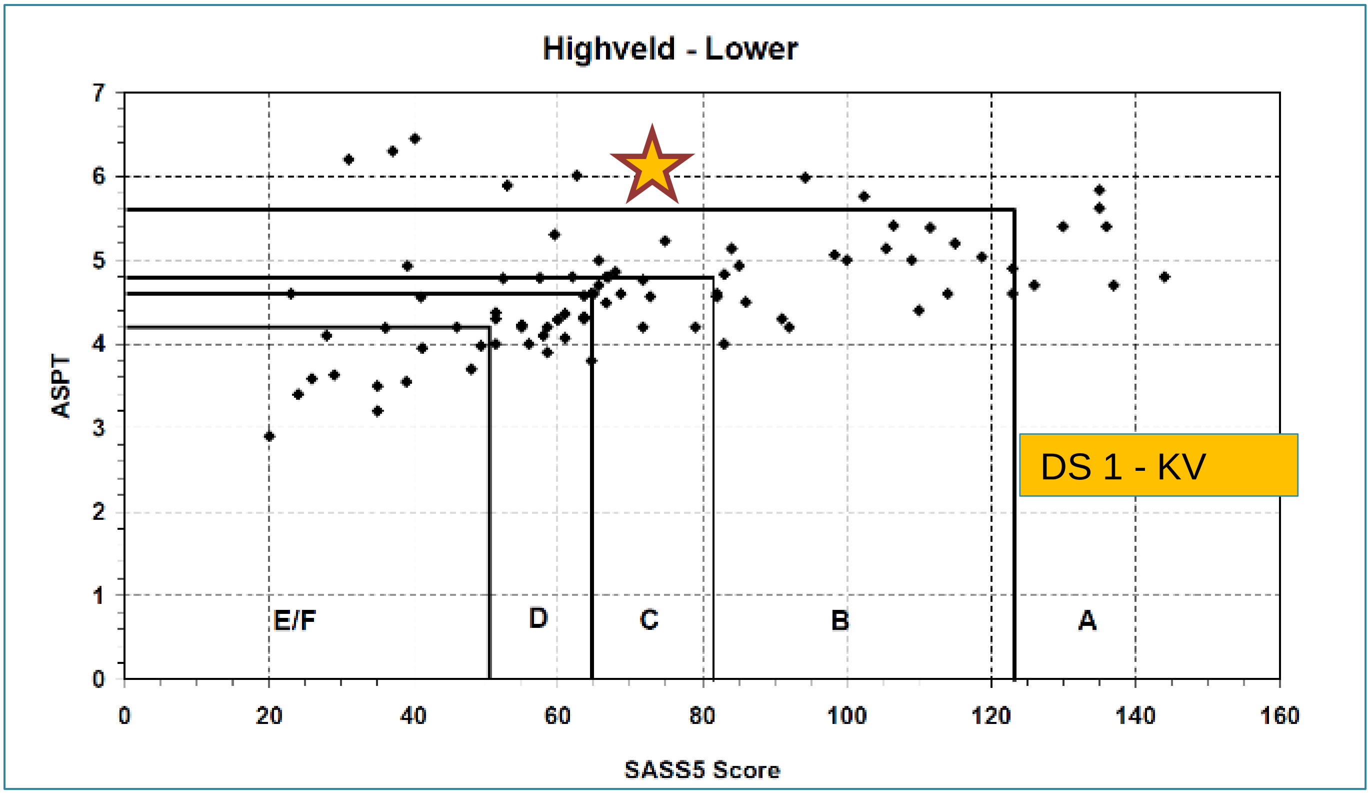

Figure 48: SASS5 classification for the sites in the lower Highveld (Class E- Lower)

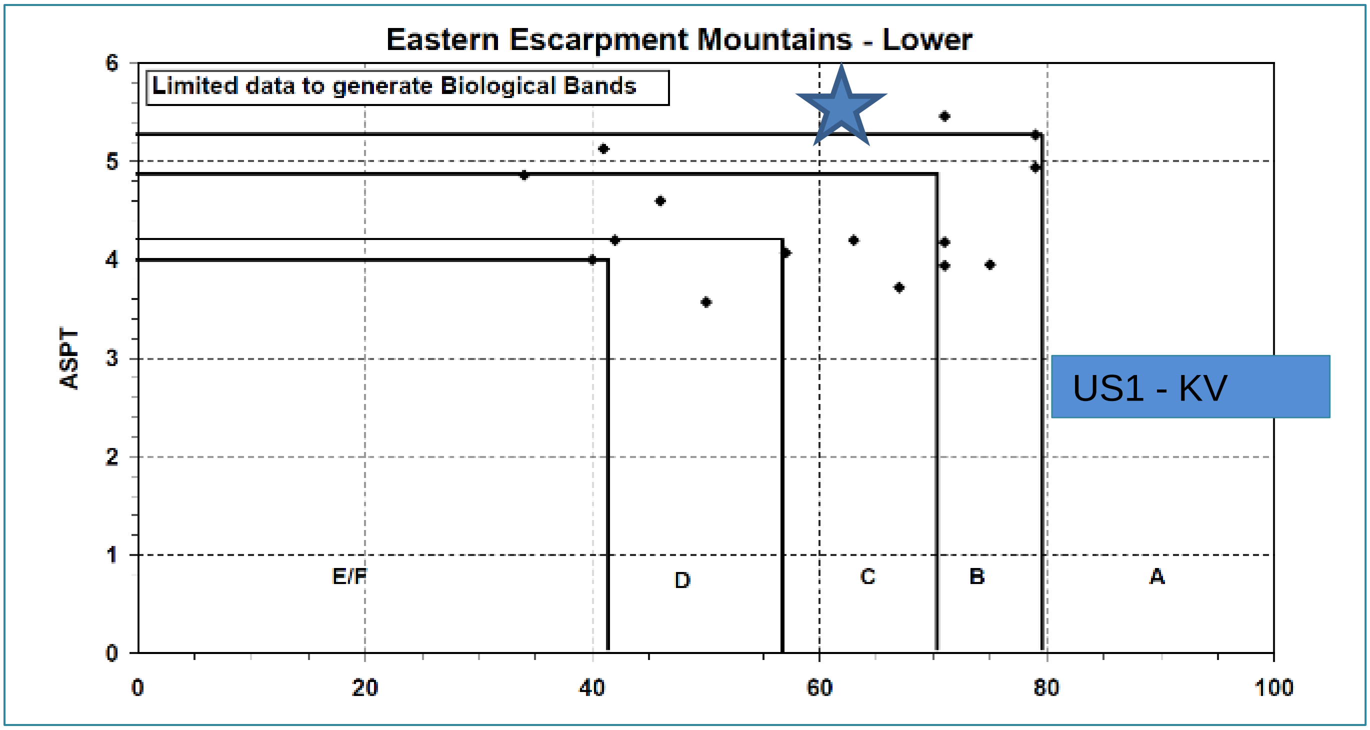

Figure 49: SASS5 classification for the sites in the lower Eastern Escarpment Mountain (Class D – Lower)

ASPT and SASS5 Scores applicable for the Ecoregion and future monitoring data should be compared against these (Figure 48) to obtain the Health Class applicable for the sections subjected to biomonitoring. The current classes as per Biomonitoring are as follows:

- Most US points were found to be seepage or channelled valley bottom systems with intermittent wetland sections and not suitable for SASS at the time of the assessment;
- Both Upstream and Downstream point sampled in the Klein-Vaal river compare well, the Upstream point scoring a Class A, and the Downstream scoring a Class A. Therefore, based on variables such as the recent rainstorms and abnormal amount of rainfall, the results are deemed to be similar and the Klein-Vaal reach applicable deemed to have a Present Ecological Status (PES) of natural with very little impacts at the time of the assessment.
- If future monitoring is conducted, it is recommended that all sites be revisited and monitored regularly to obtain seasonal data. The Assegaai river downstream could also be included in future studies if is becomes applicable, although it is foreseen that the main areas where surface impacts could occur, will be the Klein-Vaal river associated with C11C.

Two upstream sites were assessed and one sampled for aquatic invertebrates fell in the Eastern Escarpment Mountains (Ecoregion 15). If the Assegaai river is sampled during future events, it’s result should be compared against the reference scores available for Ecoregion 15.

10.7.2.14 Sensitivity

Formal floodline determinations will need to be conducted. Applicable buffers determined will also be applicable for the protection of aquatic ecology and is deemed sufficient. Sensitivity as included within the National Screening Tool has also been included in Figure 30.

10.8 WETLANDS

Reference is made to the Wetland Impact Assessment used to inform the baseline regarding the wetland delineation and attached as Appendix 9.

10.8.1 Methodology

10.8.1.1 Desktop review of Freshwater Ecosystems, Context

Freshwater ecosystems are typically linear features that are connected over regional scales in the landscape and embedded in the terrestrial matrix. Furthermore, freshwater ecosystems are typically located at topographical low points in the landscape, thereby collecting and conveying materials (water and dissolved and particulate matter) from within their entire catchment (UN Environment, 2018). It is thus important to first contextualise the onsite freshwater ecosystems in terms of local and regional setting, and conservation planning. An understanding of the biophysical and conservation context of the site will assist in the assessment of the importance and sensitivity of the onsite freshwater ecosystems, the setting of management objectives and the assessment of the significance of anticipated impacts. The following data sources and GIS spatial information listed in Table 53 was consulted to inform the specialist assessment. The data type, relevance to the project and source of the information is provided.

Table 53: Data sources and GIS information consulted to inform the baseline freshwater ecosystem assessment.

Data/Coverage Type		Relevance	Source
Biophysical / Ecological Context	**Latest Google Earth ™ imagery**	*To supplement available aerial photography where needed and to inform catchment level impacts*	Google Earth™ On-line
	National Rivers (GIS Coverage)	*Highlight potential onsite and local rivers and map local drainage network*	DWS
	South African Quaternary catchments	*Locates the project area within the principal water resource management units in South Africa*	DWS
	South African Quinary catchments	*Locates the project area within the principal water resource management units in South Africa*	DWS
	DWA Eco-regions (GIS Coverage)	*Understand the regional biophysical context in which water resources within the study area occur*	DWA (2005)

Data/Coverage Type		Relevance	Source
	South African Vegetation Map (GIS Coverage)	*Classify vegetation types and determination of reference vegetation*	SANBI (2006 - 2018)
	South African Inventory of Inland Aquatic Ecosystems (SAIIAE), 2018 – River Ecosystems	*Shows location of river within the relevant inventories*	Van Deventer et al (2018a)
	South African Inventory of Inland Aquatic Ecosystems (SAIIAE), 2018 – Wetland Ecosystems	*Shows location of wetlands within the relevant inventories*	Van Deventer et al (2018a)
Conservation Context	**The National Freshwater Ecosystem Priority Area (NFEPA) Assessment (2011)** – Wetland FEPAs	*Shows location of national wetland ecosystem conservation priorities*	CSIR (2011)
	The National Freshwater Ecosystem Priority Area (NFEPA) Assessment (CSIR, 2011) – River FEPAs	*Shows location of national river ecosystem conservation priorities*	CSIR (2011)
	National Biodiversity Assessment – Terrestrial Realm (GIS Coverage)	*Terrestrial ecosystem / vegetation type threat status*	Skowno et al. (2018)
	National Biodiversity Assessment – Inland Aquatic / Freshwater Realm (GIS Coverage)	*Freshwater ecosystem / vegetation type threat status*	Van Deventer et al (2018b)
	Mpumalanga Biodiversity Sector Plan: Freshwater Ecosystems (GIS Coverage)	*Provincial conservation planning importance.*	Mpumalanga Tourism & Parks Agency (2014)
	Mpumalanga Biodiversity Sector Plan: Terrestrial Ecosystems (GIS Coverage)	*Provincial conservation planning importance.*	Mpumalanga Tourism & Parks Agency (2014)
	Mpumalanga Biodiversity Sector Plan: Aquatic Biodiversity Sub-catchments (GIS Coverage)	*Provincial conservation planning importance.*	Mpumalanga Tourism & Parks Agency (2014)

10.8.1.2 Baseline Assessment

10.8.1.2.1 Determination of the Extent of the Study Area

For the purposes of this assessment, the study area for infield assessment comprised all wetlands within 500m of the mining activities that are likely to be measurably negatively impacted by the mine surface infrastructure only. Those wetlands likely to be impacted were identified using the 'likelihood of impact' guidelines in Table 54 below.

Table 54: Qualitative 'likelihood of impact' ratings and descriptions

<table>
<tr><th>Likelihood of Impact</th><th>Description of Rating Guidelines</th></tr>
<tr><td>Definite</td><td>These resources are likely to require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons:
➢ resources located within the footprint of the proposed development activity and will be impacted by the project; and/or
➢ resources located within 15m upstream and/or upslope of the proposed development activity and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or
➢ resources located within 15m or downslope of the development and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or
➢ resources located downstream within the following parameters:
o within 15m downstream of a low risk development;
o within 50m downstream of a moderate risk development; and/or
o within 100m downstream of a high-risk development e.g. mining, large industrial land uses.</td></tr>
<tr><td>Likely / Possible</td><td>These resources may require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons:
➢ resources located within 32m but greater than 15m upstream, upslope or downslope of the proposed development; and/or
➢ resources located within a range at which they are likely to incur indirect impacts associated with the development (such as water pollution, sedimentation and erosion) based on development land use intensity and development area. This is generally resources located downstream within the following parameters:
o within 32m downstream of a low risk development;
o within 100m downstream of a moderate risk development; and/or
o within 500m downstream of a high-risk development (note that the extent of the affected area downstream could be greater than 500m for high risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);</td></tr>
<tr><td>Unlikely</td><td>These resources are unlikely to require impact assessment or Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons:
➢ resources located a distance upstream, upslope or downslope (>32m) of the proposed development and which are unlikely to be impacted by the development project; and/or
➢ resources located downstream but well beyond the range at which they are likely to incur impacts associated with the development (such as water pollution, sedimentation and erosion). This is generally resources located downstream within the following parameters:
o greater than 32m downstream of a low risk development;
o greater than 100m downstream of a moderate risk development; and/or
o greater than 500m downstream of a high-risk development (note that the extent of the affected area downstream could be greater than 500m for high risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);</td></tr>
<tr><td>None</td><td>These resources will not require impact assessment or a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons:
➢ resources located within another adjacent sub-catchment and which will not be impacted by the development in any way, shape or form.</td></tr>
</table>

10.8.1.3 Data Collection

A field assessment to delineate and assess the wetlands within the study area was undertaken on the 16th – 18th February 2021. Data collection involved the following:

- Systematic soil sampling across all valley lines, valley bottom areas, valley heads and hillslopes where seeps may occur using a clay auger to confirm the presence and extent of wetland and alluvial (riparian) soils according to the guideline: 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005). Soil sample points were recorded onsite using a hand-held GPS. Soil sample points were recorded onsite using a hand-held GPS.
- The recording of the dominant plant species and general composition of the wetland and riparian vegetation in the vicinity of the soil sample points based on visual observations. Observations points were recorded onsite using a hand-held GPS.
- The recording of the landscape / terrain position at each sample point based on visual observations. Observations points were recorded onsite using a hand-held GPS.
- The recording of wetland impacts using a hand-held GPS.

10.8.1.4 Data Analysis

The methods and tools that were used as part of the baseline wetland ecosystem assessment are summarised in Table 55 below.

Table 55: Summary of methods used in the assessment of the affected rivers and wetlands

Method/ technique	Reference for methods/ tools used
Wetland and river /riparian delineation	• 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005).
Classification of Aquatic Ecosystems (rivers & wetlands)	• National Wetland Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis et al., 2013).
Present Ecological State (PES)	• Level 1 WET-Health assessment (Macfarlane et al., 2020)
Functional Importance	• Level 2 WET-EcoServices assessment (Kotze et al., 2020).
Ecological Importance & Sensitivity (EIS)	• Wetland EIS assessment (Kotze et al., 2020).

10.8.2 Desktop Assessment

10.8.2.1 Review of Ecosystem Context and Setting

The desktop review of the ecosystem context included an overview of the climate (refer to previous sections in which climates is discussed), the geology and soils (refer to Figure 50 and Figure 51 below), a discussion of the primary terrestrial vegetation type for the area (see Figure 52) and Drainage and River Ecosystem Setting (Figure 53 and Figure 54).

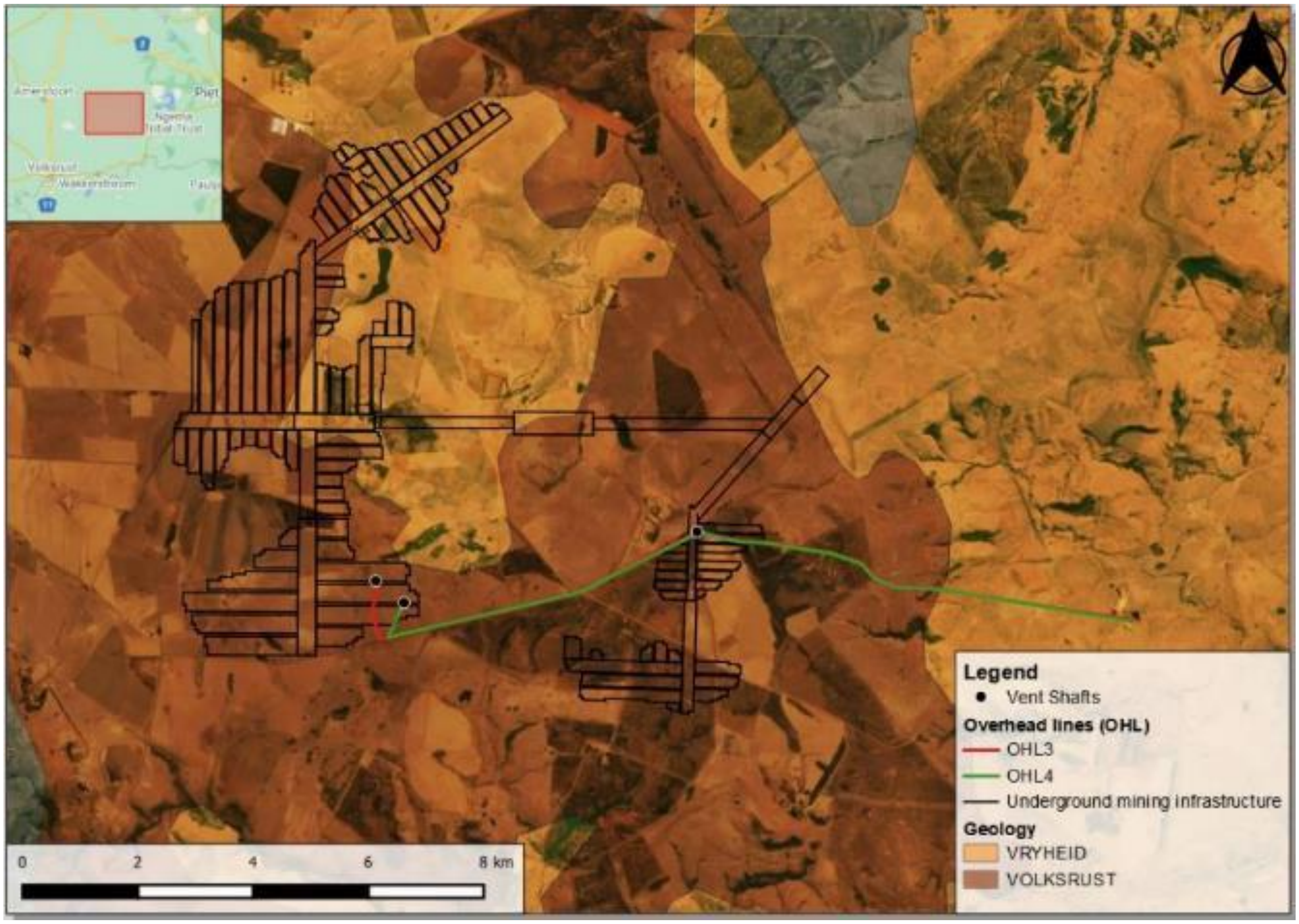

Figure 50: Geological setting of the proposed mining site

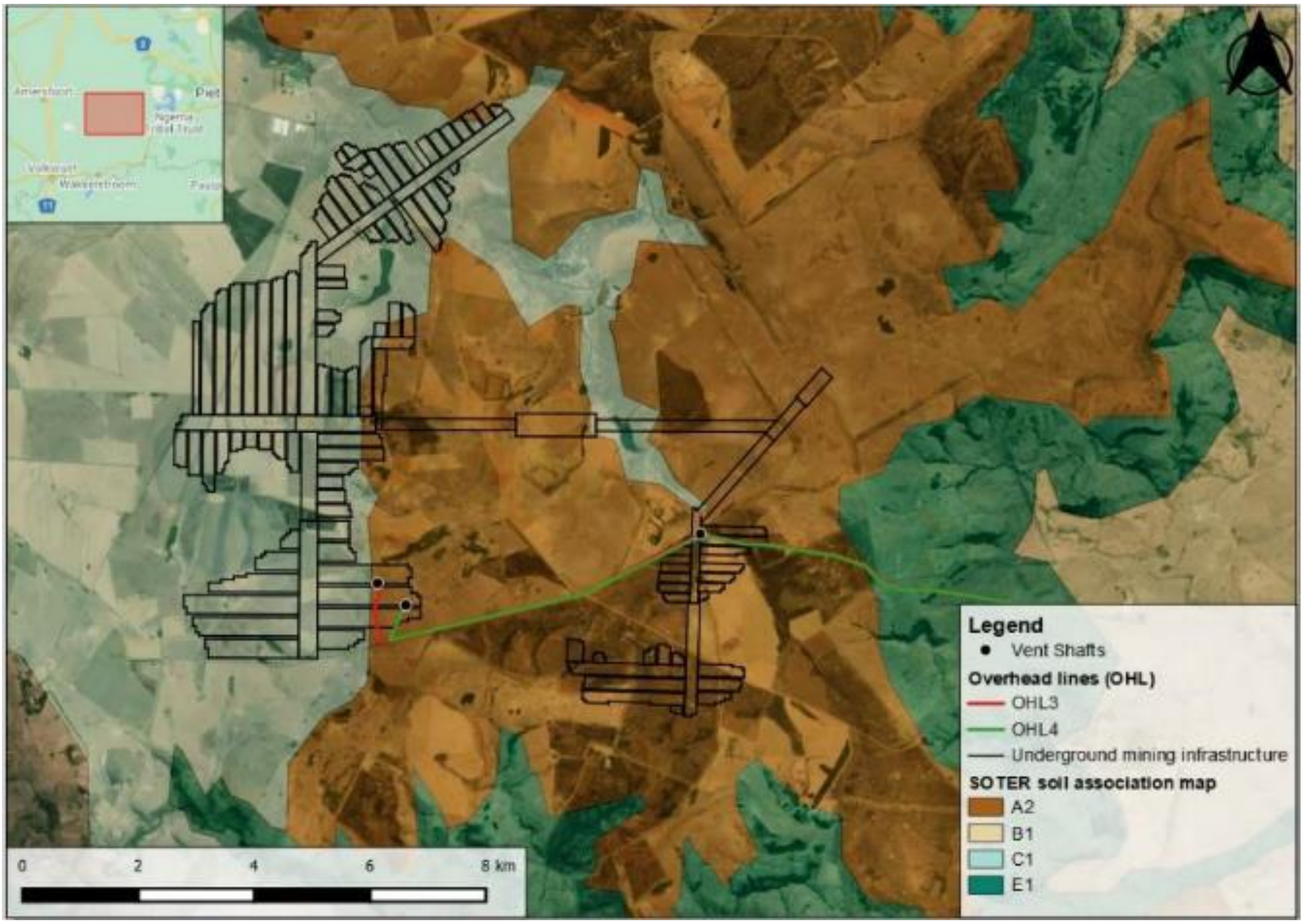

Figure 51*: SOTER Soil Association map of the proposed mining site*

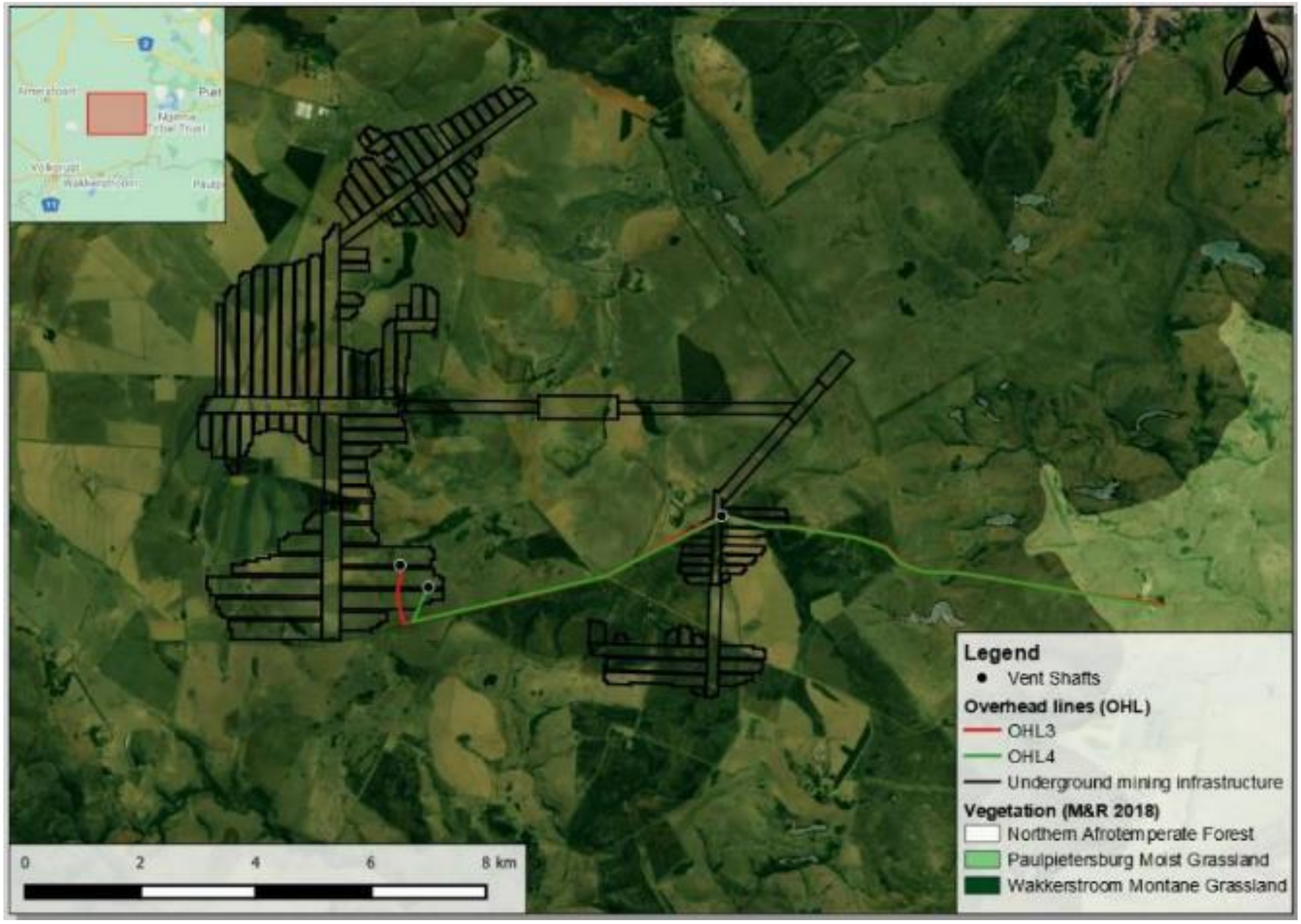

Figure 52: Terrestrial Vegetation map of the proposed mining site

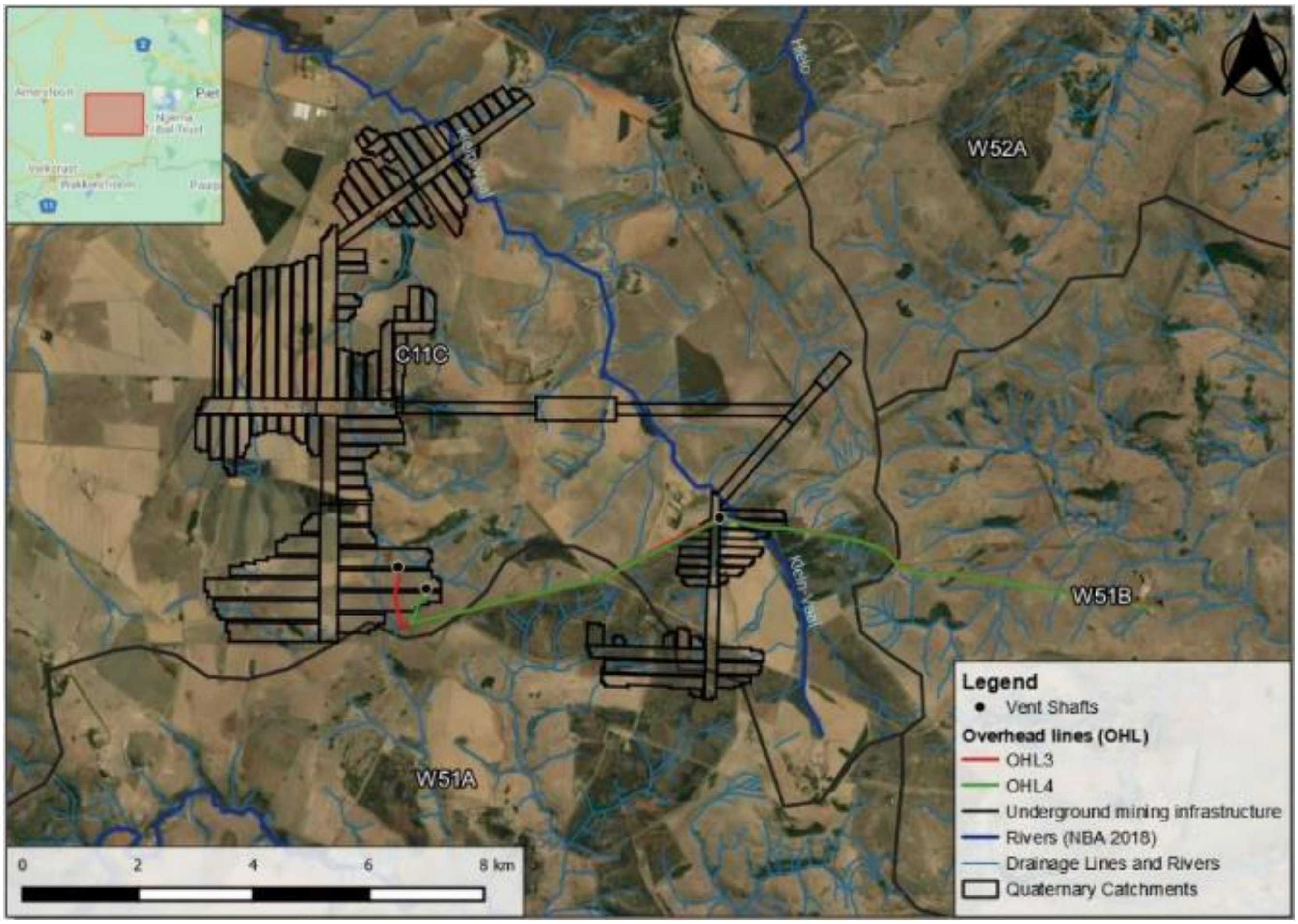

Figure 53. Drainage and river ecosystem setting of the proposed mining site

The reach of the Klein-Vaal River that flows through the project area has been assigned a 'Critically Endangered' ecosystem threat status in the latest National Biodiversity Assessment (SANBI, 2018). In addition, both sub-quaternary catchments within which the project area occurs are classified as a River FEPAs in terms of the National Freshwater Ecosystem Priority Areas (NFEPA) project (CSIR, 2011).

In terms of Mpumalanga systematic conservation plan (SCP), the relevant reach of the Klein-Vaal River has been classified as a 'Critical Biodiversity Area' (CBAs). The other tributary rivers and the greater sub-quaternary catchment are classified as 'Ecological Support Areas' (ESAs).

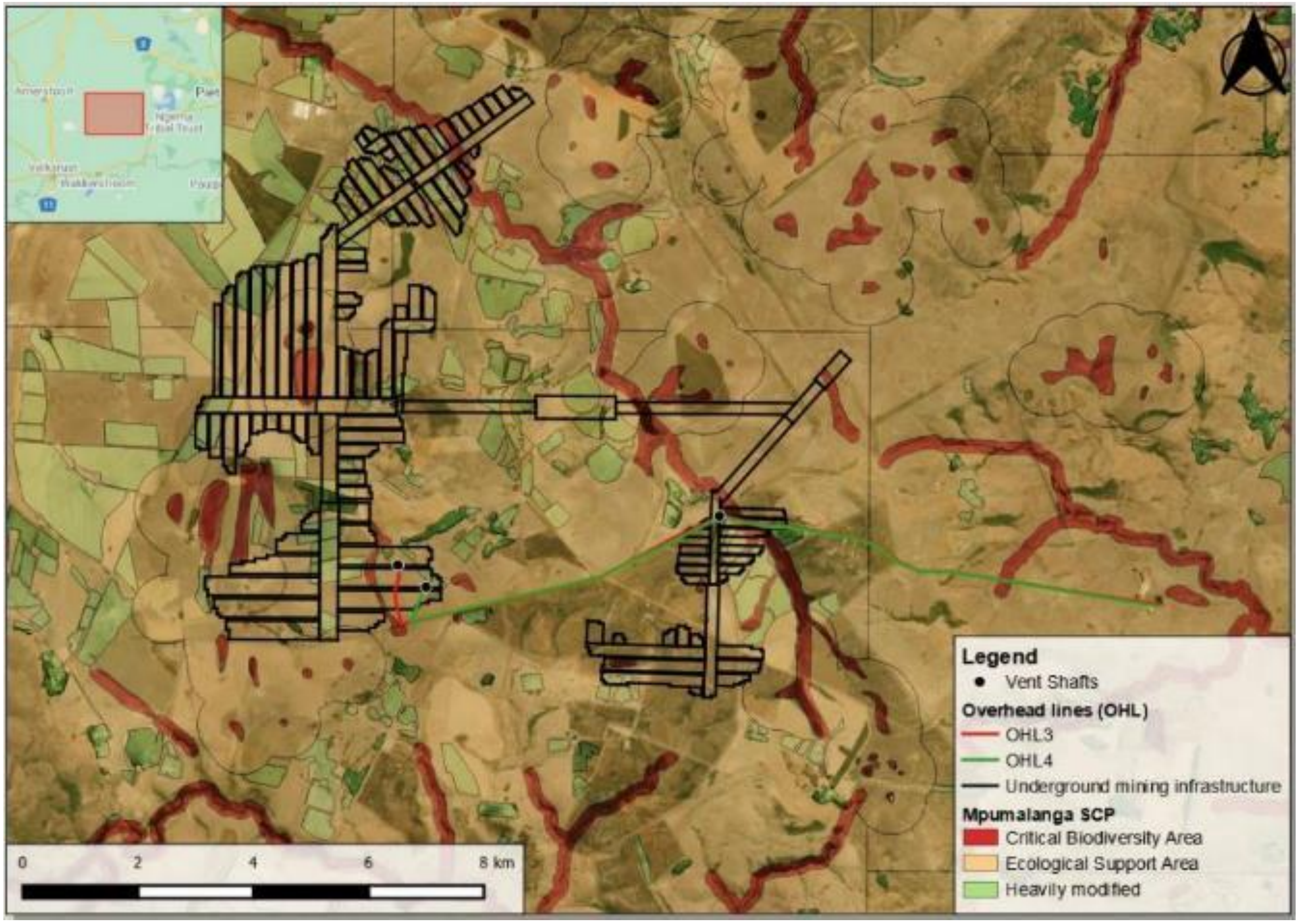

Figure 54*:* Mpumalanga systematic conservation plan (SCP) context of the proposed mining site

10.8.2.2 Hydrogeology

The groundwater impact assessment for the project prepared by Geo Pollution Technologies – Gauteng (Pty) Ltd ('GPT') dated January 2021 was reviewed to understand the hydrogeological context of the site and the link between groundwater occurrence and the presence of wetlands.

According to the 1:500 000 General Hydrogeological Map (Haupt, 1995), the main water bearing strata in the area is an intergranular and fractured aquifer made of predominantly arenaceous rocks (sandstone and conglomerate) and mudstones (shale and siltstone) of the Ecca Group (GPT, 2021). Groundwater resources are generally limited, with sustainable borehole yields ranging from 0.5 – 2L/s (GPT, 2021). Three aquifers1 are typically present in the greater project area, namely (GPT, 2021):

- A **shallow perched aquifer** mainly consisting of alluvium and transported hill wash material on top of a pebble marker and ferricretes in the low-lying areas, valleys and paleo channels. Depth 0 – 3 m.
- A **weathered aquifer**, which extends to depths of approximately 12 mbgl, depending on the extent of weathering. In the project area, this aquifer has comparatively low aquifer parameters. This aquifer is

therefore not considered to be a major aquifer, although it plays a role in recharge to the deeper hard-rock aquifers and baseflow to streams. It also feeds many springs in the study area. Depth 6 – 12 m.

- A **deeper fractured rock aquifer**, which is characterised by fractures, faults and groundwater. These conduits can also serve as connections between the above-mentioned aquifers This aquifer in the study area was also low yielding. Depths > 12 m.

In terms of groundwater quality, groundwater from the neighbouring existing mining areas indicates sodium sulphate type water as a result of mining related impacts (GPT, 2021). The remainder of the samples are unpolluted bicarbonate waters with some sodium enrichment in some of the fractured aquifer samples (GPT, 2021).

In terms of Acid Mine Drainage (AMD) Potential, the hangingwall sandstone and mudstone samples have a very low to no potential for acid generation. However, the coal has a low to medium potential to acid generation capacity and thus has the potential to generate Acid Mine Drainage (GPT, 2021).

10.8.2.3 Wetland Ecosystem Context

The National Wetland Map indicates that the project area is rich in wetlands (Figure 55). The wetlands within the region fall within the Mesic Highveld Grassland Group 8 wetland vegetation group. The following wetland hydro-geomorphic types have been picked up in the project area, with their respective ecosystem threat status from the NBA (2018):

- Seeps (Critically Endangered)
- Channelled valley bottom wetlands (Critically Endangered)
- Depressions (Least Concern)

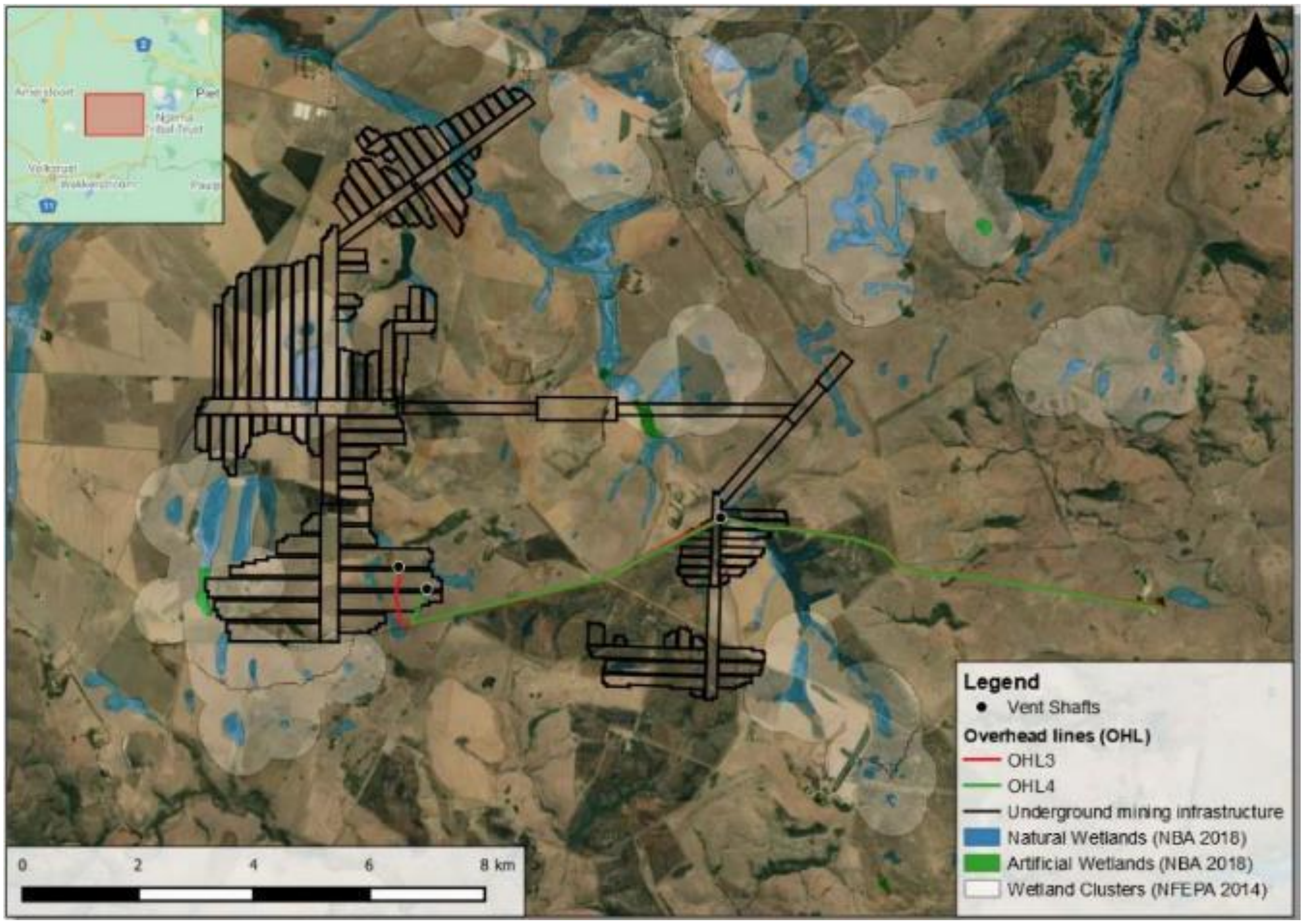

Figure 55: Wetland ecosystem context of the proposed mining site

In terms of the National Freshwater Ecosystem Priority Areas (NFEPA) project (CSIR, 2011), all the wetlands within the study area are considered Wetland FEPAs. Furthermore, serval wetland clusters have also been picked up within the study area in terms of the NFEPA project.

In terms of Mpumalanga systematic conservation plan (SCP) for freshwater ecosystems, all the wetlands mapped as occurring within the study area as part of the SCP are considered 'Critical Biodiversity Areas' (CBAs). It is thus assumed that all intact wetlands occurring within the study area should be considered CBAs. Furthermore, the buffer zones surrounding the wetlands falling within the wetland clusters have been included in the SCP as Ecological Support Areas (ESAs).

10.8.2.4 Species of Conservation Importance

The study area falls within an IBA Important Bird Area (No. SA020) linked to grassland ecosystems, and the wetlands are likely to provide habitat for numerous threatened bird species that rely on wetlands for all or part of their lifecycles. The threatened / Red Data species (Taylor et al., 2015) that have been confirmed within the Pentads of the SABAP 2 project (i.e. 2700_3005, 2700_3010, 2705_3005, 2705_3010) that overlap with the study area are highlighted below.

- Grey Crowned Crane (Endangered)
- African Marsh Harrier (Endangered)
- Black Stork (Vulnerable)
- Blue Crane (Near Threatened)
- Maccoa Duck (Near Threatened)
- Greater Flamingo (Near Threatened)
- Half-collared Kingfisher (Near Threatened)

In addition, the following threatened species are known to inhabit and/or use wetlands within the region:

- White-winged Flufftail (Critically Endangered)
- Yellow-billed stork (Endangered)
- Southern bald ibis (Vulnerable)
- Black Stork (Vulnerable)
- Pallid Harrier (Near Threatened)
- Greater Painted Snipe (Near Threatened)

10.8.2.5 Water Resource Management Context

A small portion of the study area in the southern parts has been identified as a Strategic Water Source Area (SWSA) in the NFEPA project, namely the Ekangala Drakensberg SWSA. No large / important dams are located within 10km downstream of the project site.

10.8.3 Desktop Mapping within 500m and Confirmation of the Study Area

All the potential watercourses occurring within 500m of the underground and surface mining activities were mapped as shown in Figure 55 below. All watercourses occurring within 500m of the three (3) vent shafts and within 32m of the proposed overhead powerlines are rated as having a possible or definite likelihood of impact. These areas are defined as the study area.

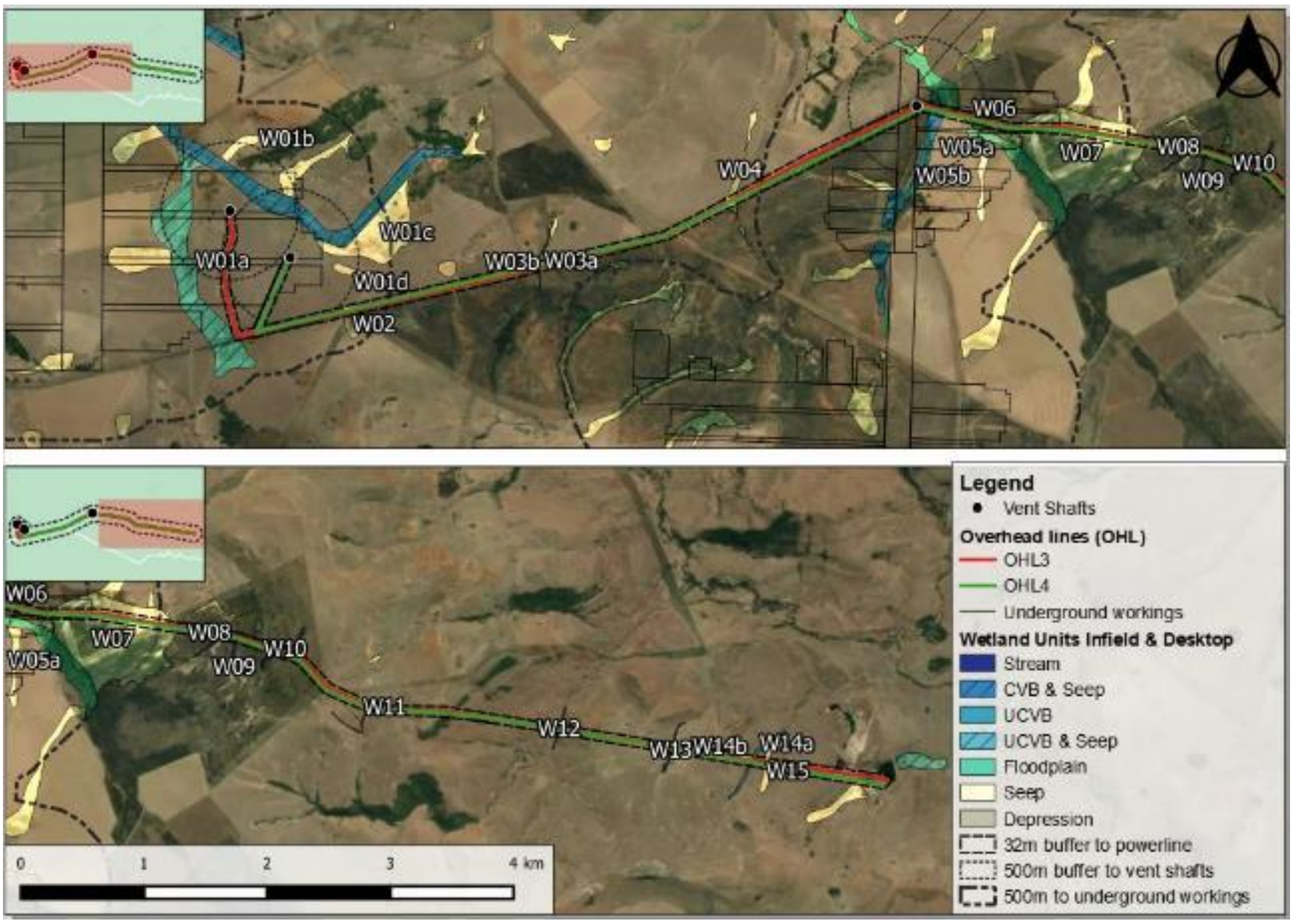

Figure 56: Watercourses within 500m of the project activities

10.8.4 Infield Baseline Assessment

The infield baseline assessment focuses on the wetland ecosystems likely to be measurably negatively impacted by the mining activities. The extent (infield delineation), classification, habitat characteristics, present ecological state (PES) and ecological importance and sensitivity (EIS) of the wetlands are discussed in this section of the report.

10.8.4.1 Delineation, Classification & Habitat Characteristics

The infield sampling of soil and vegetation in conjunction with the recording of diagnostic topographical / terrain indicators and features, enabled the delineation of the following distinct wetland and stream / river units (Table 56). The delineated wetlands and riparian areas are shown in Figure 57 to Figure 64.

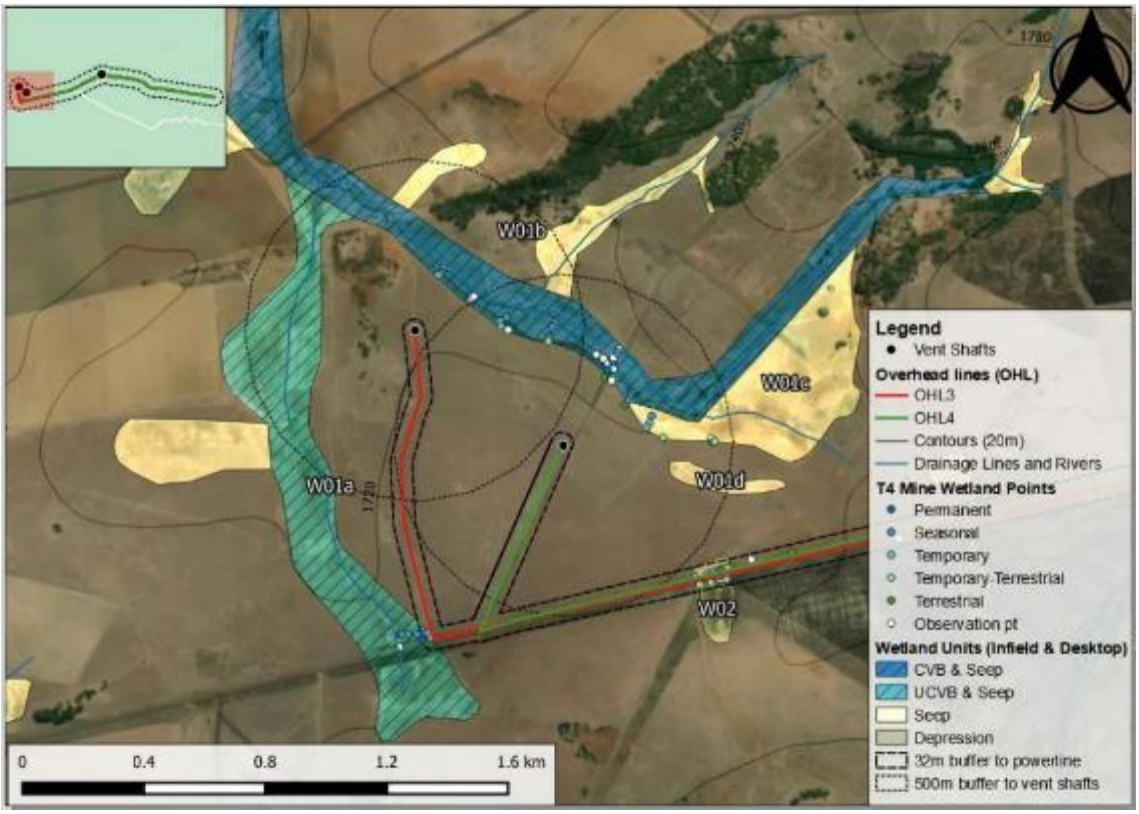

Figure 57: Location and extent of Units W01a, W01b, W01c and W01d

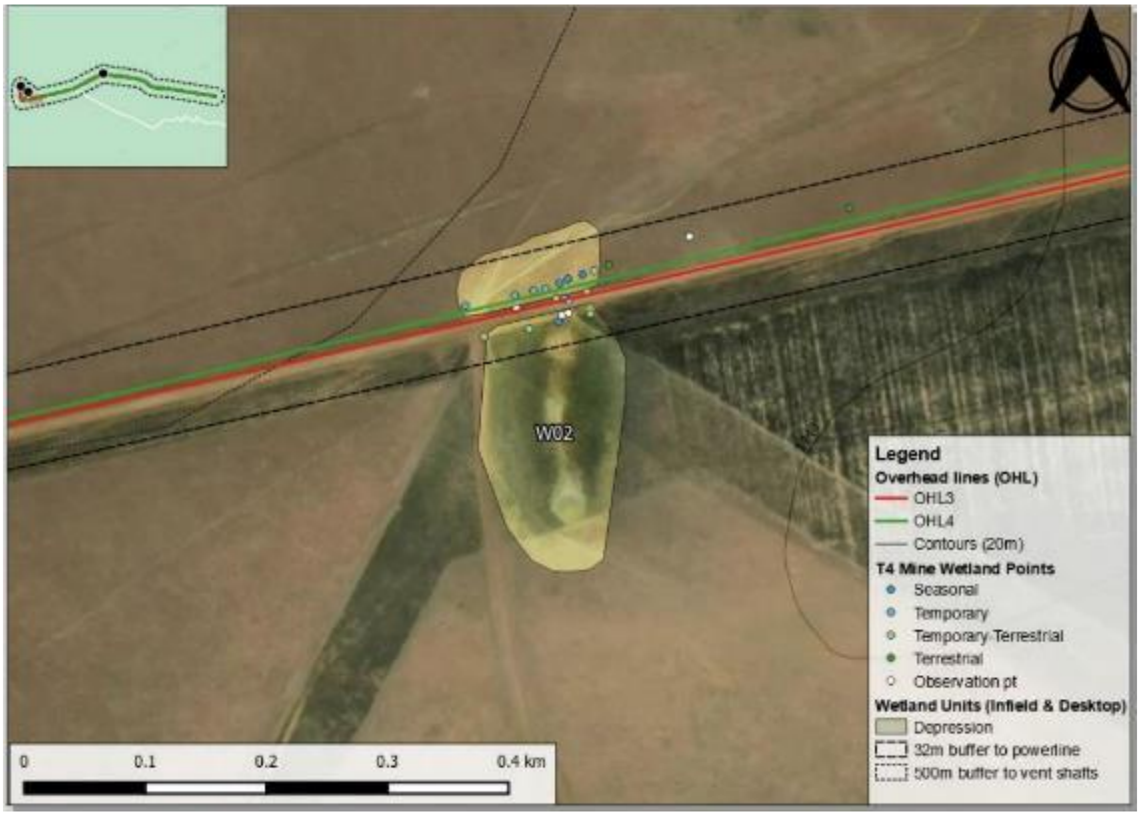

Figure 58: Location and extent of Unit W02

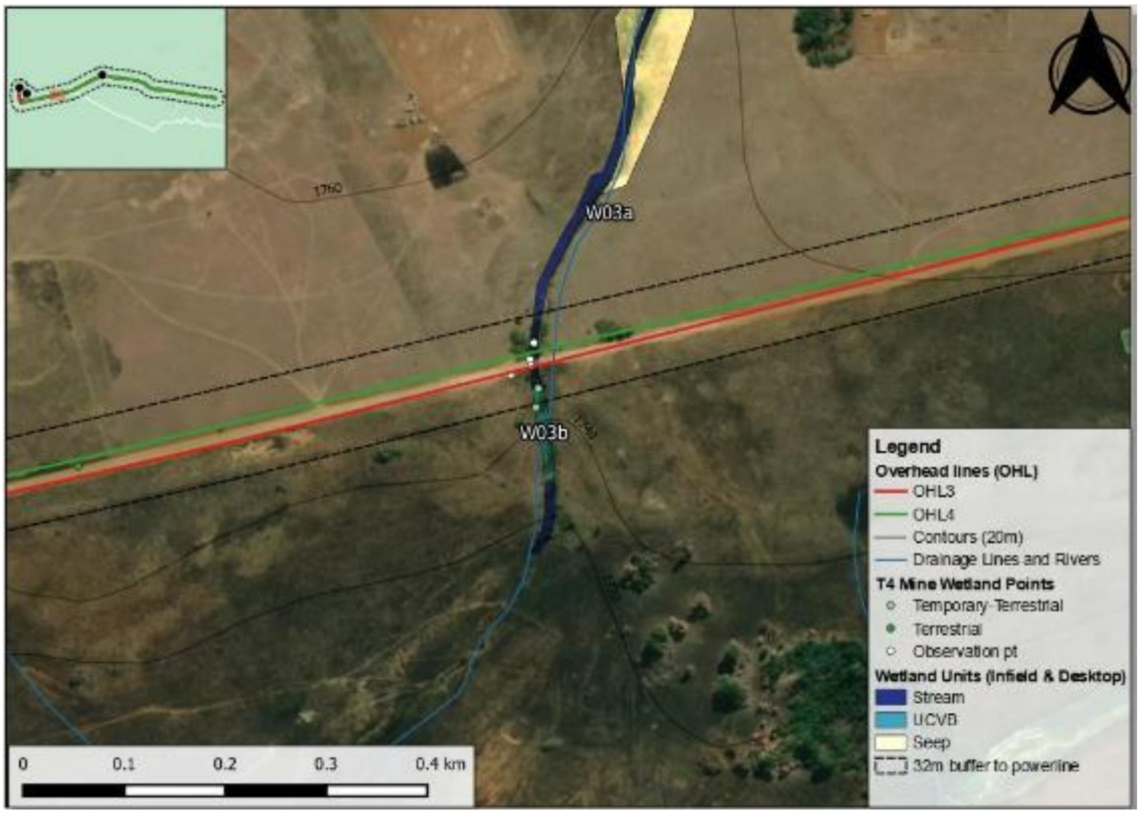

Figure 59: Location and extent of Units W03a and W03b

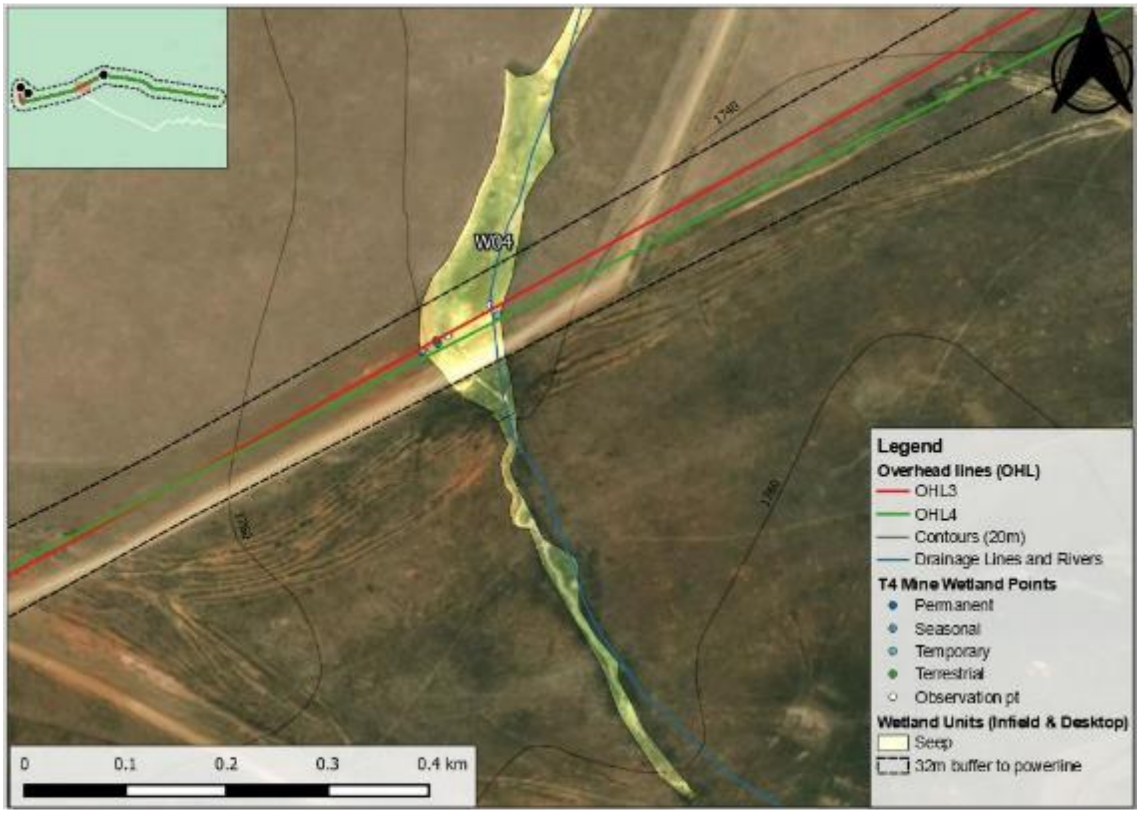

Figure 60*:* Location and extent of Unit W04

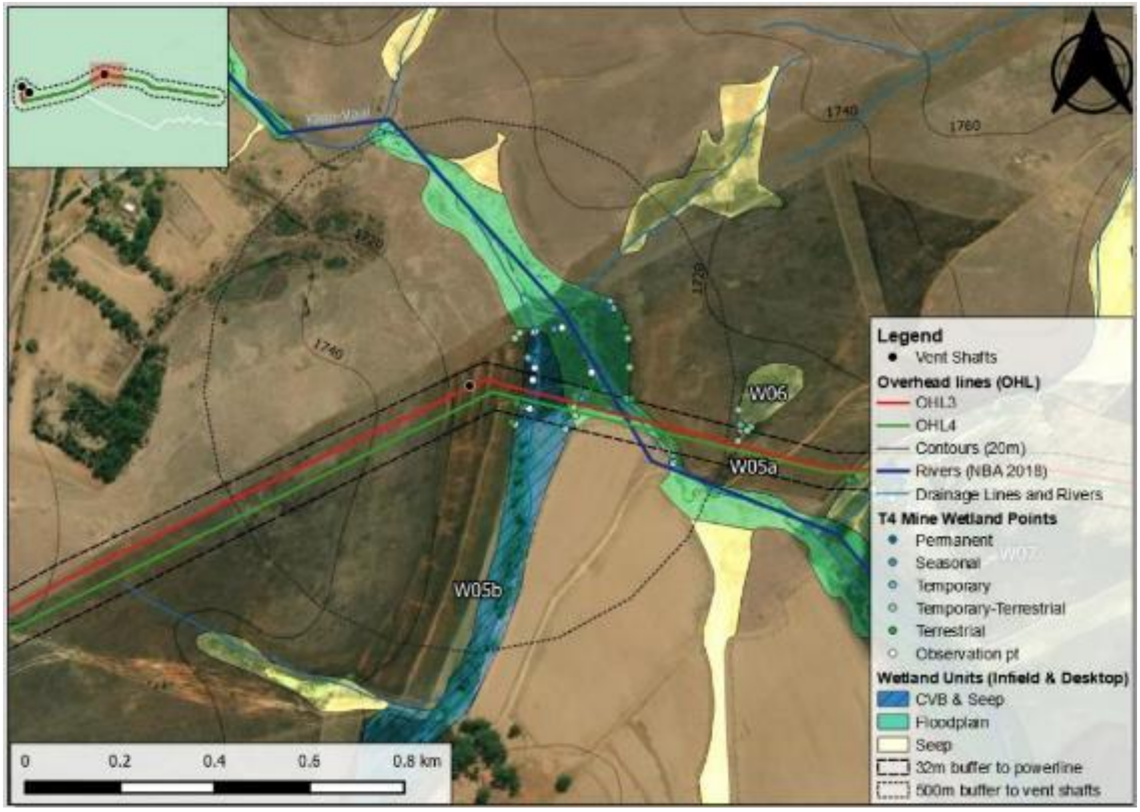

Figure 61*:* Location and extent of Units W05a, W05b and W06

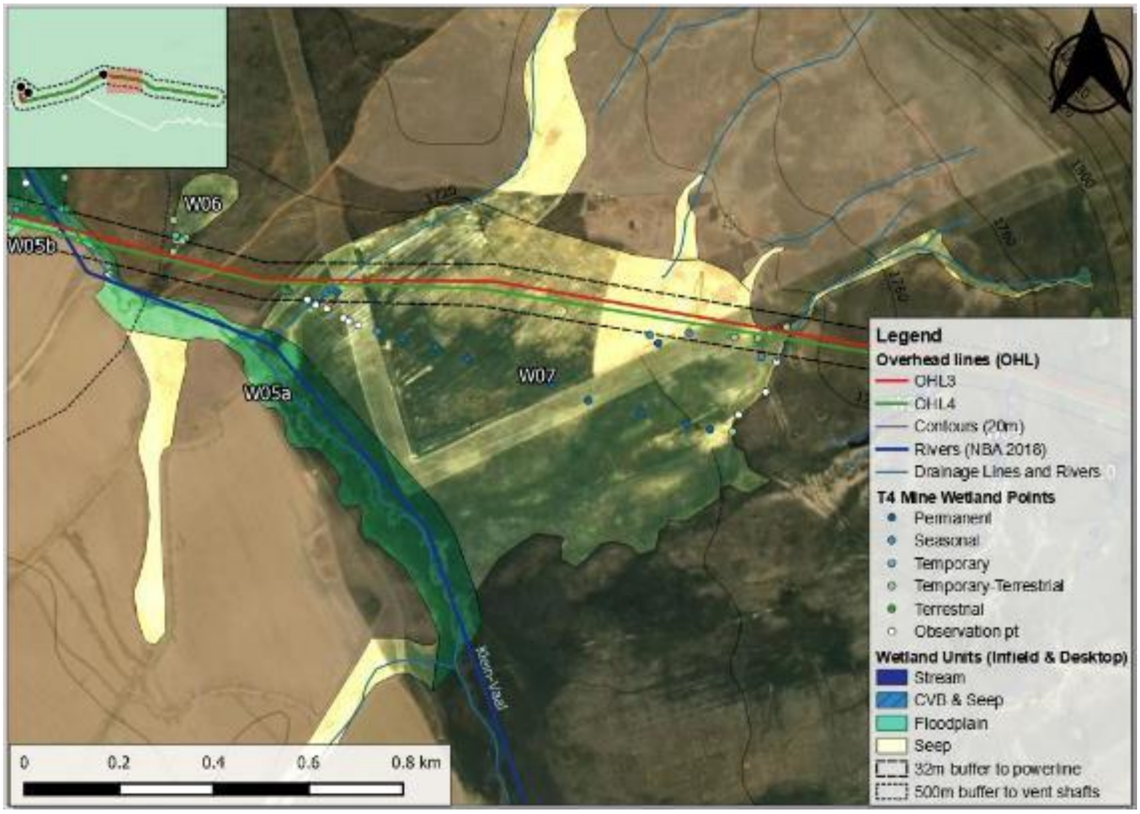

Figure 62: Location and extent of Units W06 and W07

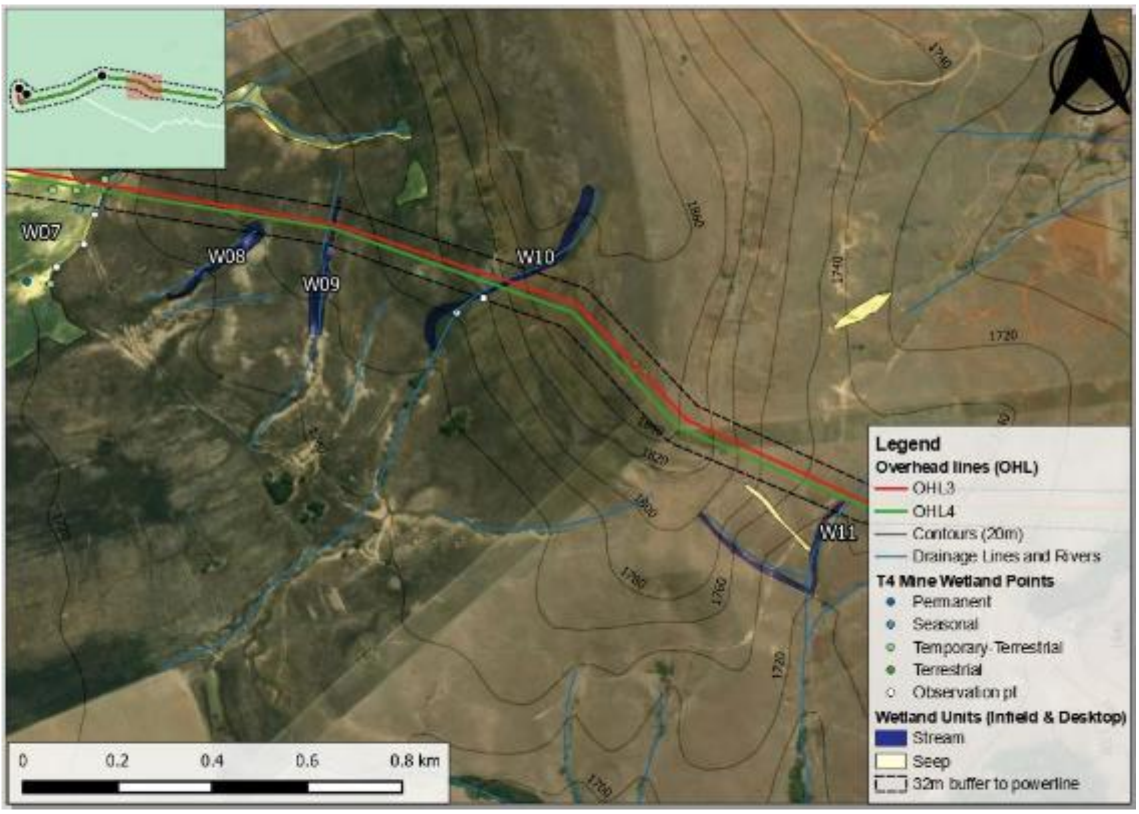

Figure 63: Location and extent of Units W08 – W11

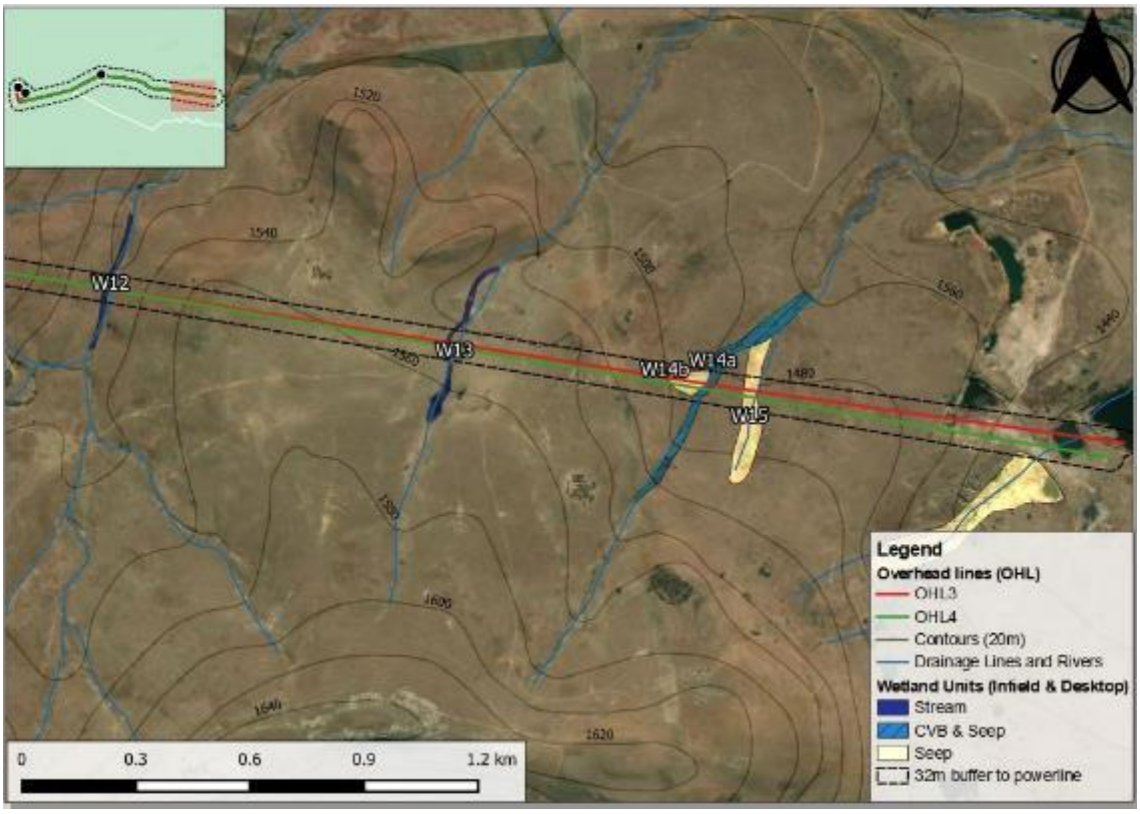

Figure 64*:* Location and extent of Units W012 – W15

Table 56:Summary of the key characteristics of the wetlands sampled and assessed

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
W01a	Un-channelled valley bottom wetland (UCVB) & Seep	The permanently wet zone, near the centre of the wetland was inundated, with the water depth being approximately 10-20cm above the surface. Soils in the seasonally wet zone comprise a dark grey, organic-rich clay with a moderate amount of small orange mottles at 0-10cm depth, transitioning to an abundance of medium-sized mottles at 10-20cm depth. The temporary wet zone was characterised by a dark grey-brown clay, without mottles in the 0-10cm layer. This transitioned to a high chroma (>3) clay between 10-20cm, then to a dark grey clay with few orange mottles at around 40cm depth. At a depth of 40-50cm, the soils comprise dark grey clay (chroma 1-2), with a moderate amount of medium-sized orange mottles.	Two similar sedgeland communities were found in the permanently wet zone: 1. A wet sedgeland, dominated by *Cyperus congestus*, with moderate amounts of *Juncus oxycarpus* and *Pycreus macranthus*, and low amounts of *Leersia hexandra*; and 2. A wet sedgeland, dominated by *Leersia hexandra*, *Eleocharis limosa* and *Fuirena sp.*, with moderate amounts of *Hemarthria altissima* and *Pycreus nitidus*, and low amounts of *Persicaria decipiens* and *Juncus oxycarpus*. The seasonally wet zone was characterized by a hygrophilous grassland, dominated by *Arundinella nepalensis*, *Eragrostis plana* and an unknown grass sp.1[2] with moderate amounts of *Leersia hexandra* and low amounts of *Pycreus* sp.1[3]. A mixed *E. plana* / *Calamagrostis epigejos*. community with moderate amounts of *Kyllinga erecta* and *Pycreus* sp.1, and low amounts of *Isolepis* sp.1[4], *Paspalum dilatatum* and *Lobelia anceps* was also found in the seasonally wet zone. The temporary zone was dominated by *E. plana*, with moderate amounts of an unknown grass sp.1 and *Paspalum dilatatum*, and

[2] Sample taken to be confirmed at herbarium.
[3] Sample taken to be confirmed at herbarium.
[4] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
			low to moderate amounts of the *Kyllinga erecta* and *Calamagrostis epigejos*.
W01b	Channelled valley bottom wetland (CVB) & Seep	The seasonal zone comprises soils of medium grey clay, with a moderate abundance of small orange mottles at 0-10cm depth, with an increase in the abundance of the mottles at 10-20cm depth. At depths of 20-30cm, the soils consist of a brown-grey clay, with an abundance of small orange mottles. The upper 20cm of soil in the temporary zone was characterised by a medium grey clay to medium brown-grey clay in places, with a low to moderate amount of small, moderately-faint, orange mottles. This transitioned to a yellow, brown-grey to light yellow-brown clay, without mottles, at about 30cm, where the auger intercepted the interflow zone. In places, the soils at 30-40cm depth comprise of a yellow-brown, low density clay with a few medium-sized, pinkish mottles and nodules occurring around depths of 40cm. The soils at 40-50cm depth typically comprise yellow, grey-brown, high chroma, sandy clay with few orange mottles.	The vegetation in the seasonal zone was mainly an *Arundinella nepalensis - Fuirena* sp1[5]. hygrophilous grassland, with moderate amounts of *Pycnostachys reticulata*, unknown grass sp.1[6] and unknown grass sp.2[7]. This transitioned to a *Eragrostis plana* hygrophilous grassland, with moderate amounts of *Eragrostis* sp.1[8] and low amounts of *Arundinella nepalensis*. The temporary zone typically comprises *E. plana* and *Paspalum dilatatum* dominated grassland with moderate abundances of *Cyperus esculentus, Lobelia anceps, Eragrostis racemosa, Eragrostis* sp.1[9] and *Haplocarpha scaposa, and low occurrences of Sporobolus africanus, Pseudognaphalium oligandrum* and *Hypochaeris radicata.* This transitioned to a *Themeda triandra* grassland, outside of the wetland boundary.

[5] Sample taken to be confirmed at herbarium.
[6] Sample taken to be confirmed at herbarium.
[7] Sample taken to be confirmed at herbarium.
[8] Sample taken to be confirmed at herbarium.
[9] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
W01c & W01d	Seeps	The seasonal zone comprises soils of medium grey clay, with a moderate abundance of small orange mottles at 0-10cm depth, with an increase in the abundance of the mottles at 10-20cm depth. At depths of 20-30cm, the soils consist of a brown-grey clay, with an abundance of small orange mottles. The upper 20cm of soil in the temporary zone was characterised by a medium grey clay to medium brown-grey clay in places, with a low to moderate amount of small, moderately-faint, orange mottles. This transitioned to a yellow, brown-grey to light yellow-brown clay, without mottles, at about 30cm, where the auger intercepted the interflow zone. In places, the soils at 30-40cm depth comprise of a yellow-brown, low density clay with a few medium-sized, pinkish mottles and nodules occurring around depths of 40cm. The soils at 40-50cm depth typically comprise yellow, grey-brown, high chroma, sandy clay with few orange mottles.	The vegetation in the seasonal zone was mainly an *Arundinella nepalensis* - *Fuirena* sp1[10]. hygrophilous grassland, with moderate amounts of *Pycnostachys reticulata*, *Leersia hexandra*, *Pycreus nitidus*, unknown grass sp.1[11] and unknown grass sp.2[12]. This transitioned to a *Eragrostis plana* hygrophilous grassland, with moderate amounts of *Eragrostis* sp.1[13] and low amounts of *Arundinella nepalensis*. The temporary zone typically comprises *E. plana* and *Paspalum dilatatum* dominated grassland with moderate abundances of *Kyllinga erecta*, *Lobelia anceps, Eragrostis racemosa* and *Eragrostis* sp.1[14]
W02	Depression	Soil was not sampled south of the road due to access constraints. Wetland and wetness zone boundaries were approximated using terrain and vegetation indicators from the fence along the road. Approximately 5cm of flooding was noted in the seasonal zone. The wetland appeared to fall	W02 (south of road): The seasonal zone comprises *Eragrostis plana – Kyllinga erecta* flooded, hygrophilous grassland.

[10] Sample taken to be confirmed at herbarium.
[11] Sample taken to be confirmed at herbarium.
[12] Sample taken to be confirmed at herbarium.
[13] Sample taken to be confirmed at herbarium.
[14] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
		within a man-made excavation, with supplemental inputs from stormwater runoff from the road. North of the road: The seasonal zone was inundated by approximately 20cm of water above the surface. The upper 25cm of soil was a dark to medium grey clay, with a moderate abundance of small, faint orange mottles, which became more distinct at about 30cm. A medium to light grey (chroma = 1, value >4) sandy clay, mixed with a heavily oxidised layer was also found in places at a depth of approximately 30cm. Below this, at 40-50cm, the soil retained a medium grey (chroma of 1) clay, with an abundance of small orange mottles. The temporary zone included dark grey-brown clays without mottles in the uppermost 0-20cm, transitioning to a medium grey (chroma = 2) clay or medium brown-grey clay with a moderate abundance of small orange mottles at about 25-30cm. The soils then transitioned to a medium to light brown-grey clay with abundant medium-sized orange mottles, or a yellow brown-grey (chroma = 2, value = 4) clay with abundant small orange mottles, at depth of 40-50cm. Terrestrial soils comprised of a dark brown-grey (7.5 YR 2.5/1) clays with few orange mottles in the uppermost 20cm, which transitioned to a dark	The western edge of the wetland was marked by a break in slope and transition from the *Arundinella nepalensis* - *Paspallum dilatatum* - *Eragrostis plana* hygrophilous grassland community in the temporarily wet zone to the *Themeda trianda* - *Aristida* terrestrial grassland. The eastern edge of the wetland was marked by a transition from a *Sporobolus africanus* - *E. plana* - *Hemarthria altissima* hygrophilous grassland, with some *P. dilatatum*, to a *Hyparrhenia* sp.1[15] dominated terrestrial grassland. W02 (north of road): The seasonal zone comprises *Eragrostis plana* dominated grassland, with moderate amounts of *Paspalum dilatatum* and *Eragrostis* sp.2[16], and low amounts of *Sporobolus africanus* and *Setaria sphacelata*. The temporary zone comprised of *E. plana* dominated grassland with moderate amounts of *Themeda triandra*, *Haplocarpha scaposa*, *Kyllinga erecta* and *Isolepis* sp.1[17], and low amounts of *Pseudognaphalium oligandrum, Paspalum dilatatum*, *Sporobolus africanus* and *Arundinella nepalensis*.

[15] Sample taken to be confirmed at herbarium.
[16] Sample taken to be confirmed at herbarium.
[17] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
		grey-brown or medium yellow-brown (chroma = 3) clay without mottles. At a depth of about 40cm, the soil transitioned to a yellow, grey-brown clay (7.5 YR 4/4) or yellow-brown clay in the 40-50cm horizon. An oxidised layer, mixed with the yellow, grey-brown horizon was breached at approximately 50cm.	
W03a	Bedrock Stream	This bedrock stream consists of a series of rapids and runs, with shallow flow over the bedrock. The dominant aquatic biotope is 'stones in the current'. Debris build-up was observed just upstream of the culvert. The edge of the riparian zone downstream of the culvert was marked by a sandy, alluvial flood bench.	The marginal vegetation comprises *Eragrostis plana* and an *Isolepis* sp.1[18] sedgeland, with a moderate amount of *Cyperus digitatus* and low amount of *Paspalum dilatatum*. *Paspalum distichum* was also noted along the left bank. A closed *Acacia dealbata* canopy occurred along the embankment.
W03b	UCVB	Downstream of the road culvert outlet the channel loses confinement and definition, and longitudinal alluvial fan occurs. An unchannelled valley bottom wetland has formed at this point. Down downslope toe of the fan is marked by a knickpoint where the stream channel reforms. No soil samples were collected for this wetland.	The vegetation on the alluvial fill comprises a mix of *Typha capensis*, *Paspallum urvillei* and *Cyperus digitatus.*
W04	UCVB & Seep	The permanently wet zone was marked by a break in slope and a water table above the surface. The seasonally wet zone consisted of a fibrous, organic-rich, black clay layer of about 0-10cm, followed by a dark black-grey clay with abundant	The permanently wet zone comprises a hygrophilous grassland, dominated by *Kyllinga erecta* and unknown grass sp.1[19], with a moderate abundance of *Arundinella* nepalensis and *Eragrostis* sp.2[20], and a low abundance of *Monopsis decipiens*, *Paspalum*

[18] Sample taken to be confirmed at herbarium.
[19] Sample taken to be confirmed at herbarium.
[20] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
		small orange mottles at 10-30cm, and a gleyed, medium grey silty sandy clay with abundant orange mottles occurring below 30cm. In places, a red-brown clay sediment cover was found in the top 30cm of the soil, before transitioning to the near-black clay with a moderate abundance of orange mottles. The temporarily wet zone was noted as having dark brown clay soil without mottles at 0-10cm depths, which transitioned to a dark brown-grey clay, with a moderate abundance of mottles at 10-20cm depth and fewer mottles at 20-40cm depth. At a depth of 40-50cm the soils comprise medium brown-grey sandy clay, with a moderate abundance of orange mottles. The interflow zone occurred at ±50cm.	*dilatatum, Persicaria decipiens, Pseudognaphalium oligandrum* and the *Pycreus* sp.2[21]. The seasonal zone comprises hygrophilous grassland, dominated by *Arundinella nepalensis and Eragrostis* sp.2[22], with moderate *Pycreus* sp.1[23], *Paspalum dilatatum, Aristida* sp.1[24] and *Eragrostis* sp.1[25], and *Cyperus natalensis*. The temporary zone comprised of *Eragrostis. curvula and E. plana* dominated vegetation, with low abundances of the *Eragrostis* sp.2 and *Paspalum dilatatum*.
W05a	Floodplain wetland	The seasonal zone of the floodplain had dark grey (7.5 YR 2.5/1), sometimes near-black and organic-rich, clays without mottles in the uppermost 20cm of soil, with a few mottles occurring from 20cm and becoming abundant at 40cm. The water table was intercepted at 50cm. The edge of the floodplain closest to the channel was inundated by 20cm of water.	The floodplain vegetation comprises hygrophilius grassland. In the wettest areas near the main channel, *Arundinella nepalensis* grassland was prominent with moderate abundances of *Pycnostachys reticulata* and *Persicaria obovata.* Moving away from the channel, the seasonal zones of the floodplain comprise *E. plana and Eragrostis* sp.2[26] hygrophilous grassland, with moderate abundances of *Arundinella nepalensis.*

[21] Sample taken to be confirmed at herbarium.
[22] Sample taken to be confirmed at herbarium.
[23] Sample taken to be confirmed at herbarium.
[24] Sample taken to be confirmed at herbarium.
[25] Sample taken to be confirmed at herbarium.
[26] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
		The temporary zone was marked by a dark brown-grey clay without mottles in the top 10cm of soil, with an abundance of faint mottles occurring from 20cm and becoming more abundant and distinct with depth. Medium grey clays with a few mottles were observed near the edge of the wetland at depth of 40-50cm, with bedrock occurring at about 50cm.	*Pseudognaphalium oligandrum, Hemarthria altissima* and *Leersia hexandra.* The temporary zone comprises high abundances of *Eragrostis* sp.2 and *E. plana*, with moderate abundances of *Senecio* sp.1[27] and *Haplocarpha scaposa*. The edge of the wetland was marked by a break in slope, with a transition from *E. plana - Arundinella nepalensis* hygrophilous grassland community to the terrestrial grassland.
W05b	CVB & Seep	In the seasonal zone the soils comprise an organic rich dark grey/near black clay topsoil in the top 10cm of the profile with few, small orange mottles that transitions to a dark grey clay (chroma = 1) with abundant small sized orange mottles at 10-20cm depth. Temporary hydric soils along the foot slopes comprise dark brown and dark grey-brown clay with no mottles in the top 0-20cm of the soil profile that grades into medium grey-brown clay with few small orange mottles at depths of 20-40cm. At 40-50cm depths, mottling increases slightly.	The seasonal zone comprises an *Arundinella nepalensis* – *Kyllinga erecta* hygrophilous grassland with moderate abundances of *Eragrostis* sp.2[28] and *Paspalum dilatatum*. The temporary zone comprises an *Eragrostis plana* hygrophilous grassland with low abundances of *Eragrostis* sp.2[29] and *Paspalum dilatatum*.
W06	Seep	The upper 20cm of soil in the temporary zone was a near-black, organic-rich clay, with few orange mottles, with an increase in mottles from 20cm,	The temporary zone was dominated by *Eragrostis plana* and *Eragrostis* sp.2[30], with moderate amounts of *Eragrostis* sp.1[31] and low amounts of *Arundinella nepalensis*.

[27] Sample taken to be confirmed at herbarium.
[28] Sample taken to be confirmed at herbarium.
[29] Sample taken to be confirmed at herbarium.
[30] Sample taken to be confirmed at herbarium.
[31] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
		transitioning to a mixed dark to medium grey clay with an abundance of medium-sized orange mottles. Terrestrial areas were characterised by a dark grey clay with few orange mottles in the topsoil, before striking bedrock at 20cm.	The edge of the wetland outlet is marked by *Eragrostis plana* and *Eragrostis* sp.2[32] grassland, with moderate amounts of *Sporobolus africanus* and low amounts of *Senecio* sp.1[33], *Monopsis decipiens* and *Wahlenbergia undulata.*
W07	Seep	Although no soils were sampled in the permanently wet zone, hydrological, terrain and vegetation indicators were used to distinguish this zone from the seasonal, temporary and terrestrial zones. A series of ridges and furrows were observed across the entire seep. The permanent wetness zones often had 20-50cm of water above the surface and coincided with incoming streamflow. The seasonal zone of this seep typically displayed dark grey to near-black clays, with a moderate abundance of small orange mottles in the top 10cm of the soil, with medium-sized mottles occurring in the 10-20cm horizon and an increase in the abundance of mottles occurring the 20-30cm horizon. In areas, a medium brown-grey clay with few faint mottles was encountered at 30cm, transitioning to a medium grey clay with a moderate to high abundance of medium-sized mottles at 30-40cm.	The extensive seep comprises of a wide variety of wetland vegetation communities that alternate with the undulating terrain created by past ridge and furrow practices. For the most part the plant communities comprise seasonal hygrophilius grassland interspersed with some wetter sedgeland communities red by incoming streamflow. Prominent plants occurring within the permanent and strongly seasonal wetlands plant communities include: • *Arundinella nepalensis*, • *Eragrostis* sp.2[34]. • *Kyllinga erecta* • *Pycreus nitidus,* • *Juncus effusus,* • *Cyperus congestus,* • *Paspalum dilatatum*, • *Juncus oxycarpus,* • *Hemarthria altissima,*

[32] Sample taken to be confirmed at herbarium.
[33] Sample taken to be confirmed at herbarium.
[34] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
			• *Pycnostachys articulata* • *Monopsis decipiens,* • *Fuirena* sp.1[35], • *Hydrocotyle* sp.1[36]. • *Pennisetum* sp.1[37], • *Satyrium longicouda,* • Juncus exertus, • Unknown grass sp.1[38], • *Eleocharis* limosa, • *Sporobolous africanus,* • *Schoenoplectus paludicola,* • *Carex* sp.1[39], • *Leersia hexandra,* • *Lobelia anceps,* • *Monopsis decipiens.*
W08	Stream	Not assessed in field	Not assessed in field
W09	Stream	Not assessed in field	Not assessed in field
W10	Stream	This dry incised channel was characterised by a high degree of disturbance and erosion. The channel upstream of the sampled waypoints had collapsed, with shale occurring in the bed of the channel. A depositional zone was noted further downstream.	Tall herbaceous species were noted in the channel, with a patch of woody vegetation occurring in the channel and along its banks immediately upstream of the sampled.
W11	Stream	Not assessed in field	Not assessed in field
W12	Stream	Not assessed in field	Not assessed in field

[35] Sample taken to be confirmed at herbarium.
[36] Sample taken to be confirmed at herbarium.
[37] Sample taken to be confirmed at herbarium.
[38] Sample taken to be confirmed at herbarium.
[39] Sample taken to be confirmed at herbarium.

Unit Label	HGM Type	Soils Sampled and Wetness Zones	Vegetation Communities
W13	Stream	Not assessed in field	Not assessed in field
W14a	CVB	Not assessed in field	Not assessed in field
W14b	Seep	Not assessed in field	Not assessed in field
W15	Seep	Not assessed in field	Not assessed in field

10.8.4.2 Present Ecological State (PES) Assessment

This section presents and discusses the results of the wetland PES assessment. PES is defined as a measure of the similarity or deviation from a natural or reference state (Macfarlane et al., 2020). The impact scores were interpreted using the PES categories and descriptions provided in Table 57 below.

Table 57: PES impact categories and descriptions

IMPACT CATEGORY	DESCRIPTION	IMPACT RANGE
None	No discernible modification or the modification is such that it has no impact on wetland integrity.	0-0.9
Small	Although identifiable, the impact of this modification on wetland integrity is small.	1-1.9
Moderate	The impact of this modification on wetland integrity is clearly identifiable, but limited.	2-3.9
Large	The modification has a clearly detrimental impact on wetland integrity. Approximately 50% of wetland integrity has been lost.	4-5.9
Serious	The modification has a clearly adverse effect on this component of habitat integrity. Well in excess of 50% of the wetland integrity has been lost.	6-7.9
Critical	The modification is present in such a way that the ecosystem processes of this component of wetland health are totally / almost totally destroyed.	8-10

Most of the wetland units assessed are in a fair condition and moderately modified (PES Class C) as summarised in Table 58 below. The only exceptions were Unit W06 that was assessed as being in a good condition / minimally modified state (PES Class B), and Units W01b and W07 that were assessed as being in a moderately poor condition and largely modified (PES Class D). The prevalence of wetlands in fair condition is because catchment impacts are moderate with most of the catchment areas being undeveloped and uncultivated, and because within-wetland impacts (direct and indirect) were small. The most prominent catchment impacts are active subsistence and commercial cultivation, erosion along livestock pathways and moderately degraded grassland / veld due to overgrazing. Prominent within-wetland impacts include road crossings, dams, stream channel erosion (incision and widening), overgrazing and historical / abandoned cultivation.

Table 58: Summary of impact scores, impact ratings and PES Class for wetlands

Unit	Hydrology Impact Rating	Geomorphology Impact Score	Water Quality Impact Score	Vegetation Impact Score	Overall PES Score & Rating
W01a	2.7	2.4	0.6	3.2	**2.3 (C)**
W01b	5.0	4.2	2.3	6.4	**4.5 (D)**
W01c	2.6	2.8	1.6	3.4	**2.6 (C)**
W02	4.2	4.3	1.4	5.2	**3.8 (C)**
W03b	3.4	4.1	1.7	4.7	**3.5 (C)**
W04	3.6	3.5	0.8	3.3	**2.9 (C)**

Unit	Hydrology Impact Rating	Geomorphology Impact Score	Water Quality Impact Score	Vegetation Impact Score	Overall PES Score & Rating
W05a	2.4	3.4	1.9	3.7	**2.8 (C)**
W05b	4.1	3.1	1.5	6.2	**3.8 (C)**
W06	1.4	1.5	0.6	1.9	**1.4 (B)**
W07	4.8	4.0	1.7	6.1	**4.2 (D)**

10.8.4.3 Ecosystem Services (Functional) Assessment

This section discusses the results of the wetland ecosystem service assessments. Ecosystem services are broadly defined as the benefits people obtain from ecosystems (Kotze et al., 2020). A broader definition is that they are all the aspects of ecosystems utilized (actively or passively) to produce human well-being (Kotze et al., 2020). The ecosystem services scores were interpreted using the categories and descriptions provided in Table 59 below.

Table 59. Ecosystem services importance categories and descriptions.

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

The results of the ecosystem services assessments are shown in Table 69 and

Table 61 below.

In terms of biodiversity maintenance benefits, Units W01a, W01c, W01d and W05a were assessed as being of very high importance, and Units W04, W06 and W07 of high importance. The reasons for these high scores are as follows:

- With the exception of Unit W07, these wetland units are in a good to fair state (PES Class B and C).
- Wetland Units W01a, W01c and W05a have been flagged as highly important in terms of national and provincial conservation planning i.e. freshwater CBAs and Wetland FEPAs.
- Wetland Units W04, W06 and W07 have been flagged as moderately important in terms of provincial conservation planning i.e. freshwater ESAs.
- All these wetland units are critically endangered types.

- All these units are likely to host endangered faunal species e.g. Grey Crowned Crane.
- All of these wetland units have moderate to high ecological connectivity in the landscape.
- All of these wetland units have intact buffer zones.

Unit W05b was assessed as being of moderate importance in terms of biodiversity maintenance due to being in a fair condition and having a moderately-high demand score driven by the critically endangered ecosystem threat status and ESA classification. The rest of the units were assessed as being of low to moderately-low importance.

In terms of regulating services[40], Units W01b, W03b, W05a and W07 were assessed as being of moderately-high importance in terms of the provision of sediment trapping services. This is due to observable sediment deposition within sections of the wetlands. Units W03b, W05a and W07 were also assessed as providing phosphate removal services of moderately-high importance linked to their ability to effectively trap sediment. With the exception of Unit W02, the units were found to provide streamflow regulation services of moderate importance. This is due to the seasonal hydroperiod of the wetlands and the high frost context that contribute to maintaining base flows during winter. It is also important to note that a perennial spring is present along the western edge of Unit W04. Units W01a, W01b, W03b, W05a, W05b and W07 were also found to provide moderately important pollutant removal services owing to their ability to trap sediment with associated pollutant removal through adsorption to sediments and due to a combination of moderate longitudinal gradients and seasonal hydroperiods.

In terms of provisioning services[41], Unit W04 was assessed as providing important water supply benefits due to a productive spring feeding the wetland unit and the water from the spring being well used by the local farmers. Unit W05a is providing moderate water supply benefits due the perennial supply of water in the river and wetlands and moderate use by local farmers. Units W01b and W01c/d and assessed a providing food for livestock benefits of moderate importance with the rest of the units providing limited provision. None of the units were assessed as providing significant cultural services[42].

Table 60: Summary of the ecosystem services scores and ratings

Ecosystem Services	W01a	W01b	W01c /d	W02	W03b
Flood attenuation	0.0	0.0	0.0	0.0	0.0
Streamflow regulation	2.2	1.8	1.8	0.0	2.2
Sediment trapping	1.9	2.5	1.3	0.0	2.5
Erosion control	0.8	0.0	0.1	0.1	0.1
Phosphate assimilation	2.0	1.9	1.3	0.0	2.3
Nitrate assimilation	1.8	1.7	1.0	0.0	1.8

[40] Regulating services - The benefits obtained from the regulation effect of ecosystem processes like water quality enhancement, flood attenuation and carbon storage services.
[41] Provisioning services - Are the goods, products and resources obtained directly from ecosystems like clean water for domestic use or reeds and sedges for craft production or house building.
[42] Cultural services - Are the non-material benefits people obtain from ecosystems like recreational and tourism benefits.

Ecosystem Services	W01a	W01b	W01c /d	W02	W03b
Toxicant assimilation	1.9	1.8	1.3	0.0	1.7
Carbon storage	1.5	1.0	1.1	1.3	1.9
Biodiversity maintenance	3.3	1.0	3.4	1.6	1.6
Water for human use	0.5	0.6	0.0	0.0	0.0
Harvestable resources	0.0	0.0	0.0	0.0	0.5
Food for livestock	1.1	1.8	1.8	0.5	0.0
Cultivated foods	0.6	1.3	1.0	1.0	0.6
Tourism and Recreation	0.0	0.0	0.0	0.0	0.0
Education and Research	0.0	0.0	0.0	0.0	0.0
Cultural and Spiritual	0.5	0.5	0.5	0.5	0.5

Table 61: Summary of the ecosystem services scores and ratings

Ecosystem Services	W04	W05a	W05b	W06	W07
Flood attenuation	0.0	0.6	0.0	0.0	0.0
Streamflow regulation	2.2	2.2	1.4	2.2	2.2
Sediment trapping	1.6	2.5	2.3	1.3	2.5
Erosion control	0.6	0.7	0.1	1.2	0.8
Phosphate assimilation	1.1	2.4	2.2	0.8	2.6
Nitrate assimilation	1.0	2.2	2.0	0.7	2.3
Toxicant assimilation	1.2	1.8	2.1	0.8	2.1
Carbon storage	2.0	1.5	1.5	1.6	1.6
Biodiversity maintenance	2.9	3.3	2.0	3.0	3.1
Water for human use	2.7	2.2	0.6	0.0	1.2
Harvestable resources	0.0	0.0	0.0	0.0	0.8
Food for livestock	0.2	1.1	0.3	0.3	0.3
Cultivated foods	0.6	0.6	0.8	0.6	0.6
Tourism and Recreation	0.0	0.0	0.0	0.0	0.0
Education and Research	0.0	0.0	0.0	0.0	0.0
Cultural and Spiritual	0.5	0.5	0.5	0.5	1.5

10.8.4.4 Ecological Importance & Sensitivity (EIS) Assessment

This section discusses the results of the Ecological Importance and Sensitivity (EIS) assessment. Ecological Importance (EI) is the expression of the importance of wetlands and rivers in terms of the maintenance of biological diversity and ecological functioning at a local and landscape level (Kotze et al., 2020). Ecological Sensitivity (S) refers to ecosystem fragility or the ability to resist or recover from disturbance (Kotze et al., 2020). The EIS scores were interpreted using the categories and descriptions provided in Table 62 below.

Table 62: EIS rating categories

Importance Category	
Very Low	0-0.79
Low	0.8 – 1.29
Moderately-Low	1.3 – 1.69
Moderate	1.7 – 2.29
Moderately-High	2.3 – 2.69
High	2.7 – 3.19
Very High	3.2 - 4.0

Units W01a, W01c/d, W04, W05a, W06 and W07 were assessed as being of high to very high EIS and the most important units. Units W01b and W03b were assessed as being of moderately-high EIS and also important, and Unit W05b of moderate EIS. The EIS assessment results are summarised in Table 63 below and EIS maps are shown in Figure 65 to Figure 67 below.

Table 63: Summary of wetland EIS scores and ratings

Unit	Biodiversity Maintenance Importance Score	Regulating Services Importance Score	Provisioning and Cultural Services Importance Score	Ecological Sensitivity	Integrated EIS Score	Integrated EIS Rating
W01a	3.3	2.2	1.1	1.4	**3.3**	**Very High**
W01b	1.0	2.5	1.8	1.3	**2.5**	**Mod-High**
W01c/d	3.4	1.8	1.8	1.6	**3.4**	**Very High**
W02	1.6	1.3	1.0	1.1	**1.6**	**Mod-Low**
W03b	1.6	2.5	0.6	1.4	**2.5**	**Mod-High**
W04	2.9	2.2	2.7	1.8	**2.9**	**High**
W05a	3.3	2.5	2.2	1.7	**3.3**	**Very High**
W05b	2.0	2.3	0.8	1.4	**2.3**	**Moderate**
W06	3.0	2.2	0.6	1.3	**3.0**	**High**
W07	3.1	2.6	1.5	1.3	**3.1**	**High**

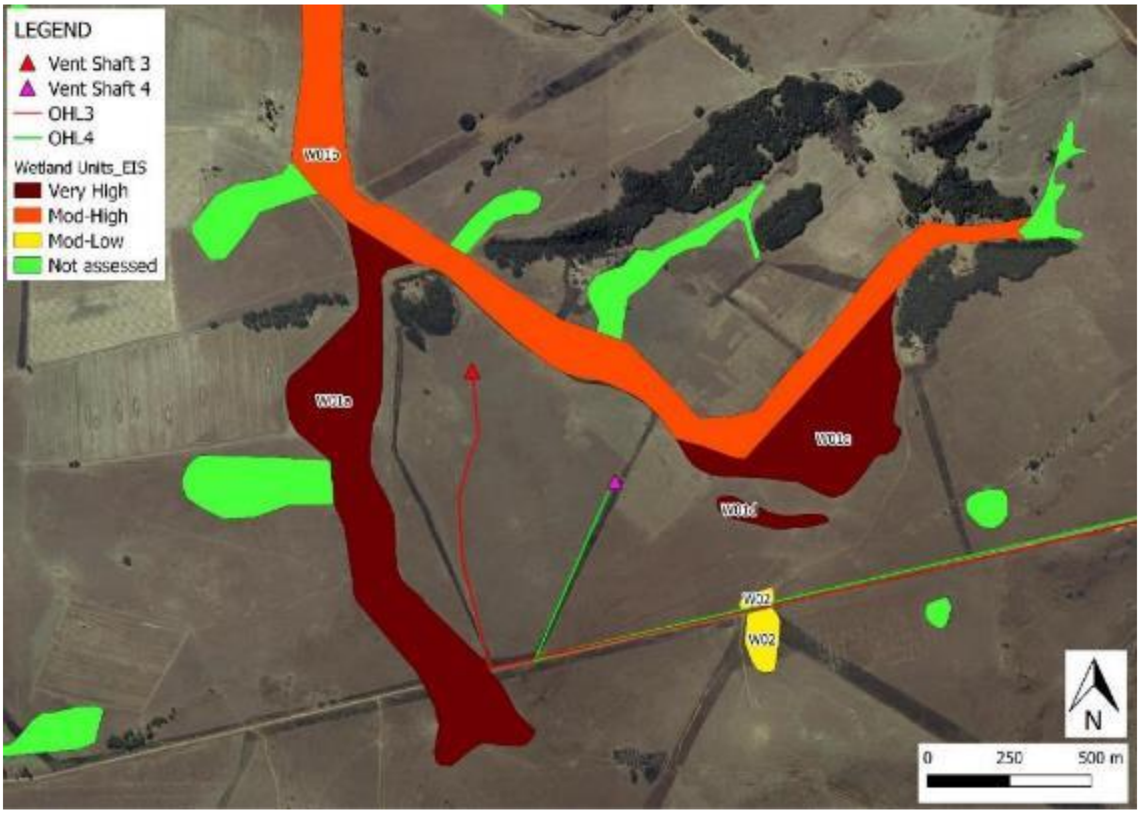

Figure 65: Wetland EIS map for Units W01a – W02.

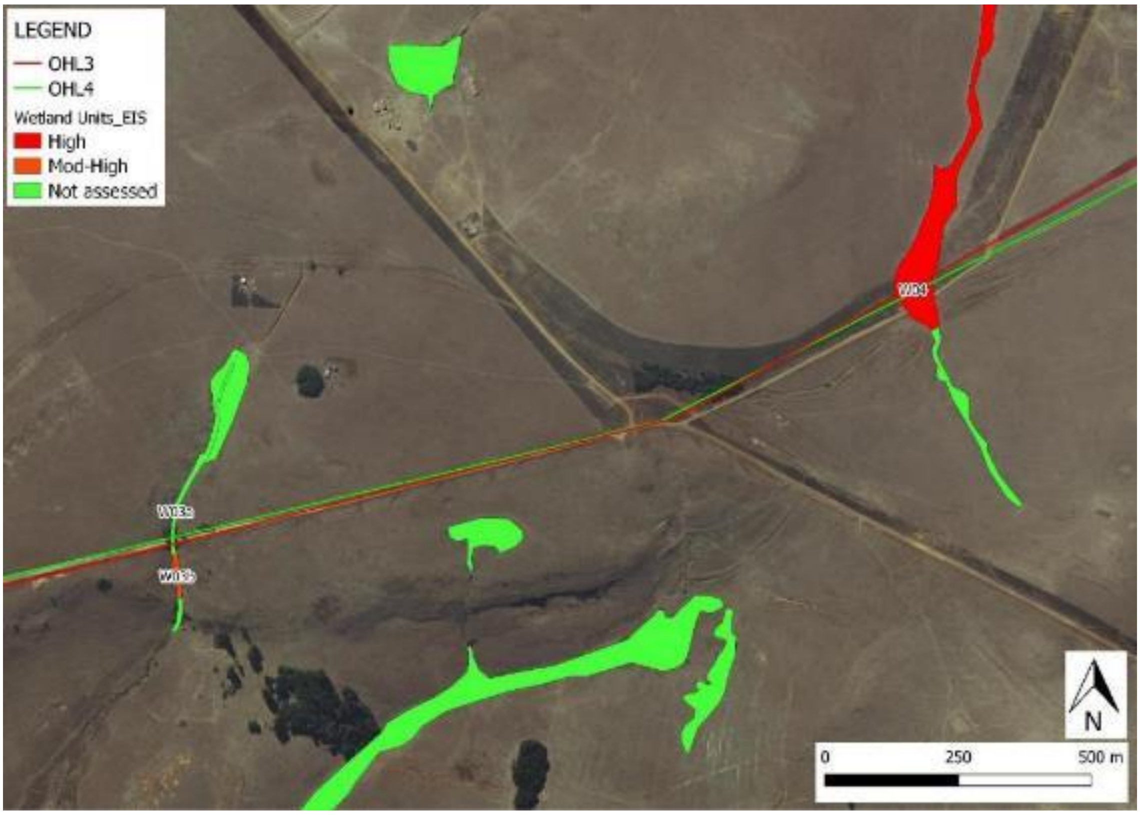

Figure 66: Wetland EIS map for Units W03b and W04

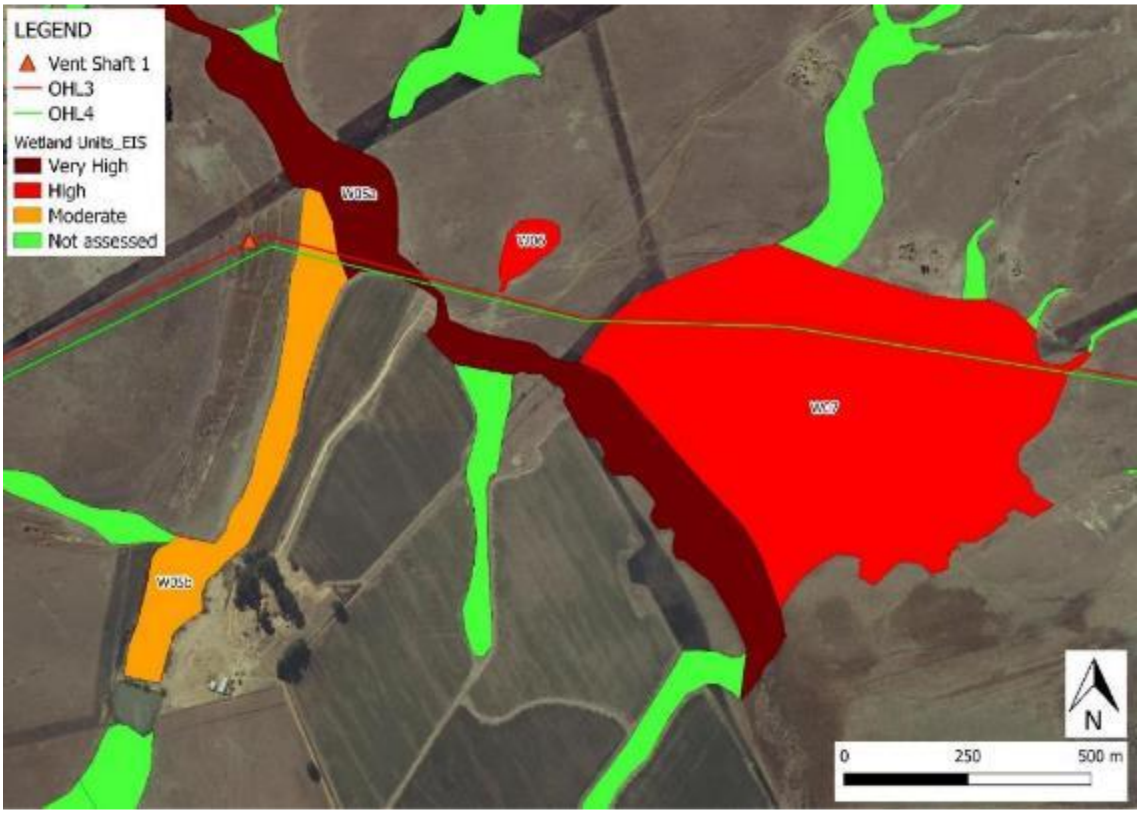

Figure 67: Wetland EIS map for Units W05a - W07

10.8.5 Recommended Ecological Category (REC)

The recommended ecological category (REC) is the target or desired state of freshwater ecosystems required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that is driven by the context / setting.

The modus operandi followed by DWAF's Directorate: Resource Directed Measures (RDM) is that if the EIS is high or very high, the ecological management objective should be to improve the condition of the watercourse (Kleynhans & Louw, 2007). However, the causes related to a PES should also be considered to determine if improvement is realistic and attainable (Kleynhans & Louw, 2007). This relates to whether the problems in the catchment can be addressed and mitigated (Kleynhans & Louw, 2007). If the EIS is evaluated as moderate or low, the ecological aim should be to maintain the river in its PES (Kleynhans & Louw, 2007). Within the Ecological Reserve context, Ecological Categories A to D can be recommended as future states depending on the EIS and PES (Kleynhans & Louw, 2007). Ecological Categories E and F PES are regarded as ecologically unacceptable, and remediation is needed if possible (Kleynhans & Louw, 2007). A generic matrix for the determination of RECs for water resources is shown in **Error! Reference source not found.** below.

Table 64: Generic matrix for the determination of REC for water resources

			EIS			
			Very high	**High**	**Moderate**	**Low**
PES	**A**	**Pristine/Natural**	A Maintain	A Maintain	A Maintain	A Maintain
	B	**Largely Natural**	A	A/B	B	B

			Improve	Improve	Maintain	Maintain
	C	**Good - Fair**	B Improve	B/C Improve	C Maintain	C Maintain
	D	**Poor**	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	**Very Poor**	D Improve	E/F Improve	E/F Maintain	E/F Maintain

As summarised in Table 65 below, the PES of most of the units is below REC. Thus, the regional water resource management objective is to improve the PES of the local wetlands. The management objective of the project should be to ensure that all impacts are minimised such that there is no change in PES for all units assessed.

Table 65: Summary of REC for assessed watercourses

Watercourse Unit	PES	EIS	REC
W01a	**2.3 (C)**	**Very High**	B
W01b	**4.5 (D)**	**Mod-High**	C
W01c/d	**2.6 (C)**	**Very High**	B
W02	**3.8 (C)**	**Mod-Low**	C
W03b	**3.5 (C)**	**Mod-High**	B
W04	**2.9 (C)**	**High**	B
W05a	**2.8 (C)**	**Very High**	B
W05b	**3.8 (C)**	**Moderate**	C
W06	**1.4 (B)**	**High**	B
W07	**4.2 (D)**	**High**	C

10.9 FLORA (PLANT LIFE)

Reference is made to the Terrestrial Ecological Assessment, which was conducted by Enviridi Environmental Consultants (Pty) Ltd. Refer to Appendix 10.

10.9.1 Methodology and Approach

It is important to note that many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have previously been disturbed. Assessing the impacts of a proposed project often requires evaluating the conservation value of the site relative to other natural areas in the surrounding area.

A simple approach to evaluating the relative importance of a site and the species found within it includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

- Is the site modified/disturbed in any way?

Thus, the general approach and angle adopted for this type of study is to identify any potential fauna species that may be affected by the proposed development. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species. The general approach adopted for this type of study is thus to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws.

Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which is most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National Legislation protecting environmental and biodiversity resources.

10.9.1.1 Literature review and desktop study

A desktop assessment was conducted to establish whether any potentially sensitive species/receptors might occur on site. The South African National Biodiversity Institute's online biodiversity tool, ADU (Animal Demography Unit) Virtual Museum was used to query a species list for the Quaternary Degree Square (QDS) within which the study area is situated. Information regarding species of conservation concern was obtained prior to the field investigation. This was conducted by researching all available information resources including, but not limited to, the following:

- International Union for Conservation of Nature (IUCN) Red List of Threatened Species;
- The Endangered Wildlife Trust's Red List of Mammals of South Africa, Lesotho and Swaziland; and
- NEMBA List of Threatened or Protected Species (TOPS List).

To describe the overall site characteristics, and to identify points of interest within the site for evaluation, Google Earth Imagery and the 1:50 000 topographical maps were examined.

The importance of a desktop 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. Consequently, it was possible to identify potential areas of concern and to draw up a list of potential species that may be affected by the proposed development.

10.9.1.2 Field investigation

A site visit was conducted in February 2021. The field assessments had been cancelled various times due to landowner disputes on the project since May 2020. It should also be kept in mind that Hurricane Eloise has been active since January 2021 and 4-5 weeks of rain had been received by the date of the field assessment.

A field investigation aims to supplement and confirm several findings from the desktop study. This mainly served as a fatal flaw analyses to determine whether any major ecological concerns exist with regards to the study area surface infrastructure establishment. During the field investigation the observed and derived presence of fauna associated with the recognised habitat types of the study site, were recorded. In addition, fauna was also identified by means of spoor, droppings, burrows, or shelters. No trapping or mist netting was conducted, as the scope of work did not require such intensive work.

10.9.1.3 Data analyses

Information obtained during the desktop assessment and the field survey were analysed and compared. Data interpretation and conclusions made were deduced from knowledge, and available literature and case studies. The habitat availability for sensitive fauna species which was assessed throughout the study area were furthermore included in the analysis as well as the potential impact of the development on sensitive fauna species.

Geospatial analysis in terms of sensitive areas and known species distribution were used in comparison with the data gathered to make certain deductions. This will also aid the planning and positioning of the infrastructure as well as management for the various proposed development activities. Better protection will be awarded to sensitive areas that have unique species compositions or sensitive habitat types.

10.9.2 Regional vegetation

The project area is located in the Grassland Biome. The Grassland Biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. Trees are absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. The Grassland Biome is considered to have an extremely high biodiversity, second only to the Fynbos Biome. Rare plants are often found in the grasslands, especially in the escarpment area. These rare species are often endangered, comprising mainly endemic geophytes or dicotyledonous herbaceous plants. Very few grasses are rare or endangered.

10.9.3 Broad Vegetation Description (Vegetation Map 2018)

The Mining Right area is located within four (4) Vegetation Groups (refer to Figure 68). Smaller sections overlap with the Eastern Highveld Grassland, Northern Afrotemperate Forest and the Paulpietersburg Moist Grassland. However, the bulk of the mining right falls, including the areas where the ventilation shafts are proposed within the Wakkerstroom Montane Grassland.

The powerline intercepts with sections of Wakkerstroom Montane Grassland, Northern Afrotemperate Forest and the Paulpietersburg Moist Grassland.

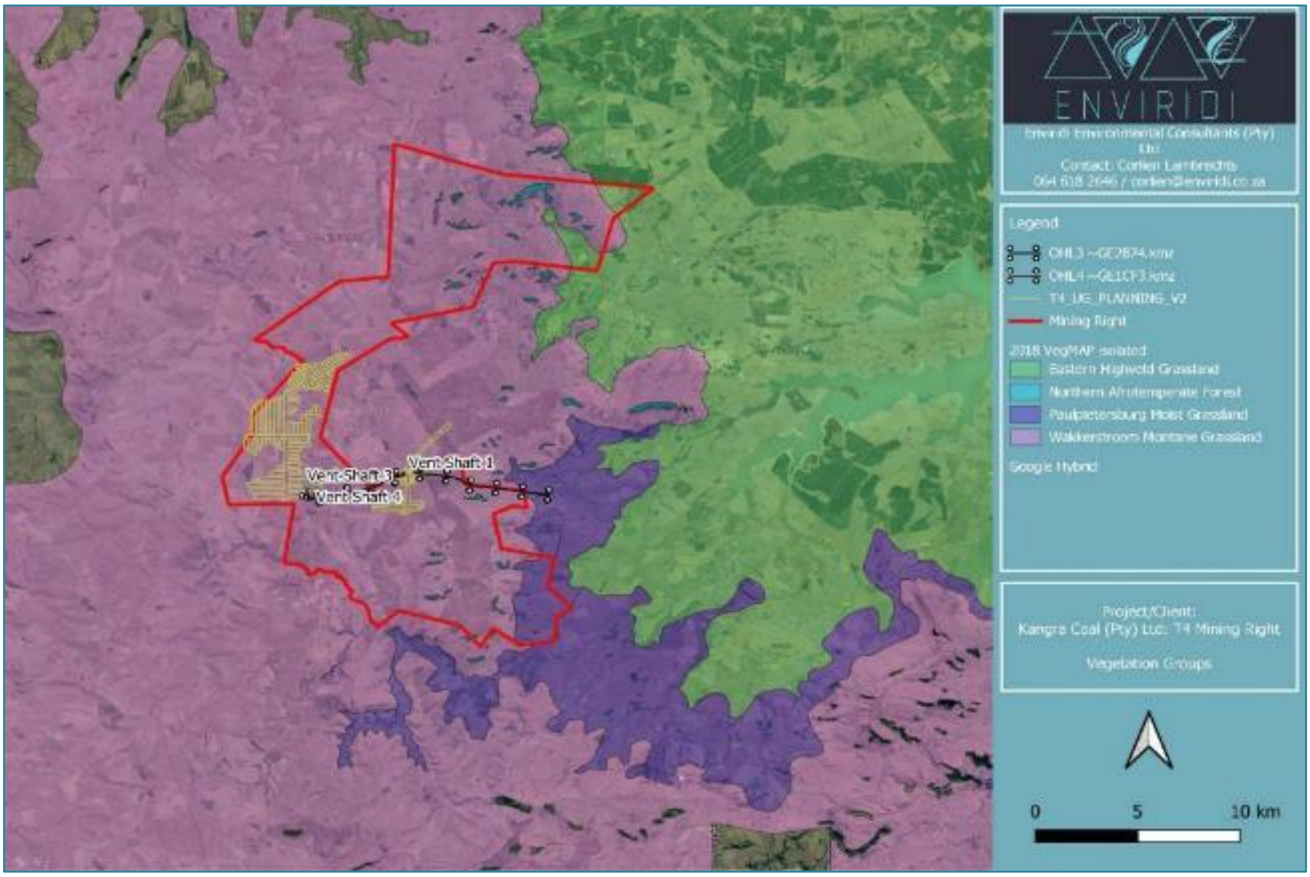

Figure 68: Vegetation Groups applicable to the Kangra T4 Mining Right Application

10.9.3.1 Eastern Highveld Grassland (GM12)

This vegetation type occurs on slightly-to-moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land dominated by the usual highveld grass composition (Arsitida, Digitaria, Erafrostsis, Themeda, Tristachya etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported.

Important taxa include:

- Garminoids: *Aristida aequigluims* (d), *A. congesta* (d), *A. junciformis* subsp. *Galpini* (d), *Brachiaria serrata* (d), *Cynodon dactylon* (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E plana* (d), *E racemosa* (d), *E sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium cereiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rhmanni* (d), *Alloteropsis semialata* subsp. *eckloniana, Andrpogon appendiculatus, A schirensi, Bewsia biflora, Ctenuim concinnum, Diheteropogon amplectens, Eragrostis capensis, E. dummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyruim sanguineum, Setaria nigrirostris, Urelytrum agropyroides*;
- Herbs: *Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Acalyha angusta, Cahmaecrista mimosoides, Dicoma anomala, Euryops gifillani, E. transvalensis subsp. setilobus,*

Helichrysum aureonitens, H caespititium, H. callicomum, H. oreophilum, H. caespititium, H. oerophilum, H rugulosum, Ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata;

- Geophytic herbs: *Gladiolus crassifolius, Haemanthus humilis* subsp. *hirsutus, Hypoxis rigidulua* var. *pilosissima, Ledebouria ovatifolia;*
- Succulent herb: *Aloe ecklonis*; and
- Low shrubs: *Anthospermum rigidum* subsp*. pumilum, Stoebe plumose.*

Conservation Endangered. Target 24%. Only very small fraction conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but Acacia mearnsii can become dominant in disturbed sites. Erosion is very low.

10.9.3.2 Northern Afrotemperate Forest (F0z2)

Found as small patches in kloofs and on sub-ridge scarps at high altitudes (1 500–1 900 m). Canopy dominated usually by *Podocarpus latifolius, Olinia emarginata, Halleria lucida, Scolopia mundii and rarely also by Widdringtonia nodiflora, in drier facies also by Pittosporum viridiflorum, Celtis africana, Mimusops zeyheri, Nuxia congesta and Combretum erythrophyllum*. *Xymalos monospora* sometimes dominate patches of species-poor mistbelt forests of northern KwaZulu-Natal.

Geology & Soils Shallow acidic soils over sandstones of the Karoo Supergroup, quartzites and rarely also volcanic rocks of Ventersdorp Supergroup and intrusive diabases of Pretoria Igneous Complex.

Important Taxa include:

- Tall Trees: *Celtis africana* (d), *Halleria lucida* (d), *Olinia emarginata* (d), *Pittosporum viridiflorum* (d), *Podocarpus latifolius* (d), *Rothmannia capensis* (d), *Scolopia mundii* (d), *Afrocarpus falcatus*, *Buddleja saligna*, *Dais cotinifolia*, *Ilex mitis*.
- Small Trees: *Acalypha glabrata* (d), *Buddleja salviifolia* (d), *Calpurnia aurea* (d), *Combretum erythrophyllum* (d), *Diospyros lycioides* subsp. *guerkei* (d), *D. whyteana* (d), *Euclea crispa* subsp. *crispa* (d), *Widdringtonia nodiflora* (d), *Bowkeria verticillata*, *Canthium ciliatum*, *Leucosidea sericea*, *Scolopia flanaganii*.
- Woody Climber: *Cassinopsis ilicifolia* (d).
- Tall Shrubs: *Myrsine africana* (d), *Cliffortia nitidula*. Soft Shrubs: *Isoglossa grantii* (d), *Hypoestes aristata*, *Plectranthus fruticosus*.
- Herbs: *Plectranthus grallatus* (d), *P. hereroensis* (d), *Peperomia retusa*, *Streptocarpus haygarthii*, *S. pusillus*.
- Geophytic Herbs: *Blechnum attenuatum* (d), *Asplenium aethiopicum*, *Polystichum luctuosum*.
- Graminoids: *Carex spicato-paniculata* (d), *Oplismenus hirtellus* (d), *Cyperus albostriatus*, *Schoenoxiphium lehmannii*, *Thamnocalamus tessellatus.*

Endemic Taxa:

- Tall Tree: *Scolopia oreophila*.
- Small Tree: *Maytenus albata*.
- Tall Shrub: *Sparrmannia ricinocarpa*.
- Herb: *Streptocarpus polyanthus* subsp. *Dracomontanus.*

Conservation Least threatened. Target 31%. About 30% statutorily conserved in uKhahlamba Drakensberg Park, Phongola Bush, Vryheid Mountain, Poccolan/Robinson's Bush, Ngome and Ncandu Nature Reserves, Magaliesberg Nature Area, Merville Ridge, Paardeplaats, Rustenburg, Suikerbosrand Nature Reserves, Marekele National Park and Pilanesberg Game Reserve. Some private nature reserves (e.g., Mooibron, Mhlongamvula, Tafelkop, Oudehoutdraai, Oshoek and Ossewakop) protect some patches too. Occasional hot fires encroaching from the surrounding savanna woodlands, uncontrolled timber extraction, medicinal-plant harvesting, and grazing in forest can be viewed as the current major threats (Von Maltitz et al. 2003).

10.9.3.3 Paulpietersburg Moist Grassland (GM15)

Mainly undulating with moderately steep slopes, but valley basins are wide and flat and mountainous areas occur mostly along the northern and eastern boundary. Tall, closed grassland rich in forbs and dominated by Tristachya leucothrix, Themeda triandra and Hyparrhenia hirta. Evergreen woody vegetation is characteristic on rocky outcrops.

Important Taxa include:

- Graminoids: *Alloteropsis semialata* subsp. *eckloniana* (d), *Andropogon schirensis* (d), *Brachiaria serrata* (d), *Ctenium concinnum* (d), *Cymbopogon caesius* (d), *Digitaria tricholaenoides* (d), *Eragrostis racemosa* (d), *Harpochloa falx* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Rendlia altera* (d), *Setaria nigrirostris* (d), *Themeda triandra* (d), *Tristachya leucothrix* (d), *Andropogon appendiculatus*, *Cynodon hirsutus*, *Diheteropogon amplectens*, *D. filifolius*, *Elionurus muticus*, *Eragrostis chloromelas*, *E. curvula*, *E. plana*, *Festuca scabra*, *Melinis nerviglumis*, *Panicum ecklonii*, *P. natalense*, *Trachypogon spicatus*, *Urelytrum agropyroides*.
- Herbs: *Argyrolobium speciosum* (d), *Cissus diversilobata* (d), *Dicoma zeyheri* (d), *Eriosema kraussianum* (d), *Geranium wakkerstroomianum* (d), *Helichrysum nudifolium* var. *nudifolium* (d), *Ipomoea oblongata* (d), *Pelargonium luridum* (d), *Acalypha glandulifolia*, *A. peduncularis*, *Acanthospermum australe*, *Aster bakerianus*, *Becium filamentosum*, *Berkheya setifera*, *Dicoma anomala*, *Euryops laxus, E. transvaalensis* subsp. *setilobus*, *E. transvaalensis* subsp*. transvaalensis, Helichrysum rugulosum*, *H. simillimum*, *Indigofera hilaris* var. *hilaris*, *I. velutina*, *Kohautia amatymbica*, *Pearsonia grandifolia*, *Pentanisia prunelloides* subsp. *latifolia*, *Senecio bupleuroides*, *S. coronatus*, *S. inornatus*, *S. isatideus*, *S. latifolius*, *Sonchus nanus*, *Thunbergia atriplicifolia*, *Vernonia capensis*, *V. natalensis*, *Xerophyta retinervis*.
- Herbaceous Climber: *Rhynchosia totta*.
- Geophytic Herbs: *Chlorophytum haygarthii* (d), *Gladiolus aurantiacus* (d), *Agapanthus inapertus* subsp. *intermedius*, *Asclepias aurea*, *Cheilanthes hirta*, *Cyrtanthus tuckii* var. *transvaalensis*, *Hypoxis*

colchicifolia, *H. costata*, *H. rigidula* var. *pilosissima*, *Moraea brevistyla*, *Pteridium aquilinum*, *Watsonia latifolia*, *Zantedeschia rehmannii*.

- Succulent Herbs: *Aloe ecklonis*, *A. maculata, Lopholaena segmentata*.
- Small Trees: *Canthium ciliatum* (d), *Dombeya rotundifolia*, *Vangueria infausta*. Succulent Tree: *Aloe marlothii* subsp. *marlothii*.
- Tall Shrubs: *Calpurnia sericea* (d), *Rhus rehmanniana* (d), *Diospyros lycioides* subsp. *guerkei*, *Euclea crispa* subsp. *crispa*.
- Low Shrubs: *Rhus discolor* (d), *Anthospermum rigidum* subsp. *pumilum*, *A. rigidum* subsp. *rigidum*, *Clutia monticola*, *Diospyros galpinii*, *Erica oatesii*, *E. woodii*, *Hermannia geniculata*, *Indigofera arrecta*, *Otholobium wilmsii*, *Polygala uncinata*, *Pseudarthria hookeri*, *Rubus rigidus*.
- Succulent Shrub: *Euphorbia pulvinata*.

Biogeographically Important Taxa (all Low Escarpment endemics):

- Succulent Herb: *Aloe modesta*.
- Low Shrubs: *Bowkeria citrina*, *Hemizygia macrophylla*, *Lotononis amajubica*.

Endemic Taxon:

- Succulent Shrub: *Aloe reitzii* var. *vernalis*.

Conservation Vulnerable. Target 24%. Only very small portion statutorily conserved in Witbad, Vryheid Mountain, Paardeplaats and Phongola Bush Nature Reserves. Some private reserves protect small patches (Rooikraal, Mhlongamvula, Kombewaria). About one third already transformed by plantations or cultivated land. Heavy livestock grazing and altered fire regimes have greatly reduced the area of grasslands of high conservation value. Aliens such as species of Acacia, Eucalyptus and Pinus are of major concern in places. Erosion very low (80%) or low (13%).

10.9.3.4 Wakkerstroom Montane Grassland (Gm14)

The bulk of the Mining Right as well as the location of the shafts are located within this Vegetation Unit specifically. This unit is a less obvious continuation of the Escarpment that links the southern and northern Drakensberg escarpments. It straddles this divide and is comprised of low mountains and undulating plains. The vegetation comprises predominantly short montane grasslands on the plateaus and the relatively flat areas, with short forest and Leucosidea thickets occurring along steep, mainly east-facing slopes and drainage areas. L. sericea is the dominant woody pioneer species that invades areas as a result of grazing mismanagement.

Important Taxa include:

- Small Trees: *Canthium ciliatum*, *Protea subvestita*.
- Tall Shrubs: *Buddleja salviifolia* (d), *Leucosidea sericea* (d), *Buddleja auriculata*, *Diospyros lycioides* subsp. *guerkei*, *Euclea crispa* subsp. *crispa*, *Rhus montana*, *R. rehmanniana*, *R. transvaalensis*.
- Low Shrubs: *Asparagus devenishii* (d), *Cliffortia linearifolia* (d), *Helichrysum melanacme* (d), *H. splendidum* (d), *Anthospermum rigidum* subsp. *pumilum*, *Clutia natalensis*, *Erica oatesii*, *Felicia filifolia*

subsp. *filifolia*, *Gymnosporia heterophylla*, *Helichrysum hypoleucum*, *Hermannia geniculata*, *Inulanthera dregeana*, *Metalasia densa*, *Printzia pyrifolia*, *Rhus discolor*, *Rubus ludwigii* subsp. *ludwigii*.

- Graminoids: *Andropogon schirensis* (d), *Ctenium concinnum* (d), *Cymbopogon caesius* (d), *Digitaria tricholaenoides* (d), *Diheteropogon amplectens* (d), *Eragrostis chloromelas* (d), *E. plana* (d), *E. racemosa* (d), *Harpochloa falx* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Microchloa caffra* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Aristida junciformis* subsp. *galpinii*, *Brachiaria serrata*, *Diheteropogon filifolius*, *Elionurus muticus*, *Eragrostis capensis*, *Eulalia villosa*, *Festuca scabra*, *Loudetia simplex*, *Rendlia altera*, *Setaria nigrirostris*. Herbs: *Berkheya onopordifolia* var. *glabra* (d), *Cephalaria natalensis* (d), *Pelargonium luridum* (d), *Acalypha depressinerva*, *A. peduncularis*, *A. wilmsii*, *Aster bakerianus*, *Berkheya setifera*, *Euryops transvaalensis* subsp. *setilobus*, *Galium thunbergianum* var. *thunbergianum*, *Geranium ornithopodioides*, *Helichrysum cephaloideum*, *H. cooperi*, *H. monticola*, *H. nudifolium* var. *nudifolium*, *H. oreophilum*, *H. simillimum*, *Pentanisia prunelloides* subsp. *latifolia*, *Plectranthus laxiflorus*, *Sebaea leiostyla*, *S. sedoides* var. *sedoides*, *Selago densiflora*, *Vernonia hirsuta*, *V. natalensis*, *Wahlenbergia cuspidata*.
- Geophytic Herbs: *Hypoxis costata* (d), *Agapanthus inapertus* subsp. *intermedius*, *Asclepias aurea*, *Cheilanthes hirta*, *Corycium dracomontanum*, *C. nigrescens*, *Cyrtanthus tuckii* var. *transvaalensis*, *Disa versicolor*, *Eriospermum cooperi* var. *cooperi*, *Eucomis bicolor*, *Geum capense*, *Gladiolus ecklonii*, *G. sericeovillosus* subsp. *sericeovillosus*, *Hesperantha coccinea*, *Hypoxis rigidula* var. *pilosissima*, *Moraea brevistyla*, *Rhodohypoxis baurii* var. *confecta*. Semiparasitic Herb: *Striga bilabiata* subsp. *bilabiata*.

Biogeographically Important Taxa (LLow Escarpment endemic, NNorthern sourveld endemic):

- Low Shrubs: *Bowkeria citrina*[L], *Lotononis amajubica*[L], *Protea parvula*[N] .
- Succulent Herb: *Aloe modesta*[N].

Endemic Taxa:

- Herbs: *Helichrysum aureum* var. *argenteum*, *Selago longicalyx*.
- Geophytic Herbs: *Kniphofia* sp. nov. (‘*laxiflora* Form C’), *Nerine platypetala*.
- Woody Climber: *Asparagus fractiflexus*.

Conservation Least threatened. Conservation target 27%, less than 1% is statutorily protected in the Paardeplaats Nature Reserve. There are 10 South African Natural Heritage Sites in this unit, although very little of it is formally protected. Land use pressures from agriculture are low (5% cultivated) probably owing to the colder climate and shallower soils. The area is also suited to afforestation, with more than 1% under Acacia mearnsii and Eucalyptus plantations. The black wattle (Acacia mearnsii) is an aggressive invader of riparian areas. Erosion very low (78%) and low (19%).

10.9.3.5 Threatened Ecosystems and Status

The Mining Right falls within the Threatened Ecosystem; Wakkerstroom/Luneburg Grasslands (MP11), which has an Endangered status. The most Northern point of the Mining Right Application area also falls within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA

2011 and NBA 2018).

The NBA 2011 does not correspond with the latest NBA 2018 in all aspects, which lists the Wakkerstroom Montane Grassland (previously included in Wakkerstroom/Luneburg Grasslands) as Poorly Protected, but Least Concern, but separated and made distinction for Paulpietersburg Moist Grassland (previously also included in Wakkerstroom/Luneburg Grasslands) and issued it a status of Poorly Protected and Endangered. Northern Afrotemperate Forest (also previously included in Wakkerstroom/Luneburg Grasslands) has a status of Well protected and Least Concern (Skowno, Raimondo, Poole, Fizzotti, & Slingsby, 2019).

10.9.3.6 Regional Conservation Assessments

The area was assessed in terms of slope to aid the assessment and classification in terms of Ridge Guidelines[43]. Since the proposed shafts both falls within low-moderately sloped ecological sensitive areas, it is recommended that access to these sites be carefully planned to prevent additional impacts on the riverine, ridge habitat and sloped areas. The riverine valley areas identified through the elevation assessments, will be sensitive environment requiring special management to prevent impacts during construction. Additionally, these drainage structures currently may need additional licensing in terms of the National Water Act, 1998 (Act No. 36 of 1998) pending the findings of the surface water assessment.

The Mining Right falls within the Threatened Ecosystem; Wakkerstroom/Luneburg Grasslands (MP11), which has an Endangered status (NBA 2011). The most Northern point of the Mining Right Application area also falls within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA 2011 and NBA 2018) and shown within Figure 68 and Figure 71.The NBA 2011 does not correspond with the latest NBA 2018 in all aspects, which lists the Wakkerstroom Montane Grassland (previously included in Wakkerstroom/Luneburg Grasslands) as Poorly Protected, but Least Concern, but separated and made distinction for Paulpietersburg Moist Grassland (previously also included in Wakkerstroom/Luneburg Grasslands) and issued it a status of Poorly Protected and Endangered. Northern Afrotemperate Forest (also previously included in Wakkerstroom/Luneburg Grasslands) has a status of Well protected and Least Concern (Skowno, Raimondo, Poole, Fizzotti, & Slingsby, 2019).

However, since these changes have not yet been formally gazetted, those ecosystem as gazetted as a Threatened Ecosystem (Government Gazette No 34809, 9 December 2011) remains and needs to be applied for as an activity during the EIA/EMPR process as both ventilation shafts fall within the NBA 2011 Wakkerstroom/Luneburg Grasslands (MP11), which has an Endangered status.

As shown below, within Figure 72 and Figure 73 areas range between Critical Biodiversity Areas proposed development site as per, Heavily or moderately modified areas and other “Other Natural Areas” within the Mpumalanga Conservation Plan.

[43] Ridge assessments are prescribed by GDARD (specifically for Gauteng), but serves as a good indicator for any site (within any province), as ridges and rocky areas are more sensitive and specialised niches in terms of ecological aspects.

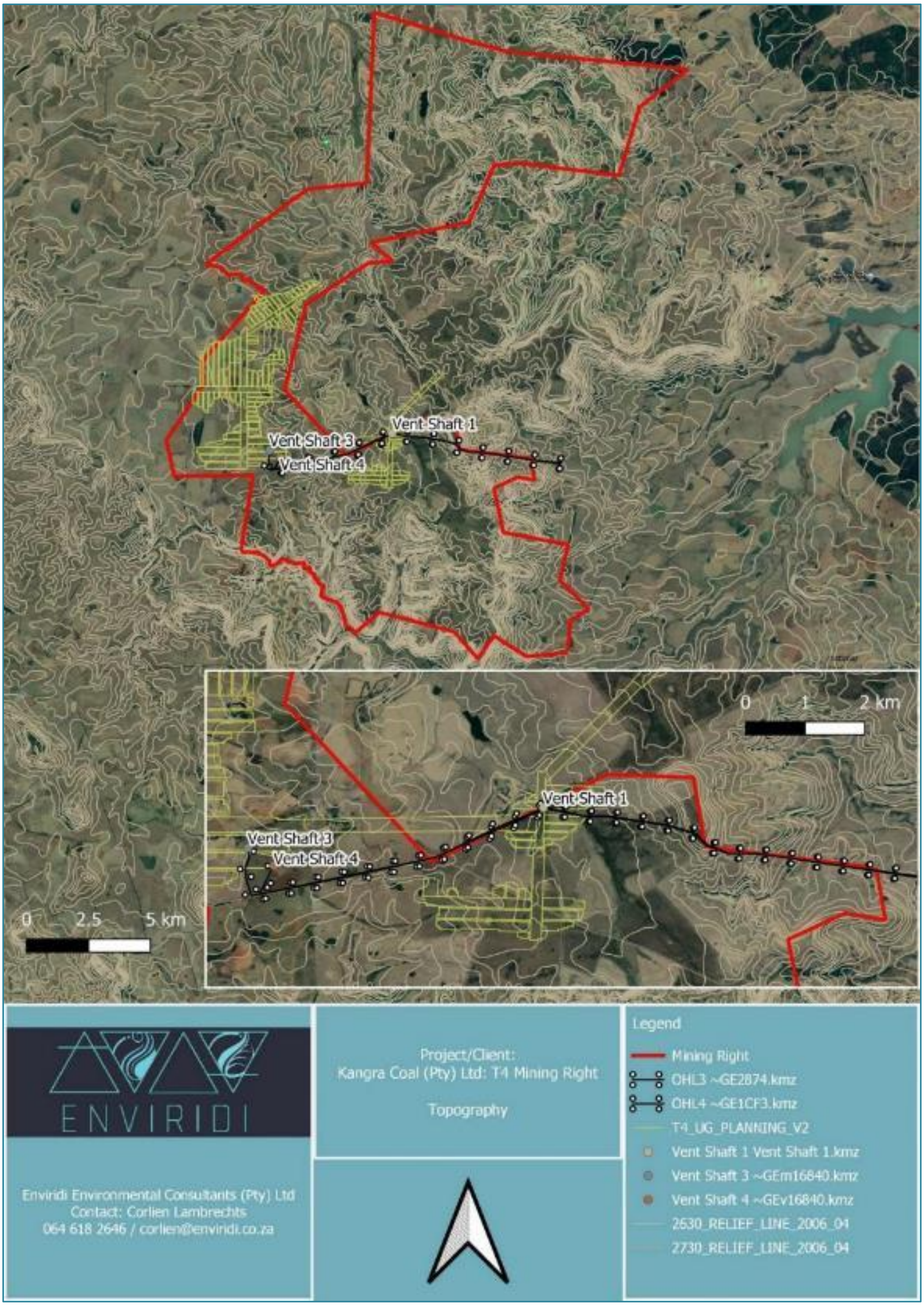

Figure 69: Topography of area associated with the Mining Right Application

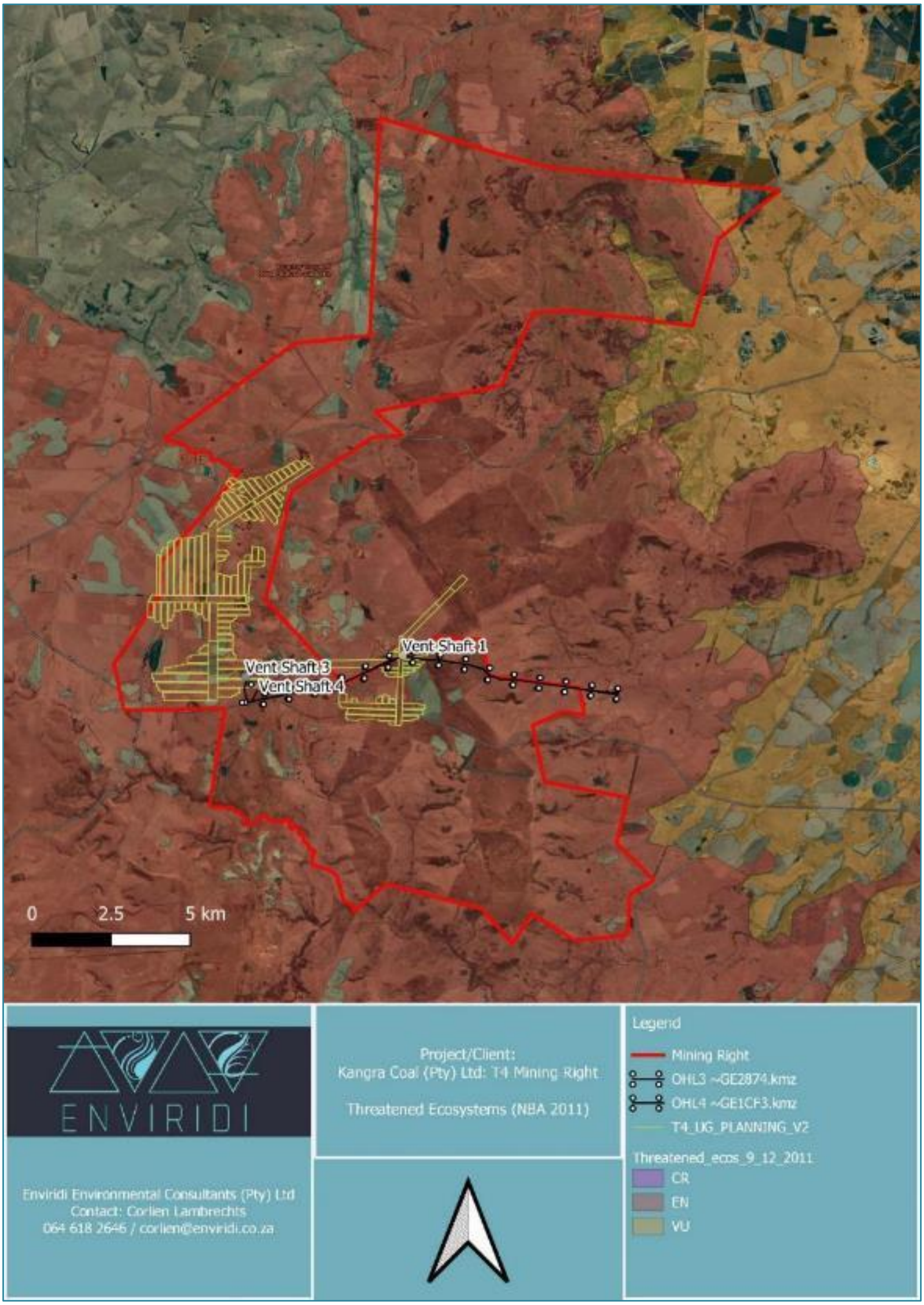

Figure 70: Kangra T4 Mining Development showing Threatened Ecosystems 2011

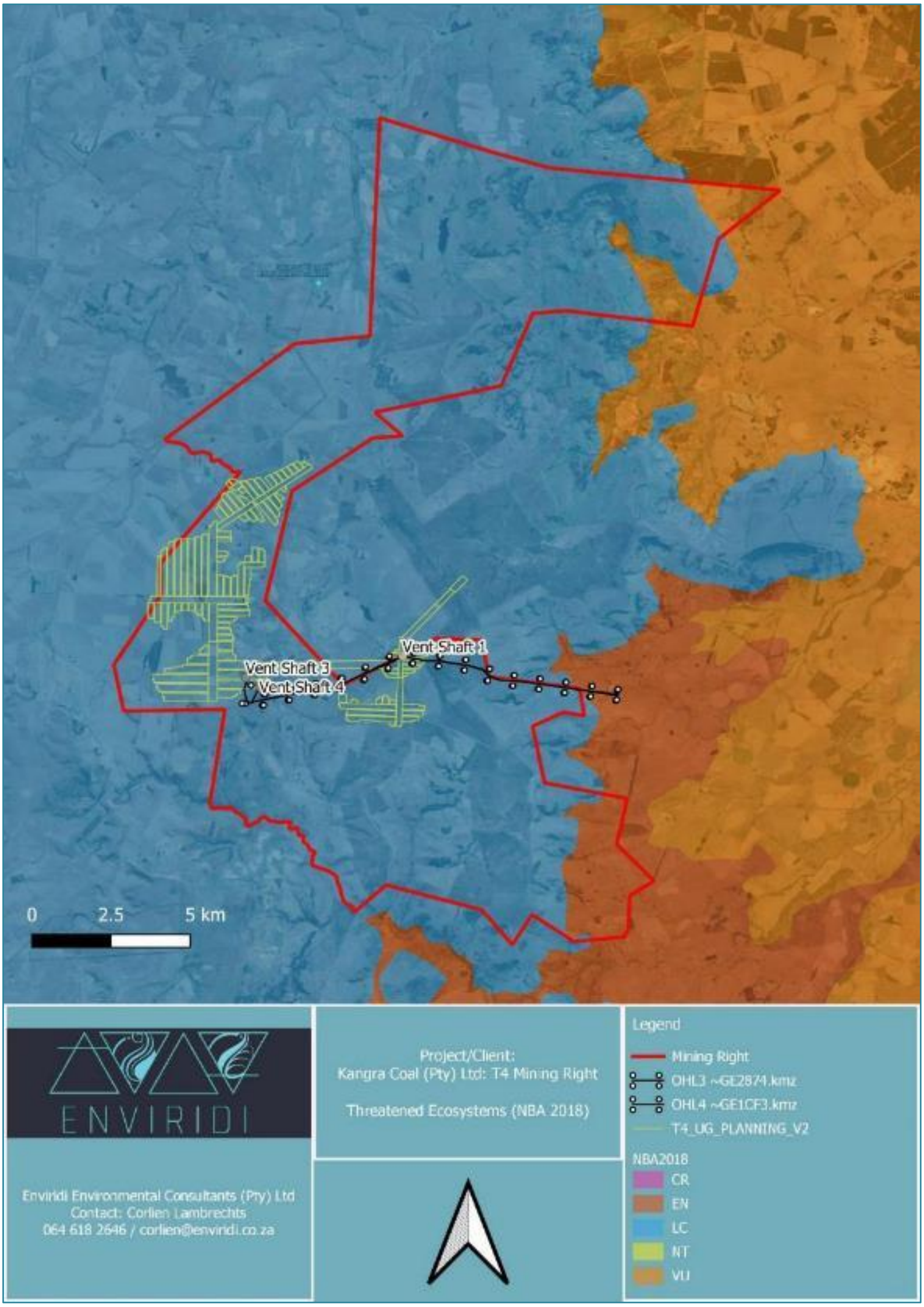

Figure 71: Kangra T4 Mining Development showing Threatened Ecosystems 2018

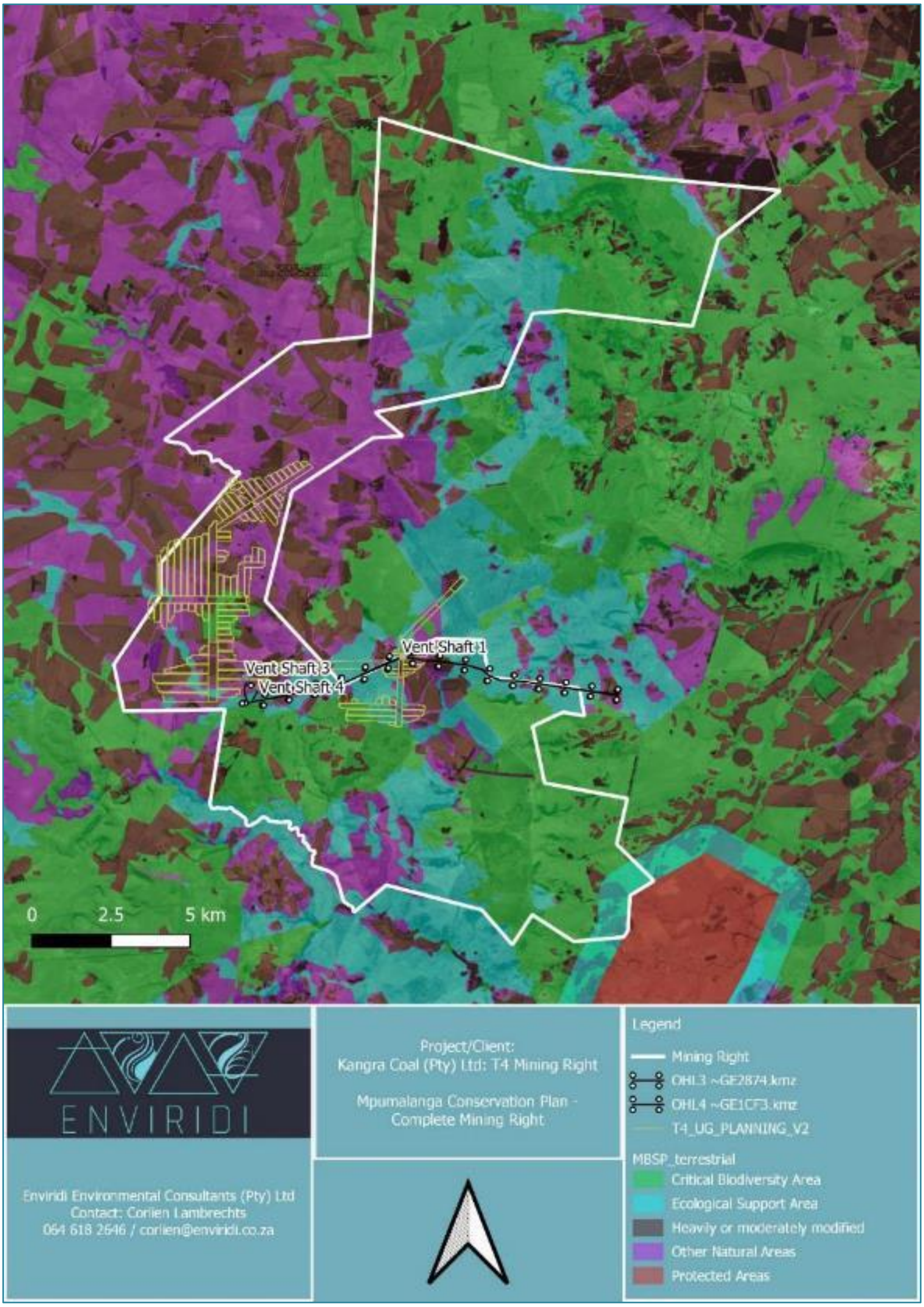

Figure 72: Mpumalanga Conservation Plan (Terrestrial Biodiversity Assessment) – Complete Mining Right

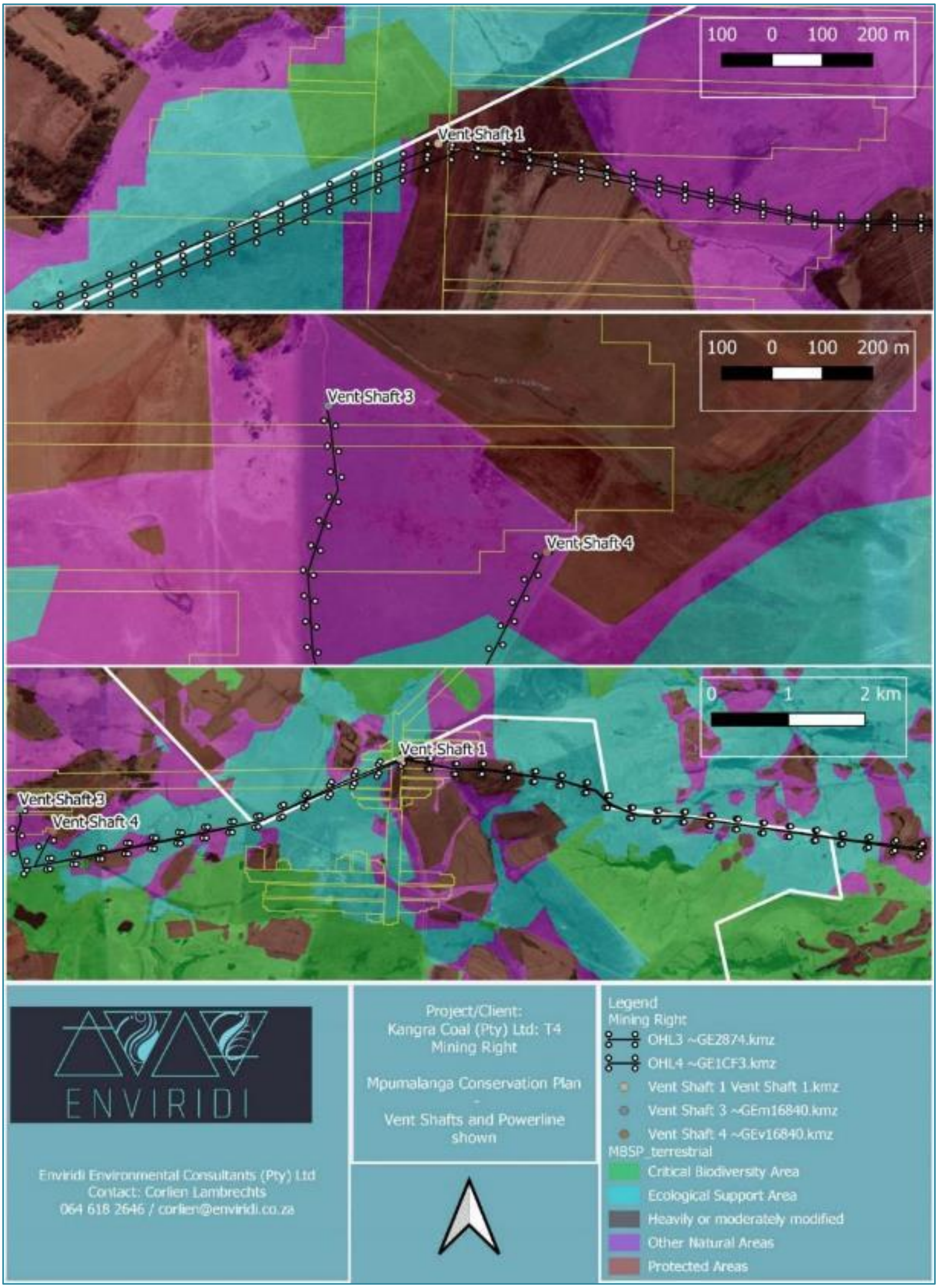

Figure 73: Mpumalanga Conservation Plan (Terrestrial Biodiversity Assessment) – Close up of Shafts and Powerline

Critical Biodiversity Areas (CBAs): Critical Biodiversity Areas are those areas (outside of Protected Areas) that are required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. They should remain in a natural state that is maintained in good ecological condition. CBAs are areas of high biodiversity value, but are often also at risk of being lost through biodiversity-incompatible land-use practices. CBAs include, inter alia, Critically Endangered Ecosystems and critical linkages (corridor pinch-points) to maintain connectivity.

Ecological Support Areas (ESAs): Ecological support areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of critical biodiversity areas or for generating or delivering important ecosystem services. They support landscape connectivity and resilience to climate change adaptation. ESAs need to be maintained in at least an ecologically functional state.

Other Natural Areas (ONA): These are natural areas that have not been selected to meet biodiversity pattern or ecosystem process targets, or to support the functioning of Critical Biodiversity Areas. Despite this, they are not without 'value'. ONAs often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP, unless CBAs or ESAs are lost, or impacting activities within the ONAs impact negatively on other areas.

Modified ('Transformed'): Modified areas (often called 'transformed' areas in other literature, including the MBCP) are those which have lost a significant proportion (or all) of their natural biodiversity and in which ecological processes have broken down (in some cases irretrievably), as a result of biodiversity-incompatible land-use practices such as ploughing, hardening of surfaces, mining, cultivation and the construction of houses or other built infrastructure. Even so, these areas may include small fragments of natural habitat such as the patches or strips of natural vegetation that survive between planted fields or the small, natural open spaces in towns. These disconnected fragments are often biologically impoverished, highly vulnerable to damage and have limited likelihood of being able to persist, though they may retain some residual biodiversity value and ecological function. They are not generally considered a priority for conservation action unless they contain unique features that demand it.

The study area contains the following classes from the MBSP:

- ESA: The majority of the project footprint and 100 m extended footprint buffer is located on ESAs. These areas were most likely denoted as ESAs due to their importance for connectivity and ecological support functions for nearby CBAs and conservation areas. The delineation of VU1 and VU2 is fairly well correlated to the ESA areas associated with the project footprint.
- ONA and modified: ONA and Modified are related to areas delineated as VU2.
- The powerlines fall within combinations of Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas and Heavily or moderately modified zones.

The Mabola Protected Environment, which is protected in terms of the NEMPAA, is situated approximately 6.5 km south-east of the project footprint. The eastern section of the powerline route is located in an area earmarked for the NPAES, Moist Escarpment Grasslands.

The area in which the project footprint is situated is classified as Highest Biodiversity Importance by the Mining Biodiversity Guidelines.

10.9.3.7 Site Characteristics

The Mining Right falls over four (4) QDS features, which has been included within this report, however, activities associated with the ventilation shafts and the bulk of the MR fall exclusively within 2730AA. The powerline falls within both 2730AA and 2730AB as shown below in Figure 74.

Information on plant species recorded for the Quarter Degree Squares (QDS) was extracted from the POSA online database hosted by SANBI. A list of plant species that have a high probability of occurring in the relevant QDS(s) is provided in Appendix B: POSA FLORA SPECIES LIST FOR QDS of the Terrestrial Ecological Assessment Report attached as Appendix 13.

A section of the Mining Right has been identified as an Ecological Corridor (Figure 75), which corresponds to the ridges and mountainous areas occurring as identified to the far north-east and far south-east. No aquatic corridor occurs close to or within the MR. Both Ventilation shaft focus areas do not intercept with the Corridor and no direct impacts to the corridor are expected.

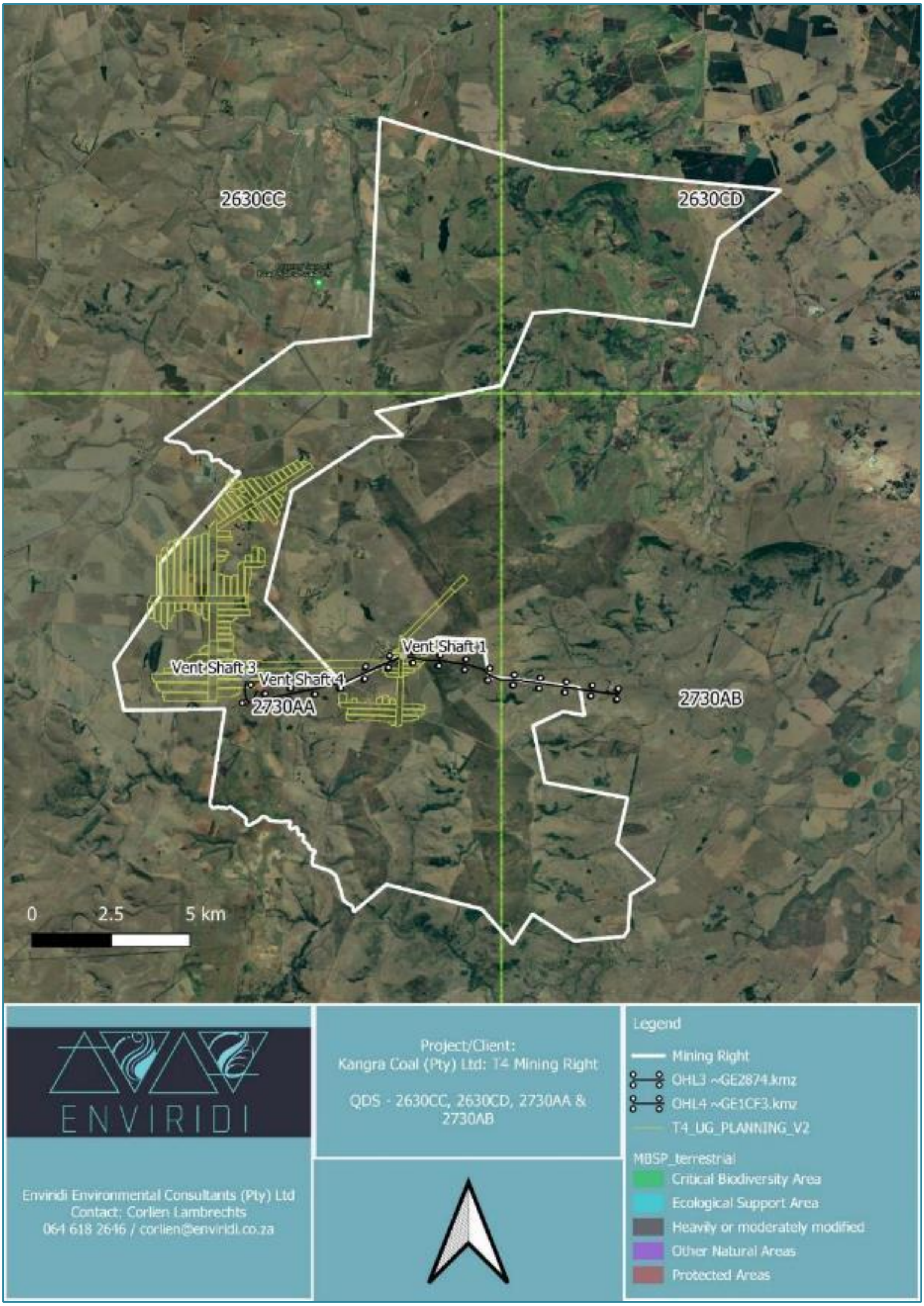

Figure 74: Quarter Degree Squares (QDS) – 2630CC, 2630CD, 2730AA and 2730AB

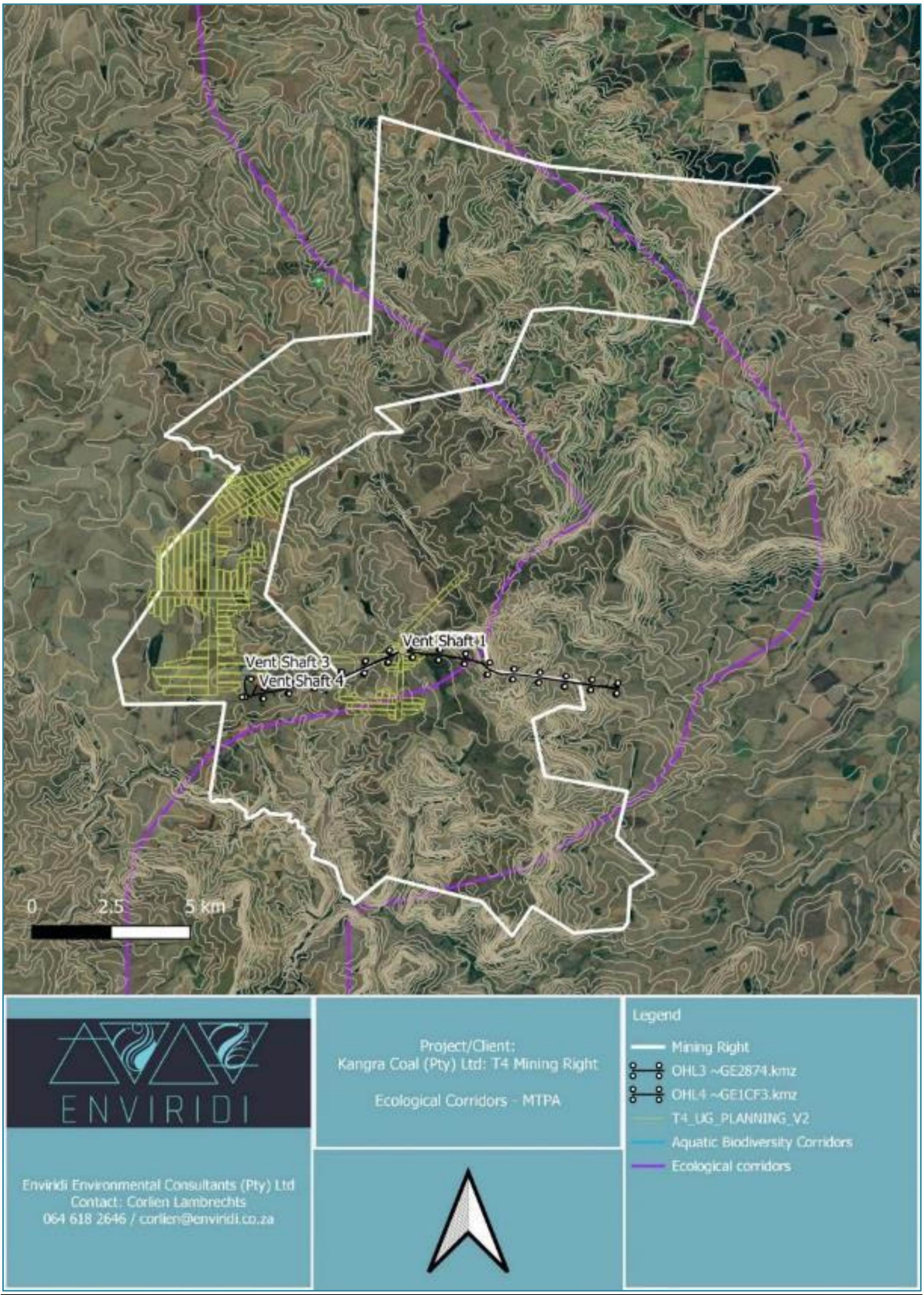

Figure 75: Mpumalanga Parks Board – Ecological Corridors

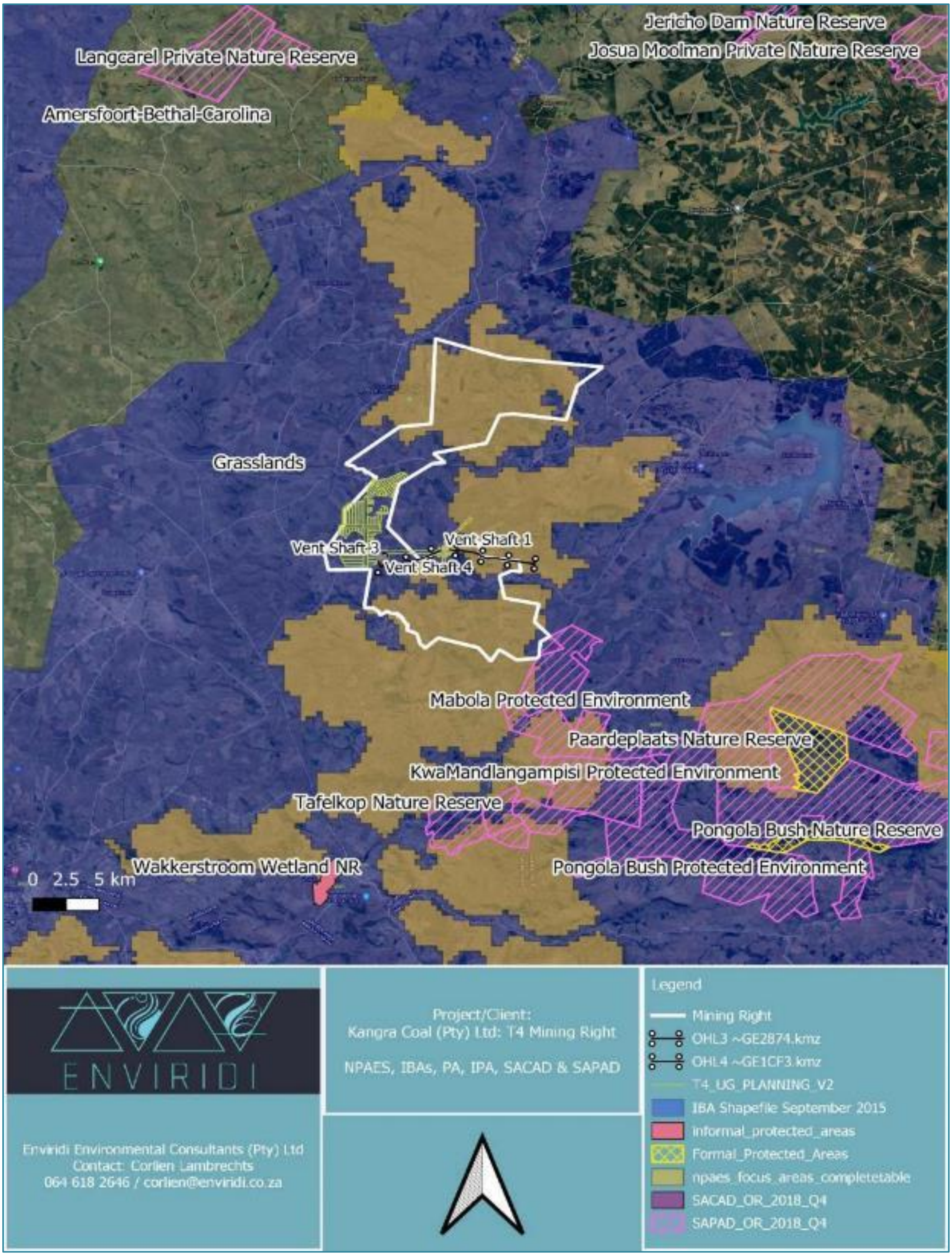

Figure 76: Important Biodiversity and Birding Areas and Protected Areas (NPAES and IBAs)

The Mining Right areas falls within the Grassland Important Birding Area (Refer to

Figure 76).[44] This IBA (ZA016) spans across 1,050,000 ha and this large area holds a significant proportion of South Africa's small known population of the globally endangered White-winged flufftail (Sarothrura ayresi). Three wetlands within the proposed Biosphere Reserve are known or thought regularly to hold Sarothrura ayresi in seasons of suitable rainfall. Corn crake (Crex crex) is also regular at some of the reserve's wetlands. Seekoeivlei supports large numbers of a rich diversity of resident and migratory waterbirds.

The IBA also holds all three of South Africa's crane species, including important numbers of Wattled crane (Grus carunculatus). Heyshope Dam is known to hold extremely large numbers of at least 52 species of resident, migratory and nomadic waterbirds. Small portions of the dam, which are regularly counted, hold up to 45,000 waterbirds, suggesting that the entire system may hold an extrapolated total of some 100 000 individuals.

Of the terrestrial birds, most of South Africa's threatened and endemic grassland species have their core populations centred on the proposed Biosphere Reserve. An estimated 85% of the global population of Rudd's lark (Heteromirafra ruddi) is thought to occur within the proposed reserve. Botha's lark (Spizocorys fringillaris), which also occurs within this site, is highly localized within moist clay highveld grassland on black clays or dolerite soils. Yellow-breasted pipit (Anthus chloris) favours mid-altitude, well-developed lightly grazed or ungrazed grassland. The largest breeding colonies of Southern bald ibis (Geronticus calvus) in the world occur within the proposed Biosphere Reserve. Large numbers also forage and roost throughout the area. Blue crane (Grus paradisea), Denham's bustard (Neotis denhami) and White-bellied bustard (Eupodotis senegalensis) are widespread at low densities. Black-winged pratincole (Glareola nordmanni) occasionally occurs in very large numbers during the austral summer. On exposed outcrops and rocky slopes at higher altitudes, African rock pipit (Anthus crenatus), Ground woodpecker (Geocolaptes olivaceus), Buff-streaked chat (Saxicola bifasciata) and Sentinel rock thrush (Monticola exploratory) are common. Gurney's sugarbird (Promerops gurneyi) is found around proteoid woodland on the escarpment, and Black stork (Ciconia nigra) breeds on steep cliffs. Pongola Bush Nature Reserve and other forest patches hold Chorister robin-chat (Cossypha dichroa), Forest canary (Serinus scotops), Bush blackcap (Lioptilus nigricapillus) and Orange ground thrush (Zoothera gurneyi).

Non-bird biodiversity: North-eastern mountain grassland holds 78 endemic and near-endemic plant species on the Black Reef quartzites, and there are a further 31 endemics on dry dolomite. Most of these endemics are present within the site. Many endemic animals also occur here.

10.9.4 Flora Assessment and Species lists compiled

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 is provided in Appendix B of the Terrestrial Ecological Assessment attached as Appendix 13. The results indicate that 627 plant species have been recorded in the area queried, consisting of ninety-one (91) families. The most prominent family is Asteraceae, with ninety-three (93) species, followed by Poaceae with (seventy-one) 71 species (see Table 66). Forty-one (41) endemic species and thirty-seven (37) exotic species are known to occur within the area queried.

[44] BirdLife International (2020) Important Bird Areas factsheet: Grasslands. Downloaded from http://www.birdlife.org on 22/04/2020.

Table 66: Floral species summary for area queried (POSA)

Number of families	Number of species	SCC	Endemic	Exotic species
91	627	7	41	37

Of the 627 species previously recorded for the area, seven (7) are Species of Conservation Concern (SCC) in terms of their Red List status.

Table 67 below list the SCC recorded for the area on the POSA database along with the likelihood of the species occurring on the project footprint. Note that none of these SCC were identified to occur on site during the site survey.

Table 67: Flora SCC recorded for the area on POSA

Species	SCC Status	Likelihood of occurrence
Aloe kniphofioides	Red list: VU	**Moderate likelihood of occurrence in VU1 and VU3.** *Aloe kniphofioides* grows in high altitude grasslands, which includes Paulpietersburg Moist Grasslands and Wakkerstroom Montane Grassland. Occurring in stony ground and damp grass places
Asclepias bicuspis	Red list: CR	**Very unlikely to occur.** Although listed on POSA as recorded on the area queried, this species has a very restricted area of occurrence in KwaZulu-Natal.
Brachystelma longifolium	Red list: VU	**Very unlikely to occur.** Although listed on POSA as recorded on the area queried, this species has a very restricted area of occurrence in the Elandspruit, Morgenzon and Amersfoort vicinity. It is described as growing in Steenkampsberg Montane Grassland, Barberton Montane Grassland and KaNgwane Montane Grassland.
Indigofera hybrida	Red list: VU	**Low likelihood of occurrence in VU1.** Described as occurring on dry highveld grassland, with a range between Ermelo and Wakkerstroom. It is recorded as growing in KaNgwane Montane Grassland and Eastern Highveld Grassland.
Merwilla plumbea	Red list: NT ToPS: Vulnerable	**Moderate likelihood of occurrence in VU1 and VU3.** A highly sought-after species that has been exploited over most of its range for medicinal use. It is widespread in the eastern half of South Africa, specifically KwaZulu-Natal and Mpumalanga. Occurs in montane mistbelt and Ngongoni grassland. It is found growing in a variety of habitats from sunny slopes, rocky hills, cliffs and ledges, to damp cliff faces, near waterfalls, in moist depressions, on the edges of streams and vleis (wetlands) to coastal areas, in groups or

Species	SCC Status	Likelihood of occurrence
		as solitary specimens.
Nerine platypetala	Red list: VU	**Moderate likelihood of occurrence in VU3.** Occurs in Wakkerstroom Montane Grassland, from Wakkerstroom to Groenvlei. Grown in Montane grassland, margins of permanently moist vleis and levees of river banks.
Protea parvula	Red list: NT	**Low likelihood of occurrence in VU1.** Its recorded range is the Drakensberg Escarpment in Swaziland, Mpumalanga and KwaZulu-Natal from Mariepskop to Vryheid, in Long Tom Pass Montane Grassland, Steenkampsberg Montane Grassland, Northern Escarpment Quartzite Sourveld, Barberton Montane Grassland, KaNgwane Montane Grassland, and Wakkerstroom Montane Grassland. It grows on rocky, exposed grassland on acid soils.

Twenty-six (26) of the species recorded on POSA for the area are listed as protected in the MNCA:

- *Agapanthus inapertus*
- *Aloe ecklonis*
- *Aloe hlangapies*
- *Aloe kniphofioides*
- *Aloe maculata*
- *Brachystelma longifolium*
- *Brachystelma rubellum*
- *Ceropegia meyeri*
- *Cyrtanthus breviflorus*
- *Cyrtanthus tuckii*
- *Gladiolus appendiculatus*
- *Gladiolus crassifolius*
- *Gladiolus longicollis*
- *Gladiolus papilio*
- *Gladiolus sericeovillosus*
- *Haemanthus humilis*
- *Hesperantha coccinea*
- *Kniphofia albescens*
- *Kniphofia laxiflora*
- *Kniphofia linearifolia*
- *Podocarpus latifolius*
- *Protea parvula*
- *Protea subvestita*
- *Watsonia latifolia*
- *Watsonia pulchra*
- *Watsonia watsonioides*

The POSA records for the area list one species protected in terms of the NFA, i.e., Podocarpus latifolius.

One species recorded for the area is listed in terms of the ToPS list, i.e., *Merwilla plumbea*.

Of the thirty-seven (37) exotic plant species recorded on POSA for the area queried, nine are listed as alien and invasive plant (AIP) species in NEMBA, 2004 (Act 10 of 2004):

- *Acacia dealbata*
- *Agrimonia procera*
- *Cirsium vulgare*
- *Phytolacca octandra*
- *Solanum pseudocapsicum*
- *Verbena bonariensis*
- *Verbena brasiliensis*
- *Verbena rigida*
- *Xanthium strumarium*

Twenty-six (26) species were found to possibly occur on site that have medicinal uses:

- *Arctotis arctotoides*
- *Centella asiatica*
- *Clematis brachiata*
- *Conyza scabrida*
- *Diospyros lycioides*
- *Gerbera piloselloides*
- *Gomphocarpus fruticosus*
- *Helichrysum nudifolium*
- *Heteromorpha arborescens*
- *Hyparrhenia hirta*
- *Melianthus comosus*
- *Merwilla plumbea*
- *Nuxia congesta*
- *Pelargonium luridum*
- *Pellaea calomelanos*
- *Pentanisia prunelloides*
- *Ranunculus multifidus*
- *Rumex lanceolatus*
- *Sandersonia aurantiaca*
- *Scabiosa columbaria*
- *Searsia dentata*
- *Solanum retroflexum*
- *Teucrium trifidum*
- *Trichilia emetica*
- *Vachellia karroo*
- *Xysmalobium undulatum*

10.10 FAUNA ASSESSMENT AND SPECIES LISTS COMPILED

The faunal assessment was also conducted by Enviridi Environmental Consultants and is included in Appendix 10 of the report.

A baseline assessment was conducted to establish whether any potentially sensitive species might occur on site. The Virtual Museum and Animal Demography Unit (ADU) was used to compile species lists based on the sightings and data gathering from the South African Biodiversity Institute. Aerial photographs and satellite imagery were used to delineate potential sensitive areas before the field visit, specifically where the surface impacts are expected and within a 100-200m buffer of the ventilation shafts. This served as the foundation for selecting various sample sites for field surveying.

Since the Mining Rights falls over four (4) Quarter Degree Squares, all four (4) have been included as part of the baseline and desktop assessment of the Mining Right Area.

10.10.1 Mammals

2630CC and CD recorded a total of twenty-one (21) species. 2730AA and AB lists a total of fourteen (14) records. However, some species have been recorded within various QDS and therefore the data reflects re-occurring records and aligning the data towards a specieslist, indicates the possible occurrence of thirty (30) mammalian species within the larger Mining Right Area. Refer to Table 68 below.

Table 68: Mammal species with a red listed status that would possibly occur in the area

Family	Scientific name	Common name	Red list category	QDS
Muridae	*Dasymys incomtus*	Common Dasymys	Near Threatened (2016)	2630CC
Bovidae	*Ourebia ourebi*	Oribi	Endangered	2630CD / 2730AA
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)	2730AB
Rhinolophidae	*Rhinolophus swinnyi*	Swinny's Horseshoe Bat	Vulnerable (2016)	2730AB
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)	2730AB

All of these species are likely to occur within the larger project site.

Table 69: Other species that could occur within the Region based on Grassland Habitat and Distribution (Not listed on SANBI Database for specific QDS)

Scientific Name	Common Name	Status	POC[45]	Habitat
Mammals				
Amblysomus robustus	Robust Golden Mole	Endangered	Could occur	Edge of peatlands and seep zones.
Amblysomus sp. nr. A. hottentotus	Hottentot Golden Mole	Data Deficient	Widespread	Sandy soils.
Chrysospalax villosus	Rough-haired Golden Mole	Critically Endangered	Could occur	Sandy soils along the edge of peatlands and seep zones.
Crocidura cyanea	Reddish-Grey Musk Shrew	Data Deficient	High	Dry terrain among rocks in dense scrub and grass, in moist places

[45] Probability of Occurance

				and in hedges. Wet vleis with good grass cover.
Crocidura flavescens	Greater Musk Shrew	Data Deficient	High	Mainly in disturbed areas and gardens.
Crocidura mariquensis	Swamp Musk Shrew	Data Deficient	High	Moist habitats, e.g., thick grass along riverbanks, reedbeds and in swamps.
Crocidura silacea	Lesser Grey-brown Musk Shrew	Data Deficient	High	Rocky areas in grassland.
Dasymys incomtus	African Marsh Rat	Near-threatened	Possible	Along rivers, streams and seeps with Typha and Phragmites.
Lutra maculicollis	Spotted-necked Otter	Near-threatened	High	Clear-flowing rivers and streams, especially upland rocky streams.
Myosorex cafer	Dark-footed Forest Shrew	Data Deficient	Could occur	Damp forested habitat.
Myosorex varius	Forest Shrew	Data Deficient	High	Confined to wetland habitats especially bogs, fens and swamps bordering grassland.
Ourebia ourebi	Oribi	Endangered	High	Upland grassland of primary condition and with a mosaic of tall and short grasses.
Panthera pardus	Leopard	Near-threatened (IUCN)	Possible, at extremely low densities	Varied and tolerant to a high diversity of habitat types. It is known that most Leopards occur outside protected areas due to their large range requirements.
Parahyaena brunnea	Brown Hyaena	Near-threatened (IUCN)	Possible, at extremely low densities	A savanna and grassland species, sometimes penetrating urban areas.
Reptiles				
Acontias breviceps	Short-headed Legless-skink	Near-threatened	High	Montane grassland
Homoroselaps dorsalis	Striped Harlequin Snake	Near-threatened	Possible	Outcrops and disused termitaria in grassland.
Tetradactylus breyeri	Breyer's Long-tailed Seps	Vulnerable	Possible	Short grassland and rocky areas in upland grassland.
Invertebrates				
Metisella meninx	Marsh Sylph	Vulnerable	High	Could occur along the many drainage lines, depending on the distribution of their host plant, *Leersia hexandra*.
Opistacanthus validus		Protected	High	Quartzite and sandstone rock exfoliations.

10.10.2 Avifaunal

Ventshaft 3 & 4 and a section of the powerline falls within 2700_3010 while the other part and Ventshaft 1 falls within 2705_3010 and 2705_3015 is also affected. These pentads have been combined to provide the Avifaunal data utilized within the desktop assessment.

Combined Hundred and eighty-six (186) species have been recorded for the combined specific pentads (three pentads were used to ensure adequate coverage over the areas where surface impacts may occur) from the data collected within the Southern African Bird Atlas Project 2 (SABAP2).

The following Avifaunal species found in the region are considered Red listed as referenced in the various databases utilised. Fifteen (15) species of conservation concern could occur associated with the Kangra Coal farms included within the application as indicated in Table 70.

Table 70: Avi-faunal species of Conservation concern and Endemic status

Common name	Scientific Name	Regional	Global
Bustard, Denham's	*Neotis denhami*	VU	NT
Crane, Blue	*Anthropoides paradiseus*	NT	VU
Crane, Grey Crowned	*Balearica regulorum*	EN	EN
Duck, Maccoa	*Oxyura maccoa*	NT	VU
Eagle, African Crowned	*Stephanoaetus coronatus*	VU	NT
Falcon, Lanner	*Falco biarmicus*	VU	LC
Ibis, Southern Bald	*Geronticus calvus*	VU	VU
Kingfisher, Half-collared	*Alcedo semitorquata*	NT	LC
Korhaan, Blue	*Eupodotis caerulescens*	LC	NT
Korhaan, White-bellied	*Eupodotis senegalensis*	VU	LC
Pipit, Yellow-breasted	*Anthus chloris*	VU	VU
Rock-thrush, Sentinel	*Monticola explorator*	LC	NT
Secretarybird, Secretarybird	*Sagittarius serpentarius*	VU	VU
Stork, Black	*Ciconia nigra*	VU	LC
Sugarbird, Gurney's	*Promerops gurneyi*	LC	NT

Although not reported per pentads identified for the project, Grassland habitats are also important possible habitat for the *Tyto capensis* (African Grass owl) and these could also be expected in the types of habitat found in the area.

10.10.3 Butterflies

Only 2730AA and AB had historic recordings for butterflies within this region, of which only one (1) species has a SCC status as per National Red Data List (South Africa Butterfly Conservation Assessment - SABCA 2013). Refer to Table 71.

Table 71: Butterfly species with a red listed status that would possibly occur in the area

Family	Scientific name	Common name	Red list category	QDS
Nymphalidae	*Dingana alaedeus*	Wakkerstroom widow	Near Threatened (SABCA 2013)	2730AB

The total amount of butterfly species recorded for the Mining Right Area amounts to twenty-nine (29) species.

10.10.4 Other Invertebrates

Only 2730AA & AB and 2730AA & AB had no historic recordings for Lacewing or Dungbeeltes within this region.

2630CC and CD recorded a total of twenty-eight (28) records of Odonata. 2730AA and AB lists a total of fifty-eight (58) records. No records reflect a species with a SCC status.

Aligning the Odonata species to exclude re-occurring records between the different QDS, indicates the occurrence of forty-nine (49) species within the Mining Right Area.

10.10.5 Reptiles

2630CC and CD recorded a total of twenty-one (21) species, with no species listed as SCC. 2730AA and AB lists a total of twenty (20) species, of which also no species are listed with a SCC status. Aligning the species to exclude re-occurring records between the different QDS, indicates the occurrence of twenty-two (22) Reptile species within the Mining Right Area.

10.10.6 Amphibians

2630CC and CD recorded a total of twenty-three (23) species, with none listed as SCC. 2730AA and AB also lists a total of twenty-three (23) species. No species has a SCC status. Aligning the species to exclude re-occurring records between the different QDS, indicates the occurrence of fifteen (15) amphibian species within the Mining Right Area.

10.10.7 Species that could occur based on Grassland Habitat and Location

Table 72 indicates other species that could occur within the region as per the SANBI distribution list.

Table 72: Other species that could occur within the Region based on Habitat and Distribution (Not listed on SANBI Database for specific QDS)

Scientific Name	Common Name	Conservation Status	Probability of Occurrence	Habitat
Mammals				
Amblysomus robustus	Robust Golden Mole	Endangered	Could occur	Edge of peatlands and seep zones.
Amblysomus sp. nr. A. hottentotus	Hottentot Golden Mole	Data Deficient	Widespread	Sandy soils.
Chrysospalax villosus	Rough-haired Golden Mole	Critically Endangered	Could occur (Belfast region)	Sandy soils along the edge of peatlands and seep zones.
Crocidura cyanea	Reddish-Grey Musk Shrew	Data Deficient	High	Dry terrain among rocks in dense scrub and grass, in moist places and in hedges. Wet vleis with good grass cover.
Crocidura flavescens	Greater Musk Shrew	Data Deficient	High	Mainly in disturbed areas and gardens.

Crocidura mariquensis	Swamp Musk Shrew	Data Deficient	High	Moist habitats, e.g. thick grass along riverbanks, reedbeds and in swamps.
Crocidura silacea	Lesser Grey-brown Musk Shrew	Data Deficient	High	Rocky areas in grassland.
Dasymys incomtus	African Marsh Rat	Near Threatened	Possible	Along rivers, streams and seeps with Typha and Phragmites.
Lutra maculicollis	Spotted-necked Otter	Near Threatened	High	Clear-flowing rivers and streams, especially upland rocky streams.
Myosorex cafer	Dark-footed Forest Shrew	Data Deficient	Could occur	Damp forested habitat.
Myosorex varius	Forest Shrew	Data Deficient	High	Confined to wetland habitats especially bogs, fens and swamps bordering grassland.
Ourebia ourebi	Oribi	Endangered	High	Upland grassland of primary condition and with a mosaic of tall and short grasses.
Reptiles				
Acontias breviceps	Short-headed Legless-skink	Near Threatened	High	Montane grassland
Homoroselaps dorsalis	Striped Harlequin Snake	Near Threatened	Possible	Outcrops and disused termitaria in grassland.
Tetradactylus breyeri	Breyer's Long-tailed Seps	Vulnerable	Possible	Short grassland and rocky areas in upland grassland.
Invertebrates				
Metisella meninx	Marsh Sylph	Vulnerable	High	Could occur along the many drainage lines, depending on the distribution of their host plant, *Leersia hexandra.*
Opistacanthus validus		Protected	High	Quartzite and sandstone rock exfoliations.

10.10.8 Sensitive Analysis for Terrestrial Ecology

The objective of a sensitivity mapping exercise is to determine the location and extent of all sensitive areas that must be protected from transforming land uses. The site sensitivity has been found to be ranging between low-high in general based on current condition and impacts already present.

The known Vegetation Groups, the Conservation plan and the field assessment were used as a general guideline to determine the conservation targets and current conservation of the area to be impacted by the activities (Please refer to Figure 68 and Figure 72 for a visual illustration).

The study area contains the following classes from the MBSP:

- ESA: The majority of the project footprint and 100 m extended footprint buffer is located on ESAs. These areas were most likely denoted as ESAs due to their importance for connectivity and ecological support functions for nearby CBAs and conservation areas. The delineation of VU1 and VU2 is fairly well correlated to the ESA areas associated with the project footprint.
- ONA and modified: ONA and Modified are related to areas delineated as VU2.

Mpumalanga grasslands, especially those still considered primary grasslands, are known to be floristically diverse and associated with protected herbaceous plants such as arum lilies, red hot pokers, aloes, watsonias, gladiolii, orchids; as well as many medicinal and culturally significant species (MTPA, 2014).

VU1 is classified as having a high sensitivity due to VU1 consisting of natural grassland with low levels of disturbance and connectivity to surrounding vegetation is present. VU1 is also considered to be of high sensitivity as it fulfils the ecological functions of an Ecological Support Area, as designated in the MNCA. It is considered suitable habitat for the SCC, Aloe kniphofioides (Red list: VU) and Merwilla plumbea (Red list: NT and ToPS: Vulnerable). Neither of these species were identified to occur on the project footprint but are considered to have a moderate likelihood of occurrence.

VU2 is classified as having a moderate sensitivity due to VU2 consisting largely of natural vegetation with moderate to high levels of disturbance and connectivity to surrounding vegetation is present. VU2 is also considered to be of moderate sensitivity as current disturbances, such as heavy livestock grazing, crop cultivation and other anthropogenic disturbances, are likely to continue to impact on the vegetation structure of the VU. VU2 is currently not considered as suitable habitat for any SCC.

Watercourses and wetlands (VU3) are considered to be of high sensitivity. The vegetation in VU3 is considered to be largely natural with low levels of disturbance to vegetation character. VU3 is also considered to be of high sensitivity as it fulfils the ecological functions of an Ecological Support Area, as designated in the MNCA. VU3 is also considered to be suitable habitat for the SCC, Aloe kniphofioides (Red list: VU), Merwilla plumbea (Red list: NT and ToPS: Vulnerable) and Nerine platypetala (Red list: VU). None of these species were identified to occur on the project footprint but are considered to have a moderate likelihood of occurrence.

The area in which the project footprint is situated is classified as Highest Biodiversity Importance by the Mining Biodiversity Guidelines.

The sensitivity has been delineated as follows:

- VU1 – High sensitivity (montane grassland – low disturbance)
- VU2 – Moderate sensitivity (montane grassland - moderate to high disturbance)
- VU3 – High sensitivity (riparian or watercourses, excluding wetlands)

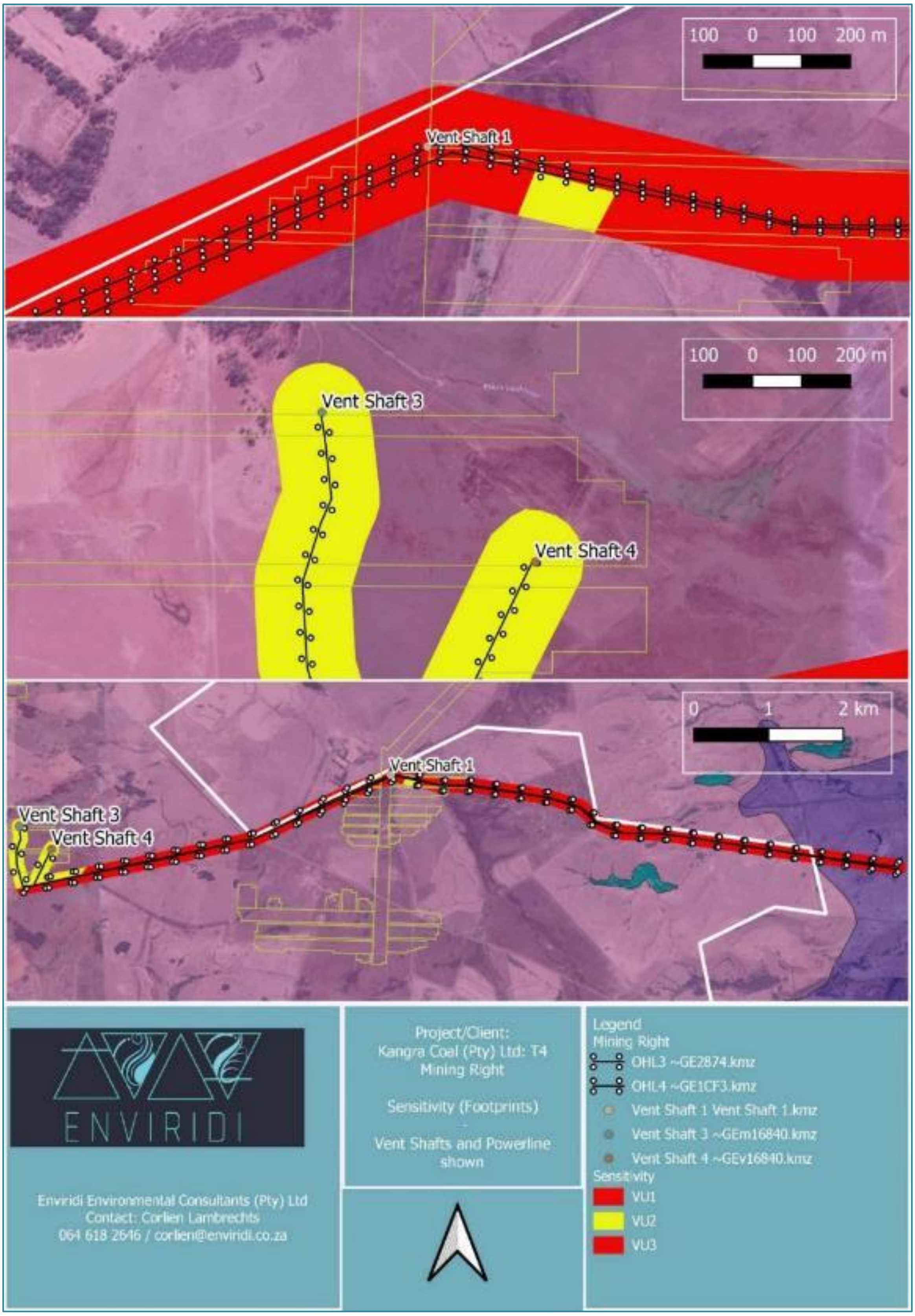

Figure 77: Sensitivity delineated according to habitat remaining condition thereof (including other ecological considerations)

Opposed to the field supported sensitivity delineated above, the following is provided in accordance with the National Screening Tool (refer to Figure 78 to Figure 80), which needs to be considered as per minimum requirements for Ecological and Terrestrial Biodiversity Assessments.

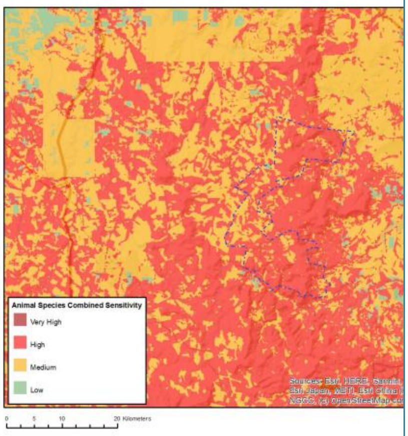	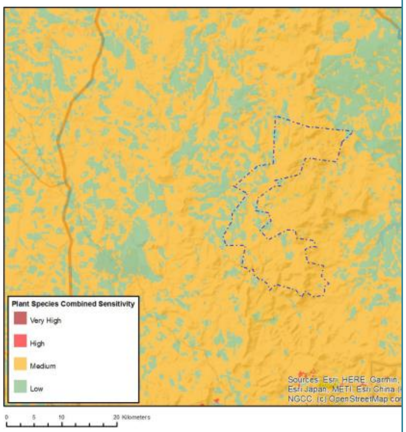	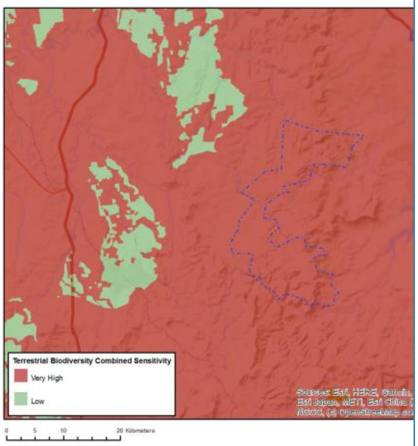
Figure 78: Animal Species Sensitivity – National Screening Tool	**Figure 79: Plant Species Sensitivity – National Screeening Tool**	**Figure 80: Terrestrial Biodiversity Sensitivity – National Screening Tool**

10.10.8.1 Results of the Terrestrial Faunal Assessment

10.10.8.1.1 <u>Habitat integrity and Faunal species found</u>

Species were recorded as sighted and occurrence verified based on signs and dung. The areas surveyed focussed mainly on the areas where surface impacts would occur, which included the areas focussed surrounding the Ventilation shafts and powerline. The larger Mining Right area (where no surface activities will commence (only underground mining) were spot checked, specifically the sensitive ecological features identified during the desktop and based on arial footage, but no impacts are expected for the larger Mining Right area on the fauna or floral composition of the area since impacts will be focussed mainly where surface activities will occur.

Large sections of the area under investigation consisted of primary and secondary (impacted) grassland which primary usage seemed to consist of cattle farming and grazing practices by the local communities and farmers.

The faunal investigation provides a description of the ecological diversity in terms of species identification as well as the occurrence of threatened/sensitive species that is dependent on available habitat. During the desktop analysis, it was determined that several Red Data species were listed on the South African National Biodiversity database (SANBI) for the QDS that encompass the specific area. These consisted of Avifaunal species and possible, red-listed mammals associated with grassland and riverine areas on the property.

The most important species of concern that will lead the management is determined to be:

- Species with specialised niches (riverine, ridges or wetland areas);
- Species with large range requirements (grazing mammals);

- Species that have limited adaptation capabilities (such as reptile niches);
- Migrating species (importance of the ecological and aquatic corridor); and
- Species that use the different grassland areas as part of their larger range or preferred habitat (predatory species).

Sensitive invertebrate species are expected to be associated with the grassland and rocky areas as these represent specialised niches.

Many conservation worthy animals occur within the area, but the overall most important feature will be the protection of the water resources, wetlands and natural grasslands within the area, it will by default protect all other endemic, sensitive and specialised species found to occur within the area. Fortunately, none of these areas will be impacted by surface impacts as the mine is an underground mine with only surface impacts expected where the Ventilation shafts are proposed.

The Grass owl (*Tyto capensis*) species is not thought to occur where the development is planned since the habitat within the areas of direct influence are agricultural lands and close to farmer property and this is not an ideal habitat for this species, which prefers very thick grassland vegetation, since they make nest on the ground in areas of long grass. The larger Mining Right do have suitable habitat for these species, however not encountered during the field survey.

The habitat (river systems and connected dams) could also be ideal for otter species and spraints were found at the Klein-Vaal river during the field assessment to the north of the Ventilation shaft 4.

The faunal investigation provides a description of the ecological diversity in terms of species identification as well as the occurrence of threatened/sensitive species that is dependent on available habitat. Several National Species of Conservation Concern (SCC) were sighted or thought to occur due to the nature of the vegetation units and associated habitat as shown above. Those listed provincially are all species that have provincial protection against being hunted or could be hunted with landowner consent. However, since these species will not need relocation, or be hunted or directly impacted, these will not require the application for permits.

10.10.8.1.2 Important Birding (and Biodiversity) Areas - IBAs

The Mining Right areas falls adjacent to the Grassland Important Birding Area. This large area is centred on the towns of Volksrust, Wakkerstroom and Memel. The southern boundary extends to Newcastle and Utrecht, the northern boundary to Amersfoort and the western boundary to about 10 km east of Vrede.

The area covers several catchments and holds many perennial rivers and wetlands. Five of these wetlands are of international importance and deserve the highest possible conservation attention. Wakkerstroom Vlei (27° 22′ S; 30° 07′ E), a proposed Ramsar site, lies at the north-western edge of the town of Wakkerstroom. The permanently wet centre of this 700-ha vlei is surrounded by a belt of sedge marsh that is often extensive and itself lies on permanently to seasonally flooded ground. This marsh grades into a narrow zone of sedge meadow and then into a large tract of wet grassland. The vlei contains very little open water; the largest area is in the north-eastern corner, close to the Amersfoort road.

The second wetland is Seekoeivlei Nature Reserve (27° 35′ S; 29° 35′ E), a Ramsar site situated in the north-eastern Free State near the town of Memel. The vlei consists of a floodplain holding numerous seasonally flooded oxbow lakes, which are drained by the Klip River, a tributary of the Vaal. The wetland area stretches northward for 20 km to where the Klip River floodplain narrows, making it the largest floodplain on the Highveld. The vlei holds much open water, often shallow, with extensive fringing vegetation and some relatively small patches of emergent vegetation.

Heyshope Dam is a large impoundment in the Assegaai River catchment of south-eastern Mpumalanga, located 60 km north-east of Wakkerstroom and about 30 km west of Piet Retief. Built for the transferral of water from the Usutu catchment to the Vaal catchment, it lies at an altitude of 1 300 m a.s.l. and, with a surface area of 12 000 ha, is the sixth largest storage dam in South Africa. The land surrounding the dam is mainly agricultural, used for the production of beef and maize, and two informal settlements, Driefontein and Kangema, adjoin the dam. The grass along the dam's gently sloping shoreline is either severely grazed or grows rank along with weeds.

The privately owned Vanger Natural Heritage Site (27° 52′ S; 29°40′ E), which lies 30 km south-east of Memel, supports the fourth important wetland. About 2 km long, this permanently flooded wetland is fringed by vegetation that was once heavily grazed but is now being allowed to regenerate. In terms of the richness of its palustrine wetland habitats, this site is probably better than most high-altitude wetlands in South Africa and should be regarded as significant in national and global terms. The fifth important wetland is Blood River Vlei (27° 47′ S; 30° 35′ E), which lies 20 km south-west of Vryheid. Several other small but significant wetlands are scattered throughout the IBA.

Birds

This area holds a significant proportion of the small population of the globally endangered White-winged Flufftail Sarothrura ayresi that has been recorded in South Africa. The species is known, or thought, to occur regularly at three wetlands in the IBA in seasons of suitable rainfall. Corn Crake Crex crex also occurs regularly at some of the wetlands. The various wetland systems hold large numbers of Little Bittern Ixobrychus minutus, Baillon's Crake Porzana pusilla, Red-chested Flufftail Sarothrura rufa and African Rail Rallus caerulescens, as well as several breeding populations of African Marsh Harrier Circus ranivorus, Grey Crowned Crane Balearica regulorum and African Grass Owl Tyto capensis.

Seekoeivlei supports large numbers of a rich diversity of resident and migratory waterbirds. All three of South Africa's crane species, including important numbers of Wattled Crane Bugeranus carunculatus, are found in the reserve and surrounding farmlands. Globally significant numbers of Yellow-billed Duck Anas undulata and Spur-winged Goose Plectropterus gambensis also occur at Seekoeivlei. Eurasian Bittern Botaurus stellaris has been recorded here in the past. The area holds several active heronries comprising breeding egrets, African Spoonbill Platalea alba and Black-crowned Night Heron Nycticorax nycticorax. Glossy Ibis Plegadis falcinellus, Little Egret Egretta garzetta, Yellow-billed Egret E. intermedia, Squacco Heron Ardeola ralloides, Red-billed Teal Anas erythrorhynch and Hottentot Teal A. hottentota are also usually present in good numbers.

Of the terrestrial birds, the core populations of most of South Africa's threatened and endemic grassland species are centred on the IBA. An estimated 85% of the global population of Rudd's Lark Heteromirafra ruddi is thought to occur within the IBA. Although this lark ranges throughout the site, it is highly localised in open, moderately to heavily grazed level grassland, without forb invasion. It prefers hill tops or plateaus and favours trampled areas.

Botha's Lark Spizocorys fringillaris also occurs in the IBA and is highly localised in grassland on black clay or dolerite soils, where it favours short, dense, natural grassland on plateaus and upper hill slopes, avoiding rocky areas, taller grass in bottomlands, vleis, croplands and planted pastures.

Yellow-breasted Pipit Anthus chloris favours mid-altitude, well-developed and lightly grazed or ungrazed grassland. Substantial breeding colonies of Southern Bald Ibis Geronticus calvus occur in the IBA and large numbers of these ibises forage and roost throughout the area. Blue Crane Anthropoides paradiseus, Denham's Bustard Neotis denhami, White-bellied Korhaan Eupodotis senegalensis, Short-tailed Pipit Anthus brachyurus and Black-winged Lapwing Vanellus melanopterus are widespread at low densities. Tracking and breeding success studies of Secretarybird Sagittarius serpentarius in the IBA show that the species breeds in and uses the site extensively. Black-winged Pratincole Glareola nordmanni and White Stork Ciconia Ciconia occasionally occur in very large numbers during the austral summer.

African Rock Pipit Anthus crenatus, Ground Woodpecker Geocolaptes olivaceus, Buff-streaked Chat Campicoloides bifasciata and Sentinel Rock Thrush Monticola exploratory are common on exposed outcrops and rocky slopes at higher altitudes. Gurney's Sugarbird Promerops gurneyi is found around protea woodland on the escarpment, and Black Stork Ciconia nigra breeds on steep cliffs. Pongola Bush Nature Reserve and other forest patches hold Crowned Eagle Stephanoaetus coronatus, Chorister Robin-Chat Cossypha dichroa, Forest Canary Crithagra scotops, Bush Blackcap Lioptilus nigricapillus and Orange Ground Thrush Zoothera gurneyi. Occasionally, Cape Vulture Gyps coprotheres, Martial Eagle Polemaetus bellicosus, Lesser Kestrel Falco naumanni, Black Harrier Circus maurus and Pallid Harrier C. macrourus are found at low densities in the area.

IBA trigger species

Globally threatened species in the IBA are Southern Bald Ibis, Wattled Crane, Blue Crane, Martial Eagle, Grey Crowned Crane, Denham's Bustard, White-winged Flufftail, Rudd's Lark, Botha's Lark, Yellow-breasted Pipit, Pallid Harrier, Black Harrier, Blue Korhaan *Eupodotis caerulescens*, Black-winged Pratincole, Maccoa Duck *Oxyura maccoa*, Bush Blackcap, Chestnut-banded Plover *Charadrius pallidus* and Secretarybird. Regionally threatened species are African Marsh Harrier, Striped Flufftail *Sarothrura affinis*, White-bellied Korhaan, African Grass Owl, Short-tailed Pipit, Black Stork, Greater Flamingo *Phoenicopterus roseus*, Lanner Falcon *Falco biarmicus* and Orange Ground Thrush. Restricted-range and biome-restricted species include Swee Waxbill *Coccopygia melanotis*, Forest Canary, Grey Cuckooshrike *Coracina caesia*, Buff-streaked Chat, Barratt's Warbler *Bradypterus barratti*, Yellow-throated Woodland Warbler *Phylloscopus ruficapilla*, Olive Bush-Shrike *Chlorophoneus olivaceus*, Kurrichane Thrush *Turdus libonyanus* and Southern Bald Ibis, which are common. Uncommon species include Knysna Turaco *Tauraco corythaix*, Rudd's Lark, Botha's Lark, Bush Blackcap, Chorister Robin-Chat, White-starred Robin *Pogonocichla stellata*, Yellow-breasted Pipit and Gurney's Sugarbird.

Important waterbirds that pass the 1% threshold are Great Crested Grebe *Podiceps cristatus*, Black-necked Grebe *P. nigricollis*, Little Grebe *Tachybaptus ruficollis,* Hadeda Ibis *Bostrychia hagedash*, White-backed Duck *Thalassornis leuconotus*, Yellow-billed Duck, African Black Duck *Anas sparsa*, Cape Shoveler *Anas smithii*, Southern Pochard *Netta erythrophthalma*, Maccoa Duck *Oxyura maccoa*, Red-knobbed Coot *Fulica cristata*, African Wattled Lapwing *Vanellus senegallus*, African Snipe *Gallinago nigripennis* and White-winged Tern *Chlidonias leucopterus*. Species passing the 0.5% threshold include Whiskered Tern *C. hybrida* and Spur-winged Goose. Large numbers of Lesser Kestrel occur and roost at several locations in the IBA, such as Newcastle.

Other biodiversity

North-eastern mountain grassland holds 78 endemic and near-endemic plant species, mostly in the Liliaceae, Iridaceae, Asteraceae, Lamiaceae and Orchidaceae families, on Black Reef quartzites. A further 31 endemics are found on dry dolomites. Most of these endemics are present in this IBA. The rare rock barbel *Austroglanis sclateri* is reported from the region. Giant girdled lizard *Cordylus giganteus* occurs on some of the farms and rough-haired golden mole *Chrysospalax villosus*, serval *Felis serval*, African striped weasel *Poecilogale albinucha* and Warren's girdled lizard *Cordylus warreni* range throughout the region. Laminate vlei rat *Otomys laminatus* and many-spotted mountain snake *Anplorhinus multimaculatus* have been recorded in the grassland areas near wetlands. Natal red rock rabbit *Pronolagus crassicaudatus* occurs on the rocky outcrops and in upland areas. The extremely rare striped harlequin snake *Homoroselaps dorsalis* and Zulu golden mole *Amblysomustris* may occur within this large blanket area. The streams in the forested areas of the south-eastern section of the IBA may hold Natal ghost frog *Heleophryne natalensis*.

Conservation issues

Threats: This extremely valuable IBA is under considerable threat from a number of quarters. Applications to prospect and mine in the area are received regularly, sometimes on land bordering formally protected areas. If these applications were to be approved, they could have a negative impact on the region as a whole. Some are applicable to water catchment areas, in which case the impact of the mine would be felt downstream and beyond the IBA's borders. Other threats include inappropriate farming practices such as burning too frequently and at the wrong time of year, excessive grazing, the ploughing of new veld and the damming and draining of wetlands.

Conservation action: Three protected environments have been declared in this IBA: Mabola, KwaMandlangampisi and Pongola Bush. The declaration of the Sneeuwberg Protected Environment is currently in progress. Management plans for these protected environments are being drafted or have been finalised. These initiatives greatly improve the conservation status of this area, providing protection against mining and assisting landowners to manage the grassland on their farms for particular species or communities of birds. Other nature reserves in the area are Wakkerstroom Wetland, Pongola Bush, Paardeplaats, Tafelkop and Seekoeivlei.

This IBA is extremely important from a biodiversity point of view and is considered to be one of the most important sites in the IBA network. However, it faces numerous threats, and initiatives to improve the conservation status of the land and to assist landowners to improve their land management, for example by implementing correct burning and grazing practices, must continue.

EWT's African Crane Conservation Programme drives crane conservation in Wakkerstroom. Staff members of the BirdLife South Africa Wakkerstroom Tourism and Education Centre are actively involved in environmental education and community conservation projects in Wakkerstroom and across southern Mpumalanga. The WWF-SA Enkangala Grasslands Project has been operating in Wakkerstroom for the past decade.

10.11 AGRICULTURAL AGRO ECOSYSTEM ANALYSIS

Reference is made to the Agricultural Agro Ecosystem Analaysis which was conducted by an Refer to Appendix 11.

10.11.1 Methodology

10.11.1.1 Desktop analysis of satellite imagery

The most recent aerial photography of the area available from Google Earth was obtained. The satellite imagery was analysed prior to the site visit to determine areas of existing impact and land uses within the Kangra T4 project area as well as the surrounding areas. It was also scanned for any areas where crop production and farming infrastructure may be present.

10.11.1.2 Site assessment

The first site visit was conducted on 15 February 2021. This was in the summer season of South Africa and prior to the site visit, the area has had high rainfall for two weeks. Soil properties of natural (undisturbed) soils change over several years and the assessment is therefore not affected by the season of the site visit. On arrival at the proposed areas where the surface infrastructure of the T4 project will be located, some landowners refused access to their properties. Other landowners indicated that they will only allow visual observations of the landscape and the collection of photographic evidence but no soil classification and soil sampling with a soil auger.

Following the decisions of the landowners, the larger area of the proposed T4 project area were traversed by vehicle and observations were made of the terrain units, slope, the agricultural and other land use activities as well as landscape features such as wetland areas, homesteads and roads. The data recorded during the site visit will be supplemented by published reports and other data of the larger area around the T4 project area. The baseline description of the soil and agricultural properties that were included in the assessments done for the Environmental Authorisation of the Kusipongo project area, are considered the most relevant as the Kusipongo project is the adjacent to the proposed T4 project area.

10.11.1.3 Analysis of available spatial data

To get a comprehensive overview of the natural resources that contribute to the agro-ecosystems of the T4 project area, the following spatial data was analysed:

- The National Land Capability Evaluation Raster Data Layer was obtained from the DAFF to determine the land capability classes of the project area according to this system. The data was developed using a spatial evaluation modelling approach (DAFF, 2017).
- The long-term grazing capacity for South Africa 2018 was analysed for the area and surrounding area

of the project assessment zone. This data set includes incorporation of the RSA grazing capacity map of 1993, the Vegetation type of SA 2006 (as published by Mucina L. & Rutherford M.C.), the Land Types of South Africa data set as well as the KZN Bioresource classification data. The values indicated for the different areas represent long term grazing capacity with the understanding that the veld is in a relatively good condition.

- The Mpumalanga Field Crop Boundaries (November 2019) was analysed to determine whether the proposed project assessment zone falls within the boundaries of any crop production areas. The crop production areas may include rainfed annual crops, non-pivot and pivot irrigated annual crops, horticulture, viticulture, old fields, small holdings and subsistence farming.
- Land type data for the project assessment zone was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 – 2006). The land type data is presented at a scale of 1:250 000 and entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units.
- The rating of the susceptibility of soil to wind and water erosion as well as the regeneration potential of soil (when degraded) was obtained from the spatial data of the Overview of the Agricultural Natural Resources of South Africa (ARC – Institute for Soil, Climate and Water, 2005).

10.11.1.4 Review of other specialist reports

Reports that were part of the Environmental Authorisation process for the Kusipongo Project as well as the final Scoping Report for the T4 project (submitted in 2017), were reviewed for information on the soil properties and land capabilities of the project area. Below follows a list of the reports reviewed:

- Environmental Scoping Report for the Kangra Coal T4 Project (Version – Final for Authority Review) submitted by GCS (Pty) Ltd on 20 June 2017 (DMR Reference Number: MP30/5/1/2/2/10175MR)
- Soil, Land Use and Land Capability Assessment as part of the Water Use Authorisation Process for Three New Coal Mining Projects within the Greater Kusipongo Project Area, near Piet Retief, Mpumalanga Province.
- Groundwater Impact Assessment for Kangra Coal T4 Project (Draft version) submitted in January 2021 by Geo Pollution Technologies – Gauteng (Pty) Ltd.

While the draft versions of other specialist assessments for the T4 project such as the vegetation and socio-economic studies were not available prior to submission of this report version, these assessment reports have been reviewed and the findings incorporated into the final Agricultural Agro-Ecosystem Report.

10.11.2 Baseline description of the agro-ecosystem

10.11.2.1 Climate

The Department of Agriculture, Forestry and Fisheries (2017) compiled an updated description of the agricultural suitability of South African climatic conditions, accompanied by a raster data layer of the entire country. The description of climate capability refers to a definition by Strydom (2014) that defines it as the “capability of a geographic area to grow an agricultural crop under existing climatic conditions" (DAFF, 2017). The climate capability includes three parameters i.e. moisture supply capacity, physiological capacity and climatic constraints. The climate capability classes range from 1 (the lowest or worst) to 9 (the highest or best climate for agricultural production).

According to the climate capability raster data, the entire T4 area has Moderate-High (Class 6) climate capability (refer to Figure 81). This indicates that the climate of the area is very suitable for rainfed crop production and that few climate hazards to production (such as drought or extreme temperatures) exist in the area.

The climate capability data is verified by the climate data presented in the Groundwater Impact Assessment Report (Geo Pollution Technologies, January 2021) that indicates the average annual rainfall for the area as 749.17mm with the range of variation over a thirty year period between 573mm and 1314mm per year. The summer months (November, December and January) receive the highest monthly rainfall, ranging between 129.8mm and 147.1mm per month. According to the Scoping Report for the Kangra T4 Project (GCS, 2017), the project area has warm summer months with average daily temperatures of 20 to 26°C while the minimum winter temperatures can reach a low of 4°C.

Following the climate data, the area is highly suitable for the production of summer crops such as maize and soybeans as well as livestock farming as the area do not suffer from climate extremes that increase the risk of livestock mortalities and crop failure.

10.11.2.2 Soil

10.11.2.2.1 Soil descriptions from other reports

The soil data was derived from the land type classification of the project area. In addition, the description of the soil forms and other soil properties of the nearby Kusipongo area are also discussed as it falls within the same climatic area with similar terrain features. According to the Scoping Report for the T4 project (GCS, 2017), the area consists of three main soil categories and that is:

- Red and yellow-brown freely drained apedal soils;
- Shallow, rocky soils of the Glenrosa and Mispah forms; and
- Soils typical of a plinthic catena with frequent occurrence of duplex and/or margalitic soils.

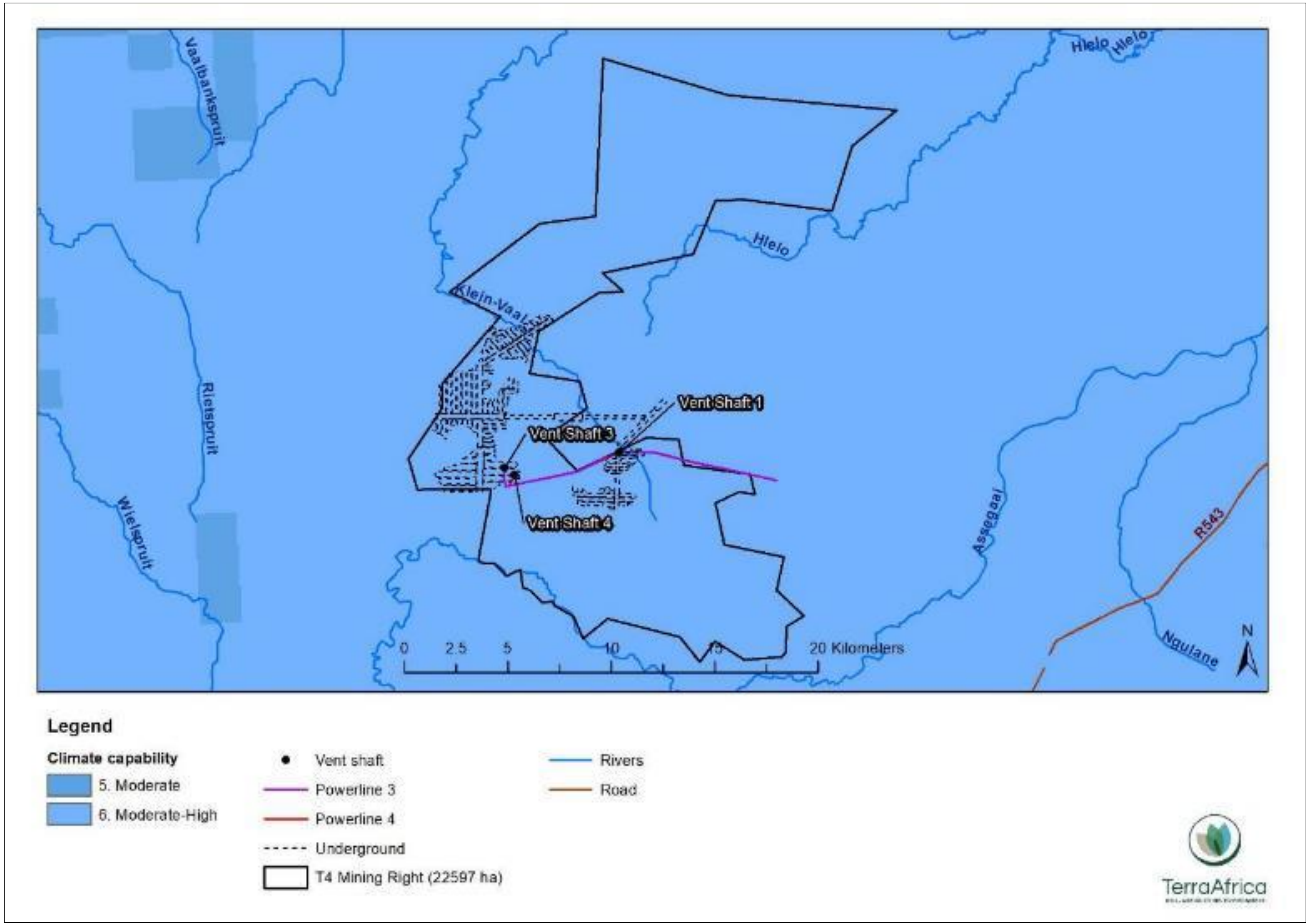

Figure 81 Climate capability rating of the T4 project area (source: DAFF, 2017)

The Soil, Land Use and Land Capability Assessment for three new coal mining projects within the Kusipongo Project Area (Scientific Aquatic Services, September 2019), focussed on the soil classification of the three areas where surface impacts were anticipated. The report categorises the different soil forms identified according to the definitions described by Fey (2010). According to the report (Scientific Aquatic Services, September 2019), there are four main soil groups i.e. Plinthic, Oxidic, Lithic and Anthropic soils. It also states that the following soil forms are found within these focussed areas withing the Kusipongo Project Area:

• Ermelo	• Umvoti	• Longlands
• Vaalbos/Nkonkoni	• Bethesda	• Mfabeni
• Carolina/Clovelly	• Tshiombo	• Wasbank
• Bainsvlei	• Eland	• Westleigh
• Pinedene	• Avalon	• Dresden
• Dundee	• Glencoe	• Mispah/Glenrosa
• Kroonstad	• Constantia	• Witbank
• Tukulu	• Katspruit	• Longlands

10.11.2.2.2 Soil descriptions from land type data

Following the land type classification data, the area consists of six different land capability classes. These land types run roughly parallel to each other in bands run from north to south. The largest part of the underground mining area falls within Land Type Ca17. The three vent shafts and about two-thirds of the powerline, falls within Land Type Ac39. This land type also includes the remaining areas of the underground section. The eastern third of the powerline traverses through Land Types Fa162 an Ba45. Below follows a description of each of the land types within the project area with specific focus on the soil forms present within each. The position of each land type is illustrated in Figure 82 and the complete land type data sheets, are attached as Appendix 1 in the Agro-Ecosystem Assessment.

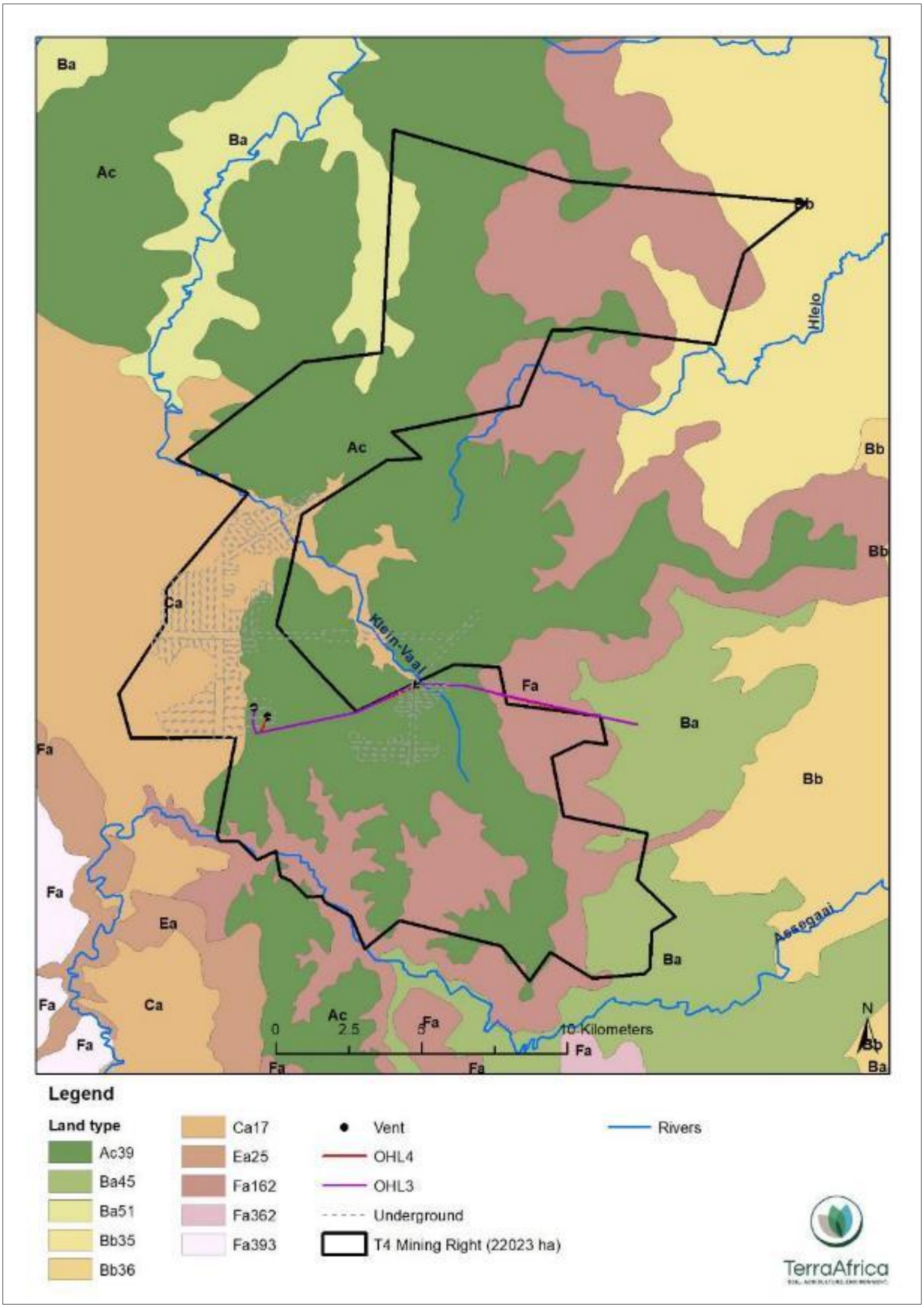

Figure 82 Land types of the Kangra T4 project area

Land Type Ac39:

Land Type Ac39 represent the higher-lying, hilly terrain units between the surrounding flatter toe-slopes of Land Type Ca17 and Land Type Fa162 (see Figure 83). This land type consists largely of mid-slopes (Terrain unit 3) and crests (Terrain unit 1) with approximately 2% small depressions where duplex soils (Valsrivier form) and margalitic soils (Bonheim and Milkwood forms) are found. The red oxidic Hutton soil form is the most prevalent soil form found at the mid-slopes and crests and these soil profiles are between 0.4 and 1.2m deep. In addition to the Hutton soils, several other soil forms including Clovelly, Glencoe, Mayo, Mispah, Glenrosa, Shortlands and Glenrosa are present in smaller areas of the total land type area.

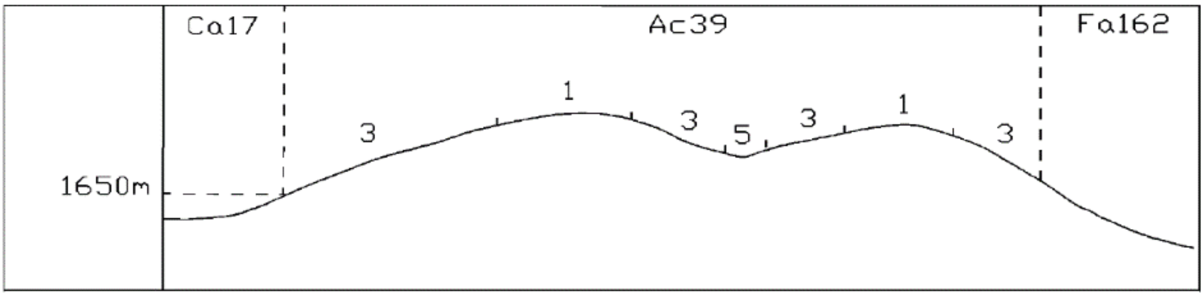

Figure 83 Terrain form sketch of Land Type Ac39

Land Type Ba45:

Land Type Ba45 is found at elevations between 1300 and 1600 m.a.s.l. and consists of five different terrain units in a slight undulating landscape (refer to Figure 84). Terrain units 1, 3, 4 and 5 are slightly sloped (between 1 and 4%) while Terrain unit 2 represent vertical rock cliffs with slope up to 100% (1% of the total land type area). Approximately 67% of the total land type area consists of mid-slopes (Terrain unit 3) and 10% are toe-slopes. The mid-slopes consist of oxidic soils (Clovelly and Hutton forms), plinthic soils (Avalon, Longlands and Wasbank), while soils of the toe-slopes also include duplex soils (Valsrivier) and soils underlain by a gley horizon (Katspruit and Kroonstad forms). Terrain units 1 and 2 consist of a mixture of solid rock, shallow Glenrosa and Mispah soils and Hutton soils ranging between 0.4 and 1.2m in depth.

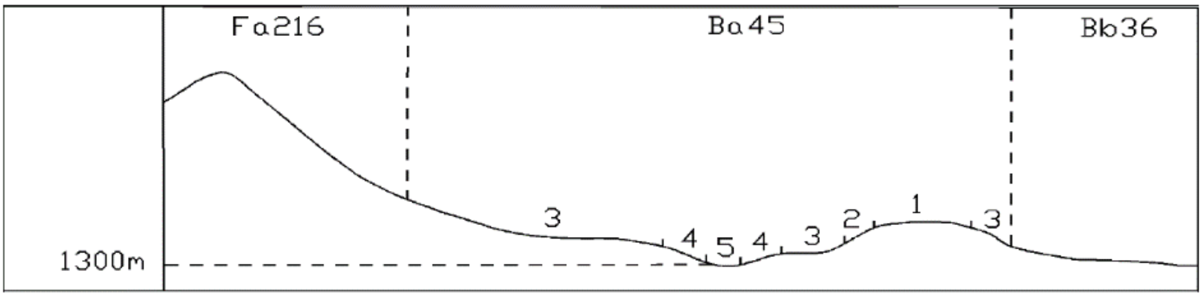

Figure 84 Terrain form sketch of Land Type Ba45

Land Type Ba51:

Land Type Ba51 is similar to Land Type 45 but the lowest elevation of this land type is 1630 m.a.s.l. and there are no steep cliffs (Terrain unit 2) in this land type (refer to Figure 85). Approximately 50% of the total land type area consists of mid-slopes (Terrain unit 3) where the slope ranges between 3 and 15%. The average slope lengths range between 600 and 1200m. Around 30% of the mid-slopes consist of deep Hutton profiles (between 0.9 and 1.2m deep) while other soil forms in these areas include that of the Avalon, Glenrosa and Longlands forms. Smaller areas of the Griffin, Shortlands, Valsrivier, Kroonstad and Glencoe forms may also be present. The same soil forms are also present in the flat crest positions (slope of 0 to 8%) and the lower-lying toe-slopes (slope of 2 to 3%). The valley bottoms (Terrain unit 5) have soil forms typically affected by water saturation as well as water movement and include soil of the Katspruit, Willowbrook, Dundee and Bonheim forms as well as stream beds.

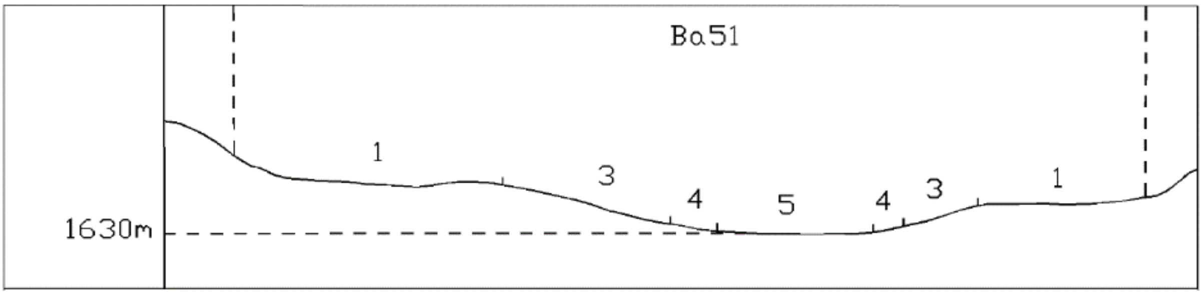

Figure 85 Terrain form sketch of Land Type Ba51

<u>Land Type Bb35</u>:

Land Type Ba35 is present in the far northern parts of the T4 project area along the western boundary of the proposed Mining Right Area. This land type represents slightly undulating hills (with slope no more than 6%) with a typical plinthic catena dominated by yellow-brown and bleached soil colours (see Figure 86). The crests (Terrain unit 1), mid-slopes (Terrain unit 3) and toe-slopes (Terrain unit 4) consist of the following soil forms: Glenrosa, Mispah, Clovelly, Avalon, Cartref, Longlands, Wasbank, Hutton, Griffin and Glencoe forms. The valley bottoms are typical wetland areas with the following soil form distribution: 50% soil of the Katspruit form, 30% stream beds and the remaining 20% soil of the Wasbank form.

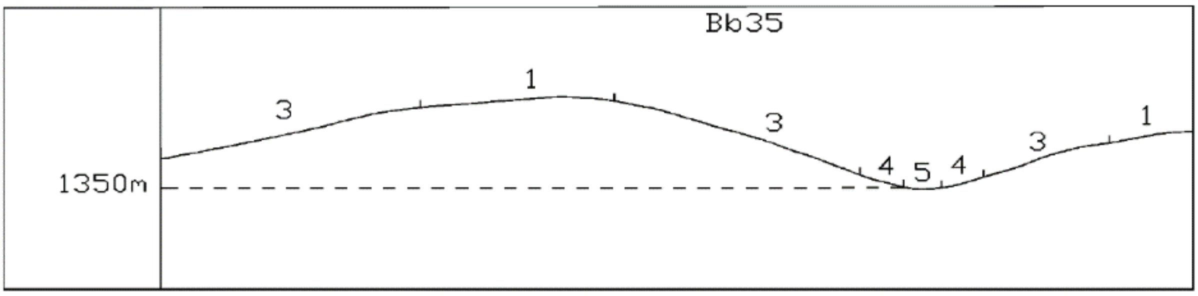

Figure 86 Terrain form sketch of Land Type Bb35

<u>Land Type Ca17</u>:

This land type is present in the middle section of the T4 project area, coinciding with the largest section of the planned underground mining. Land Type Ca17 consist of flat areas with deep soil profiles and 30% of the total land type area consist of valley bottoms (Terrain unit 5) that consist of hydric soil forms (Katspruit, Kroonstad, Willowbrook and Wasbank) and stream beds. Soil forms present at the crests (Terrain unit 1), include that of the Clovelly, Wasbank, Kroonstad, Cartref, Griffin forms.

The mid-slopes can be divided into two categories i.e. Terrain unit 3 and Terrain unit 31. Terrain unit 3 has longer slope lengths (between 600 and 1800m) and slighter slope (3 to 6%) while Terrain unit 31 has slope of 5 to 12% and slope lengths of 100 to 200m. The soil forms of the mid-slopes are similar to that of the crests and the depth of these soil profiles range between 0.4 and 1.2m deep. The position of the different terrain units is indicated in Figure 87.

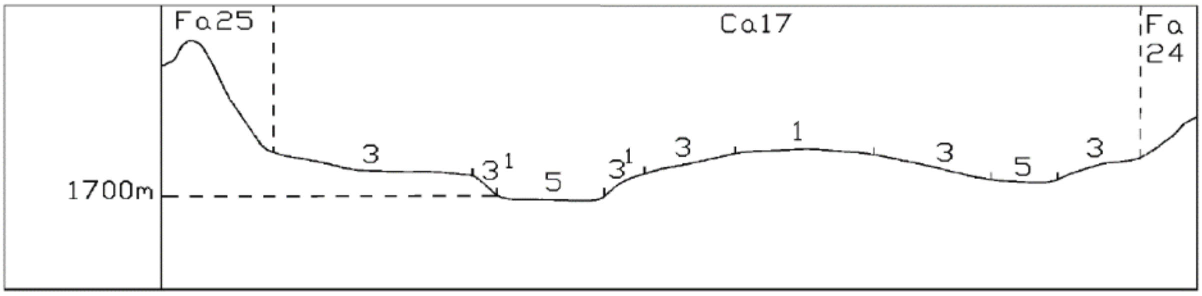

Figure 87 Terrain form sketch of Land Type Ca17

Land Type Fa162:

Land Type Fa162 is present in the north-eastern section as well as the southern part of the T4 project area. This land type consists largely of mid-slopes (Terrain unit 3) with slope between 15 and 100% and crests (Terrain unit 1) (6 to 15%) (refer to Figure 88). Soil in this land type is characterised by shallow profiles with Sand Loam and Sandy Clay Loam texture that are underlain by rock, fractured rock and lithic material. Although not depicted in the terrain form sketch, Land Type Fa162 also has 5% steep cliffs (Terrain unit 2), 8% toe-slopes and 2% valley bottoms. The valley bottoms consist of Shortlands, Mayo, Swartland and Bonheim soil forms with higher clay content (between 25 and 50% clay particles).

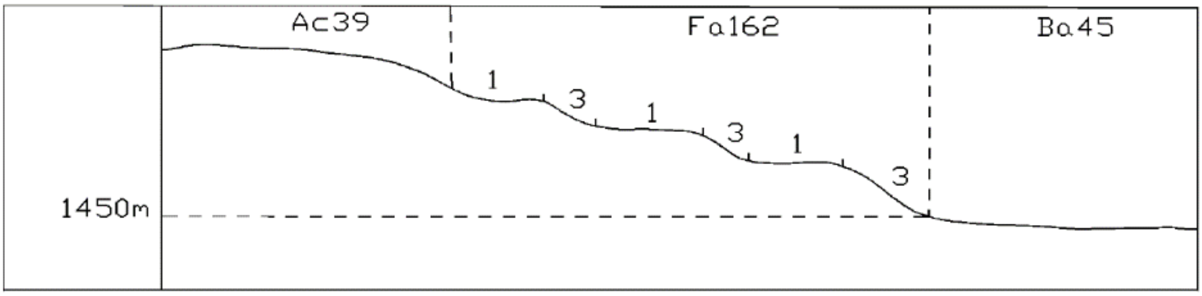

Figure 88 Terrain form sketch of Land Type Fa162

10.11.2.2.3 *Soil forms observed during site visit of 15 February 2021*

As a result of the limitations to site access, soil profiles could not be classified using a soil auger. However, profiles could be observed from the public gravel access road. The first profile observed had Sandy Loam orthic A horizons (topsoil) that are slightly darkened by the accumulation of organic material. These horizons are underlain by red apedal horizon with Sandy Clay Loam texture. It was not possible to detect what the nature of the underlying materials are and what the effective depth of this area is. The soil profile is well aerated and grass roots were observed to a depth of 0.6m (see Figure 89).

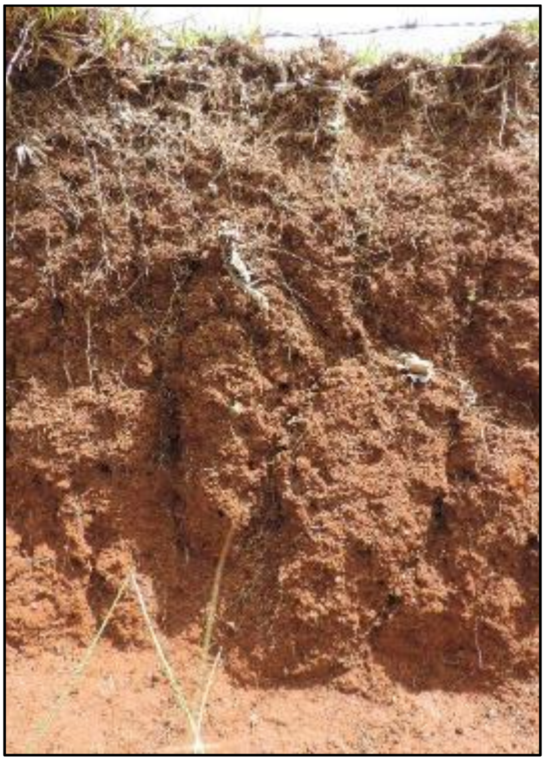

Figure 89 Photographic evidence of soil profile observed along a road cutting

Figure 90 Exposed soil profile in area where topsoil was removed

At the second observation point, the topsoil above the underlying fractured rock was removed in a small area where there are signs of previous quarrying activities (refer to Figure 90). The chromic (red) topsoil in this area is around 0.3 to 0.45m thick and has a Sandy Clay Loam texture. This profile is present in the crest position of land Type Ac39, in close proximity to where the proposed powerline has been indicated in the site layout plan.

10.11.2.3 Terrain

The T4 project area and surrounding area consist of a landscape of undulating hills with flat to slightly sloped toe-slopes and valley bottoms (see Figure 91). Some parts can be considered mountainous with steep slopes and short slope lengths. Between the hills are flatter areas with longer hillslopes where crop fields are located and where soil-water accumulation supports wetland habitats. Elevations within the project area range from around 1500 to 1900 metres above sea level (m.a.s.l.).

Figure 91 Example of the typical terrain of a large portion of the T4 project area

The terrain poses some limitations to crop production and where flatter areas are not available for crop fields, cultivation against slopes must include management measures such as contours that will minimise the risk of soil erosion. The terrain is suitable for livestock farming (both cattle and sheep).

10.11.2.4 Land capability

By overlying the project area boundary and proposed infrastructure layout on the DAFF land capability raster data (DAFF, 2017), the production capability of the area can be depicted (igure 92). Following this data, the most dominant land capability class of the T4 area, is Moderate-High (Class 09). Smaller areas with higher land capability classes (Moderate-High [Class 10], High [Class 11] and High-Very-High [Class 12]) in the middle of the project area as well as towards the north-western and south-eastern corners.

The mountainous areas with shallow, rocky soils have land capability classes of Low-Moderate (Class 07) and lower. These lower land capability classes are largely limited to the north-eastern corner of the project area as well as along the southern boundary, directly north of the Assegaai River. The majority of the infrastructure are located in areas where land has Moderate-High (Class 09) land capability. Approximately 4 km of the powerline alignment is located in an area with Low-Very-Low (Class 3) to Low-Moderate (Class 07) land capability.

10.11.2.5 Agricultural production

10.11.2.5.1 Crop production

The area where the proposed underground mining will be, coincides with the area where the most crops are produced within the T4 project area. According to the DAFF raster data layer, it is rainfed crops and/or cultivated pastures that are present in these crop fields (see Figure 93). Both rainfed agriculture and/or planted pastures as well as production under pivot irrigation is present in the areas surrounding the T4 project area.

Within the T4 project area, observations made from the existing public access roads, have provided evidence that maize and soybeans (see Figure 94) are produced under rainfed conditions. The survey data gathered for the purpose of the Socio-Economic Assessment provides insight into the average yields obtained. According to the landowners, the average yield for maize is between 9 and 10 tonnes/ha while that of soybeans is 3 tonnes/ha. Subsistence production of maize were also observed around the homesteads present in the project area.

When the surface infrastructure layout is superimposed on the field crop boundary data, Vent shafts 1 and 3 as well as three short sections of the powerline, are located in crop fields or within 50m of crop fields. Although no fields with irrigated crop production is present within the T4 project boundaries, three centre pivot irrigation areas are present directly east of the middle section and overlaps with a planned underground mine tunnel.

Crop fields classified as subsistence farming is present in the north-eastern corner of the site, just north of the Hlelo River. More of the subsistence farming crop fields are found along the banks of the Hlelo River.

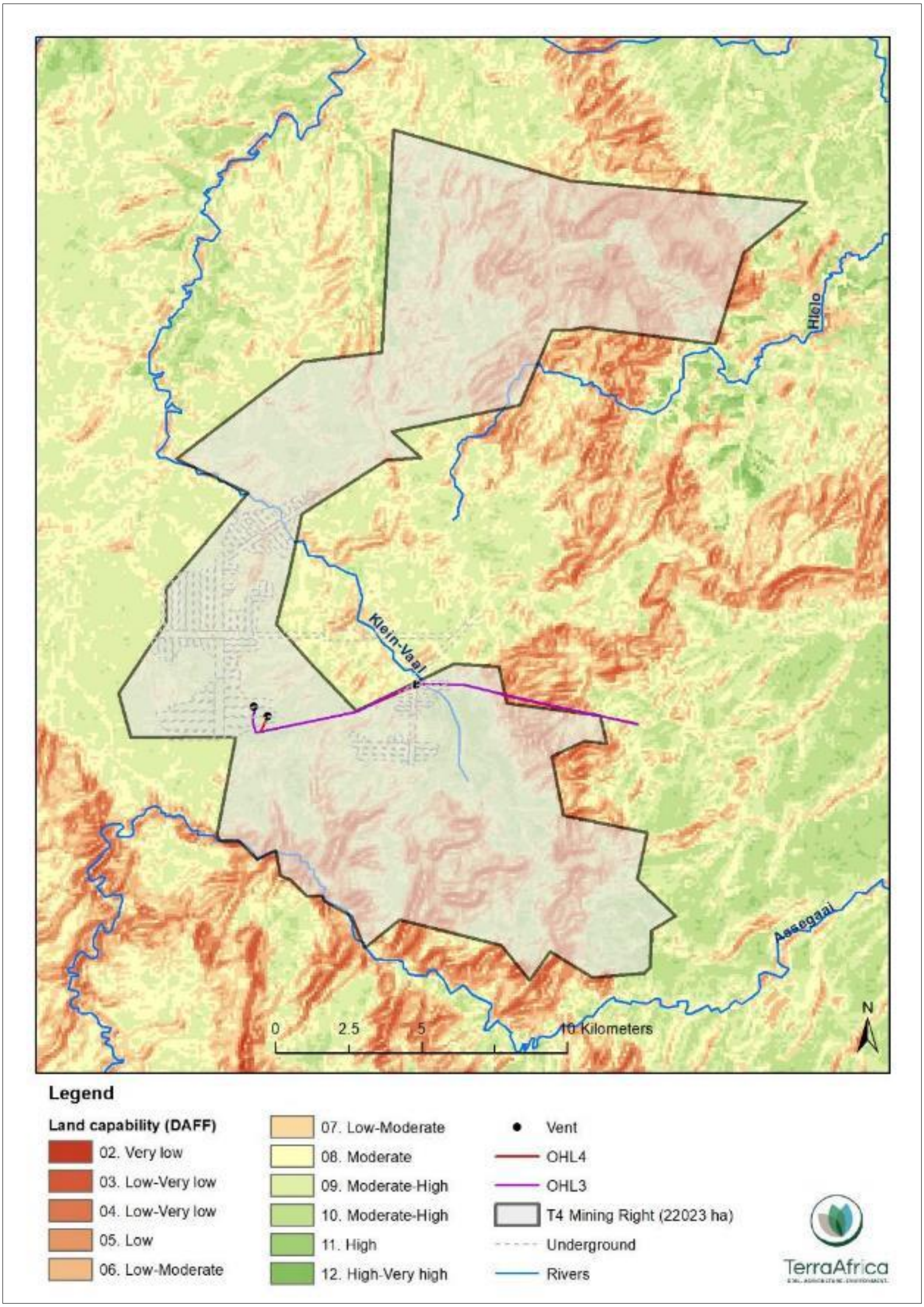

Figure 92 Land capability map of the T4 project area (data source: DAFF, 2017)

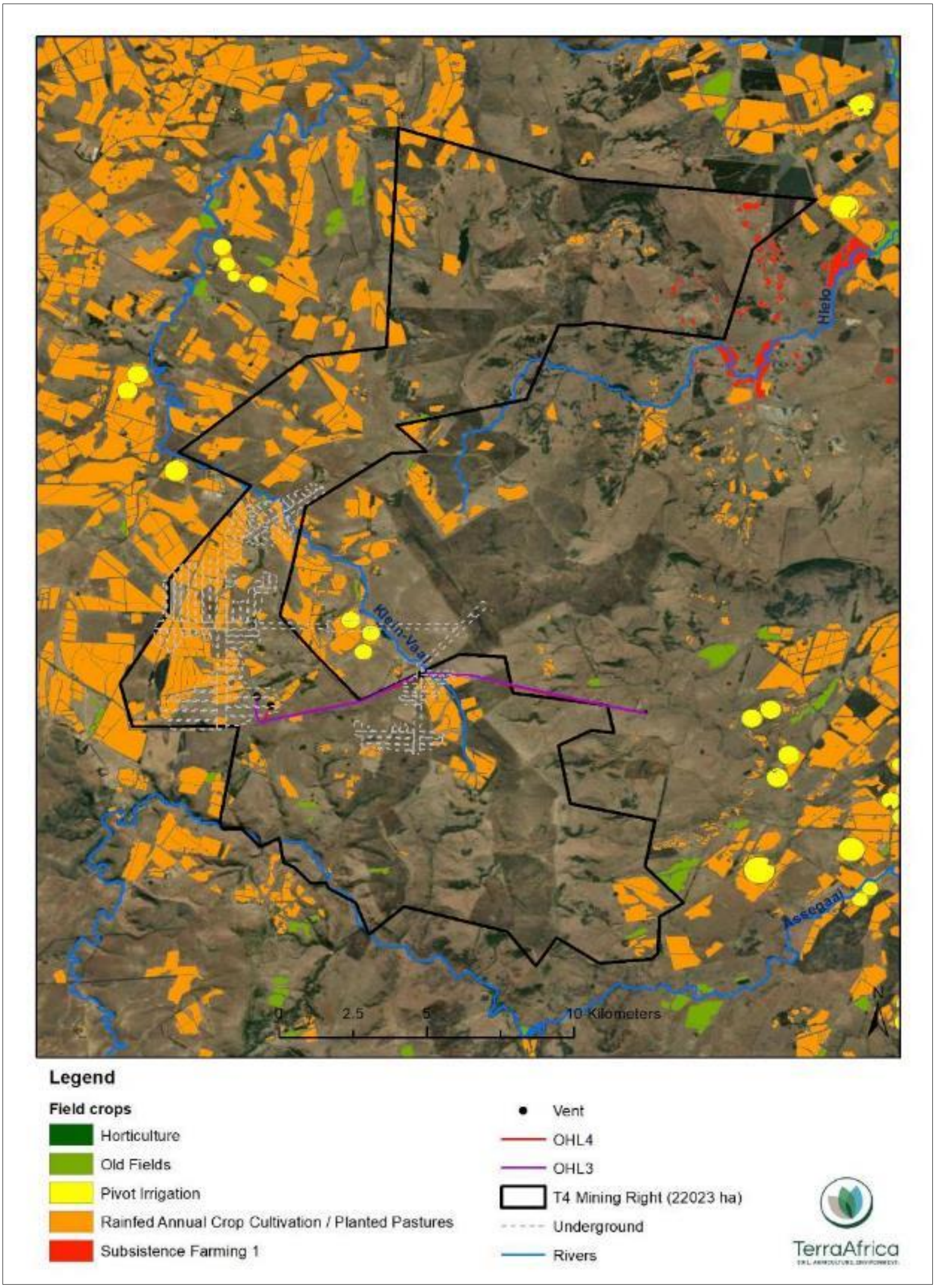

Figure 93 Position of field crop boundaries within and around the Kangra T4 project area

Figure 94 Example of soybean production in crop fields within the T4 project area

10.11.2.5.2 *Livestock farming*

According to the vegetation assessment (Nicole Upton, 2021), the project area is located within four Vegetation Groups. Smaller sections overlap with the Eastern Highveld Grassland, Northern Afrotemperate Forest and the Paulpietersburg Moist Grassland. However, the bulk of the mining right falls, including the areas where the ventilation shafts are proposed, within the Wakkerstroom Montane Grassland. The vegetation comprises predominantly short montane grasslands on the plateaus and the relatively flat areas, with short forest and Leucosidea thickets occurring along steep, mainly east-facing slopes and drainage areas.

The powerline intercepts with sections of Wakkerstroom Montane Grassland, Northern Afrotemperate Forest and the Paulpietersburg Moist Grassland.

The ideal grazing capacity of a specified area is an indication of the long-term production potential of the vegetation layer growing there to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit [LSU]) with an average feed intake of 10 kg dry mass per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is, therefore, expressed in a number of hectares per LSU (ha/LSU) (South Africa, 2018).

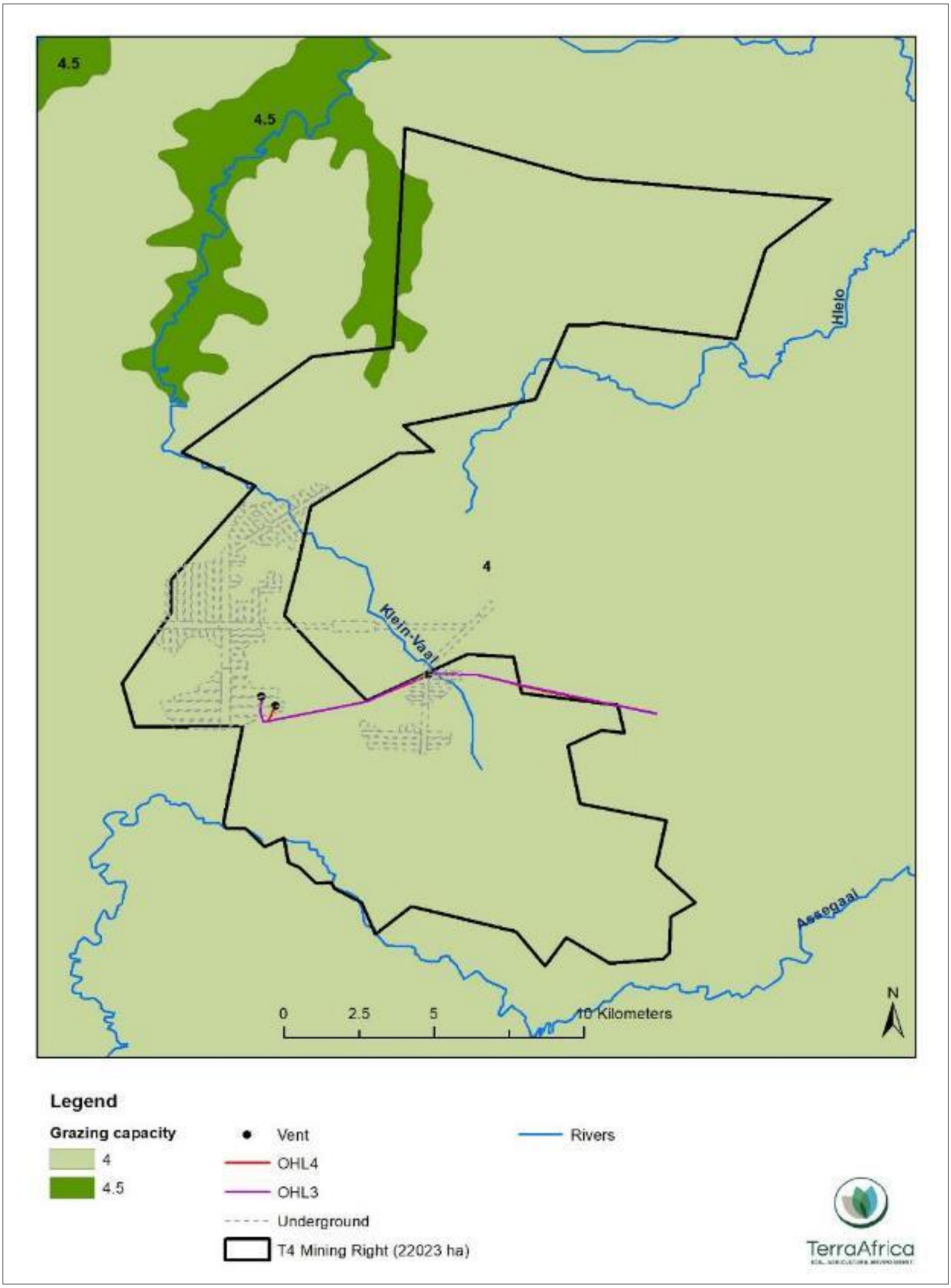

Figure 95 Long-term grazing capacity of the Kangra T4 project area and surrounding area

While the scope of this assessment excluded a detailed grazing capacity analysis, the long-term grazing capacity of the area could be derived from the DAFF data layer (DAFF, 2018). According to this data, almost the entire area has grazing capacity of 4ha/LSU and this includes all areas where the proposed project infrastructure will be located. Only a small section of land, east of the Klein-Vaal River, having grazing capacity of 4.5ha/LSU. With grazing capacity of 4 ha/LSU and good climate capability that includes high rainfall and cooler temperatures, the project area is highly suitable for livestock farming.

During the site visit, large herds of cattle and sheep (see Figure 96) were observed in the project area. As far as could be observed, the cattle herds consist of mixed breeds including Drakensberger and Bonsmara (refer to Figure 97). A few goats and horses were also observed although there was no indication that it is part of a larger farming unit. However, information could not be obtained on the stocking density practised by the farms and therefore, the number of animals per production unit. Background information on the project indicates that some landowners own several portions of land within the project area as well as the surrounding area. It is therefore likely that livestock are rotated between grazing camps and that areas that will be affected by the proposed project, form part of larger farming units.

While two landowners have indicated to the socio-economic specialist that drinking water for the livestock originates from both underground resources (accessed via boreholes), as well as surface resources (rivers and streams and fountains), another farmer only has borehole water available. As the success of livestock farming is dependent on water quality and availability, any project activities that will negatively affect these, will have a negative impact on livestock production.

Figure 96: Example of a sheep herd within the project area

Figure 97: A cattle herd with mixed breeds within the project area

10.11.2.6 Agricultural employment

The results from the consultation process for the Socio-Economic Assessment (data received from Marchelle Terblanche, February 2020) show that two of the three farmers consulted, employ a larger number of permanent employees. The number of permanent employees is180 and 120 for the two farmers, respectively. In addition to permanent employment, one of the farmers provides temporary employment to 100 employees. A third farmer that was consulted, has a much smaller farming unit and employs four permanent employees. Most of these farm employees reside on the farm while the remaining employees live in nearby areas such as Driefontein and Dirkiesdorp.

It is anticipated that the initial stages of the Kangra T4 project, will not result in immediate losses of agricultural employment. However, as the impacts on water resources and risk of subsidence increase, farming activities may be affected, and the resulting financial losses may force landowners to reduce the number of workers employed. Both the possible financial and employment losses, cannot be accurately quantified per production with the current data gaps and uncertainties.

10.11.2.7 Comparative benefit analysis

The authorisation of the Mining Right Application for the Kangra T4 project will ensure that the coal mining activities of the Kangra Coal Mine can continue, once the resources at the Kusipongo project area, has been depleted. This will ensure that employees of Kangra Coal will not be at risk of job losses but will be able to continue working in the new T4 project area. The mined coal resources will be sold and generate revenue that will also benefit other industries such as that supplying construction materials to the mine as well as the towns where Kangra's employees spend their disposable income.

However, coal is a finite resource and once it is depleted, an area is left with the environmental impacts that could not be mitigated or rehabilitated and the cost of these externalities are left with the local landowners and land users. The proposed T4 project area consists of land with moderate-high land capability over larger areas and sufficient rainfall that result in above-average yield potential for maize and soybeans. In addition to the crops produced, farmers have large herds of cattle and sheep that they have been successfully farming with for a minimum of 23 years. The sustainability of the livestock farming depends on uninterrupted supply of good quality water that is suitable for livestock purposes.

Although the proposed surface infrastructure will affect a limited area in comparison to the underground area that will be mined, there is currently no data available that indicates to what extent the farming activities will be affected by potential groundwater and surface water impacts as well as the extent to which subsidence may occur once the underground areas of the T4 project area, are mined.

From a land use perspective, the current mixed agricultural activities of the area, is a more sustainable land use than the proposed coal mining activities.

10.12 NOISE

Reference is made to the Noise Impact Assessment Report which was used to inform the following section Refer to Appendix 12.

10.12.1 Methodology

The procedures, as detailed in SANS10328:2008 and SANS10103:2008, have been applied to the noise measurements and assessments made in the Noise report. A summary of the approach to this study is outlined below.

10.12.1.1 Field Work

One noise measurement was conducted on the 26th October 2020. Site access was limited due to court lodgements by landowners. One measurement was discarded (weather not suitable), with one measurement presented in Section 6 of the Noise Impact Assessment attached as Appendix 12 A worst-case SANS10103:2008 Rural Rating was used for assessment. The Rating level was also selected based on desktop assessment and historical data obtained from projects receptors in a similar environment.

The modelled scenario was designed and based on the project layout. The significant noise sources were identified, and noise contours were developed. The modelled scenario took into consideration the following:

- Corrections for ground conditions (obtained from Environmental Potential Altus, site observations) and metrological conditions;
- Ground elevation contours (if available;
- Building facades (if information available). Onsite investigations will be compiled to determine the design and acoustical corrections (both development and receptors) based on dwelling layouts/specifications (if feasible);
- Noise modelling based on future predicted noise climate. Sound Power Levels (SPL) will be sourced

online; and

- Numerous methodologies were incorporated for modelling and calibration (increased confidence in findings). These include CoRTN: 1996 (UK), RLS90 (German), ISO 9613-2, SANS 10357:2008 etc.

Noise contour representation was developed focusing on pre-mitigation and post-mitigation effectiveness (if required).

10.12.2 Noise Measurements

Measurement localities are presented in Figure 98 below. Ten-minute LAIeq (SANS10103:2008) measurements were conducted during the daytime (22:00 – 06:00 46) safe periods within the study area.

A SANAS calibrated type 1 Noise Sound Level meter, set to A-weighting, and impulse settings applied, was used at each measurement point. Using a SANAS calibrated sound calibrator, the acoustic sensitivity of the Sound Level Meters (SLMs) was checked immediately before and after each of the sound level measurements and the results coincided within 2.0 dB. No dBC was measured.

10.12.3 Attended Measurements - ML01

A minimum 10-minute measurement was conducted near the Kangra Coal T4 Project Boundary. Equivalent values (impulse setting) are presented in Table 73. Subsequent analysis of the data, desktop information and onsite investigations concluded the following:

- Calculated LAIeq was 46,5 dBA.

Table 73:Shorter-term measurements

Point	Locality	Measured LAIeq,10min (dBA)
ML01	Kangra Coal T4 Project Boundary	LAIeq,10min = 46.5

10.12.4 Baseline Noise Levels Findings and identified SANS10103:2008 Rating Levels

Based on the measurements the following Rating Levels was selected for receptors:

- Only one measurement was conducted 26 October 2020. The consultants had limited access, as the I&AP's lodge an objective against the project and site access was limited. A worst-case SANS10103:2008 Rural Rating will be used for assessment. The Rating level was also selected based on desktop assessment and historical data obtained from projects receptors in a similar environment.

[46] SANS10103:2008 criterion

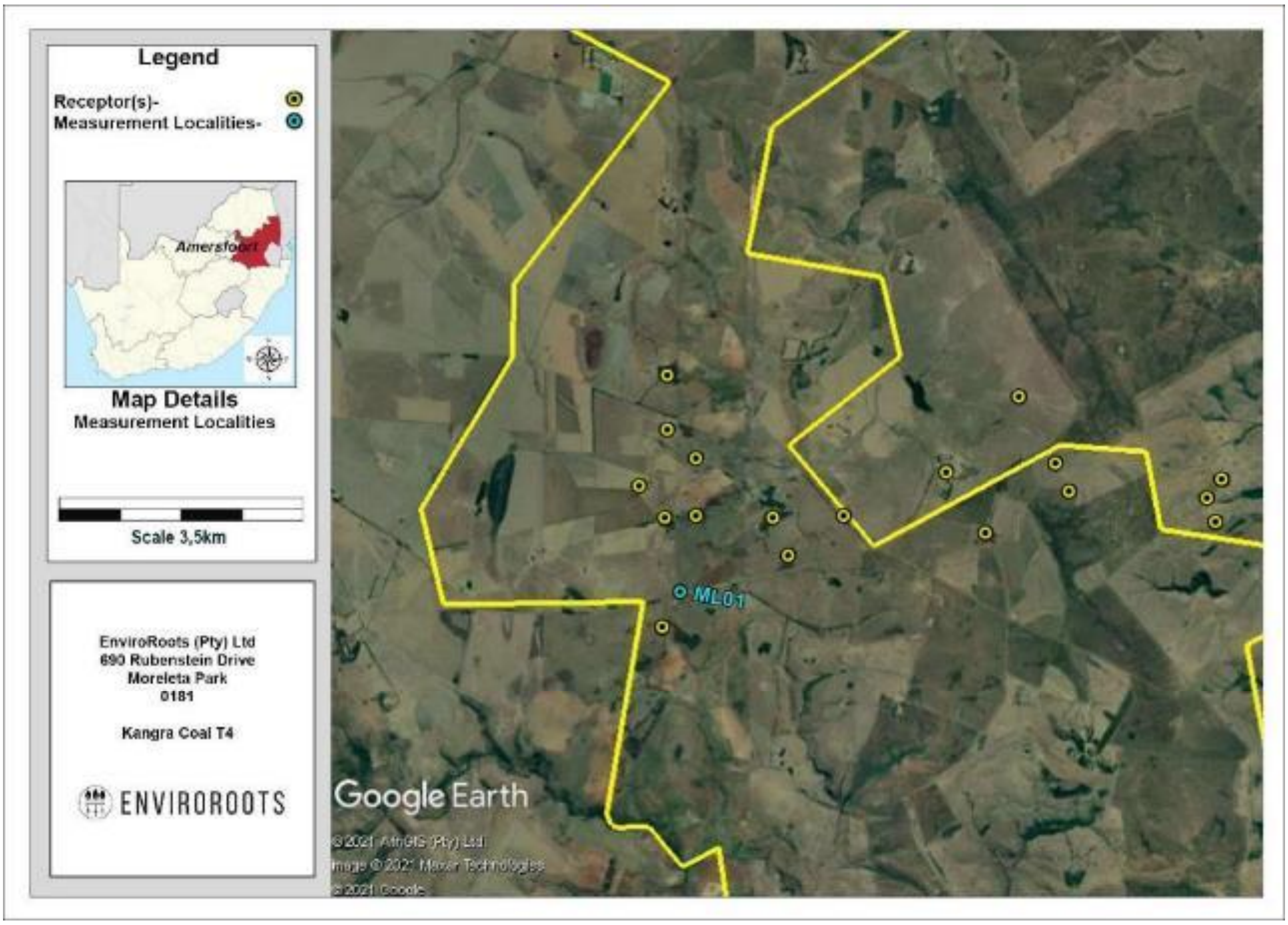

Figure 98: Noise Measurement Localities

10.12.4.1 Results

A worst-case controlled scenario was used to help identify potential issues, identify the significance rating and potential noise impacts in terms of legislation requirements. Five phases will be assessed namely the Planning, Construction, Operational, Closure & Post Closure Phases. The results of the scenario are discussed in Section 14.5.8.

10.13 BLASTING ASSESSMENT

A Blasting Impact Assessment has been conducted by Blast Management & Consulting (BM&C) shows the sensitivity mapping with the identified points of interest (POI) in the surrounding areas for the proposed Kajngra T4 Project. A copy of the report is included in Appendix 13 of the EIAR and EMPR.

10.13.1 Methodology

The detailed plan of study consisted of the following sections:

- Baseline influence: There are no blasting activities currently being done at the proposed vent shaft areas. Towards the north east there is an active opencast mine;
- Identifying surface structures/ installations that are found within reason from the project site. A list of

Point of Interests (POI's) was created that will be used for the evaluation; and

- Site evaluation: This entails an evaluation of the planned mining, drilling and blasting operations and the possible influences from the blasting operations. The methodology includes the modelling of the expected impacts based on the expected drilling and blasting information provided for the project. Various accepted mathematical equations were applied to determine the attenuation of ground vibration, air blast and fly rock. These values were then calculated over the distance investigated from the site and shown as amplitude level contours. Overlaying these contours on the location of the various receptors gave an indication of the possible impacts and the expected results of potential impacts. Evaluation of each receptor according to the predicted levels further gave an indication of the possible mitigation measures to be applied. The possible environmental or social impacts were addressed in the detailed EIA phase investigation.

10.13.2 Site Investigation

The site visit and structure identification were undertaken on 24th August 2020. This site visit was done specifically to get an understanding of the location of the vent shafts for the project and identifying the structures and installations surrounding the proposed vent shaft areas.

10.13.3 Project Sensitivity

A review of the project and the surrounding areas was done before any specific analysis is undertaken and sensitivity mapping is done, based on typical areas and distance from the proposed mining area. This sensitivity map uses distances normally associated where possible influences may occur and where influence is expected to be very low or none. Three different areas were identified in Vent Shaft 1, 3 and 4 in this regard:

- A highly sensitive area of 500 m around the vent shaft mining area. Normally, this 500 m area is considered an area that should be cleared of all people and animals prior to blasting. Levels of ground vibration and air blast are also expected to be higher closer to the vent shaft areas;
- An area 500 m to 1000 m around the vent shaft area can be considered as being a medium sensitive area. In this area, the possibility of impact is still expected, but it is lower. The expected level of influence may be low, but there may still be reason for concern, as levels could be low enough not to cause structural damage but still upset people; and
- An area greater than 1000 m is considered low sensitivity area. In this area it is relatively certain that influences will be low with low possibility of damages and limited possibility to upset people.

Figure 99, Figure 100 and Figure 101 shows the sensitivity mapping with the identified POIs in the surrounding areas for the proposed Vent Shafts 1, 3 and 4 at Kangra T4.

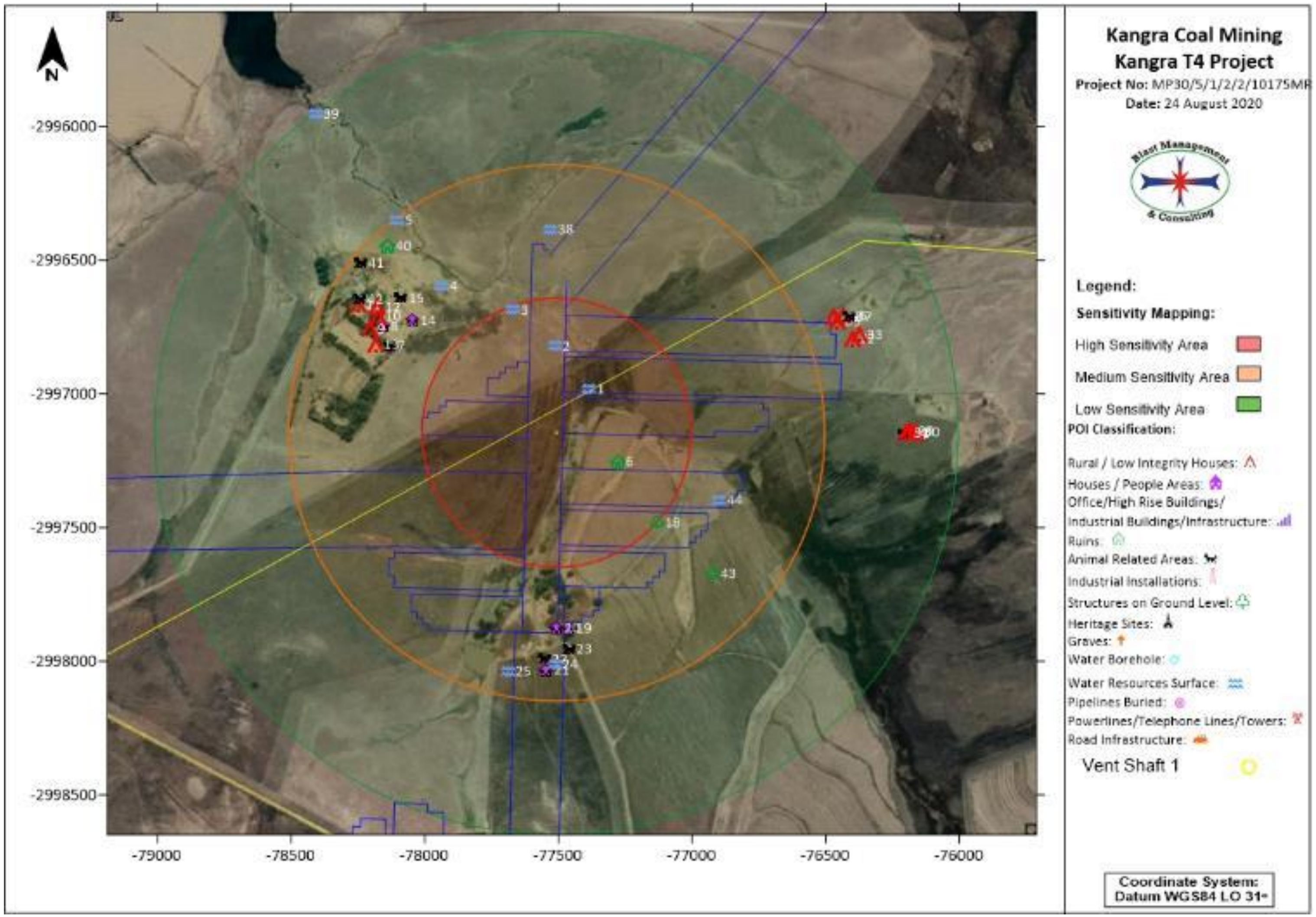

Figure 99: Identified sensitive areas for Vent Shaft 1

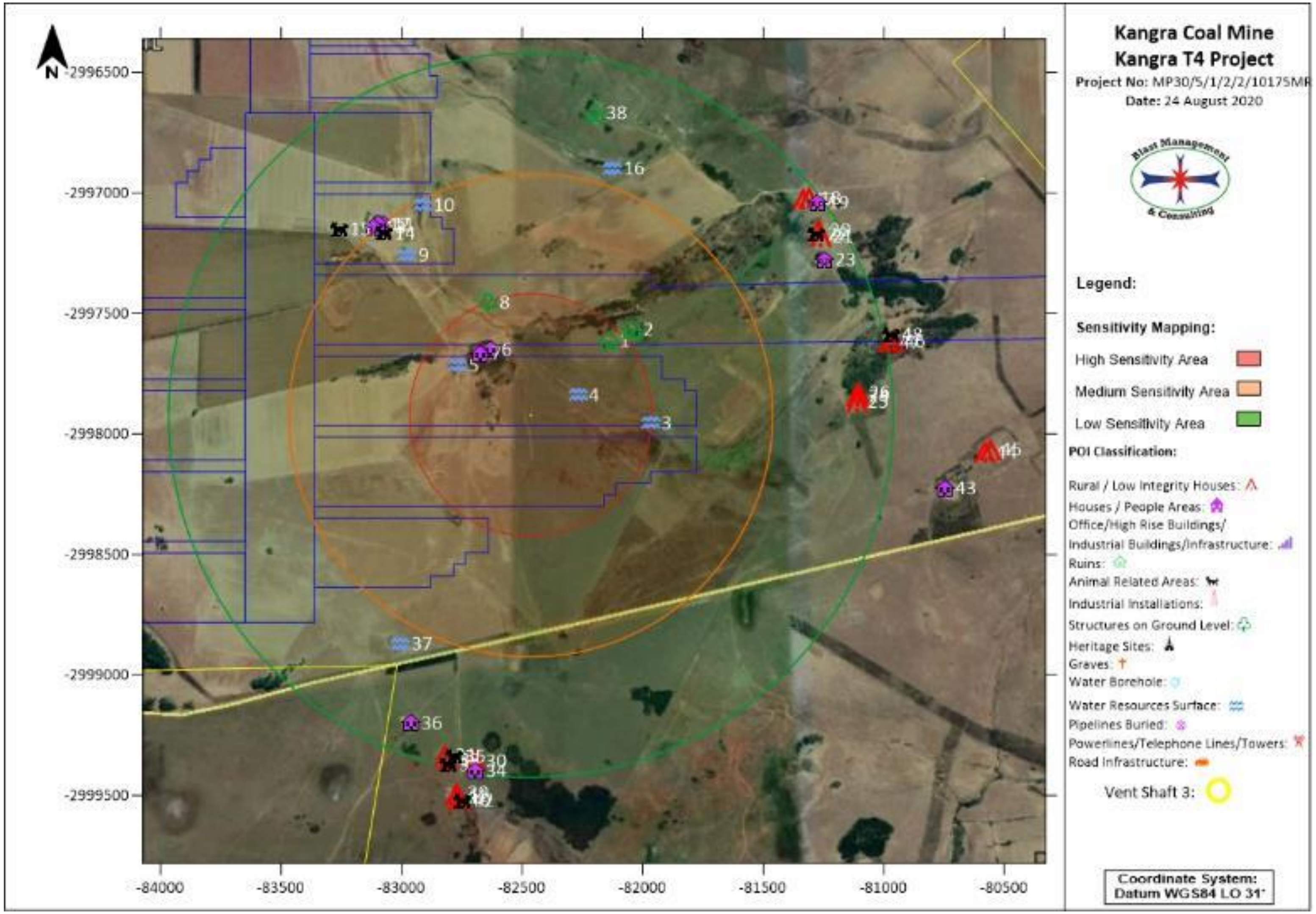

Figure 100: Identified sensitive areas for Vent Shaft 3

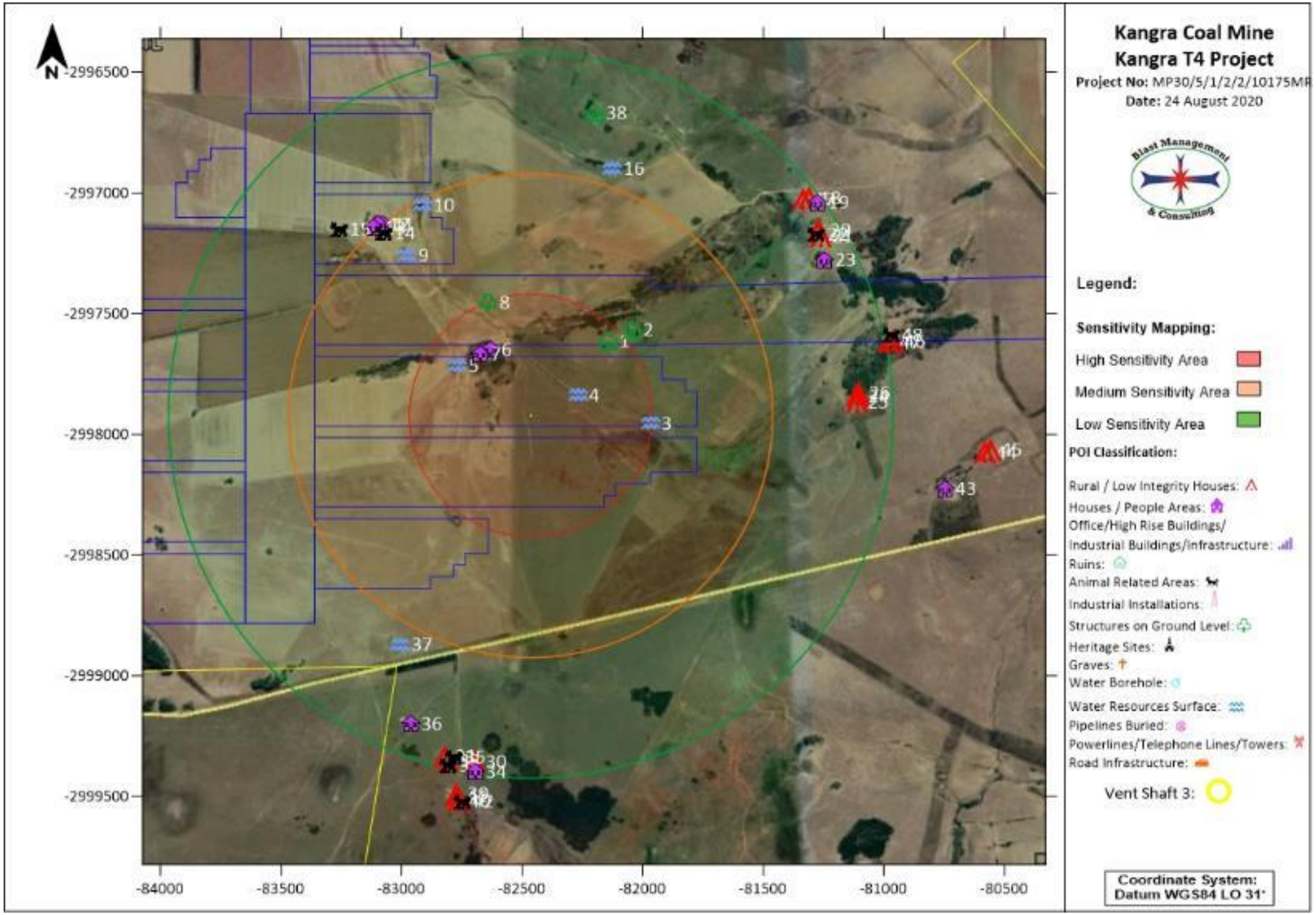

Figure 101: Identified sensitive areas for Vent Shaft 4

10.13.4 Influence from Blasting Operations

Blasting operations are required to break rock for excavation to access the development of the vent shafts. Explosives in blast holes provide the required energy to conduct the work. Ground vibration, air blast and fly rock result from the blasting process. Based on the regulations of the different acts consulted and international accepted standards these effects are required to be within certain limits. The following sections provide guidelines on these limits. As indicated, there are no specific South African ground vibration and air blast limit standards.

10.13.4.1 Ground Vibration Limitations on Structures

Ground vibration is measured in velocity with units of millimetres per second (mm/s). Ground vibration can also be reported in units of acceleration or displacement if required. Different types of structures have different tolerances to ground vibration. A steel structure or a concrete structure will have a higher resistance to vibrations than a well-built brick and mortar house. A brick and mortar house will be more resistant to vibrations than a poorly constructed or a traditional built mud house. Different limits are then applicable to the different types of structures. Limitations on ground vibration take the form of maximum allowable levels or intensity for different installations or structures. Ground vibration limits are also dependent on the frequency of the ground vibration. Frequency is the rate at which the vibration oscillates. Faster oscillation is synonymous with a higher frequency and lower oscillation is synonymous with a lower frequency. Lower frequencies are less acceptable than higher frequencies because structures have a low natural frequency. Significant ground vibration at low frequencies could cause increased structure vibrations due to the natural low frequency of the structure and this may lead to crack formation or damages to occur.

Currently, the USBM criteria for safe blasting are applied as the industry standard where private structures are of concern. Ground vibration amplitude and frequency is recorded and analysed. The data is then evaluated accordingly. The USBM graph is used for plotting of data and evaluating the data. Figure 102 below provides a graphic representation of the USBM analysis for safe ground vibration levels. The USBM graph is divided mainly into two parts. The red lines in the figure are the USBM criteria:

- Analysed data displayed in the bottom half of the graph shows safe ground vibration levels; and
- Analysed data displayed in the top half of the graph shows potentially unsafe ground vibration levels.

Added to the USBM graph is a blue line and green dotted line that represents 6 mm/s and 12.5 mm/s which are additional criteria that are used by BM&C. The 6 mm/s is used for informal housing and 12.5 mm/s is used for structures that are considered being of lesser structural integrity than brick and mortar structures built according to building regulations.

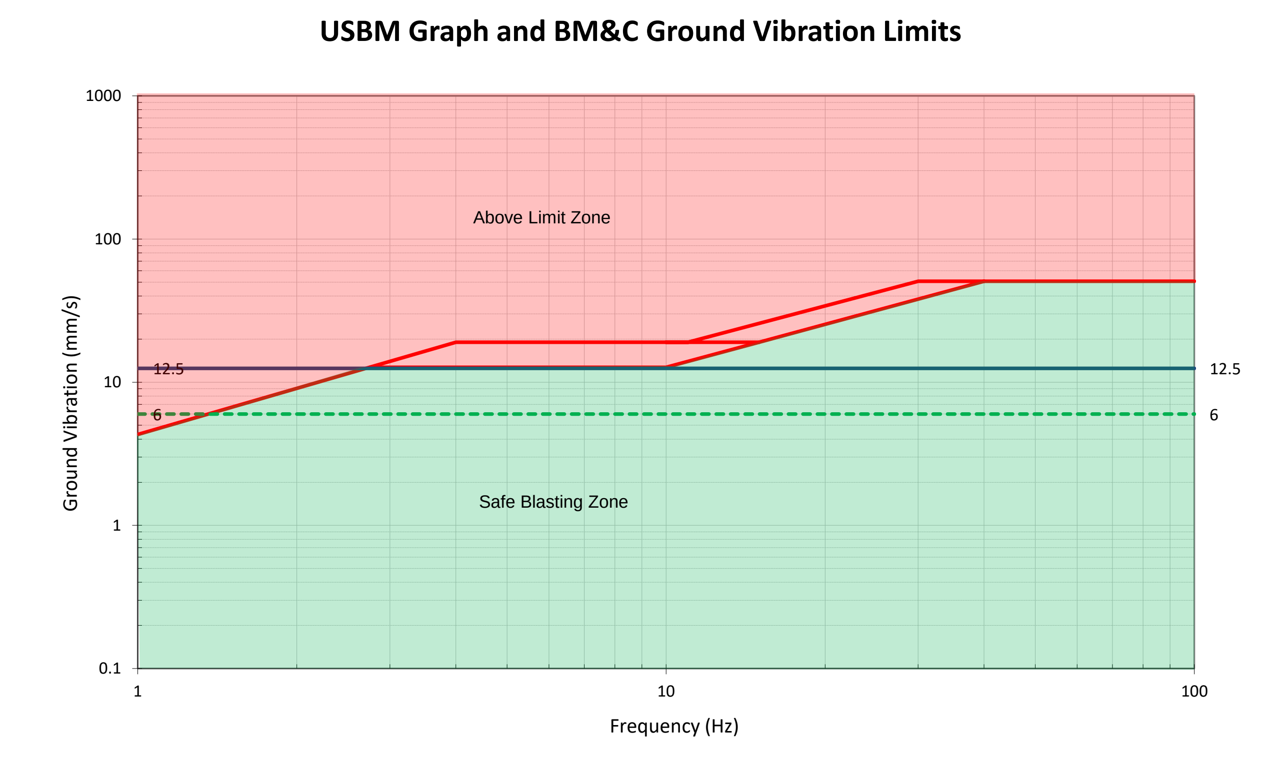

Figure 102: USBM Analysis Graph

Additional limitations that should be considered were determined through research and prescribed by the various institutions; these are as follows:

- National roads/tar roads: 150 mm/s
- Steel pipelines: 50 mm/s (Rand Water Board)
- Electrical lines: 75 mm/s (Eskom)
- Sasol Pipelines: 25 mms/s (Sasol)
- Railways: 150 mm/s
- Concrete less than 3 days old: 5 mm/s
- Concrete after 10 days: 200 mm/s
- Sensitive plant equipment: 12 mm/s or 25 mm/s, depending on type. (Some switches could trip at levels of less than 25 mm/s.)
- Water wells: 50 mm/s

Considering the above limitations, the specialists work is based on the following:

- USBM criteria for safe blasting.
- The additional limits provided above.
- Consideration of private structures in the area of influence.
- Should structures be in poor condition the basic limit of 25 mm/s is halved to 12.5 mm/s or when structures are in very poor condition limits will be restricted to 6 mm/s. It is a standard accepted method to reduce the limit allowed with poorer condition of structures.
- Informal/Traditional built mud houses are limited to 6 mm/s. The 6 mm/s limit is used due to unknowns

on how these structures will react to blasting. There is also no specific scientific data available that would indicate otherwise.

- Input from other consultants in the field locally and internationally.

10.13.4.2 Ground Vibration Limitations and Human Perceptions

A further aspect of ground vibration and frequency of vibration that must be considered is human perceptions. It should be realized that the legal limit set for structures is significantly greater than the comfort zone of human beings. Humans and animals are sensitive to ground vibration and the vibration of structures. Research has shown that humans will respond to different levels of ground vibration at different frequencies.

Ground vibration is experienced at different levels; BMC considers only the levels that are experienced as “Perceptible”, “Unpleasant” and “Intolerable”. This is indicative of the human being’s perceptions of ground vibration and clearly indicates that humans are sensitive to ground vibration and humans perceive ground vibration levels of 4.5 mm/s as unpleasant (See Figure 103). This guideline helps with managing ground vibration and the complaints that could be received due to blast induced ground vibration.

Indicated on Figure 103 is a blue solid line that indicates a ground vibration level of 12.5 mm/s and a green dotted line that indicates a ground vibration level of 6 mm/s. These are levels that are used in evaluation.

Generally, people also assume that any vibration of a structure - windows or roofs rattling - will cause damage to the structure. Air blast is one of the causes of vibration of a structure and is the cause of nine out of ten complaints.

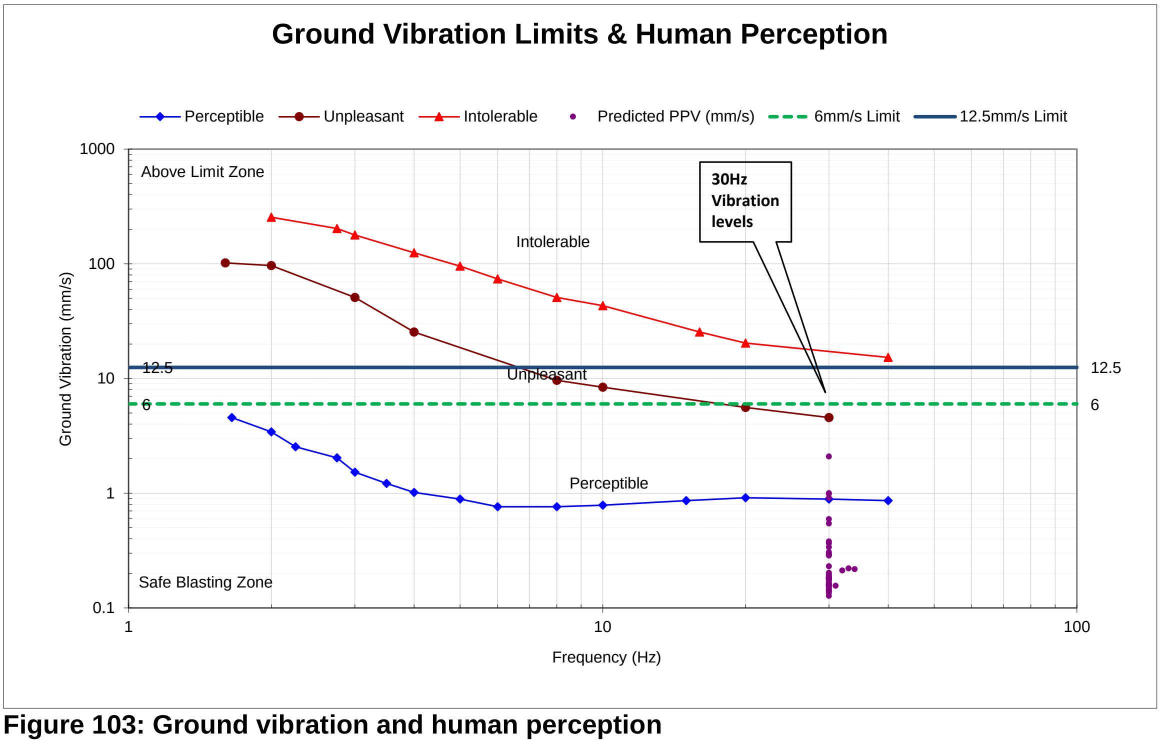

Figure 103: Ground vibration and human perception

10.13.4.3 Air Blast Limitations on Structures

Air blast or air-overpressure is a pressure wave generated from the blasting process. Air blast is measured as a pressure in pascal (Pa) and reported as a decibel value (dBL). Air blast is normally associated with frequency levels less than 20 Hz, which is at the threshold for hearing. Air blast can be influenced by meteorological conditions, the final blast layout, timing, stemming, accessories used, blast covered by a layer of soil or not etc. Air blast should not be confused with sound that is within the audible range (detected by the human ear). A blast does generate sound as well but for the purpose of possible damage capability we are only concerned with air blast in this report. The three main causes of air blasts can be observed as:

- Direct rock displacement at the blast; the air pressure pulse (APP).
- Vibrating ground some distance away from the blast; rock pressure pulse (RPP).
- Venting of blast holes or blowouts; the gas release pulse (GRP).

The general recommended limit for air blast currently applied in South Africa is 134 dBL. This is based on work done by the USBM. The USBM also indicates that the level is reduced to 128 dB in proximity of hospitals, schools and sensitive areas where people congregate. Based on work carried out by Siskind et al. (1980), monitored air blast amplitudes up to 135 dB are safe for structures, provided the monitoring instrument is sensitive to low frequencies. Persson et al. (1994) have published estimates of damage thresholds based on empirical data (Table 74). Levels given in Table 74 are at the point of measurement. The weakest points on a structure are the windows and ceilings.

Table 74: Damage Limits for Air Blast

Level	Description
>130 dB	Resonant response of large surfaces (roofs, ceilings). Complaints start.
150 dB	Some windows break
170 dB	Most windows break
180 dB	Structural Damage

All attempts should be made to keep air blast levels from blasting operations well below 120dB where the public is of concern.

10.13.4.4 Air Blast Limitations and Human Perceptions

Considering human perceptions and the misunderstanding about ground vibration and air blast, BMC generally recommends that blasting be done in such a way that air blast levels are kept below 120 dB. This will ensure fewer complaints regarding blasting operations. The effect on structures that startle people will also be reduced, which reduces the reasons for complaints. It is the effect on structures (like rattling windows, doors or a large roof surface) that startles people. These effects are sometimes erroneously identified as ground vibration and considered to be damaging to the structure.

In this report initial limits for evaluating conditions have been set at 120 dB, 120 dB to 134 dB and greater than 134 dBL. The USBM limits for nuisance are 134 dBL.

10.13.4.5 Fly Rock

Blasting practices require some movement of rock to facilitate the excavation process. The extent of movement is dependent on the scale and type of operation. For example, blasting activities at large coal mines are designed to cast the blasted material over a greater distance than in quarries or hard rock operations or a decline shaft as in this project. The movement should be in the direction of the free face. The orientation of the blast and expected movement direction is important. Material or elements travelling outside of a planned or expected range would be considered fly rock. Figure 104 shows a schematic representation of the following fly rock definitions.

Fly rock can be categorised as follows:

- Throw - the planned forward movement of rock fragments that form the muck pile within the blast zone.
- Fly rock - the undesired propulsion of rock fragments through the air or along the ground beyond the blast zone by the force of the explosion that is contained within the blast clearance (exclusion) zone. When using this definition, fly rock, while undesirable, is only a safety hazard if a breach of the blast clearance (exclusion) zone occurs.
- Wild fly rock - the unexpected propulsion of rock fragments that travels beyond the blast clearance (exclusion) zone when there is some abnormality in a blast or a rock mass.

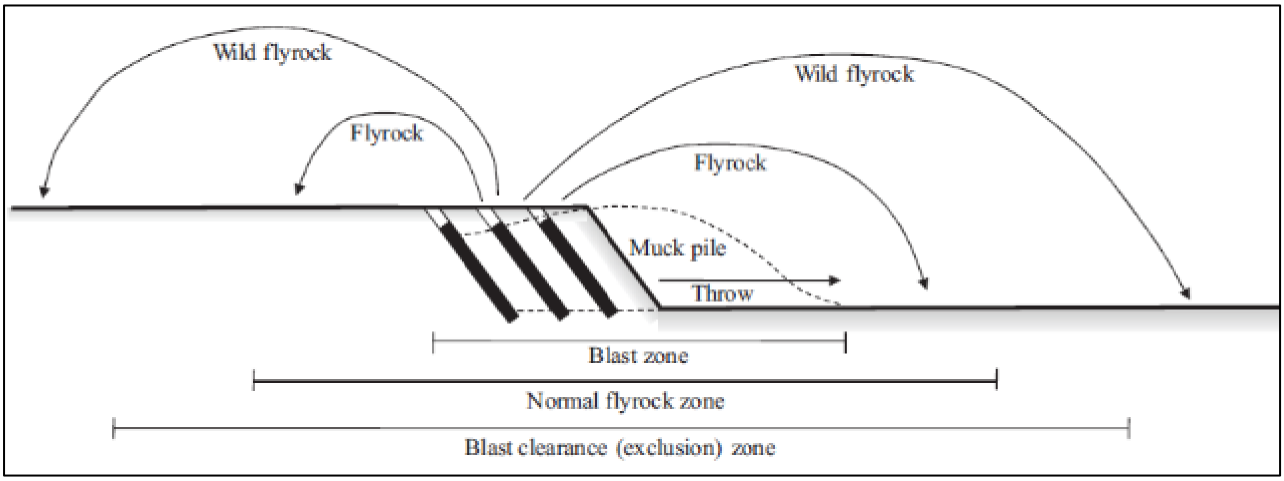

Figure 104: Schematic of fly rock terminology

Fly rock from blasting can result under the following conditions:

- When burdens are too small, rock elements can be propelled out of the free face area of the blast.
- When burdens are too large and movement of blast material is restricted and stemming length is not correct, rock elements can be forced upwards creating a crater forming fly rock.
- If the stemming material is of poor quality or too little stemming material is applied, the stemming is ejected out of the blast hole, which can result in fly rock.

Stemming of correct type and length is required to ensure that explosive energy is efficiently used to its maximum and to control fly rock.

The occurrence of fly rock in any form will have impact if found to travel outside the safe boundary. If a road or structure or people or animals are within the safe boundary of a blast, irrespective of the possibility of fly rock or not, precautions should be taken to stop the traffic, remove people or animals for the period of the blast. The fact is that fly rock will cause damage to the road, vehicles or even death to people or animals. This safe boundary is determined by the appointed blaster or as per mine code of practice. BMC uses a prediction calculation defined by the International Society of Explosives Engineers (ISEE) to assist with determining minimum distance.

10.13.4.6 Noxious Fumes

Explosives used in the mining environment are required to be oxygen balanced. Oxygen balance refers to the stoichiometry of the chemical reaction and the nature of gases produced from the detonation of the explosives. The creation of poisonous fumes such as nitrous oxides and carbon monoxide are particularly undesirable. These fumes present themselves as red brown cloud after the blast has detonated. It has been reported that 10 ppm to 20 ppm can be mildly irritating. Exposure to 150 ppm or more (no time period given) has been reported to cause death from pulmonary edema. It has been predicted that there is a 50 % chance of death following exposure to 174 ppm for 1 hour. Anybody exposed must be taken to hospital for proper treatment. Factors contributing to undesirable fumes are typically: poor quality control on explosive manufacture, damage to explosive, lack of confinement, insufficient charge diameter, excessive sleep time, water in blast holes incorrect product used or product not loaded properly and specific types of rock/geology can also contribute to fumes.

10.13.4.7 Vibration impact on provincial and national roads

The influence of ground vibration on tarred roads are expected when levels is in the order of 150 mm/s and greater. Or when there is actual movement of ground when blasting is done to close to the road or subsidence is caused due to blasting operations. Normally 100 blast hole diameters are a minimum distance between structure and blast hole to prevent any cracks being formed into the surrounds of a blast hole. Crack forming is not restricted to this distance. Improper timing arrangements may also cause excessive back break and cracks further than expected. Fact remain that blasting must be controlled in the vicinity of roads. Air blast from blasting does not have influence on road surfaces. There is no record of influence on gravel roads due to ground vibration. The only time damage can be induced is when blasting is done next to the road and there is movement of ground. Fly rock will have greater influence on the road as damage from falling debris may impact on the road surface if no control on fly rock is considered.

10.13.4.8 Vibration will upset adjacent communities

The effects of ground vibration and air blast will have influence on people. These effects tend to create noises on structures in various forms and people react to these occurrences even at low levels. As with human perception given above – people will experience ground vibration at very low levels. These levels are well below damage capability for most structures. A lot of work has also been done in the field of public relations in the mining industry. Most probably one aspect that stands out is to “Promote good neighbourliness”. This is achieved through communication and more communication with the neighbours. Consider their concerns and address in a proper manner.

The first level of good practice is to avoid unnecessary problems. One problem that can be reduced is the public's reaction to blasting. Concern for a person's home, particularly where they own it, could be reduced by a scheme of precautionary, compensatory and other measures which offer guaranteed remedies without undue argument or excuse. In general, it is also in an operator's financial interests not to blast where there is a viable alternative. Where there is a possibility of avoiding blasting, perhaps through new technology, this should be carefully considered in the light of environmental pressures. Historical precedent may not be a helpful guide to an appropriate decision.

Independent structural surveys are one way of ensuring good neighbour ship. There is a part of inherent difficulty in using surveys as the interpretation of changes in crack patterns that occur may be misunderstood. Cracks open and close with the seasonal changes of temperature, humidity and drainage, and numbers increase as buildings age. Additional actions need to be done in order to supplement the surveys as well.

The means of controlling ground vibration, overpressure and fly rock have many features in common and are used by the better operators. It is said that many of the practices also aid cost-effective production. Together these introduce a tighter regime which should reduce the incidence of fly rock and unusually high levels of ground vibration and overpressure. The measures include the need for the following:

- Correct blast design is essential and should include a survey of the face profile prior to design, ensuring appropriate burden to avoid over-confinement of charges which may increase vibration by a factor of two,
- The setting-out and drilling of blasts should be as accurate as possible and the drilled holes should be surveyed for deviation along their lengths and, if necessary, the blast design adjusted,
- Correct charging is obviously vital, and if free poured bulk explosive is used, its rise during loading should be checked. This is especially important in fragmented ground to avoid accidental overcharging,
- Correct stemming will help control air blast and fly rock and will also aid the control of ground vibration. Controlling the length of the stemming column is important; too short and premature ejection occurs, too long and there can be excessive confinement and poor fragmentation. The length of the stemming column will depend on the diameter of the hole and the type of material being used,
- Monitoring of blasting and re-optimising the blasting design in the light of results, changing conditions and experience should be carried out as standard.

10.13.4.9 Cracking of houses and consequent devaluation

Houses in general have cracks. It is reported that a house could develop up to 15 cracks a year. Ground vibration will be mostly responsible for cracks in structures if high enough and at continued high levels. The influences of environmental forces such as temperature, water, wind etc. are more reason for cracks that have developed. Visual results of actual damage due to blasting operations are limited. There are cases where it did occur, and a result is shown in Figure 105 below. A typical X crack formation is observed.

Figure 105: Example of blast induced damage.

Observing cracks of this form on a structure will certainly influence the value as structural damage has occurred. The presence of general vertical cracks or horizontal cracks that are found in all structures does not need to indicate devaluation due to blasting operations but rather devaluation due to construction, building material, age, standards of building applied. Proper building standards are not always applied or else stated was not always applied in the countryside when houses were built. Thus, damage in the form of cracks will be present. Exact costing of devaluation for normal cracks observed is difficult to estimate. A property valuator will be required for this and I do believe that property value will include the total property and not just the house alone. Mining operations may not have influence to change the status quo of any property.

10.13.5 Baseline Results

Baseline work for this report normally consists of two parts. The first part is monitoring of blasting operations if the mine is operational. The second part of baseline work done is familiarising oneself with the surroundings and the typical structures that are found in the area of the project. The information for this is presented below.

10.13.5.1 Baseline influence

The Kangra T4 Vent Shafts 1, 3 and 4 are currently not operational and as such do not have any specific influence at present.

10.13.5.2 Structure Profile

As part of the baseline, all possible structures in a possible influence area are identified. The site was reviewed using Google Earth imagery. Information sought during the review was to identify surface structures present in a 1500 m radius from the proposed vent shaft areas, which will require consideration during modelling of blasting operations, e.g. houses, general structures, power lines, pipelines, reservoirs, mining activity, roads, shops, schools, gathering places, possible historical sites, etc. A list was prepared of all structures in the vicinity of the open pit areas. The list includes structures and POI within the 1500 m boundary – see Table 75 below. A list of structure locations was required to determine the allowable ground vibration limits and air blast limits. Figure 106, Figure 107 and Figure 108 shows an aerial view of the Vent Shafts 1, 3 and 4 area and surroundings with POIs. The type of POIs identified is grouped into different classes. These classes are indicated as "Classification" and provided in the Blasting report. The classification used is a BMC classification and does not relate to any standard or national or international code or practice. Table 75 shows the descriptions for the classifications used.

Table 75: POI Classification used

Class	Description
1	Rural Building and structures of poor construction
2	Private Houses and people sensitive areas
3	Office and High-rise buildings
4	Ruins
5	Animal related installations and animal sensitive areas
6	Industrial buildings and installations
7	Earth like structures – no surface structure

Class	Description
8	Heritage sites (buildings, infrastructure, activity, graves)
9	Graves
10	Water Borehole
11	Water Resources Surface
12	Pipelines Buried
13	Powerlines / Telephone Lines / Towers

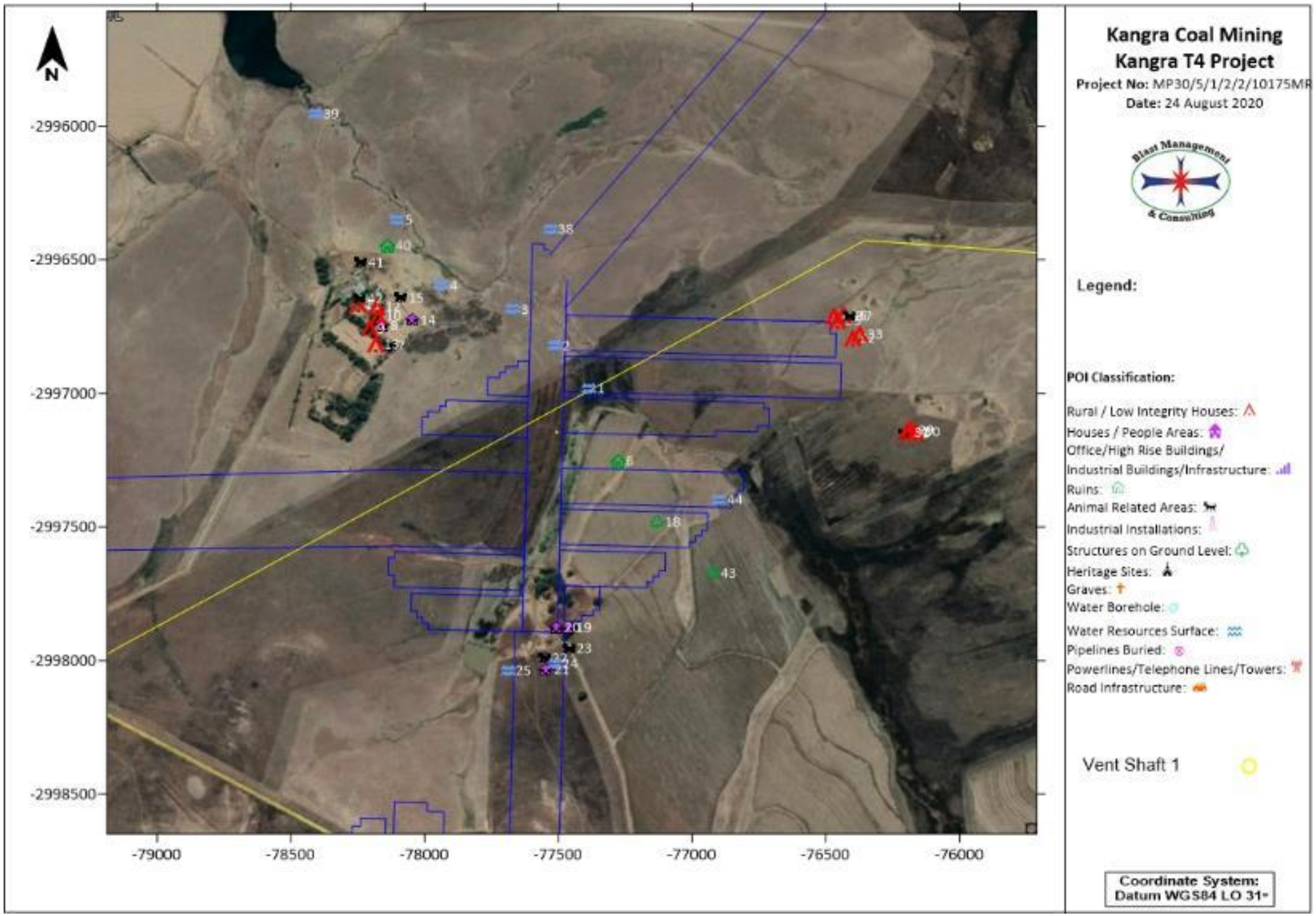

Figure 106: Aerial view and surface plan of the proposed Vent Shaft 1 area with points of interest identified

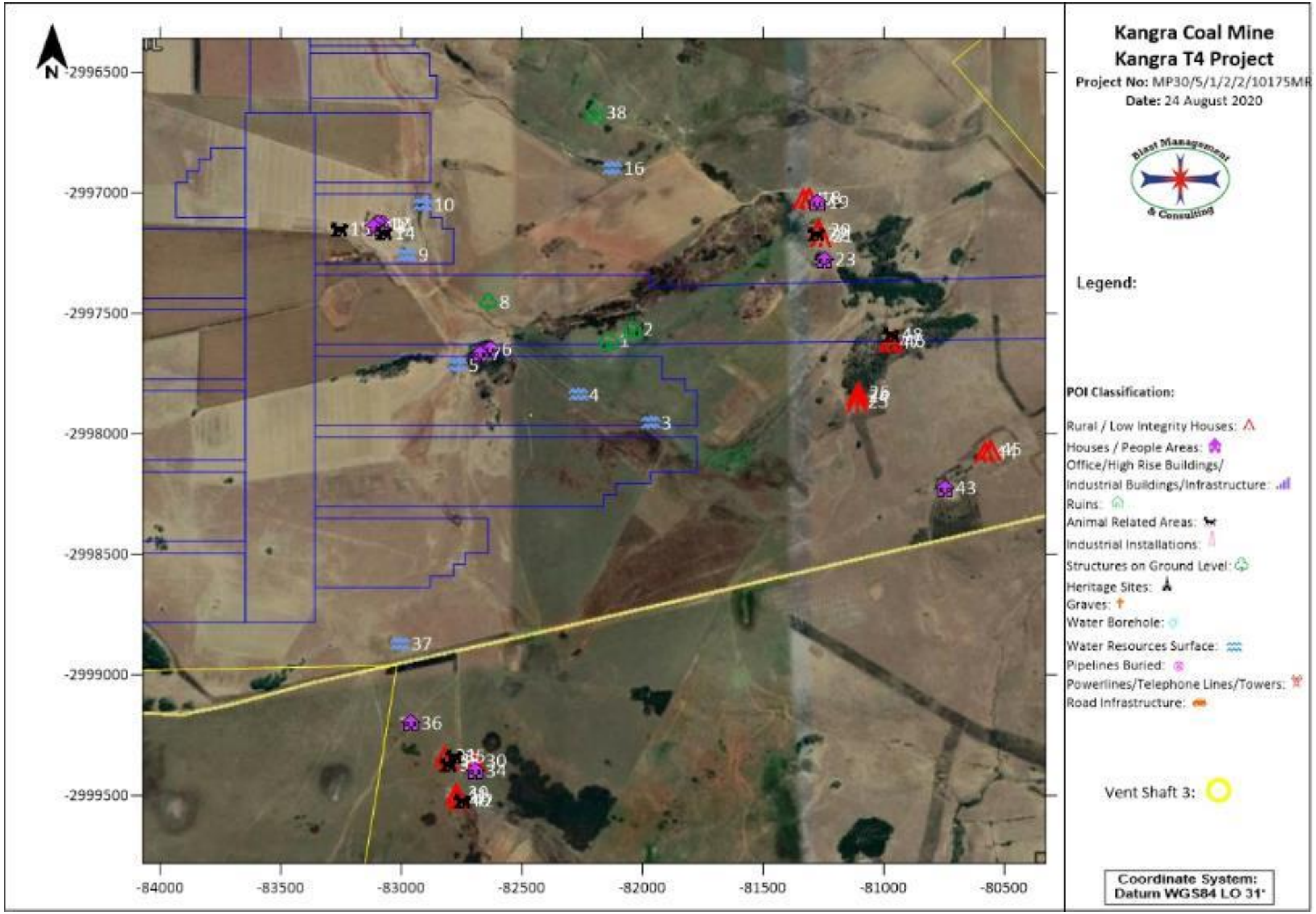

Figure 107: Aerial view and surface plan of the proposed Vent Shaft 3 area with points of interest identified

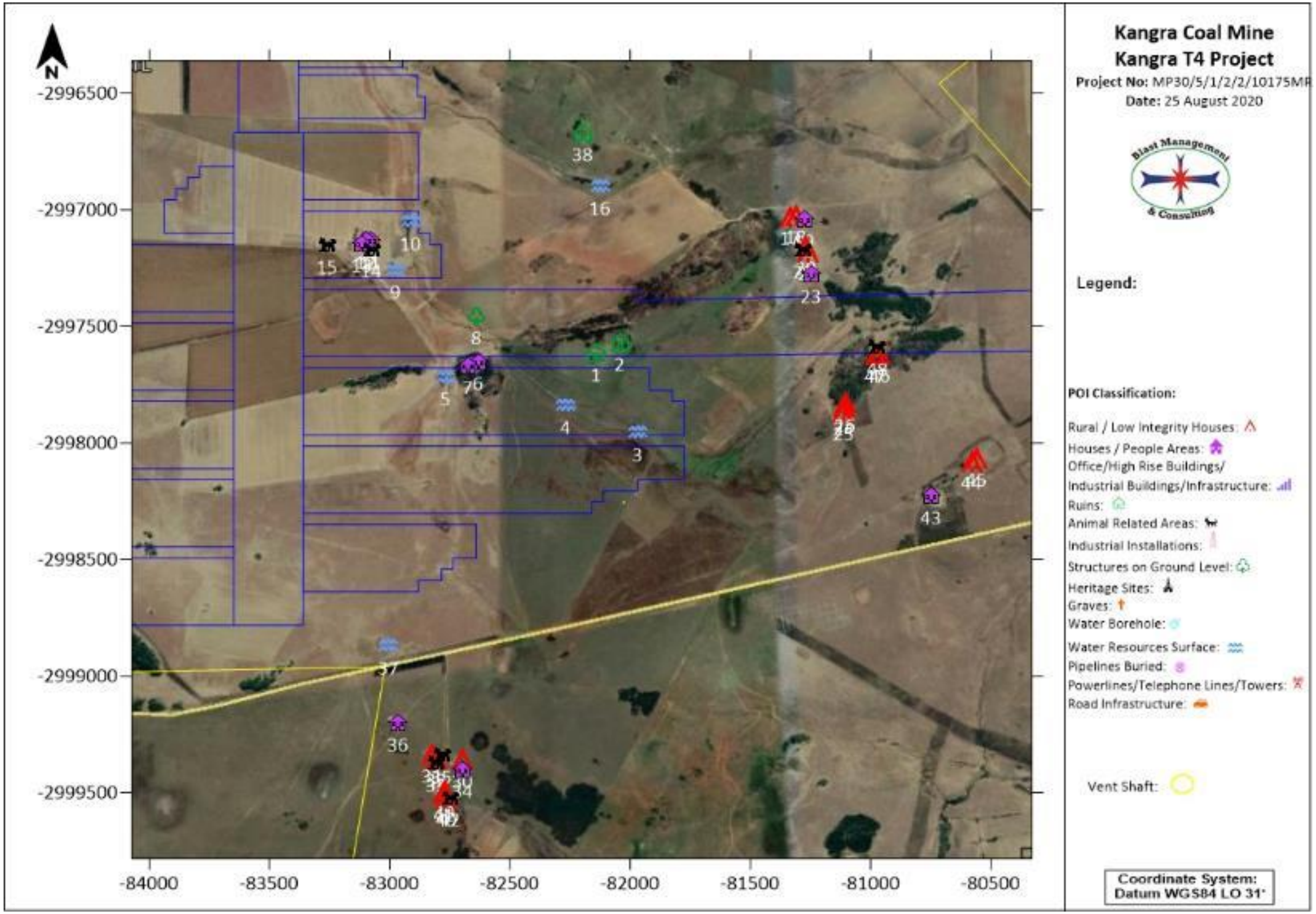

Figure 108: Aerial view and surface plan of the proposed Vent Shaft 4 area with points of interest identified

10.14 VISUAL

At present the visual character of the area is dominated by agricultural activities (maize cultivation and grazing of cattle), as well as mining related infrastructures such as the existing plant area and existing coal discard facilities. The mine site is located remotely from any substantial population settlement or any major thoroughfares. As a result, the limited deterioration in aesthetic quality will only be witnessed by the persons

located in close proximity of the mine site. Furthermore, the infrastructure related to the mine is limited in height and does not involve any facility to a height of greater than approximately 50m. The undulating nature of the surrounding landscape should be effective in concealing the mine related infrastructure from the surrounding area. Since there will be minimal surface infrastructure for the Kangra T4 Project, the visual impact of the proposed project is relatively low.

10.15 ARCHAEOLOGY AND HERITAGE

Reference is made to the Heritage Impact Assessment conducted and utilized to provide the baseline information within this section (Marais, 2019)*. Refer to Appendix 14.*

10.15.1 Methodology

Due to access constraints the archaeological reconnaissance of the study area was conducted during three separate site visits: August 2020, November 2020 and February 2021. The project area was inspected through a combination of unsystematic pedestrian and vehicular surveys of the area proposed for underground mining and a systematic pedestrian survey of the proposed powerline (Figure 109).

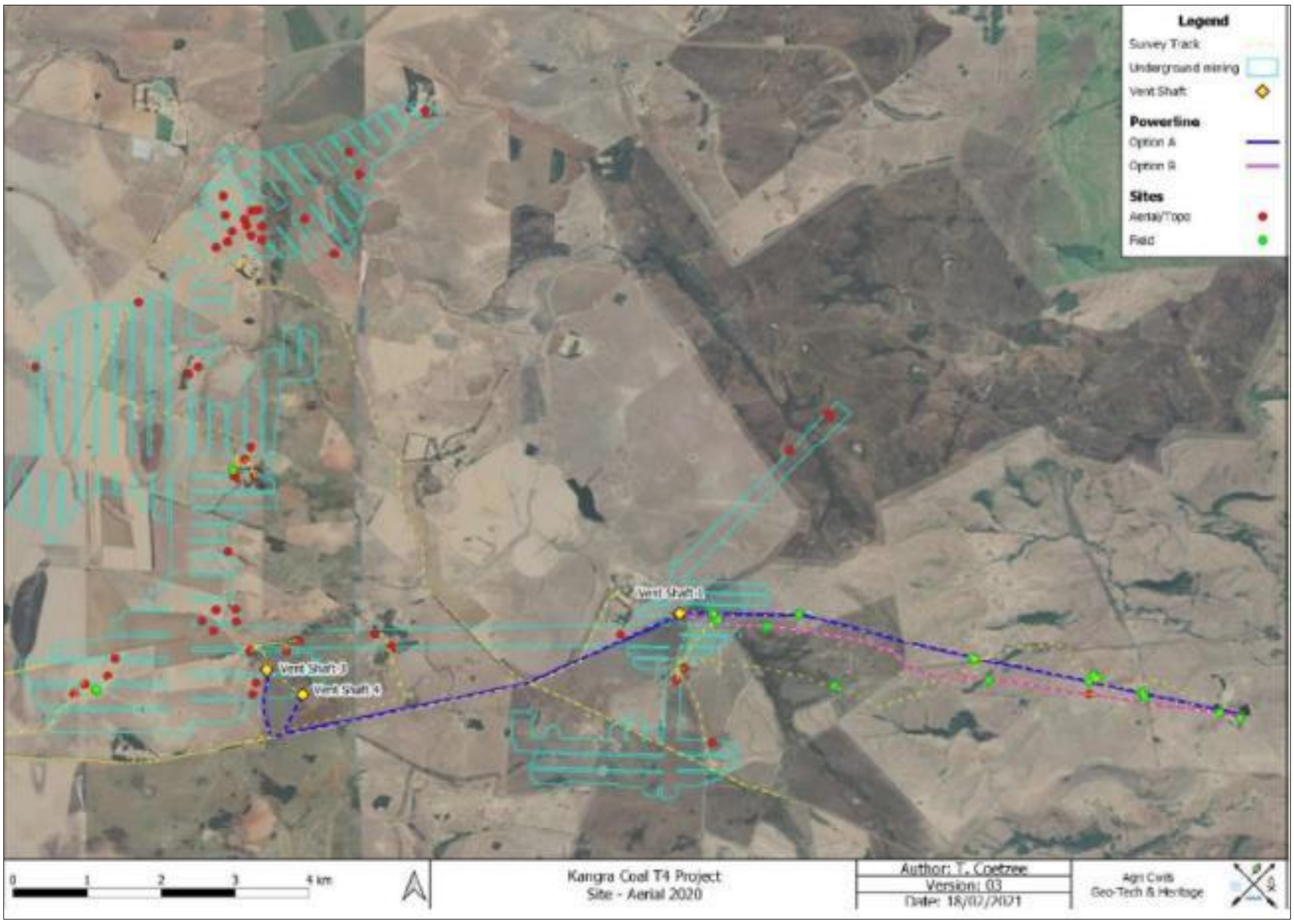

Figure 109: Study area with pre-plotted and field-recorded sites on a 2020 aerial backdrop

The areas demarcated for surface infrastructure and underground mining were inspected beforehand on Google Earth, historical aerial imagery and topographical maps in order to identify possible heritage remains. Fifty-one sites were identified and pre-plotted (**Error! Reference source not found.** & Figure 109), however, 29 sites falling within the area demarcated for underground mining appear to have been demolished completely and were therefore not visited. Of the pre-plotted sites, nine sites could not be inspected due to access and time constraints. Twenty additional sites were identified during the study as a result of the pedestrian survey and personal communication with landowners and residents. It should be noted that the prefixes '2730AA' and '2730AB' are not used when referring to the site names due to the length of the name, but are recorded as such in the report. The historical topographical datasets dating to 1969 and 1987, as well as the historical aerial photographs dating to 1939, 1961 and 1969 proved useful in terms of providing an indication of the location and age of some of the structures and features associated with the study area. The total area inspected was roughly 1900 ha.

All three proposed ventilation shafts (1, 3, 4), were inspected during the 3rd site visit. Site visit 1 consisted off the surveying of the proposed powerline from just east of ventilation shaft 1 via route option A to the end towards the east. Two pre-plotted sites (K18 & K22) were inspected as well. The 2nd site visit was marked by a lack of access to the properties, except Middelpan 44 HT. Because of the lack of access, but good visibility due to recent veldt fires, the sections of the proposed powerline directly next to the road were. During the 3rd site visit the majority of the environment was characterised by relatively short grass cover. Most of the remaining sites that could be accessed were recorded during the 3rd site visit. It should also be noted that based on the results of the 1st site visit, the option B route for the powerline was proposed and was surveyed during the 3rd site visit as well.

The reconnaissance of the area under investigation served a twofold purpose:

- To obtain an indication of heritage material found in the general area as well as to identify or locate archaeological sites on the areas demarcated for development. This was done in order to establish a heritage context and to supplement background information that would benefit developers through identifying areas that are sensitive from a heritage perspective.
- All archaeological and historical events have spatial definitions in addition to their cultural and chronological context. Where applicable, spatial recording of these definitions were done by means of a handheld GPS during the site visit.

10.15.2 Results of the Heritage Assessment

10.15.2.1 Archaeological and Historical Remains

10.15.2.1.1 Stone Age Remains

No Stone Age archaeological remains were observed within the demarcated study area. Although no Stone Age archaeological remains were found, such artefacts may occur in the area. These artefacts are often associated with rocky outcrops or water sources. Archaeological studies done on the surrounding areas also did not locate material pertaining to the Stone Age. According to Bergh (1999: 5), no major Stone Age archaeological sites are located in the direct vicinity of Amersfoort.

10.15.2.1.2 Iron Age Farmer Remains

No Iron Age Farmer remains were located within the demarcated study area. The Heritage Impact Assessment done by Birkholtz (2019) located one circular stone-walled enclosure that dates to the Late Iron Age.

10.15.2.1.3 Historical

Fifty-three sites dating to the Historical Period were identified using a combination of historical topographical maps, aerial images and via personal observation.

Table 76 lists the 24 sites that were identified using aerial imagery dating to 1939 and 1961. These sites consist of buildings and structures, however, based on recent aerial imagery appear to have been demolished completely. These sites were therefore not visited.

Table 76: Demolished sites not visited

Name	Type	Source	Year	Status	Age	Parcel
K07	Structure	Aerial	1939	Demolished	Historical	2/11
K08	Building	Aerial	1939	Demolished	Historical	2/11
K10	Building	Aerial	1939	Demolished	Historical	RE/9
K21	Building	Aerial	1961	Demolished	Historical	8/43
K24	Structure	Aerial	1961	Demolished	Historical	1/9
K25	Building	Aerial	1961	Demolished	Historical	1/12
K27	Building	Aerial	1939	Demolished	Historical	1/43
K28	Building	Aerial	1939	Demolished	Historical	1/43
K29	Building	Aerial	1939	Demolished	Historical	RE/9
K30	Building	Aerial	1939	Demolished	Historical	RE/9
K31	Structure	Aerial	1939	Demolished	Historical	RE/9
K32	Building	Aerial	1939	Demolished	Historical	RE/9
K33	Building	Aerial	1939	Demolished	Historical	RE/9
K34	Building	Aerial	1939	Demolished	Historical	RE/9
K35	Building	Aerial	1939	Demolished	Historical	RE/9
K36	Building	Aerial	1939	Demolished	Historical	6/43
K37	Building	Aerial	1939	Demolished	Historical	3/43
K38	Building	Aerial	1939	Demolished	Historical	3/43
K39	Building	Aerial	1939	Demolished	Historical	0/9
K40	Building	Aerial	1939	Demolished	Historical	4/8
K41	Building	Aerial	1939	Demolished	Historical	1/9
K42	Building	Aerial	1961	Demolished	Historical	RE/9
K43	Building	Aerial	1961	Demolished	Historical	RE/9
K45	Building	Aerial	1961	Demolished	Historical	6/43

Table 77 lists seven historical sites, consisting of buildings and structures, identified on 1939 and 1961 aerial imagery. Based on recent aerial imagery, surface remains appear to be present at these sites, but due access constraints (discussed in the Limitations section), these sites could not be visited.

Table 77: Historical buildings/structures with apparent surface remains - not visited

Name	Type	Source	Year	Status	Age	Parcel
K02	Structure	Aerial	1961	Ruin	Historical	1/6
K03	Structure	Aerial	1961	Ruin	Historical	2/11
K04	Building	Aerial	1939	Intact	Historical	4/8
K11	Building	Aerial	1939	Intact	Historical	18/43
K19	Building	Aerial	1939	Intact	Historical	1/9
K23	Building	Aerial	1961	Ruin	Historical	4/8

K44	Building	Aerial	1939	Ruin	Historical	2/43

Table 78 lists the three historical building/structure sites that were identified on 1939 aerial imagery. According to recent aerial imagery these sites have been demolished but were netherless visited.

Site K09, located on Portion 8 of the Farm Grootvallei 43 HT, consists of an open area that appear to have been used as a kraal. Structures are visible on the 1939 aerial image, but not on subsequent images or topographical maps.

Site K14 is located on the Farm Middelpan 44 HT and appears as a potential structure with rows of trees on 1939 aerial imagery. The trees and potential structure appear on the 1961 and 1969 aerial images as well but are omitted thereafter. No building, however, is visible on historical toparchical maps. No evidence of infrastructure could be detected during the site visit.

K09 – Demolished structure.

K14 – Demolished structure.

K15 – Demolished building.

Site K15, also located on the Farm Middelpan 44 HT and to the north of the main residence, is visible on the 1939, 1961 and 1969 aerial images. The 1969 topographical map shows the site to be a kraal. Subsequent topographical maps do not indicate any structure. The outline of the kraal is visible on recent aerial imagery, but no surface remains could be detected during the site visit.

Table 78:Demolished historical buildings/structures – visited

Name	Type	Source	Year	Status	Age	Parcel
K09	Structure	Aerial	1939	Structure	Historical	8/43
K14	Structure	Aerial	1939	Structure	Historical	RE/44
K15	Building	Aerial	1939	Building	Historical	RE/44

Table 79 lists the 19 visited historical sites that are associated with surface remains. These sites were identified on a combination of 1939 and 1961 aerial imagery, as well as through observation during the pedestrian survey.

Site K01 was identified on the 1939 aerial image as a rectangular structure measuring approximately 50 X 56 m. The structure appears to have been demolished by 1961 and is not indicated on any of the topographical maps. The site visit confirmed that the structure consists of dilapidated stone-walling and smaller cement structures within the larger enclosure. The site, however, is overgrown and dense vegetation hampered visibility. The function of the structure is unclear, but it might have been used as a kraal.

Site K05 is located on Portion 3 of the Farm Grootvallei 43 HT and consists of a farmhouse and outbuilding. The farmhouse, a painted brick building with a stone foundation, and a stone-constructed outbuilding are visible on the 1939 aerial image. Both structures appear to be in a fairly good condition. However, it is not clear whether the buildings visible on the 1939 aerial image are still present or if they have been demolished and replaced by more recent buildings.

Site K06 first appears on the 1961 aerial image as a building on Portion 16 of the Farm Grootvallei 43 HT and is present on all subsequent aerial and topographical maps. The building appears to be a rondavel at the centre of the settlement with a few additional and more recent buildings nearby. The settlement is fenced-off and it should be noted that a cemetery was observed. Direct access, however, was not gained.

Site K12 consists of three dilapidated buildings, two constructed from bricks and one from stone. The site is located on Portions 3, 4 and 12 of the Farm Grootvallei 43 HT. The buildings appear on the 1939, 1961 and 1969 aerial images , but not on the 1969 topographical map. Though the western-most building is shown on the 1987 topographical map and the eastern-most on the 2009 topographical map.

Site K13 is characterised by a farmhouse and several outbuildings on the Farm Middelpan 44 HT. The farmhouse first appears on the 1939 aerial image, but some of the buildings appear to have only been constructed between 1939 and 1961. One of the outbuildings is constructed from stone, while the rest of the buildings consist of painted brick buildings. The farmhouse, however, has a stone foundation.

Sites K16 & K17 are located on Portion 8 of the Farm Grootvallei 43 HT. Both sites appear on the 1939, 1961 and 1969 aerial images , as well as on all of the topographical maps. Both sites appear to consist of several buildings, but it is unclear whether the buildings visible on the 1939 aerial image are still present or have been demolished and replaced by more recent buildings. It should also be noted that site K17 could not be closely inspected due to access restrictions caused by wet and marshy conditions.

Sites K18 & K22 respectively appear on 1939 and 1961 aerial imagery. The sites are located on Portion 4 of the Farm De Paarl 39 HT and appear to be the original farmhouse and outbuilding (Site K18) with a nearby kraal (Site K22). Both sites consist of several buildings and structures, however, several of the smaller buildings associated with the sites appear to be of a more recent origin and are not clearly visible on the aerial imagery. The topographical maps indicate two buildings at Site K18 and a Kraal at Site K22.

Site K20 is located directly southwest of Site K05 on Portion 3 of the Farm Grootvallei 43 HT. The site consists of an angular stone-walled enclosure with a cement structure that appears to have been used as a dip for small stock. Site K20 appears on historical aerial imagery dating to 1939 but not on any of the topographical maps.

Site K50, a cluster of angular and circular stone-walled enclosures located on the Farm Naauwhoek 37 HT, was observed on 1939, 1961 and 1969 aerial imagery. The topographical map dating to 1969 indicates a building, while no indication is noted on the following topographical maps. A wheel tax plate dating to 1942 was observed at the site. The exact number of enclosures could not be determined due to dense vegetation cover and the dilapidated state of the structures, but at least one circular enclosure, possibly used for livestock, and one angular enclosure, possibly a residence, were identified. The angular enclosure measures approximately 10 X 7 m while the circular enclosure has an approximate diameter of 16 m. No other material remains were observed. It should be noted that the option B powerline route runs directly through the site.

Site K51, is located approximately 16 m south of the proposed powerline option B route on the Farm Naauwhoek 37 HT. The site consists of a section of stone-walling, but due to the dilapidated state and dense vegetation, the extent could not be determined. The site is not visible on any of the aerial images and is not depicted on any of the topographical maps.

Site K57 consists of a fenced-off settlement characterised by several buildings and structures. A building first appears on the 1961 aerial image near the centre of the settlement and appears to have increased in size by 1969. Recent aerial imagery, however, shows the location of the original building to be vacant land, while new buildings are visible directly to the east and west. The topographical map dating to 1969 shows the presence of the original building while no building is shown on the 1987 map. The 2009 topographical map, however, indicates the two buildings to the east and west. It should be noted that a cemetery was observed within the fenced-off settlement, but access was not gained as a result of the language barrier. Also, the proposed powerline route A runs directly through the settlement.

Sites K60 & K61 are located approximately 140 m north of site K50 on Portion 2 of the Farm Roodepoort 38 HT and consist of similar stone-walling. Both sites are not clearly visible on historical aerial imagery, although a faint outline of Site K61 appears on the 1939 aerial image. No building or structure is visible on any of the topographical maps. Site K60 consists of a circular stone-walled enclosure with an approximate diameter of 10 m, while Site K61, located 120 m to the northeast, measures approximately 24 X 17 m and has two angular and two rounded corners. The proposed powerline option A runs directly through Site K60 and 60 m to the south of Site K61.

Site K62 consists of a singular stone-walled enclosure with a diameter of approximately 10 m. The site is located 15 m north of the proposed powerline option A and falls on Portion 2 of the Farm Roodepoort 38 HT. No indication of a structure is observed on any of the topographical maps or aerial images (Appendix A of the Heritage report attached as Appednix 14 to this EIAR). No surface material was observed at the site.

Site K63, also located no Portion 2 of the Farm Roodepoort 38 HT, is located 23 m south of the proposed powerline option A and consists of a section of stone-walling. Due to the dilapidated state of the stonewalling and dense vegetation, the exact extent and shape could not be determined. No indication of a structure was observed on any of the topographical maps or aerial images and no surface material were observed at the site.

Site K64 consists of a singular stone-walled enclosure with a diameter of approximately 3 m. The site is located 63 m south of the proposed powerline option A and 53 m north of option B and falls on Portion 3 of the Farm Roodepoort 38 HT. No indication of a structure is observed on any of the topographical maps or aerial images. No surface material was observed at the site.

Site K69 consists of a stone-constructed building approximately 200 m west of site K13 on the Farm Middelpan 44 HT. The building is present on the 1939 aerial image. A kraal is indicated directly to the southwest of the building on the 1969 topographical map, though have been demolished since. Also, a section of the building appears to have been demolished and another restored in later years. A section was added to the building as well. It is unclear whether the building was completely demolished and rebuilt at some stage. The building material and style, however, suggests a historical building.

Table 79: Historical buildings/structures with surface remains - visited

Name	Type	Source	Year	Status	Age	Parcel
K01	Building	Aerial	1939	Ruin	Historical	16/43
K05	Building	Aerial	1939	Intact	Historical	3/43
K06	Building	Aerial	1961	Intact	Historical	16/43
K12	Building	Aerial	1939	Intact	Historical	12/43
K13	Building	Aerial	1939	Intact	Historical	RE/44
K16	Building	Aerial	1939	Intact	Historical	8/43
K17	Building	Aerial	1939	Intact	Historical	8/43
K18	Building	Aerial	1939	Intact	Historical	4/39
K20	Structure	Aerial	1939	Intact	Historical	3/43
K22	Building	Aerial	1961	Intact	Historical	4/39
K50	Stone-Walling	Aerial	1939	Intact	Historical	RE/37
K51	Stone-Walling	Field	Unknown	Intact	Historical	RE/37
K57	Settlement	Field	Unknown	Intact	Historical	3/39
K60	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K61	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K62	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K63	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K64	Stone-Walling	Field	Unknown	Intact	Historical	3/38
K69	Building	Aerial	1939	Intact	Historical	RE/44

 K09 – Demolished structure.	 K14 – Demolished structure.
 K15 – Demolished building.	

Table 80 lists the 19 visited historical sites that are associated with surface remains. These sites were identified on a combination of 1939 and 1961 aerial imagery, as well as through observation during the pedestrian survey.

Table 80: Historical buildings/structures with surface remains - visited

Name	Type	Source	Year	Status	Age	Parcel
K01	Building	Aerial	1939	Ruin	Historical	16/43
K05	Building	Aerial	1939	Intact	Historical	3/43
K06	Building	Aerial	1961	Intact	Historical	16/43
K12	Building	Aerial	1939	Intact	Historical	12/43
K13	Building	Aerial	1939	Intact	Historical	RE/44
K16	Building	Aerial	1939	Intact	Historical	8/43
K17	Building	Aerial	1939	Intact	Historical	8/43
K18	Building	Aerial	1939	Intact	Historical	4/39
K20	Structure	Aerial	1939	Intact	Historical	3/43
K22	Building	Aerial	1961	Intact	Historical	4/39
K50	Stone-Walling	Aerial	1939	Intact	Historical	RE/37

K51	Stone-Walling	Field	Unknown	Intact	Historical	RE/37
K57	Settlement	Field	Unknown	Intact	Historical	3/39
K60	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K61	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K62	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K63	Stone-Walling	Field	Unknown	Intact	Historical	2/38
K64	Stone-Walling	Field	Unknown	Intact	Historical	3/38
K69	Building	Aerial	1939	Intact	Historical	RE/44

	
: K01 –Stone-walling.	K01 – Cement structure.
	
K05 – Farmhouse.	: K05 – Outbuilding.
	
K06 – Buildings	K12 – Dilapidated building.

46: – Outbuilding.

: K50 – Circular stonewalled enclosure.

: K50 – Angular stonewalled enclosure.

: K50 – Wheeltax plate, 1942.

: – Stonewalling.

: K57 – Settlement.

: K57 – Cemetery.

: K60 – Circular stone-walled enclosure

: K61 – Angular stone-walled enclosure.

: K62 – Circular stone-walled enclosure.

: K63 - Stonewalling.

: K64 – Circular stonewalled enclosure.

K69 – Intact historical building.

10.15.2.1.4 Contemporary Remains

Table 81 lists the nine sites that date to contemporary times. Five of these sites (K26, K46, K47, K48, K49) first appear on the 1969 aerial image as structures and buildings, but based on recent aerial images, were demolished. These sites were therefore not visited.

Sites K53 & K54 were recorded as natural rocky outcrops on Portion 5 of the Farm De Paarl 39 HT during the pedestrian survey and inspected afterwards on historical aerial images and topographical maps. These sites are therefore not considered significant from a heritage perspective.

Site K65 & K66 are located on Portion 3 of the Farm Roodepoort 38 HT. Site K65 consists of the concrete foundations of a small angular structure measuring 5 X 5 m. Site K66 is located at the easternmost point of the proposed powerline and consists of a concrete building ruin measuring 14 X 7 m. Site K65 & K66 are not visible one any of the historical aerial images and are not indicated on any of the topographical maps (Appendix A of the Heritaeg Report attached as Appendix 14 to this EIAR). The use of these sites is unknown, but it is suspected that they may be connected to a waterfilled quarry located 150 m to the east. This might indicate past mining activity. The building material used also suggests more recent construction.

Table 81: Contemporary Remains

Name	Type	Source	Year	Status	Age	Parcel
K26	Structure	Aerial	1969	Demolished	Contemporary	3/41
K46	Structure	Aerial	1969	Demolished	Contemporary	RE/44
K47	Building	Aerial	1969	Demolished	Contemporary	RE/9
K48	Building	Aerial	1969	Demolished	Contemporary	RE/9
K49	Building	Aerial	1969	Demolished	Contemporary	RE/9
K53	Natural	Field	N/A	N/A	N/A	5/39
K54	Natural	Field	N/A	N/A	N/A	5/39
K65	Building	Field	Unknown	Ruin	Contemporary	3/38
K66	Building	Field	Unknown	Ruin	Contemporary	3/38

	
K26 – Natural rock outcrop.	K54 – Natural rock outcrop.
	
K65 – Angular ruin.	: K66 – Building ruin.

The heritage study done by Birkholtz (2019) recorded recent black homesteads.

10.15.2.1.5 *Graves*

Eight confirmed cemeteries and one possible grave were identified using a combination of personal communication with local farm workers and via personal observation. Table 82 lists these sites.

Site K52 is located on Portion 3 of the Farm De Paarl 39 HT and directly adjacent the proposed powerline option B. The sites consistsof a stone cairn measuring approximately 1 X 1 m with no surface remains. The site is also not fenced-off and no indications were observed on any of the topographical maps (Appendix A of Heritage report).

Site K55 consists of a fenced-off cemetery to the southeast of Site K16 on Portion 8 of the Farm Grootvallei 43 HT. Approximately 12 graves are located in the cemetery, all oriented in an east-west direction. All the graves appear to consist of formal surface dressings and in two cases inscriptions on the headstones could be identified. Dense vegetation and a few graves in a dilapidated state hampered identifying all graves. The cemetery also appears to be the Coetzer family cemetery with the oldest burial date visible dating to 1915. No grave goods were observed at the cemetery. The cemetery appears not to be in use anymore.

Site K56, a cemetery located 15 m east of Site K55, is associated with approximately 35 graves. The majority of the graves consist of informal surface dressings in the form om elongated stone cairns. The cemetery is not fenced-off, but low stone-walling surrounds the site. All graves are oriented in an east-west direction and one grave is fenced-off with metal rods. Two headstones were noted, the oldest of which date to 1982. Grave goods include empty beer bottles and plastic bottles, suggesting that the cemetery is still visited. Whether the cemetery is still used for new burials is unclear.

Site K58 consists of 11 graves oriented in an east-west direction. The cemetery is located on Portion 2 of the Farm Roodepoort 38 HT, 90 m north of the proposed powerline option A, is not fenced off but stacked stones surround the entire site. Four of the graves are associated with formal grave dressings, while the rest consist of elongated stone cairns. The cemetery is kept tidy and the vegetation has been cleared, but no grave good were observed. Also, the graves consisting of formal surface dressings are in a dilapidated state. The cemetery appears not to be in use anymore. The oldest grave, belonging to Zymon Shongwe, date to 1980 while the rest of the graves with headstones belong to the Shongwe family as well.

Site K59 consists of approximately 6 unfenced graves oriented in an east-west direction on Portion 1 of the Farm Roodepoort 38 HT. Although the vegetation surrounding the graves was cleared, the individual graves are not clearly marked which hampered identifying the number of graves. All the graves consist of elongated stone cairns and are absent of grave goods, headstones and inscriptions. The cemetery appears not to be in use anymore. It should be noted that the proposed powerline option A runs directly through the cemetery.

Cemetery K67 is located on the Remaining Extent of the Farm De Paarl 39 HT and approximately 640 m south of the proposed powerline option B. Approximately 10 graves with formal surface dressings are oriented in an east-west direction, are surrounded by a stone-walling and are in a dilapidated state as several headstones are broken. The cemetery is no longer in use and it is unclear whether the graves are still visited.

One of the graves is that of a Mr. Grobbelaar and dates to 1899.

Site K68 consists of an unknown number of graves, but is estimated at 20 graves oriented in an east-west direction. The cemetery is located on Portions 1 & 2 of the Farm Roodepoort 38 HT, 15 m south of the proposed powerline option A, is fenced off and stacked stones partially surround the site. Six of the graves are associated with formal surface dressings, while the rest consist of elongated stone cairns with no inscriptions. The overgrown state of the cemetery hampered identifying graves and no grave good were observed. It is unclear whether the cemetery is still in use. Some of the inscriptions are faded, but appear to date to 1971.

Site K70, located on the Farm Middelpan 44 HT and to the north of Site K69, consists of a 5 X 6 m angular stone-walled enclosure with an entrance on the northern side. Extremely dense vegetation completely prevented access to the interior and visibility was completely blocked as well. Although no physical verification could be obtained that the site is a cemetery, it is assumed to be as such. This assumption is based on other stone-walled enclosures in the general area that are of a different design. These structures were likely used for livestock or small stock, are mostly circular in design with no clear entrances. Based on the extent, shape and proximity of other cemeteries to farmhouses, this enclosure is likely to be a cemetery.

Cemetery K71 is associated with Site K57 on Portion 3 of the Farm De Paarl 39 HT. Due access constrains as a result of the language barrier discussed in the limitations section; the cemetery could only be observed from a distance. The age, number and condition of the graves are therefore not known. It should also be noted that the proposed powerline option A runs through the cemetery.

Table 82: Graves/cemeteries located within the demarcated stud area

Name	Type	Source	Status	Parcel
K52	Potential grave	Field	Intact	3/39
K55	Cemetery	Field	Intact	8/43
K56	Cemetery	Field	Intact	8/43
K58	Cemetery	Field	Intact	2/38
K59	Cemetery	Field	Intact	1/38
K67	Cemetery	Field	Intact	RE/39
K68	Cemetery	Field	Intact	1/38; 2/38
K70	Cemetery	Field	Intact	RE/44
K71	Cemetery	Field	Intact	3/39

K52 – Stone cairn / possible grave.

: K55 – Cemetery.

K55 – close-up of headstone.

K56 – Unfenced cemetery.

K56 – Fenced-off grave.

K56 – Cement surface dressing.

 K58 – Unfenced cemetery.	 K58 – Formal grave ressings.
 : K58 – Informal grave dressings.	 K59 – Unfenced cemetery.
 : K67 – Cemetery.	 K67 – Close-up of headstone.

7 : K68 – Fenced off cemetery.

K68 – Formal & informal surface dressings.

K68 – Formal surface dressings.

: K70 – Potental cemetery.

: K71 – Cemetery.

10.15.3 Evaluation

The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. istorical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences.

A fundamental aspect in the conservation of a heritage resource relates to whether the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. There are many aspects that must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and if appropriate mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed.

10.15.3.1 Field Ratings

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA as indicated in Table 83.

Table 83: Field Ratings

Rating	Field Rating/Grade	Significance	Recommendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3 A	High	Mitigation not advised
Local	Grade 3 B	High	Part of site should be retained
General protection A	4 A	High/Medium	Mitigate site
General Protection B	4 B	Medium	Record site
General Protection C	4 C	Low	No recording necessary

The individual field ratings are provided in Table 83 in Section 12.5.4 of this report.

10.15.4 Statement of Significance

Some of the areas demarcated for the proposed Kangra Coal T4 Project are considered to be significant from a heritage perspective. The significance of the proposed areas and the observed sites are discussed here.

The general study area is associated with a combination of historical buildings, settlements, building ruins, stonewalled enclosures, and burial sites. As the majority of the study area will consist of underground mining methods, only the sites that might be impacted on by the proposed surface development and underground mining.

Demolished historical sites – not visited.

The following 24 sites, consisting of buildings and structures, have been identified on historical aerial and topographical maps: K07 & K08, K10, K21, K24 & K25, K27 – K43, K45. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, these sites have completely been demolished and were not visited. No surface impact is envisaged.

Historical sites associated with surface remains – not visited

Seven historical sites associated with surface remains were identified on historical aerial imagery: K02 – K04, K11, K19, K23, K24. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, structures and buildings still exist at these sites. Due to access constraints, however, these sites could not be inspected. Because these buildings/structures are likely to exceed 60 years of age, they are considered significant form a heritage perspective and are protected under the NHRA act 25 of 1999.

Historical sites associated with surface remains – visited

The following 11 sites were identified on historical aerial imagery and were inspected during the site visits: K01, K05 & K06, K12 & K13, K16 – K18, K20 & K22, K69. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. The site visits confirmed that structures and buildings are still associated with these sites and it is therefore likely that these buildings and structures, or parts thereof, exceed 60 years of age and are considered significant form a heritage perspective. These sites are therefore protected under the NHRA act 25 of 1999.

Demolished historical sites – visited.

Three sites (K09, K14, K15) recorded on historical aerial imagery and consisting of buildings and structures intersect the area planned for underground mining, but are not located within close proximity of planned surface development. These sites were visited and no surface material were observed. No surface impact is envisaged.

Demolished contemporary sites – not visited.

Five sites consisting of buildings and structures that date to contemporary times were identified on 1969 aerial imagery: K26, K46 – K49. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, these sites have completely been demolished, were not visited and are not considered significant form a heritage perspective.

Contemporary sites – visited

Two sites (K65 & K66) are located at the eastern end of the proposed powerline. One of the structures has been demolished, while the other is in a dilapidated state. Accordingly, these sites were constructed in recent years and are not considered significant from a heritage perspective.

Historical sites in close proximity of surface development – visited.

Eight sites (K50 & K51, K57, K60 – K64) associated with surface infrastructure were recorded in close proximity of the proposed powerline. Seven of these sites consist of stone-walled enclosures and based on surface remains and the combination of angular and circular building patterns, these sites date to historical times. The possibility, however, exists that some of the circular stone-walled enclosures might date to the Late Iron Age Farmer period. One of the sites, settlement K57, consists of a demolished homestead dating to historical times, as well as modern buildings and a cemetery. Because these buildings/structures, as well as the potential subsurface cultural material, exceed 60 years of age, they are considered significant form a heritage perspective and are protected under the NHRA act 25 of 1999.

Natural sites

Sites K53 & K54 were recorded during the pedestrian survey and identified as natural rock outcrops as no evidence, whether material or archival, could be obtained to indicate otherwise.

Graves/Cemeteries located outside of the areas demarcated for surface development but within the underground mining boundary

The following graves/cemeteries fall outside of the area demarcated for surface development, but within the boundary of underground mining activity. These sites might therefore be at risk of suffering impact from the proposed underground mining activities: K55 & K56, K67, K70. Also, the burial dates of the majority of the graves could not be determined. As stated above, no graves could be observed at Site K70 due to access limitations, although the surface infrastructure suggests a cemetery. Therefore, the site should be regarded as a cemetery until proven otherwise. It is likely that the cemeteries contain graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply.

Graves/cemeteries located within close proximity of the areas demarcated for surface development.

Sites K52, K58, K59, K68, K71 are graves/cemeteries located within close proximity of the proposed powerline. These sites are therefore at risk of being negatively impacted by the proposed development. Also, Site K52 consists of stone cairn and should be regarded as a grave until proven otherwise. It is likely that the cemeteries contain graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply.

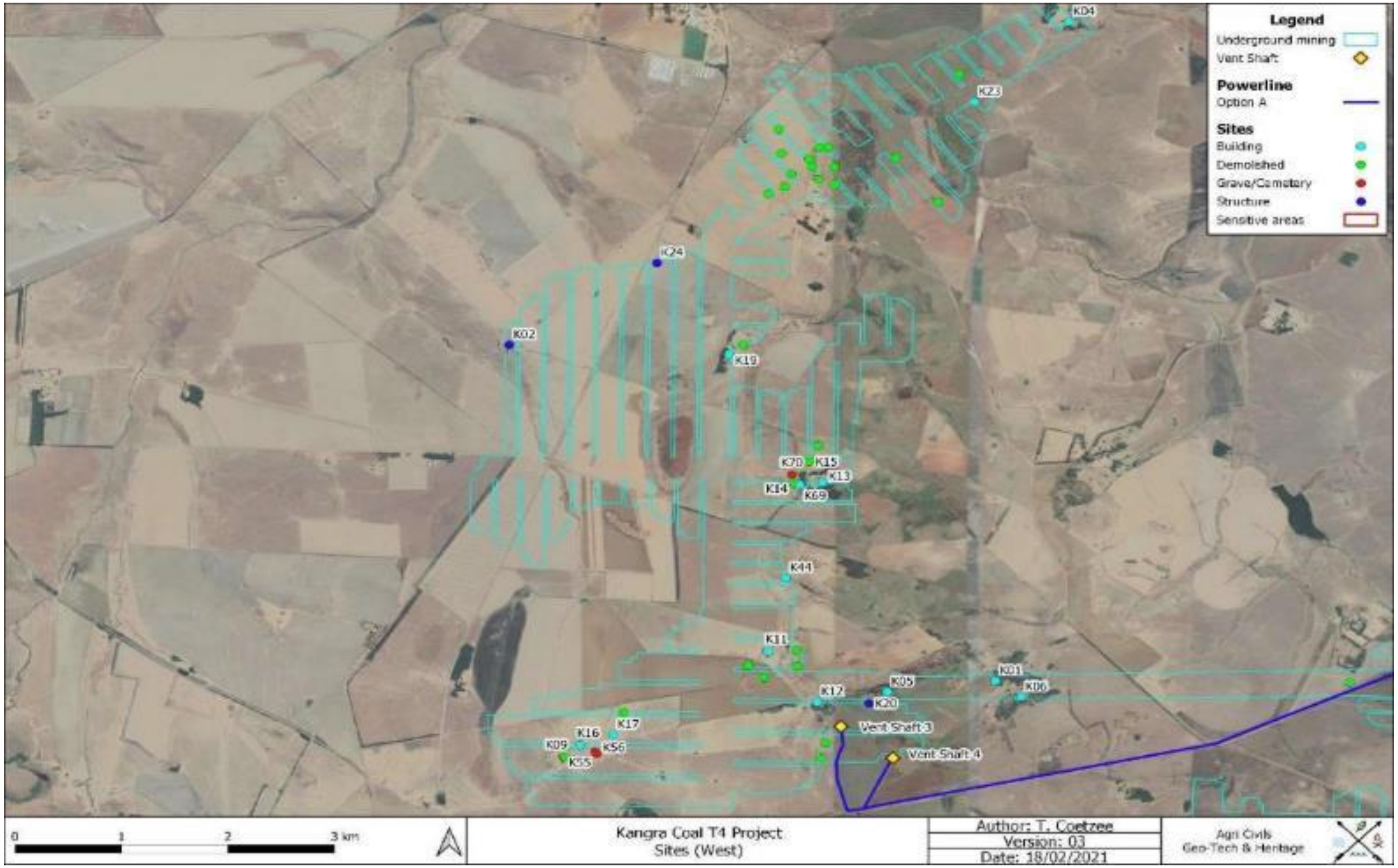

Figure 110: Western sites, buffer zones and sensitive areas indicated on a 2020 aerial backdrop

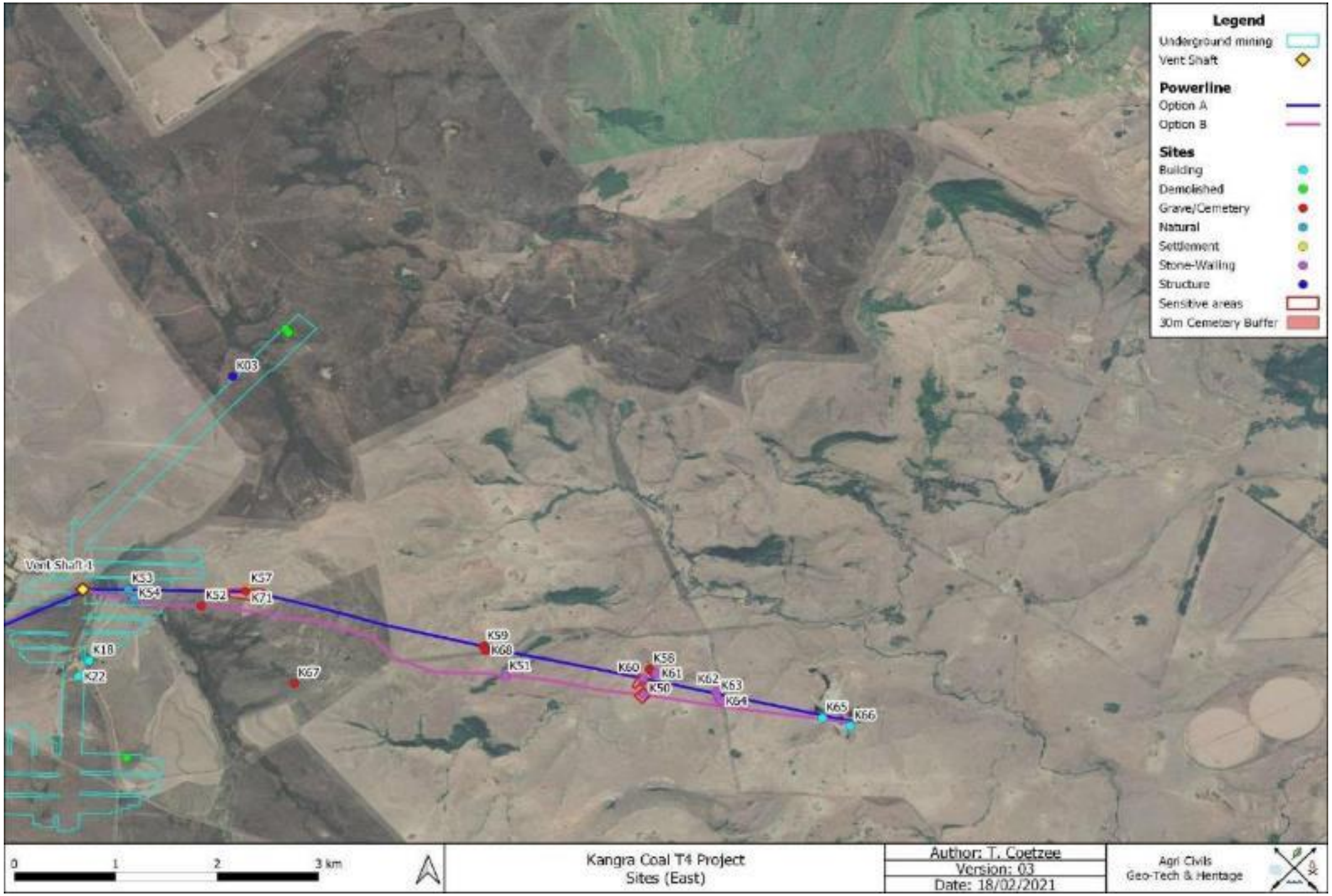

Figure 111: Eastern sites, buffer zones and sensitive areas indicated on a 2020 aerial backdrop

The following recommendations are made in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the areas demarcated for development:

Powerline option A

- Sties K65 (demolished structure) & K66 (dilapidated building) are of contemporary origin and therefore not of heritage significance. No further action is required.
- Sites K62, K63 & K64 consist of stone-walled enclosures dating to the historical / LIA period. Option A of the powerline runs between Site K62 & K63, while Site K64 is located further to the south. It is recommended that these sites be avoided by the proposed powerline.
- Site K61 and Cemetery K58 is located a significant distance to the north of the proposed powerline and should therefore not be at risk. It is recommended that these sites be avoided by the proposed powerline.
- Site K60, a stone-walled enclosure directly in the path of the proposed powerline, dates to the Historic Period / LIA, exceeds 60 years of age and is protected by the NHRA 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline.
- Cemeteries K59 & K68 are located in close proximity of the proposed powerline. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemeteries and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemeteries.
- Site K57 (settlement) falls directly in the path of the proposed powerline. It is recommended that this site be avoided by the proposed powerline as potential subsurface remains associated with a demolished structure at the centre of the settlement might be impacted during construction. The settlement is also associated with a cemetery, Site K71. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemetery and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemetery must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemetery.
- Site K53 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required.
- Should impact to sites K62, K63, K64, K60 and K61 be unavoidable, destructions permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stonewalled enclosures.

- Due to the high number of heritage sites, Option A is not advised, unless altered to avoid the specified heritage resources. This, however, will require a revision of the recommendations made for the specific heritage sites in the vicinity of the powerline.

Powerline option B

- Site K50, consisting of several stone-walled enclosures directly in the path of the proposed powerline, exceeds 60 years of age and is protected by the NHRA 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline as per the indicated sensitive area.
- Site K51, a small stone-walled enclosure is located to the south of the proposed powerline and should therefore not be at risk of impact from the construction of the proposed powerline.
- Impact to Site K52, a potential grave (stone cairn), should be avoided during the construction of the proposed powerline. Should this not be possible, the potential grave may be inspected using Ground Penetrating Radar employed by a professional specialising in human remains.
- Site K54 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required.
- Should impact to sites K50 and K51 be unavoidable, destructions permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stone-walled enclosures.
- Due to fewer heritage sites, Option B is preferred. Should the route be altered to avoid the affected heritage sites, a revision of the recommendations must be made.
- Sites falling outside of the proposed surface development area, but within the proposed underground mining boundary.
- Sites K01 – K06, K11 – 13, K16 – 20, K22, K23, K44 and K69 consist of historical buildings or structures associated with surface infrastructure that fall within the area demarcated for underground mining. It is therefore recommended that the mine's ECO quarterly, as well pre- and post-blasting, inspect these structures. Should any impact be observed, or if impact cannot be avoided, all buildings and structures associated with the demarcated areas must be adequately recorded by a qualified archaeologist and destruction permits be obtained from the relevant heritage authority.
- Sites K55, K56, K67 and K70 are cemeteries located within the boundary of the area demarcated for underground mining. These cemeteries may be impacted by the proposed underground mining. Therefore, it is recommended that the mine's ECO quarterly, as well as pre- and post-blasting, inspect these graves. Should any impact be observed, or if impact cannot be avoided, a qualified archaeologist should be contacted to provide the required input to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused.
- Sites K07, K08, K09, K10, K14, K15, K21, K24, K25, K27 – K43 and K45 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. The structures, however, no longer exist and no surface impact is expected. No further action is required.

- Sites K26, K46, K47, K48 and K49 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. These sites, however, date to contemporary times and were subsequently demolished. No further action is required

General Recommendations

- The above recommendations are based on the specific powerline route options and underground mining boundaries as indicated in this report. Should the proposed development expand to any area outside of the proposed surface or underground boundaries, a qualified archaeologist must revise the recommendations made in this report to ensure the safeguarding of heritage sites. Also, should the proposed surface impact areas be changed, a qualified archaeologist must conduct a pedestrian survey on the new areas and amend the report accordingly.
- As the following historical sites associated with surface infrastructure could not be visited due to access constraints, it is recommended that a qualified archaeologist inspect and verify these sites prior to mining: K02 – K04, K11, K19, K23 & K24.
- Access constraints caused by ongoing court cases, the language barrier and limited time also resulted in a lack of communication with the land owners. Since land owners and local farm workers are the most reliable and efficient source for locating burial sites, it is recommended that this information be gathered, mapped, inspected and the required recommendations be made to ensure the safeguarding of heritage sources.
- As archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).
- From a heritage point of view, development may proceed on the demarcated areas, subject to the abovementioned conditions, recommendations and approval by the South African Heritage Resources Agency.

10.16 PALEONTOLOGICAL ASSESSMENT

A Palaeontological Impact Assessment: Phase 1 Field study was undertaken by Dr. H. Fourie. A copy of the report is included in Appendix 15.

10.16.1 Methodology

The palaeontological impact assessment field study was undertaken in August 2020. A Phase 1: Field Survey of the affected portion includes photographs (in 7.1 mega pixels) taken of the site with a digital camera (Canon PowerShot A470). Additionally, Google.maps were accessed on a cellular phone for navigation. A Global Positioning System (GPS) (Garmin eTrex 10) was used to record fossiliferous finds and outcrops (bedrock) when the area is not covered with topsoil, subsoil, overburden, vegetation, grassland, trees or waste. The survey did identify the Karoo Supergroup. A literature survey was included in the report and the study relied heavily on geological maps.

SAHRA document 7/6/9/2/1 (SAHRA 2012) requires track records/logs from archaeologists not palaeontologists as palaeontologists concentrate on outcrops which may be recorded with a GPS. Isolated occurrences of rocks usually do not constitute an outcrop. Fossils can occur in dongas, as nodules, in fresh rock exposures, and in riverbeds. Finding fossils require the experience and technical knowledge of the professional palaeontologist, but that does not mean that an amateur can't find fossils. The geology of the region is used to predict what type of fossil and zone will be found in any particular region. Archaeozoologists concentrate on more recent fossils in the quaternary and tertiary deposits.

10.16.2 Outline of the geology and the palaeontology in the project area

The geology was obtained from map 1:100 000, Geology of the Republic of South Africa (Visser 1984) and 2730 Vryheid (Wolmarans 1988) and 2630 Mbabane (Walraven 1984), 1:250 000 geological map. Refer to Figure 112 below.

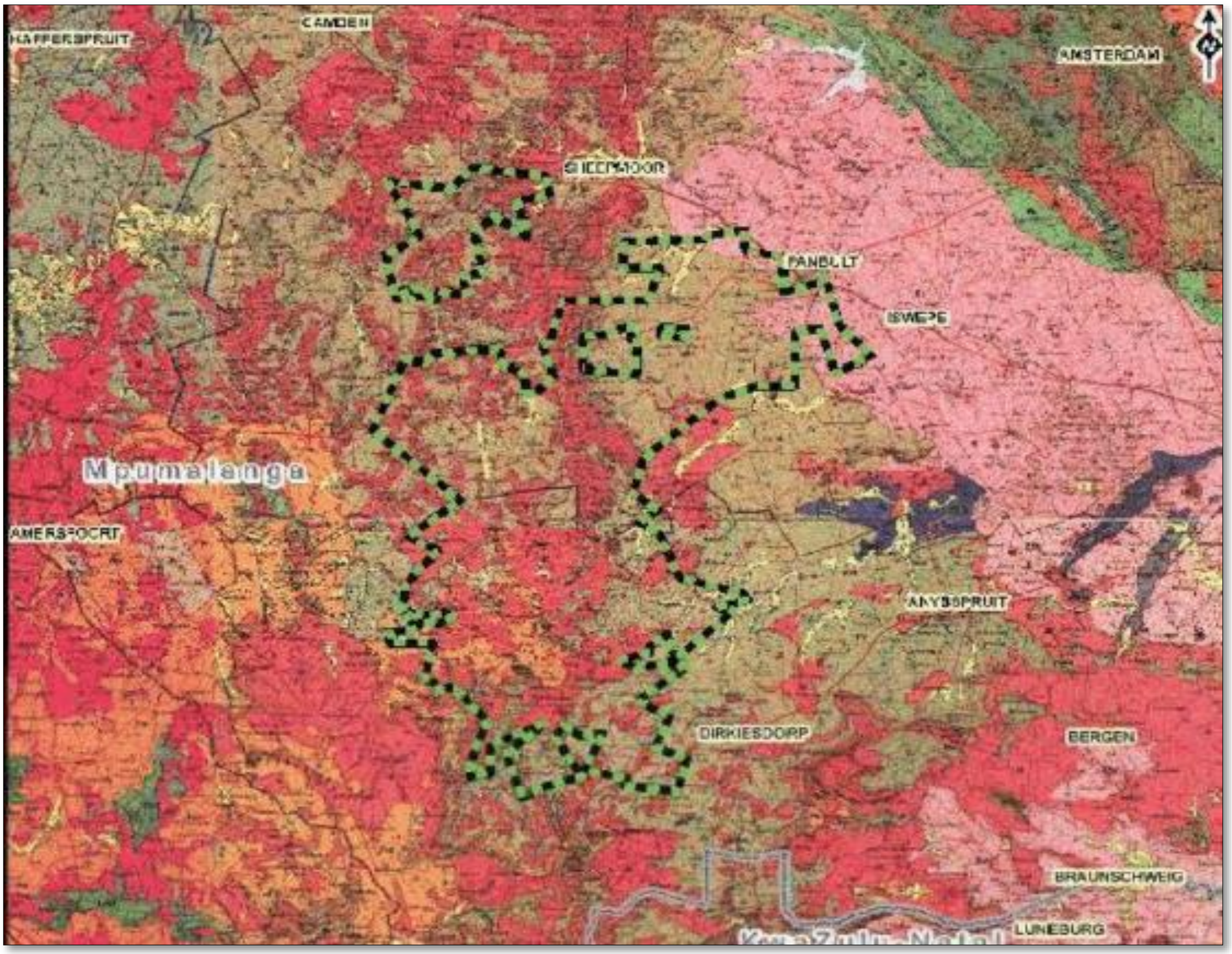

Figure 112: The geology of the development area

Legend to Map and short explanation.

M – Alluvium (yellow). Quaternary.

Jd – Dolerite (pink). Karoo Supergroup. Jurassic.

Pe – Undifferentiated Ecca Group, includes Pp, Pv, Pvo (dark brown). Ecca Group, Karoo Supergroup. Permian.

Pvo – Mudstone, siltstone, shale (orange). Volksrust Formation, Ecca Group, Karoo Supergroup. Permian.

Pv – Shale, shaly sandstone, grit, sandstone, conglomerate and coal in places near base and top, oil shale beds (brown). Vryheid Formation, Ecca Group, Karoo Supergroup. Permian.

…… – (black) Lineament (Possible dyke).

--f— Fault.

┴10˚ - Strike and dip.

┼ - Horizontal bed.

□ – Approximate position of mining application.

Overlying the Volksrust Formation in the Estcourt- Mooi River area is a mappable unit called the Estcourt Formation which is about 400 m thick (Kent 1980). Kent (1980) described the Volksrust Formation as the 150-270 m of shale which overlies the Vryheid Formation. The deposition of this formation coincides with that of the Fort Brown and Waterford Formations in the south (Snyman 1996). It occurs from the south of Kwazulu-Natal into the Free State (now Free State, Mpumalanga and Kwazulu-Natal) and is concordant (Visser 1989).

The Vryheid Formation is named after the type area of Vryheid-Volksrust. In the north-eastern part of the basin the Vryheid Formation thins and eventually wedges out towards the south, southwest and west with increasing distance from its source area to the east and northeast (Johnson 2009). The Vryheid Formation consists essentially of sandstone, shale, and subordinate coal beds, and has a maximum total thickness of 500 m. It forms part of the Middle Ecca (Kent 1980). This formation has the largest coal reserves in South Africa. The pro-delta sediments are characterised by trace and plants fossils (Snyman 1996).

Palaeontology – Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity can generally be LOW to VERY HIGH, and here locally MODERATE for the Volksrust Formation, and VERY HIGH for the Estcourt Formation and Vryheid Formation (SG 2.2 SAHRA APMHOB, 2012).

The Estcourt Formation (Pe) contains evidence of an abundance of marine and probably estuarine invertebrates that left trace fossils in the rock record (Groenewald 2012). The Estcourt Formation contains evidence of an abundance of marine and probably estuarine invertebrates that left trace fossils in the rock record (Groenewald 2012).

The Volksrust Formation (Pvo) consists of a monotonous sequence of grey shale and fossils are significant, but very rarely recorded. Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, fish scales, petrified wood, and low-diversity marine to non-marine trace fossil assemblages (Groenewald and Groenewald 2014).

The Ecca Group, Vryheid Formation (Pv) may contain fossils of diverse non-marine trace, Glossopteris flora, mesosaurid reptiles, palaeoniscid fish, marine invertebrates, insects, and crustaceans (Johnson 2009). Glossopteris trees rapidly colonised the large deltas along the northern margin of the Karoo Sea. Dead vegetation accumulated faster than it could decay, and thick accumulations of peat formed, which were ultimately converted to coal. It is only in the northern part of the Karoo Basin that the glossopterids and cordaitales, ferns, clubmosses and horsetails thrived (McCarthy and Rubidge 2005).

Summary of findings (1d): The Phase 1: Field Study was undertaken in August 2020 in the winter in dry and mild conditions during the official covid-19 Level 3 lockdown, and the following is reported:

A project area, outlined in yellow and blue, is located 69 km south-east of Ermelo, 39 km west of Piet Retief and 65 km north east of Volksrust. The approximate size of the site is 22,375.33 hectares with 3 hectares underground mining.

Description of significant fossil occurrences

All Karoo Supergroup geological formations are ranked as LOW to VERY HIGH, and for this project the impact is potentially VERY HIGH for the Vryheid Formation and MODERATE for the Volksrust Formation.

The Volksrust Formation consists of a monotonous sequence of grey shale and fossils are significant, but very rarely recorded. Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, fish scales, petrified wood, and low-diversity marine to non-marine trace fossil assemblages (Groenewald and Groenewald 2014).

Fossils likely to be found are mostly plants (Appendix 1) such as 'Glossopteris flora' of the Vryheid Formation. The aquatic reptile Mesosaurus and fossil fish may also occur with marine invertebrates, arthropods and insects. Trace fossils can also be present. During storms a great variety of leaves, fructifications and twigs accumulated and because they were sandwiched between thin films of mud, they were preserved to bear record of the wealth and the density of the vegetation around the pools. They make it possible to reconstruct the plant life in these areas and wherever they are found, they constitute most valuable palaeobotanical records (Plumstead 1963) and can be used in palaeoenvironmental reconstructions.

Details of the location and distribution of all significant fossil sites or key fossiliferous rock units are often difficult to be determined due to thick topsoil, subsoil, overburden and alluvium. Depth of the overburden may vary a lot.

The threats are:

- Earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, and
- The sealing-in or destruction of fossils by development, vehicle traffic, and human disturbance.

10.17 SOCIAL-ECONOMIC ENVIRONMENT

As part of the environmental impact assessment phase, a Social Impact Assessment was undertkaken. A copy of the report is attached as Appendix 16.

10.17.1 Background to the Project

The Kangra Coal T4 Project falls within the Gert Sibande District municipality, which is designated as DC30 as per the Municipal Demarcation Board and is one of the three (3) District Municipalities that constitute Mpumalanga Province. The District Municipality is bordered by the Ekurhuleni Metropolitan Municipality and Sedibeng District Municipality to the west. Thabo Mofutsanyane District Municipality is located to the southwest. The Ehlanzeni District Municipality is located to the north-east and Nkangala District Municipality to the north. Amajuba and Zululand District Municipalities in KwaZulu-Natal Province are located to the south, and Swaziland to the east.

Gert Sibande District Municipality is the largest of the three Districts in Mpumalanga Province at 31 841 km², covering 40% of the Mpumalanga Province's land mass. The western portion of the District mostly comprises typical Highveld vegetation and climate, with the eastern end of the District being more mountainous and characterised by extensive forestry and rural settlements and villages in the east (Albert Luthuli and Mkhondo Local Municipalities).

10.17.2 Local study area

10.17.2.1 Land uses

The area is characterised by rural land uses that include residential and agricultural activities. Traditional rural housing, small settlements and farmsteads with related farming infrastructure are scattered throughout the study area. Farming includes subsistence and intensive, commercial activities that produce high-value commodities including soya beans, mutton, wool and dairy (refer to Figure 113 to Figure 116).

Figure 113. Traditional / Rural housing structures

Figure 114. Natural landscape / Grazing

Figure 115. Natural landscape

Figure 116. Crop fields (Soya)

10.17.2.2 Ward 10

Ward 10, where the Project Area is located, is 2 075,3 km2 in extent. It is the biggest of all the wards in the DPKISLM and is sparsely populated with only 5,4 people per square km (www.wazimap.co.za; Census 2011).

Towns and villages include Kalkoenkrans, Abesuthwini, Vaalbank, Kaalbank, Bethamoya, Somershoek, Krurwepoort, Sterkfontein, Donkerhoek, Tweedehoek, Pampoen and Welgelegen. The administrative unit is located in Daggakraal (DPKISLM IDP, 2020/21).

Due to the rural nature of the ward, most of the roads are gravel. There is a growing need for footbridges over streams and rivers, as many roads become inaccessible during rainy periods. (DPKISLM IDP, 2020/21).

Figure 117. Wards that surround the study area

10.17.2.3 Regional study area

Gert Sibande District Municipality ("DM"), 31 841 km2 in extent, is located in the Mpumalanga Province, bordered by the Ehlanzeni and Nkangala DM's to the north, Kwa-Zulu-Natal ("KZN") and Free State to the south, Swaziland to the east and Gauteng to the west (refer to Figure 118). The DM comprises the following local municipalities:

Chief Albert Luthuli	Lekwa
Dipaleseng	Mkhondo
Dr Pixley Ka Isaka Seme	Msukaligwa
Govan Mbeki	

It is the largest of the three (3) districts in Mpumalanga covering 40% of the province's land mass. At 1 135 409 people in 2016 it is however the smallest district in population amongst the three districts in the province. (GSDM IDP, 2020/21)

Main towns and service centres include Amersfoort, Amsterdam, Balfour, Bethal, Carolina, Ermelo, Evander, Greylingstad, Leandra, Lothair, Secunda, Standerton, Trichardt and eMkhondo (Piet Retief). The DM is traversed by the N11, which goes through to the N2 in KwaZulu-Natal, the N17 from Gauteng passing through to Swaziland and the N3 from Gauteng to KZN.

Manufacturing, agriculture and transport make up the main economic sectors, followed by trade, community services, construction, electricity, finance and mining. (www.municipalities.co.za)

Figure 118. Gert Sibande DM *Source: www.municipalities.co.za*

Dr Pixley Ka Isaka Seme LM is situated on the eastern border between Mpumalanga and KZN (Newcastle LM).

Furthermore, the municipal area is framed by the Mkhondo LM in the east, Msukaligwa LM to the north and Lekwa LM to the west. The DPKISLM is 5 227 km2 in extent and accounts for 16% of the geographical area of the Gert Sibande district. Amersfoort, Wakkerstroom, Volksrust and Perdekop are the main towns and activity nodes.

Agriculture is the main economic sector of the municipality, followed by Trade, Community services and Construction. Manufacturing and Mining only contribute to 4,6 and 2,2% respectively to the local economy.

The N11 between Ermelo, Amersfoort and Volksrust is an important north-south freight arterial route providing access from Limpopo Province to Northern KZN and can also be viewed as a potential corridor on boosting the tourism in the area. This route can be used to tap into the economic development of the municipal jurisdiction as it is in good condition. (www.municipalities.co.za)

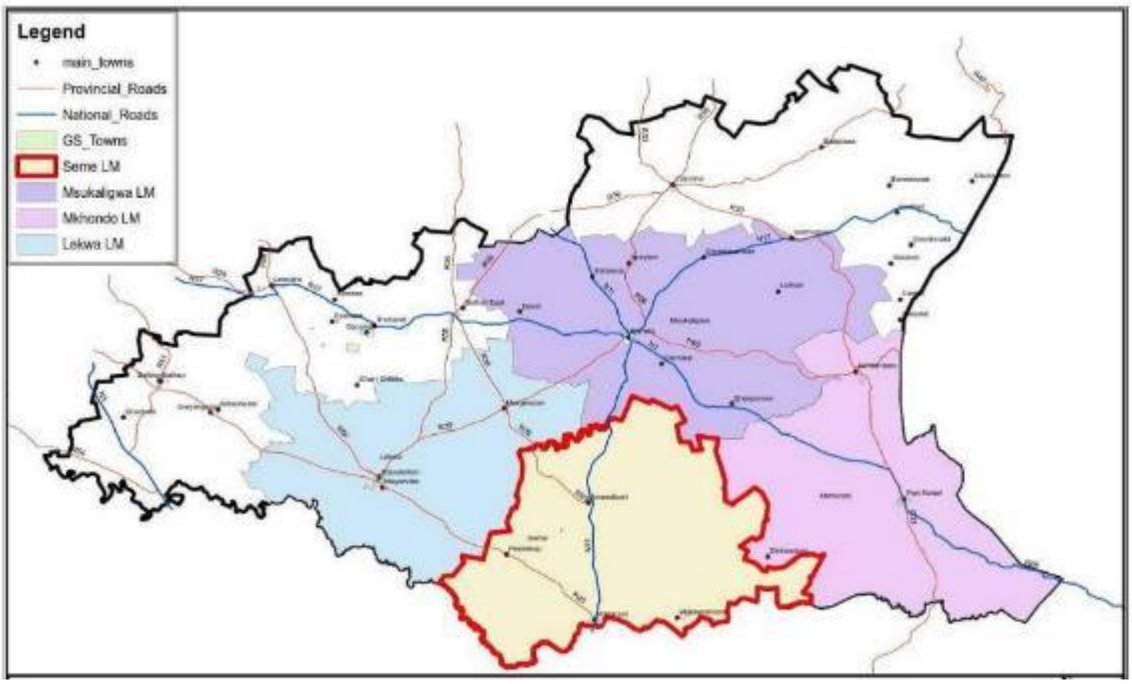

Figure 119. Dr Pixley Ka Isaka Seme LM *Source: DPKIS LM IDP, 2020/21*

Mkhondo LM located adjacent east of the DPKISLM, is at this stage the major recipient of Kangra Coal's project benefits such as employment, as the Mine complex and surface infrastructure is located here. The municipality is 4 882 km2 in extent with 189 036 people, amounting to 38,7 people per square km (GSDM IDP, 2020/21).

Mkhondo is the main link for both industrial and commercial transport from Gauteng to the import/export harbour at Richards Bay as it is ideally situated halfway between the Gauteng metropolis and the Natal Coast. Main towns are Piet Retief and Amsterdam.

Piet Retief (now known as eMkhondo) is surrounded by forestry and plantations. Sawmills together with other components of manufacturing, personal services, real estate and tourism, play a crucial role in boosting a well-diversified economy. Amsterdam/KwaThandeka and its rural nodes in the Mkhondo municipal area are fundamentally agricultural and have forestry support. Several scattered pockets of mining are found in the municipal area of jurisdiction.

Natural conservation and tourist activities also contribute towards the socio-economic conditions of the municipality.

Towns / Settlements

Volksrust

Volkstust, located 40 km south-west from the MR area, was founded in 1888 when the then Transvaal government decided to establish a town on the edge of the Drakensberg escarpment, on the border of Natal. Today, the town is a commercial centre of which the main products are maize, wool, sorghum, sunflower seed, beef and dairy. The town is the junction for the main Johannesburg-Durban railway line with other towns in the eastern part of Mpumalanga. (DPKISLM ISP, 2020/21)

Wakkerstroom

Wakkerstroom, located 25 km south from the MR area, was established in 1859 due to a need for a town between Potchefstroom and Utrecht with good grazing and plenty of water for the residents and travellers. However, the earliest people that lived in the Wakkerstroom area were the Khoisan due to the examples of rock art that can be found in the vicinity (DPKISLM IDP, 2020/21). Today the town is a tourism destination with primary agricultural activities that revolve around sheep and cattle farming.

With the Balele Mountains to the south, the area surrounding the town is mountainous with kloofs, mountain springs, vlei areas, dams, conservation and heritage sites. It is internationally renowned as a "birders paradise". Due to the high occurrence of high priority wetlands and the proximity to the sources of three rivers, the Vaal, Tugela (via Buffalo tributary) and Pongola, it was declared a National Freshwater Ecosystem Priority Area. It is also a protected area under the Protected Areas Act, which means that mining is generally not allowed. (www.wikipedia.org)

Piet Retief

Piet Retief/eMkhondo, located east of the MR area, is surrounded by forestry and plantations. The town was founded by the Voortrekkers in 1883 and named it after the Voortrekker leader, Piet Retief, who was killed by the Zulus under their King Dingaan's orders after he tried to settle on their land. In 1886, the inhabitants of the town declared the Klein Vrystaat (Little Free State), which contained a population of only 72. This republic existed until 1891, when it was incorporated into the South African Republic. The town became a municipality in 1932. Its main tourist attraction is the Dutch Reformed Church that was designed by the architect Gerard Moerdijk and built in 1921 (www.mkhondo.gov.za).

The town’s main economic activities are timber, paper and wattle bark production as well as mica, kaolin and iron mining.

Daggakraal

Daggakraal is an impoverished isolated community located west of the MR area. The town had about 1 450 households in 2014 with no means of production and limited economic opportunities. A number of communities agricultural and infrastructure projects were handed to the community as part of South Africa’s Land Reform Programmes, but due to factors such as misappropriation of funds and infighting amongst beneficiaries the bequests are now unproductive or never completed (www.wikipedia.org). The settlement/town has two (2) clinics and a number of schools.

Driefontein

Driefontein, also known as Saul Mkhizeville, is located in close proximity to the Kangra Coal Surface Infrastructure Area in the Mkhondo LM. The town changed its name to Mkhizeville after Saul Mkhize who was shot and killed by the apartheid police for organising a march against forceful removals (www.wikipedia.org). Driefontein town has an extent of 53,65 km^2 and a total population of 15 319 (Census 2011). Many of the farm workers in the local study area[47] and the Kangra Mine reside here.[48]

10.17.2.4 Key demographic and economic information

Demographic and economic information of the study area and surrounds provide valuable insights for planning and monitoring purposes. It should be a constant aim of the Project to maximise its positive impacts for locals, and skills, needs and gender analysis of the mine host communities would thus enable the Mining Right holder to determine to what extent the Project achieved its desired socio-economic goals. Similarly, by comparing current and future baseline social data will indicate if the predicted negative impacts were effectively mitigated and what additional measures should be implemented.

The demographic and socio-economic information for each of the study areas are provided (where available) and where relevant the broader district and provincial social and economic environments are also discussed.

10.17.3 Demographics

10.17.3.1 Population and population growth

Population figures of the district and local regions are reflected in Table 84 below:

Table 84. Population statistics

Demographics	Gert Sibande DM (CS 2016)	DPKISLM (CS 2016)	Ward 10 (Census 2011)
Population	1 135 409	85 395	11 174
Households	333 811	22 547	2 160
Average household size	3.4	3.8	5.2
People per km^2	35.4	16.3	5.4
Age structure			
- **Population under 18 years**	37 %	41 %	50 %
- **18 to 64 years**	58 %	53 %	46 %

[47] Landowner consultation. 17 February 2021.
[48] T4 Project SLP, 2017.

- **Over 65 years**	5 %	6 %	4%
Population growth per annum	1.93 %	0.58 %	-
Male: female ratio	50 : 50	48 : 52	48 : 52
Female headed households	39 %	47 %	43 %
Dependency ration per 100 (15 – 64 years)	51.9	63.5	-

Source: StatsSA; www.wazimap.co.za

According to StatsSA (DPKISLM IDP 2020/21) the local municipal population at 85 359 contributes to 7,5% of the total population of Gert Sibande DM (2016). The population growth between 2011 and 2016 is calculated at 0,58% per annum. The population is estimated to be 86 491 in 2019 and more than 92 855 in 2030, given the historic population growth per annum. (DPKISLM IDP 2020/21)

The number of households increased with 2 708 from 2011 to 2016 (12% increment), whereas the size of the households decreased from 4,2 to 3,8 members per household.

Census 2011 figures indicate that Ward 10, with a population of 11 174 and 2 160 households, has 5,2 members per household. Although this is the ward with the highest population numbers in the LM, it is the sparsest populated with only 5,4 people per km^2. As illustrated in the subsequent sections of this report, Ward 10's population is marginalised with regards to access to services and economic opportunities.

10.17.3.2 Migration

Migration patterns impact population growth and planning as it ultimately influences service delivery and the distribution of employment opportunities. Figure 120 illustrates the areas of origin of the populations of the DPKISLM and Ward 10. It is likely that the slightly more diverse economic opportunities in the LM area attract people from other provinces and abroad. In Ward 10, 90% of the population originates from Mpumalanga, as employment is limited to the agricultural sector.

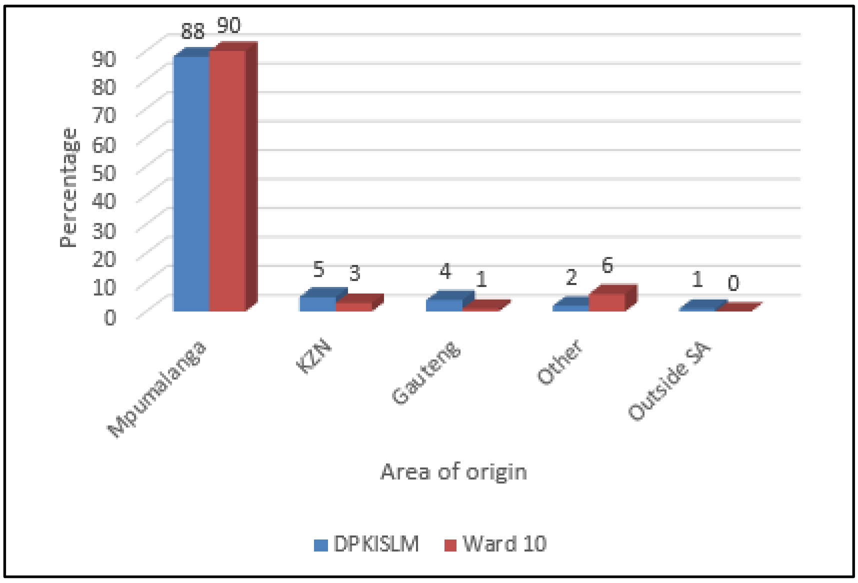

Figure 120. Migration *Source: www.wazimap.co.za*

10.17.3.3 Age and gender

The age and gender structure of a population is a key determinant of population change and dynamics and are thus indicators of the current and future needs smaller geographic areas would experience in terms of education provision for younger children, health care, employment opportunities for the economic active age groups, social security services such as pensions, and assistance to those in need.

Age

The age analyses in the district and local municipalities demonstrate the pressure placed on government to prioritise for youth development and empowerment programmes, as young people constitute the largest section of the population. (Refer Table 84. *Population statistics*, Page 322)

In 2016 more than 41% of the DPKISLM population was under 18 years old and 50% of Ward's 10 population (2011). Youth (the 15 to 34 years age group) forms 36% of the LM (DPKISLM IDP, 2020/21).

Gender

- Table 84. *Population statistics* reflects that there are equal number males as females in the district. The DPKISLM and Ward 10 both have 4% more females than males (48:52 ratio).
- Forty-seven percent (47%) and 43% of households respectively in the LM and in Ward 10 are female-headed households. Longer distances to business centres to secure incomes, access health facilities and so forth result in numerous social problems and economic challenges for women:
- Children are often left unattended for long periods during the day;
- Access to water and sanitation are often problematic and requires hard labour, lengthy hours and long distances to travel to water resources;
- Poor quality water and lack of sanitation can cause illness and strain already depleted resources;
- Unemployment is higher amongst females and when they do generate income it is usually through the informal sector as a means of survival. This requires access to business centres, requiring suitable roads and means of transport often not readily available;
- Women are frequently unable to leave rural areas as they often lack the means to do so;
- A lack of access to grid electricity creates additional labour for women and girl children, also reducing their available time for family, education and income generating activities;
- Ownership of land and housing is often restricted to men, excluding women from land and home security. Yet, women often maintain the home and attend to home activities; and
- High crime rates impact on women and children, often exacerbated by lack of electricity, water, sanitation and safer recreational facilities. (DPKISLM IDP, 2020/21);
- There is a clear and urgent need for public and private sector to harness economic opportunities for women and to introduce women in their development initiatives.

10.17.3.4 Race and language

There are 92% Black people in DPKISLM, followed by 7% Whites; and 98% Blacks in Ward 10, followed by 2% Whites. In the LM IsiZulu (87%) and Afrikaans (6%) are the main languages spoken, followed by English, Sesotho and so forth. In Ward 10 the major language is also iZulu (91%), followed by Arikaans (2%) and others, such as isiNdebele and SiSwati. (www.wazimap.co.za)

10.17.3.5 People with disabilities

Approximately 26% (22 253 people) of the LM population have disabilities that include hearing, seeing, remembering/concentrating or walking disabilities. (CS 2016; DPKISLM IDP, 2020/21). People with disabilities are classified as Previously Disadvantages Individuals ("PDIs") / HDSAs and the Mining Charter (2018) and Employment Equity Act No. 55 of 1998 set clear targets for the inclusion of this group as part of the workforce.

10.17.3.6 Labour force

This section of the report focuses on unemployment/youth unemployment, existing skills and education levels, as low levels of education and inadequate skill levels impact negatively on the employability of a labour force.

10.17.3.7 Education

The importance of education is emphasized, as it plays an important role in labour market outcomes. In 2016, almost 11% of the district's population older than 20 years was illiterate (unable to read or write with understanding), compared with 17,6% in DPKISLM. In the local study area (Ward 10) a staggering 32% of the population was illiterate in 2011 and is therefore restricted to perform manual labour.

Both the district and local municipalities made improvements with regards to the number of people that completed matric between 2011 and 2016. Tertiary education levels however decreased (refer Figure 121 below).

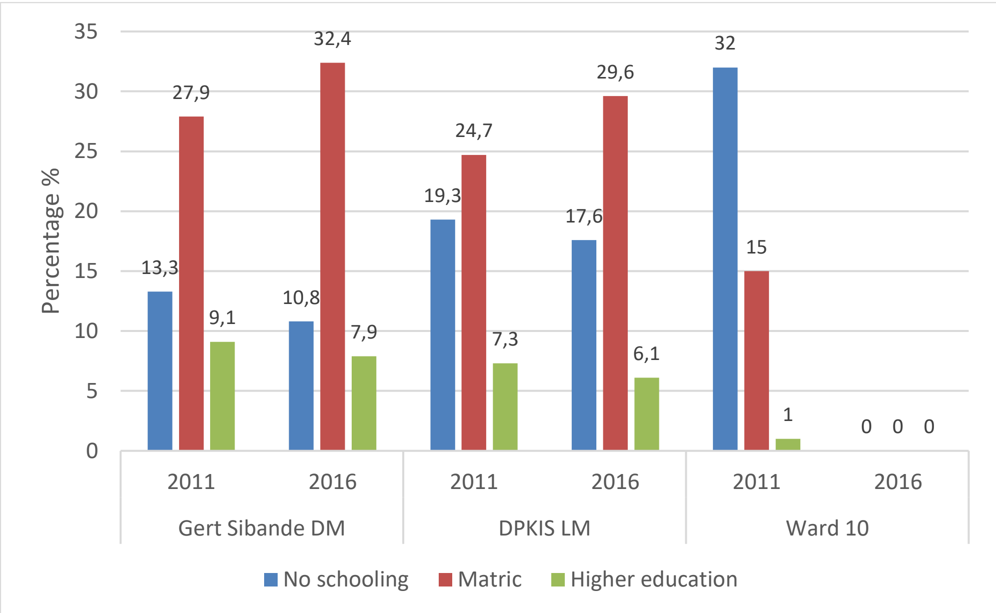

Figure 121: **Education Levels** *Source: Census 2011, CS 2016; www.wazimap.co.za*

DPKISLM Grade 12 pass rate improved from 68% in 2014 to 78% in 2018, which is considered a very good achievement, especially since it is the first time in many years that DPKISLM is not ranked in the bottom three (3) municipality's in Mpumalanga. The LM achieved an admission rate to university/degree studies of 26,8% in

2018 (DPKISLM IDP, 2020/21). What these figures no not, however, consider is the high drop-out rate, especially amongst the Grade 10 to 12 group, which paints a much a much grimmer picture to these outcomes. The negative impact of school drop-outs on education and the economy, specifically considering the recent COVID-19 lockdown, is discussed in the following section.

The challenge now is for the LM to provide economic opportunities to accommodate these educated young people, as such opportunities simply do not currently exist. An additional challenge is the importance of quality and relevant education and training in line with economic needs of the broader district and province.

10.17.3.8 Impacts of the COVID-19 lockdown on education

10.17.3.8.1 School drop-out rates

In SA the high dropout rate of matrics before sitting their exam is troublesome as it worsens the South African Youths' ability to be absorbed into the labour market. Using a combination of its own calculations as well as StatsSA data, the Department of Education indicated that the effective drop-out rate in SA is close to 48%. The data shows that the higher grades typically had the highest number of drop-outs. Grade 11 had the largest percentage of dropouts (24%) followed by Grade 10 (15%). Reasons for drop-outs include household poverty and income shocks, migration, health problems, unabilities to perform at school and so forth (Businesstech, 6 October 2020). In line with this, Equal Education estimated that the real pass-rate figure for the period ending 2017 is around 50% (way below the 78,2% announced by Government). This means that half of all learners leave school with no qualifications at all (SAFTU, 2019).

Statistics that indicate local drop-out rates could not be obtained, but a similar scenario in the district and local municipalities can be expected. This implies that the 78% Grade 12 pass rate (refer to previous Section 10.17.3.7: *Education*) in the DPKISLM is in all likelihood an excessive overestimation.

The COVID-19 lockdown and its restrictions impacted drop-out rates even further. Nationally more than 20 000 matrics were unaccounted for ahead of 2020's final exams and are feared to have dropped out (www.citizen.co.za, 28 January 2021). Short and long-term negative impacts of the COVID-19 lockdown on drop-out rates, especially for Grades 10 to 12 learners, could include:

- Lost school time could discourage youths about their chances of completing the National Senior Certificate or lead to school push out;
- Some international evidence indicate that time out of school leads to other activities and to pregnancies, which in turn could impact on drop-out;
- Local and international studies are predicting large and unequal losses in learning due to COVID-19 related school closures;
- Unequal losses of school attendance and remote learning opportunities by socio-economic status; and
- International studies show that these types of large learning losses are predictive of lifelong outcomes, including educational attainment and labour market performance. (www.businesstech.co.za, 6 October 2020)
- The actual long-term effects of the pandemic and subsequently drop-outs on education and the economy are still be determined.

10.17.3.8.2 <u>Skills development and training adaptations</u>

The COVID-19 lockdown restrictions affected learners' and students' access to educational institutions and it is therefore worth providing data that indicate households' access to internet. Internet access would directly and indirectly impact learners' and students' ability to continue productive education and training when physical attendance is not possible. It is thus essential that education becomes adaptable to change. For rural students online learning is cheaper than building institutions, so ensuring they have online access is crucial.

Whilst the majority of households in the local study area have some form of access to an internet source, only 5% have access from their homes (refer Table 85), which would be considered the ideal scenario for a learner to continue productive education in these difficult circumstances.

Table 85: Households with Internet Access

	DPKIS LM	**Ward 10**
From cell phone	56 %	77 %
Other mobile service	13 %	-
From home	5 %	5 %
From work	8 %	3 %
From elsewhere		13 %
- Place of education	5 %	Included in "from elsewhere"
- Library	14 %	
- Internet café < 2km from dwelling	11 %	
- Internet café > 2km from dwelling	15 %	

Source: www.wazimap.co.za; Census 2011

Although it can be assumed that household access to internet sources have improved since 2011 and many schools and institutions of higher learning have already adopted to the digital transformation process, many households are still challenged with basic service delivery issues, unemployment, poverty and inequality, and a single, simple solution to education challenges and skills development adaptations in these fluctuating times is not likely.

Change in the workplace necessitates changes to major skills required and being able to collaborate online is an essential requirement for future work. Worldwide and locally roles that can be automated are disappearing and mining is becoming increasingly digital for greater efficiency and to reduce risks. Companies therefore also need to take responsibility internally to encourage entrepreneurship and digital upskilling and adaptations are required to address Youth unemployment, as much of this can take place online (www.mg.co.za, 29 June 2020).

10.17.3.8.3 Unemployment and youth unemployment

Employment status refers to whether a person is employed, unemployed or not economically active. The official unemployment rate therefore gives the number of unemployed persons as a percentage of the labour force. The labour force, in turn, is the part of the 15 - 64 year population that is ready to work and excludes persons not economically active (scholars, housewives, pensioners, disabled) and discouraged work-seekers. In South Africa, high unemployment coincides with low economic growth.

Unemployment

Table 86 is the unemployment and Youth unemployment figures for the national, regional and local study areas.

Table 86: **Unemployment and Youth unemployment**

	Unemployment %	**Youth unemployment % (15-34 years)**
South Africa (2019)	27,6 [49]	40,7 [50]
Mpumalanga (2019)	34,2 [51]	38,8 [52]
Gert Sibande DM (2011) [53]	29,7	38,4
DPKISLM (2011) [54]	36,1	45,1
DPKISLM (2017) [55]	33,7	-
Ward 10 (2011) [56]	23 %	-

The overall official unemployment rate for South Africa during the first quarter of 2019 was 27,6% and for Mpumalanga province 34,2%; the largest increase of the nine provinces (2,2% since the last quarter of 2018[57]).

DPKISLM's official unemployment rate is higher than the national, provincial and regional averages and was ranked 4th highest among all municipal areas of Mpumalanga. It however improved from 36,1% in 2011 (Census 2011) to 33,7% in 2017. The unemployment rate for females is higher at 38,6% than for their male counterparts at 29,6% (DPKISLM 2020/21; Mpumalanga SERO 2019). According to the municipal IDP (Mpumalanga SERO 2018) employment between 2014 and 2017 rose from 15 241 to 16 172. Ward 10's unemployment in 2011 was calculated at 23% (Census 2011; www.wazimap.co.za). The Project SLP (2017) indicates that the highest unemployment rate is found in Ward 9 (Daggakraal) (62,9%) and lowest unemployment rate is found in Ward 4 (Greater Volksrust) (12.8%).

Youth unemployment

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[49] Source: QLFS, Quarter 1, 2019.
[50] Reported by the Spectator Index; obtained from www.Politicsweb.co.za.
[51] Source: QLFS, Quarter 1, 2019.
[52] Source: QLFS, Quarter 1, 2019.
[53] www.municipalities.co.za; Census 2011.
[54] www.municipalities.co.za; Census 2011.
[55] Source: DPKISLM IDP, 2020/21; Mpumalanga SERO 2018
[56] Census 2011; www.wazimap.co.za
[57] Source: QLFS, Quarter 1, 2019.

From above it is clear that South African Youth (15 to 34 years) are vulnerable in the labour market. The unemployment rate among young people was 40,7% in the first quarter of 2019, implying that more than one in every three young persons in the labour force did not have a job. The rate for females was higher than for their male counterparts; more than one in every ten young females were unemployed during this same period (www.statssa.gov.za). Some of these young people have become discouraged with the labour market and they are also not building on their skills base through education and training.

At 45,1% Youth unemployment, the situation amongst the Youth is even worse in the local municipality, especially amongst young females. Since the municipality is mostly made up of the Youth (36%), this has a great impact on the municipality's financial performance and collections rate.

The DPKISLM has established a 'Youth Development Unit' with the mandate to co-ordinate, facilitate, advocate, monitor and evaluate programmes for the youth and to ensure that the municipality is correctly advised and informed about the needs and aspirations of the youth. These Youth Development Programmes are however being strained by limited resources (DPKISLM 2020/21).

10.17.3.8.4 Impacts of the COVID-19 lockdown on unemployment

The Quarterly Labour Force Survey ("QLFS") data shows that South Africa's unemployment rate rose to 30,8% in the third quarter of 2020, up from 23,3% in the previous period. It is the highest jobless rate since quarterly data became available in 2008 and comes amid the ongoing COVID-19 pandemic lockdown, which has contributed to the depressed economic environment. The data indicates that the number of unemployed people rose by 2.2-million to 6.5-million when compared to the second quarter of 2020. Key to note are the yearly net job losses observed in trade (400 000), manufacturing (300 000), community and social services (298 000) and construction (259 000) (www.engineeringnews.co.za, 13 November 2020).

It can be expected that the Mpumalanga Province, Gert Sibande district and the DPKISLM have also not escaped the negative economic impacts associated with the national lockdown, exacerbated by the mismanagement of relieve funds. Economic and social impacts, which have already manifested as a result of the lockdown, such as an escalation in the unemployment rate, lower income levels, malnutrition amongst a large portion of the population, gender based violence, an increase in illegal informal settlements, dependence on social grants, higher school drop-out rates, and so forth are likely to increase and could possibly be exacerbated by political infighting and power struggles amongst provincial and local government members and a lack in business activity. Job creation, digital upskilling and adaptation to education and skills development need to be a consolidated effort by both government and the private sector to accelerate much needed economic recovery.

10.17.3.9 Incomes

The income level per household is considered a barometer of poverty and reflects that the average annual income in DPKISLM is R64 990 (R5 415 per month) and ranks 11th in the province (Census 2011). Average household income in Ward 10 is almost half at R30 000 (R2 500 per month). Seventy-four percent (74%) of the local population earn less than R1 600 per month and can thus be classified as Indigent. Refer to Figure 122.

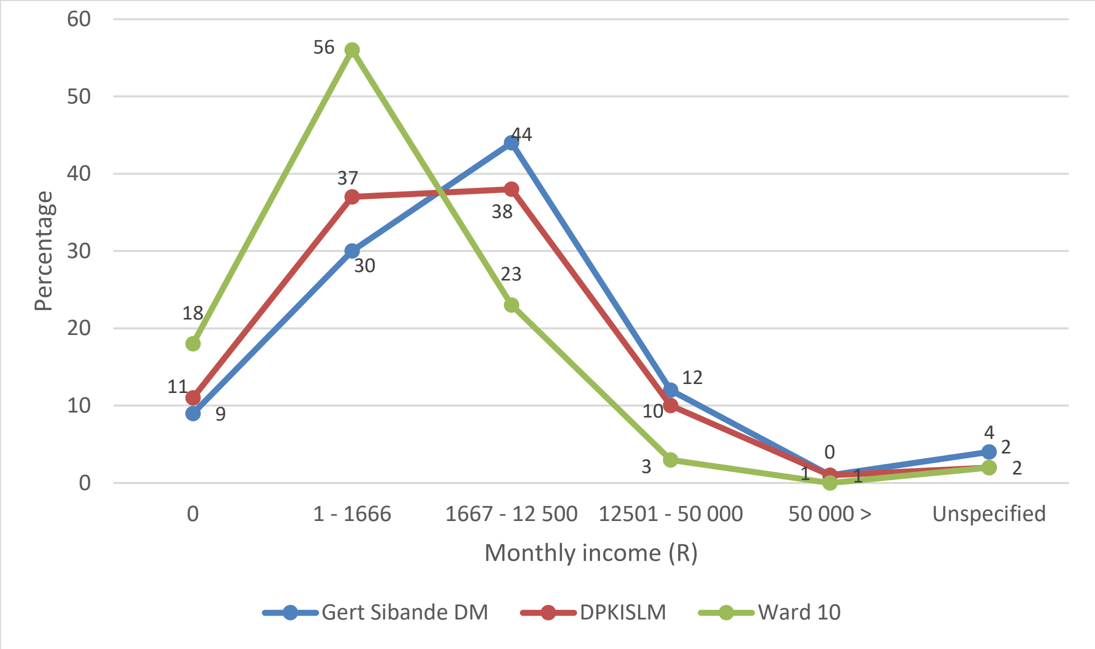

Figure 122: Monthly individual incomes *Source: www.wazimap.co.za; Census 2011*

10.17.3.10 Employment sectors

The employment distribution in an economy refers to the proportional level of employment in each economic sector. The table below indicates that due to its rural nature and low education levels, less of Ward 10's population is employed in the formal sector (51% vs 68% in the DPKISLM). A great portion of Ward 10's population (38%) thus depends on the informal sector as a means of survival. Refer to Table 87.

Table 87: Employment per Sector

	Formal %	Informal %	Private Household %	Unspecified / Do not know %
Mpumalanga	69	17	12	2
Gert Sibande DM	71	15	10	3
DPKISLM	68	19	11	2
Ward 10	51	38	11	1

Source: www.wazimap.co.za; Census 2011

It would seem that agriculture's contribution to employment decreased since 2011. The largest employing industries in DPKISLM was Agriculture (20%), Trade (19,9%), Community services (16,4%), Construction (12,1%), Finance (5,9%), Manufacturing (4,6%), Transport (4,4%), Utilities (3,8%) and Mining (2.2%) (Census 2011; www.municipalities.co.za).

Figure 123 provides the information obtained from the LM IDP (Mpumalanga SERO 2018) that reflects that the largest employing industries are Trade (including tourism), Finance, Community services and Construction, occupying roughly 66% of total employment. In 2017 Agriculture occupied 6,5% of employment and Mining occupied 3% of employment, a slight reduction of 0,4% since 2014 (DPKIS LM IDP 2020/21).

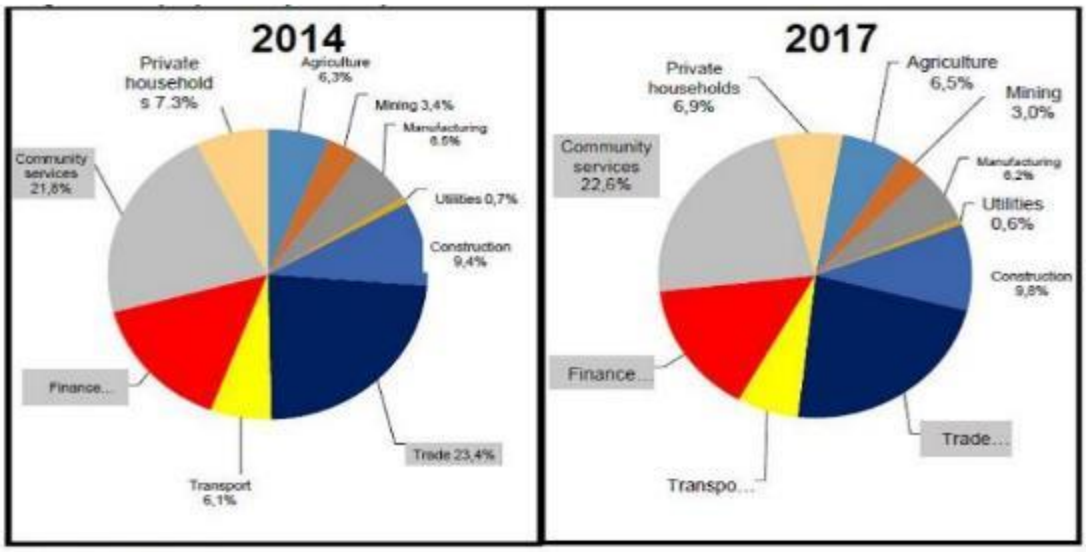

Figure 123: **Employment by sector** *Source: DPKISLM 2020/21; Mpumalanga SERO 2018*

10.17.3.11 Economic indicators

10.17.3.11.1 Economic profile

The average annual economic growth rate for the municipality was 1,9% over the period 1996 to 2015. The annual growth dropped from 2,5% on average over the period 1996 to 2017 to 0,2% between 2014 to 2017 (DPKISLM 2020/21; CS 2016). Based on this growth, the forecasted growth for DPKISLM for 2017 to 2022 is approximately 1,3% per annum, in line with national and provincial growth expectations (DPKISLM 2020/21). DPKISLM's economic contribution (Table 88) to the district is a meagre 3,3% and it is the second smallest economic contributor in the province at 0,9%. In 2017 the size of the economy was estimated at almost R3,4 billion (DPKISLM IDP, 2020/21).

Table 88: Contribution to the Gert Sibande DM economy

	Agriculture	Mining	Manufacturing	Utilities	Construction	Trade	Transport	Finance	Community services
DPKISLM	7,2	0,7	1	7,8	11,2	4,5	4,7	4,3	5
Total	3,3 %								

Source: DPKISLM 2020/21; Mpumalanga SERO 2017

Economic Sectors & Activities

At 20% agriculture is the main economic sector of the municipality, followed by Trade (19,9%), Community services (16,4%) and Construction (12,1%). Manufacturing and Mining only contribute to 4,6 and 2,2%

respectively to the local economy (www.municipalities.co.za).

This information, however, contradicts the data obtained from the municipal IDP (2020/21) (Figure 124 below), which indicates that agriculture only contributes 10,2% to the local economy.

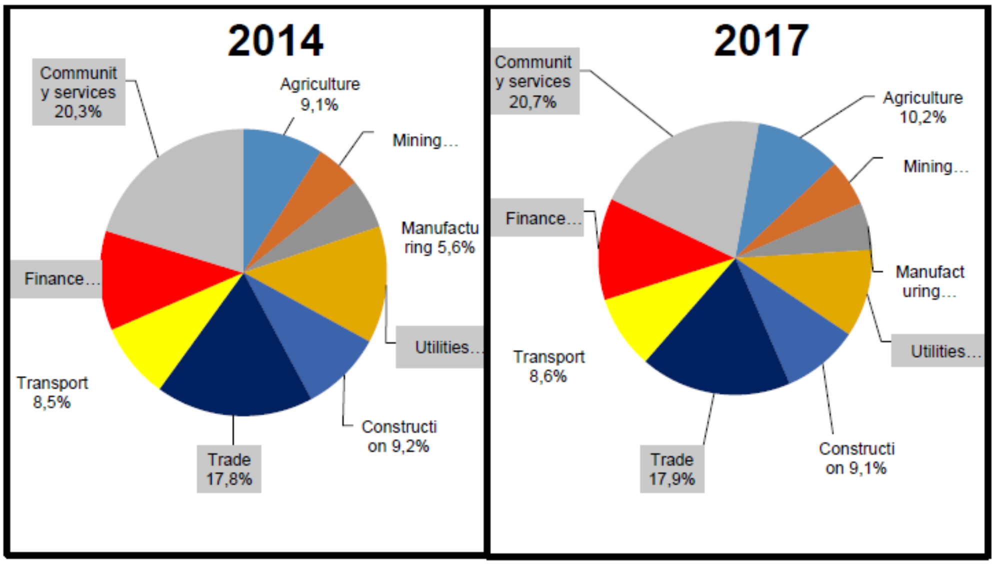

Figure 124: **Economic contribution to Mpumalanga Province** *Source: DPKISLM IDP 2020/21; Mpumalanga SERO 2017*

Tourism expenditure as a percentage of the local GDP was estimated at 8,1%, which is the 8th highest in the province and indicating the importance of tourism in the area.

The municipality has a limited and almost non-existent industrial economy and the predominantly rural nature of the municipality limits commercial and business development. Business activities are restricted to Newcastle (KZN province), which means that a substantial portion of DPKISLM community's income is not being reinvested in the Mpumalanga province. Furthermore, portions of the municipality's income (such as Perdekop, Daggakraal and Amersfoort) is being reinvested in Ermelo that falls under the neighbouring Msukaligwa municipality. (DPKISLM 2020/21)

10.17.3.12 Mining

There is some mining within the jurisdiction of the municipality. Mines in operation are scattered around the municipality and include sand, dolerite and coal mining. Small scale open cast coal mining is being undertaken to the east of Wakkerstroom and there is a coal mine adjoining the Majuba Power Station south west of Amersfoort. There has been evidence that the municipalities jurisdiction is underlain by coal, which could be a solution to the growing poverty should it be explored (T4 SLP, 2017).

10.17.3.13 Conservation

The area is and around Wakkerstroom has significant conservation status. Three (3) protected environments have been declared in this Important Bird and Biodiversity Area ("IBA") i.e. Mabola (70 000 ha), KwaMandlangampisi (23 000 ha) and Pongola Bush. The declaration of the Sneeuwberg Protected

Environment is currently in progress. Management plans for these protected environments are being drafted or have been finalised. These initiatives greatly improve the conservation status of this area, providing protection against mining and assisting landowners to manage the grassland on their farms for particular species or communities of birds. Other nature reserves in the area are Wakkerstroom Wetland, Pongola Bush, Paardeplaats, Tafelkop and Seekoeivlei. There are also a number of private nature reserves nearby (www.birdlife.org.za).

Mabola Protected Environment near Wakkerstroom is part of more than 70 000 hectares of grasslands in Mpumalanga that was declared protected under the Protected Areas Act by the Mpumalanga provincial government in 2014. This followed years of investment, including extensive research and planning by a number of government agencies, including the then Department of Environmental Affairs, the South African National Biodiversity Institute and the Mpumalanga Tourism & Parks Agency ("MTPA") (https://cer.org.za/news/constitutional-court-rules-against-coal-mining-in-mpumalanga-protected-area).

The proposed Wakkerstroom Protected Environment is municipal land and is managed by the Wakkerstroom Protected Environment Management Committee consisting of all relevant stakeholders in Wakkerstroom. The proclamation of both these protected environments is facilitated by the MTPA as part of the Mpumalanga Protected Area Expansion Strategy. Conservancies include the Bloukop and Rietvaal Conservancies and the newly proposed Baltrasna Conservancy (DPKISLM IDP, 2020/21).

10.17.3.14 Social indicators

Poverty and inequality

Human Development Index ("HDI") is a summary measure of average achievement in key dimensions of human development (a long and healthy life, being knowledgeable and having a decent standard of living) (www.hdr.undp.org). A population scores a higher HDI when a lifespan is higher, the education level is higher and the gross per capita income is higher. It is measured on a scale of 0 to 1. The DPKISLM HDI measured 0,57 in 2017, a slight improvement from 0,54 in 2014 (DPKISLM 2020/21; Mpumalanga SERO 2017).

In the local municipality the population that live below the poverty line and earn less than R1 600 per month is estimated at 48%, and in Ward 10, 74% (refer to Figure 122*: Monthly individual incomes*). The IDP (2020/21) however indicates that at least 80% of the municipality's households are classified as Indigent.

Another indicator of a poverty is the number of people that depend on social grants such as Old Age, Disability, Child Support and so forth. In 2012, 13% of the DDPKISLM population were Social Grant beneficiaries and accounted for 5% of all grants in the Gert Sibande DM (StatsSA, Census 2011).

Health and HIV/AIDS

Mpumalanga is one of the three (3) provinces with the highest infection rates of HIV/AIDS. According to Department of Health, the HIV prevalence rate of DPKISLM was measured at 42,4% in 2013 making it the 8th highest of all the municipal areas in the province, even though this shows a decrease of 5,6% when compared to the 48% prevalence rate in 2012. DPKISLM is one of six (6) municipal areas that recorded a reduction in their HIV prevalence rate between 2012 and 2013. Figure 125 below represents the HIV Prevalence rate from 2011 to 2013.

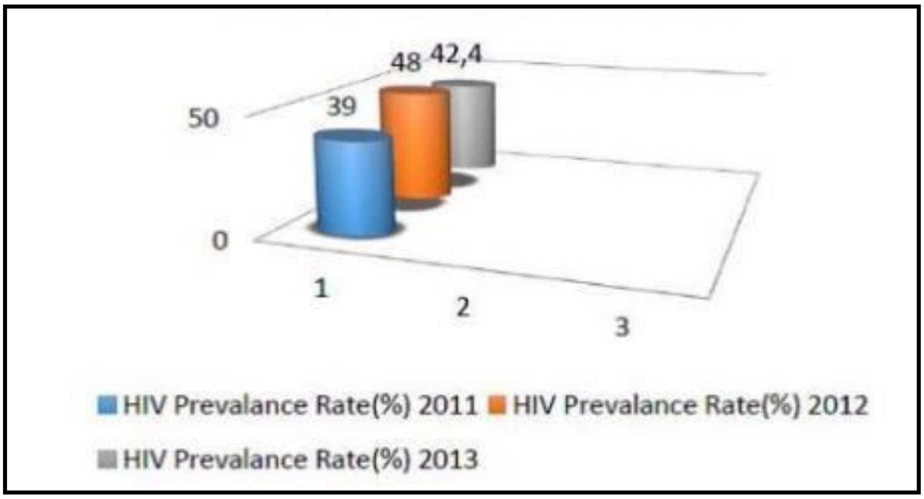

Figure 125: HIV Prevalence 2011-2013 *Source: DPKISLM 2020/21; CS 2016*

The municipality is in a process of developing a HIV/AIDS Strategy. The Local Aids Council ("LAC") was formed as part of the strategy to fight the high infection rate within the municipality and consists of a number of role-players that include the local municipality, Department of Health, community groupings and so forth.

Orphans and vulnerable children

HIV/AIDS and related diseases have resulted in an increase in the number of children orphaned and child-headed households. The Department of Health and Social Development and Department of Education, together with community groupings have implemented programmes to ensure that these children are identified and taken care of, and to minimise neglect and abuse (DPKISLM IDP 2020/21).

Paternal orphans in DPKISLM (2079) are more than double than maternal orphans (1127), while the number of double orphans is the lowest (849) (CS 2016; DPKISLM IDP 2020/21).

Table 89 indicates that in the local and regional study areas between 33 and 48% of the heads with households that are younger than 18 years are headed by females. Not only is this group vulnerable from an orphan perspective, but girls/women are usually also more exposed and defenceless when confronted with crime, livelihoods and related socio-economic issues.

Table 89: **Heads of Households under 18 yrs / Female Heads / Orphans**

	Households with heads under 18 yrs	**Female heads under 18 yrs**	**Children under 14yrs with no biological parents**
Gert Sibande DM	2 088	42 %	1, 7 %
DPKISLM	360	38 %	1,7 %
Ward 10	56	33 %	4 %

Source: CS 2016, www.wazimap.co.za

10.17.3.15 Institutional profile

10.17.3.15.1 Housing, infrastructure and services

Spatial development characteristics

Figure 126 provides the nodal hierarchy proposed within the municipal area: (DPKISLM IDP, 2020/21).

Area	Economic Focus	Nodal Hierarchy
Volksrust / Vukuzakhe	▪ Agriculture ▪ Livestock ▪ Basic Services ▪ Retail ▪ Industry ▪ Offices	▪ Primary Node
Amersfoort / Ezamokuhle	▪ Agriculture ▪ Livestock ▪ Basic Services	▪ Secondary Node
Wakkerstroom / Esizameleni	▪ Tourism ▪ Basic Services	▪ Secondary Node
Perdekop / Siyazenzela	▪ Agriculture ▪ Basic Services	▪ Secondary Node
Daggakraal / Sinqobile	▪ Basic Services	▪ Rural Node

Figure 126: Nodal hierarchy in DPKISLM

Nearest activity nodes to the proposed MR area are Wakkerstroom (south), Amersfoort (west), Piet Retief (located in Mkhondo LM towards the east) and the rural node of Daggaskraal/Sinqobile (28 km west). Gert Sibande DM identified Daggakraal as an area to accommodate the Farmer Production Support Unit of the Municipality. The area is also a focal point for the District's Rural Intervention Areas.

Types of dwellings

Due to the rural nature of Ward 10, 35% of the population reside in traditional/other housing, compared with 11% in the district and local municipalities. Refer to Table 90.

Table 90: Households by type of dwelling

	Formal (house) %	**Informal (shacks) %**	**Flat in backyard %**	**Traditional / Other %**
Gert Sibande DM (2016)	67	13	8	11
DPKIS LM (2016)	83	3	4	11
Ward 10 (2011)	64	1	-	35

Source: www.wazimap.co.za; Census 2011; CS 2016

Six (6) informal settlements have been identified in the m, i.e. two (2) in Vukuzakhe, one (1) in Amersfoort and one (1) in Siyazenzela (T4 Project SLP, 2017). The total number of households living in these informal settlements are estimated at 1 370 (DPKISLM, 2020/21). The municipality has started implementing Township Establishment Projects that will create 579 sites in Siyazenzela, 272 sites in Esizameleni, 1100 sites in Vukuzakhe and 1000 sites in Amersfoort. (T4 SLP, 2017)

10.17.3.16 Household Services

Water:

The DPKISLM IDP (2020/21) indicates that 9,8% of the municipal population do not have access to piped water (Mpumalanga SERO 2017). Table 91 provides thes statistics obtained from StatisticsSA.

Table 91: **Engineering services on household level for DPKISLM**

	Flush toilet or chemical toilets %	**Weekly refuse removal %**	**Piped water inside dwelling %**	**Electricity for lighting %**
Census 2011	62,5	62	38,9	85,2
CS 2016	64,8	53,2	23,7	86,8

Source: StatsSA, www.municipalities.co.za

Due to the rural nature of Ward 10, a large percentage of the population's main water sources are rivers (17%), boreholes (17%), springs (9%) or other (15%). Only 42% are getting water from a regional or local service provider. In the broader DPKISLM 85% of the population receive water from regional or local water supplier (CS 2016).

The Pie chart below (Figure 127) indicates that there are 64% households (14497) with access to piped water inside their dwelling or house, 24% households (5343) with access to piped water inside their yard and 1% of the households have access through a communal tap. There are 2212 households (11%) that have no access to piped water (CS 2016; DPKISLM, 2020/21).

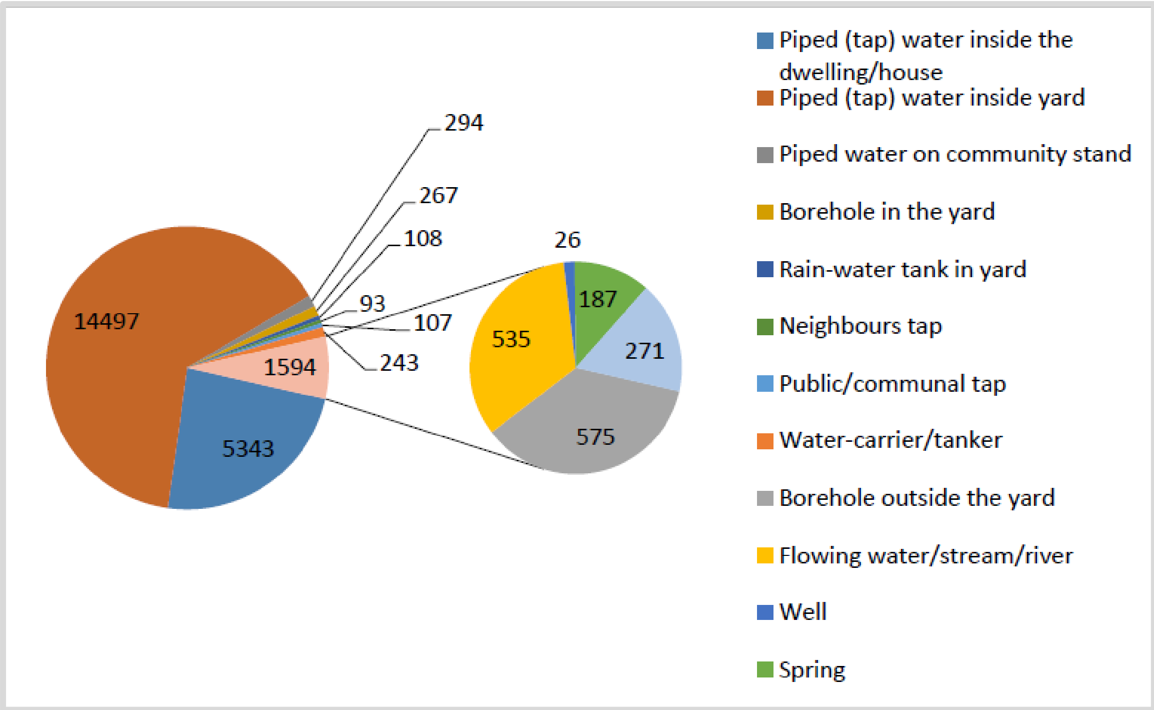

Figure 127: Main source of water supply

Information obtained for Ward 10 from the municipal IDP (2020/21) informs that 510 households (19%) do not have access to piped water. Construction of water connections with water meter is implemented and at the end of March 2020 the project was 15% complete.

Sanitation:

The total backlog of households in the local municipality with no toilets was 4,2% in 2016. The backlog for flush/chemical toilets stood at 33%. Based on CS 2016 and the IDP information (2020/21), 19% of households in Ward 10 had no access to toilets.

Electricity:

The DPKISLM purchases electricity from ESKOM and then provides to Volksrust, Vukuzakhe and a portion of Daggakraal (Sinqobile C). Other administrative units are supplied by ESKOM. The biggest challenge is maintenance and replacement of aging infrastructure due to inadequate funding. The electricity backlog in the DPKISLM in 2016 was 11,4% household and in Ward 10, 19% (CS 2016).

10.17.3.17 Emergency services

There are five (5) SAPS stations in the municipality. Main crime categories are theft, burglaries, common assault, stock theft, drugs and malicious damage to property.

There is no proper Fire Station in the DPKISLM and lack of capacity and lack of personnel due to budget constraints further hinders effective and efficient services delivery to the communities. The fire section relies on outside stakeholders for assistance in serious incidents. The municipality is a member of the Farmers Protection Association of DPKISL, as it is the requirement of the Forest Act.

In terms Disaster Management, the municipality is experiencing a shortage of human resources and limited resources to render efficient and effective services to communities. During the 2016/17 financial year, the Gert Sibande DM funded the establishment of the Sub-Disaster Management Centre for DPKISLM and completed in 2019/20 financial year. The Disaster Management services for DPKISLM is incorporated in the Fire Services section. Officials conduct dual duties in order to render efficient and effective services to our communities.

10.17.3.18 Health services

Local municipal health facilities are indicated in Table 92.

Table 92: Health facilities in DPKISLM

Health facilities	Number
Private hospital	0
Government hospitals	2
Private doctors	10
Primary Health Clinic	7
Community Health Centre	1
Mobile Clinics	4
Dentist2	3

Source: DPKISLM IDP 2020/21

There are two (2) district hospitals, i.e. Amajuba Hospital situated in Volksrust Town and Elsie Ballot Hospital situated in Amersfoort. There are no private hospitals or clinics in the Municipality and such a service still remains a critical service that is needed by the Community. In terms of Community Health Clinics ("CHC's") currently there are two CHC's, one located in Perdekop and the other one in Daggakraal. These clinics operate for 12 hours a day for seven days.

10.17.3.19 Education facilities

In relation to the population of 83 235 residents and the number of available facilities in the municipality's jurisdiction, one can only understand the frustration of the communities. During previous consultative meetings with the community, residents have repeatedly requested for higher education institution and the Department of Higher Education and Training responded positively to this request and a 'Gert Sibande District TVET College - Agriculture Campus' has been built and is operational in Perdekop. Refer to Table 93.

Table 93: **Educational institutions in DPKISLM**

Educational institutions	Number
Independent schools	5
Public Primary Schools	46

Public Secondary Schools	14
Combined Schools	3
TVET Campus	1

Source: DPKISLM IDP 2020/21

Ward 10 consists of sic (6) primary schools, a high school, an agriculture hall and a day care centre (DPKIS LM IDP, 2020/21).

10.17.4 Local Economic Development

10.17.4.1 Purpose, strength and weaknesses

The aim of LED implemented by local government is to achieve economic growth, alleviate poverty, and inclusively improve the quality of life of all community members to redress socio-economic imbalances and stimulate economic growth and development. The outcome should be creation of employment opportunities and the alleviation of poverty, whilst attracting external investment. It is not an isolated function and the output should be the result of public, business and non-governmental sector partners that collaborate together to create better conditions for economic growth. Projects, budgets and strategies for job creation, SMME development and skills development and training that are incorporated in the Project SLP should thus be in line and linked with IDP and LED initiatives of the DPKISLM.

DPKISLM has a high unemployment rate and poverty levels that result in low affordability levels which turn manifest in low levels of investment, development and service delivery and underutilization of development opportunities.

The LED Strategy and Tourism of 2015 is currently under review. It has been identified that the agriculture and tourism are comparative advantages to enhance the economy of the municipality. Plans focusing directly on these areas should, therefore, be developed on finalisation of the overall Local Development Strategy (DPKISLM IDP, 2020/21).

The synopsis of key internal and external environment concerns confronting DPKISLM indicating the strengths, weaknesses, opportunities and threats was conducted and reviewed during the Strategic Planning sessions. Figure 128 below demonstrates the outcomes of the process.

STRENGTHS	WEAKNESSESS
1. Comparative advantage in agriculture 2. IGR Structures in place 3. Compliance with Legislation 4. Good water infrastructure 5. Ability to service creditors 6. Job creation through internal 7. Capable political and administrative leadership	1. Non Functionality of some IGR Structures 2. Weak financial systems 3. Road & Sanitation Infrastructure 4. Ageing electricity infrastructure 5. Limited land available for development 6. Financial capacity to fill vacant positions 7. Low revenue base & collection 8. Retention of scarce skills 9. Inadequate management systems(ICT)
OPPORTUNITIES	**THREATS**
1. Geographical location 2. Agricultural development 3. Tourism development 4. Mining opportunities 5. Job creation through EPWP and CWP 6. Development of R23, R543 and N11 corridor (Agri & Ecotourism) 7. Weather and topography 8. Attraction of investors 9. Training opportunities (External support for capacity building)	1. Unqualified Audit outcome 2. High unemployment rate 3. Illegal occupation of land 4. Climate Change / Natural disasters 5. Damaged road infrastructure 6. HIV/AIDS 7. Crime/ drug abuse 8. Teenage pregnancy 9. Poverty 10. Lack of skills/illiteracy rate 11. Low economic activities 12. Coronavirus (COVID-19) Global Pandemic

Figure 128: DPKISLM indicating the strengths, weaknesses, opportunities and threats *Source: DPKISLM IDP, 2020/21*

10.17.4.2 Needs and economic plans and opportunities

Development in the municipal area is limited as a result of backlog in social and economic infrastructure, although the natural resources of the area provide the basis for socio-economic developments. Economic plans and opportunities for the DPKISLM identified were: (IDP 2020/21; Mpumalanga SERO 2018)

- Opportunities in industries such as agriculture, agro-processing and tourism.
- Support to SMMEs and cooperatives where the Social Enterprise Model/Programme and Government Nutrition Programme will contribute to job creation and economic development.
- Rejuvenation of township businesses with initiatives to transform townships and villages from labour and consumption reserves into thriving productive investment hub.
- The needs identified for Ward 10 in the latest adopted IDP (2020/21) are indicated in Table 94 below.

Table 94: **Ward 10 IDP priorities**

WARD		10
WARD COUNCILLOR		CLLR X.L SIMELANE
NO	CAPITAL	OPERATIONS/MAINTANANCE
1	Water and Sanitation	
2	Water in Driefontein Farm	
3	Electricity in Singobile D (Silahliwe)	
4	High Mast Lights	
5		Fencing of cemeteries
6		Upgrading of Sport Ground
7		Grazing land
8	Youth Centre	
9	Dropping Centre	
10	RDPs in Rural areas	
11	Community Hall	
12		Job opportunities

10.17.4.3 Job creation initiatives

10.17.4.3.1 *Community Works Programme ("CWP")*

The Community Work Programme ("CWP") is a job creation initiative by Department of Cooperative Governance ("COGTA") that provides an employment safety net. It aims to supplement existing livelihood strategies by providing a basic level of income security through work. The programme is targeted at unemployed and underemployed women and men of working age. The CWP programme has employed 1 200 people for the 2020/21 financial year.

10.17.4.3.2 *Expanded Public Works Programme ("EPWP")*

The Expanded Public Works Programme ("EPWP") is a government programme aimed at the alleviation of poverty and unemployment. The programme ensures the full engagement on Labour Intensive Methods of Construction to contractors for skills development. The EPWP focuses at reducing unemployment by increasing economic growth by means of improving skills levels through education and training and improving the enabling environment for the industry to flourish. People are hired on a six-month contract period. The DPKISLM through the EPWP Programme has employed 66 people during the 2019/20 financial year and aims to employ 121 employees during the 2020/21 financial year.

10.17.4.3.3 *Private Partners*

Mines are obligated, through their SLP commitments, guided by the New Mining Charter (2018), to invest a portion of their profits into HRD, community based projects, job creation and infrastructure. The mines' SLP's do not function in isolation and through coordination with the municipal LED Unit, projects that will address real community based needs are identified and implemented. Annual progress is reported to the DMR and revision done every five (5) years.

Mining is not a primary economic activity of the municipality as it represents small scale activities (Kangra Coal, Yzermyn underground mine, Fly Ash Project). The Mining Right of the Kangra Coal Kusipongo Project is located within two (2) municipalities, i.e. DPKISLM and Mkhondo and project benefits are therefore divided. As is planned for the T4 Project, workers of the Kangra Coal Maquasa operations were used for Kusipongo and the majority of these workers originate from Mkhondo LM. The DPKISLM, through the existing Kusipongo and proposed T4 Projects, therefore, benefits marginally from employment.

In addition, it is likely that economic spin-offs and reinvestments due to these mining projects are concentrated in Piet Retief, Newcaste (KZN Province) and Ermelo (Msukaligwa KM), resulting in even fewer economic benefits for the DPKISLM (DPKISLM IDP 2020/21).

According to Stats SA (2016 Community Survey - CS), Gert Sibande's population increased from 1 043 194 in 2011 to 1 135 409 people in 2016. This makes the District the smallest district in population amongst the three districts in the province. Population grew by 92 215 in the same period and recorded a population growth rate of 1.9% per annum. The population number for 2019 is estimated at 1 203 807 people and projected at 1 505 441 people in 2030 based on historic population growth patterns.

The number of households in Gert Sibande increased from 273 490 in 2011 to 333 815 households (almost 60 000 households increase) in 2016 representing 27% of the Mpumalanga household figure. Household size declining from 3.8 to 3.4 people in the same period. Youth population (15-34 years) forms 39.3% of the total population. The share of the female population in 2016 according to the CS was 50.3% and males 49.7%.

The two local municpaities in which the project falls:

Name of Municipality	Main Admin Location	Area (km²)
Mkhondo	Piet Retief	4882
Dr. Pixley Isaka Ka Seme	Volksrust	5227

The PixleykaSeme Local Municipality is a category B municipality, situated on the eastern border between Mpumalanga and KwaZulu-Natal and is framed by the Mkhondo Municipality in the east, Msukaligwa Municipality to the north and Lekwa Municipality to the west. It comprises an area of approximately 5227.98km², which includes Amersfoot, Ezamokuhle, Perdekop, Siyanzenzeda, Volksrust, Vukuzakhe, Wakkerstroom, Esizameleni and Daggakraal. Agriculture (20%), trade (19.9%), community services (16.4%), construction (12.1%), finance (5.9%), manufacturing (4.6%), transport (4.4%), utilities (3.8%), mining (2.2%).

The Mkhondo Local Municipality is a Category B municipality situated within the Gert Sibande District in the Mpumalanga Province. It is a gateway to the province from KwaZulu-Natal and Swaziland. It is ideally situated halfway between the Gauteng metropolis (Johannesburg and Pretoria) and the Natal coast (Richards Bay and Durban). It is one of the seven municipalities in the district. The municipality amalgamated two former Transitional Local Councils and two Transitional Rural Councils – the historic towns of Piet Retief and Amsterdam. It is the main link for both industrial and commercial transport from Gauteng to the import/export harbour at Richards Bay. Piet Retief, now known as eMkhondo, is surrounded by forestry and plantations. Much of its economy originates from these sources. Three major sawmills, Mondi, Tafibra and PG Bison, are located just outside of eMkhondo. These play a crucial role in boosting a well-diversified economy, and the other components of manufacturing, personal services, real estate and tourism.

10.17.5 Method for SEIA

The SEIA report complies with Appendix 6 of the NEMA 2014 EIA Regulations (GN R982 of 4 December 2014). Steps followed for the study are outlined below:

10.17.5.1 Desktop studies and literature review

Various secondary data sources were used to extrapolate information and to determine and analyse the social and economic characteristics of the study area. Such data included maps, census data, internet searches, municipal documents and socio-economic planning documents and surveys. Data and Results of similar studies were extrapolated from documents, journals and case studies obtained from the internet and from the SEIA consultant’s previous project experience.

10.17.5.2 Site visit

A site visit for SEIA purposes was done on 17 and 18 February 2021 with the aim to orientate the consultant with the general social fabric of the study Area.

10.17.5.3 Primary data

10.17.5.3.1 Public Participation for EIA

In order to elaborate on the baseline social environment (social setting and characteristics of the study area, as well as the key economic activities) links are established with the public participation process ("PPP") done for the EIA. Issues that emerged during the PPP are:

- Impacts on water resources.
- A 1km buffer surrounding the Mabola Protected Environment should be respected as the area is regarded as an area with the highest risk for mining MPTA.
- Potential impacts on paleontological resource within the shale and sandstone being mined out with coal reserves and potential impacts on graves/ruins and archaeological resources due to surface infrastructure.

10.17.5.3.2 Consultation and fieldwork

Consultation with affected parties and role-players were done during February 2021 with the purpose of obtaining information about the role-players’ perceptions about the study area and Project and to supplement and enhance data sourced from desktop resources, which is often outdated. The names of I&APs consulted are contained in Addendum, Section **Error! Reference source not found.**.

10.17.5.3.3 Secondary data

As part of the SEIA assessment, it is required to link with other sources and specialist studies done for this specific Project, since many of the issues of socio-economic relevance are interweaved with environmental concerns. The Groundwater, Blasting and Archaeological/Heritage Assessments were scrutinized and the SEIA findings and significance ratings aligned with them.

10.17.5.3.4 Project area of influence

For purposes of this report the following study areas (areas of influence) are relevant:

Primary Area of influence/site-specific study area

- The power line servitude and a buffer of 500 to 1 000 m around it.
- The three (3) vent shafts with a 500 m buffer around it.
- Directly affected farm portions.
- Scattered rural settlements located within the proposed MR area.

Secondary area of influence/local study area

- Ward 10 in the DPKISLM (the ward impacted in terms of its proximity to the Project).
- The settlements/villages/towns that will directly and/or indirectly be impacted/benefit from the Project, i.e. Driefontein, Daggakraal and those villages identified in the SLP for project investments.
- Adjacent farm portions and landowners.
- The broader DPKISLM.

Indirect area of influence/Regional study area

- Communities within a 40 km radius[58] around the Project (host communities/mine communities).
- Mkhondo LM.
- Towns that surround the Project such as Amersfoort, Piet Retief, Wakkerstroom, Volksrust and Ermelo.
- The demographic and socio-economic information for each of these study areas are provided (where available) and where relevant the broader district and provincial social environments are also discussed.

10.17.5.3.5 *Stakeholder identification*

Stakeholders within the various spheres of influence were identified throughout the EIA's PPP and SEIA. Although geographic location of the stakeholder can aid the categorization of the 'degree of impact' that could potentially manifest, a higher level of impact is not necessarily awarded to the stakeholder that is in closer proximity to the Project. As an example, during construction, positive economic impacts due to procurement could manifest for local suppliers in the broader DPKISLM area (regional study area), whereas Ward 10 and Daggakraal/Driefontein (local study area) would not benefit if suppliers of goods and services are not available or competitive with prices.

10.17.5.3.6 *Site-specific stakeholders*

- Landowners and residents
- Residents in rural settlements
- Farm workers and their families
- Communal Property Association ("CPA") members

10.17.5.3.7 *Stakeholders in the local study area*

- Neighbouring landowners
- Neighbouring farm workers
- Residents in surrounding rural settlements and towns

[58] The T4 Project MWP (2020) indicated that new employment, if any, will be sourced locally, i.e. 40 km from the Project Area.

- Motorists on the access roads
- Ward Councillor
- DPKISLM LED Unit

10.17.5.3.8 Stakeholders in the Regional study Area

- Residents in communities within a 40 km radius from the Project
- Fire, Rescue and Emergency Services
- Organized Agriculture
- Business interests

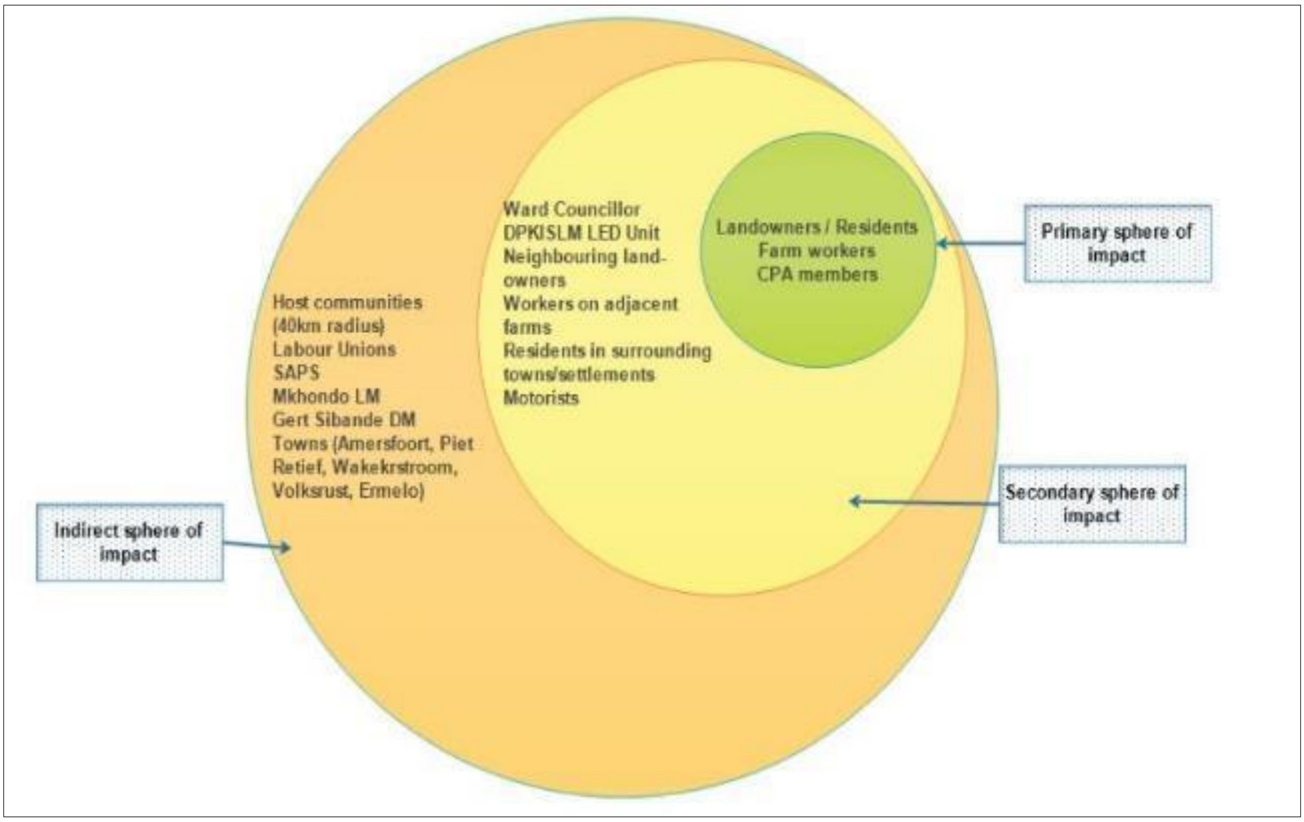

Figure 129. Role-players within their spheres of impact

10.17.5.3.9 Identification of sensitive Receptors

Sensitive Receptors and other features in close proximity to the powerline and ventilations shafts and within the MR area are indicated in Figure 130 to Figure 133 below. These include:

- Residences/farmsteads;
- Rural settlements;
- Crops and other farming activities;
- Agricultural infrastructure;
- Heritage/archaeological sites.

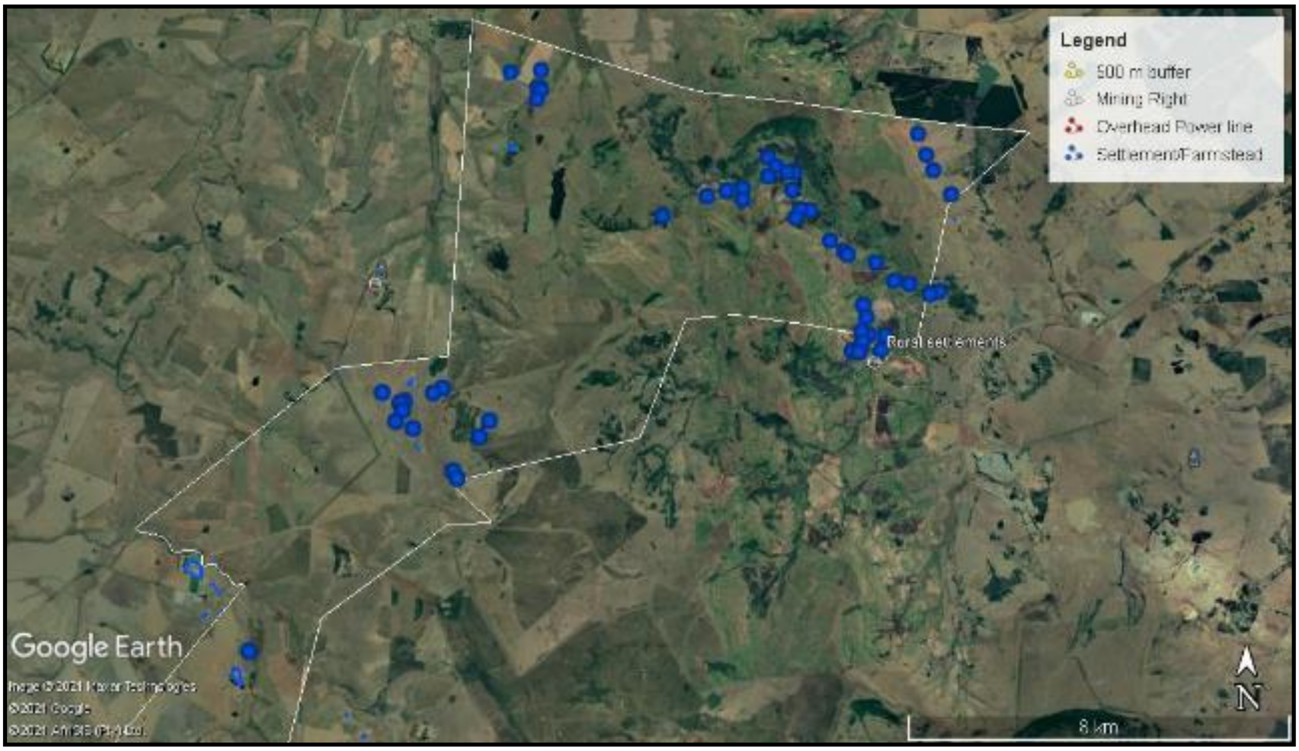

Figure 130: Sensitive receptors: Northern MR area

Figure 131: Sensitive receptors: Central MR Area

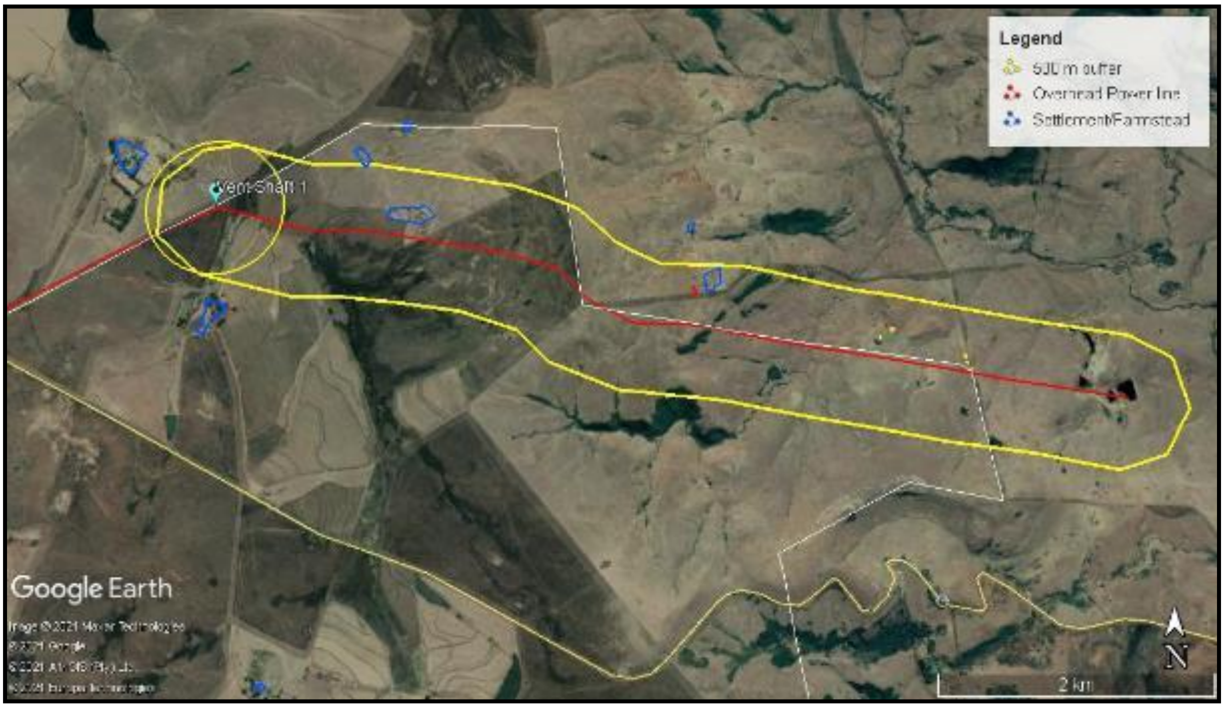

Figure 132: Sensitive receptors: Overhead Powerline

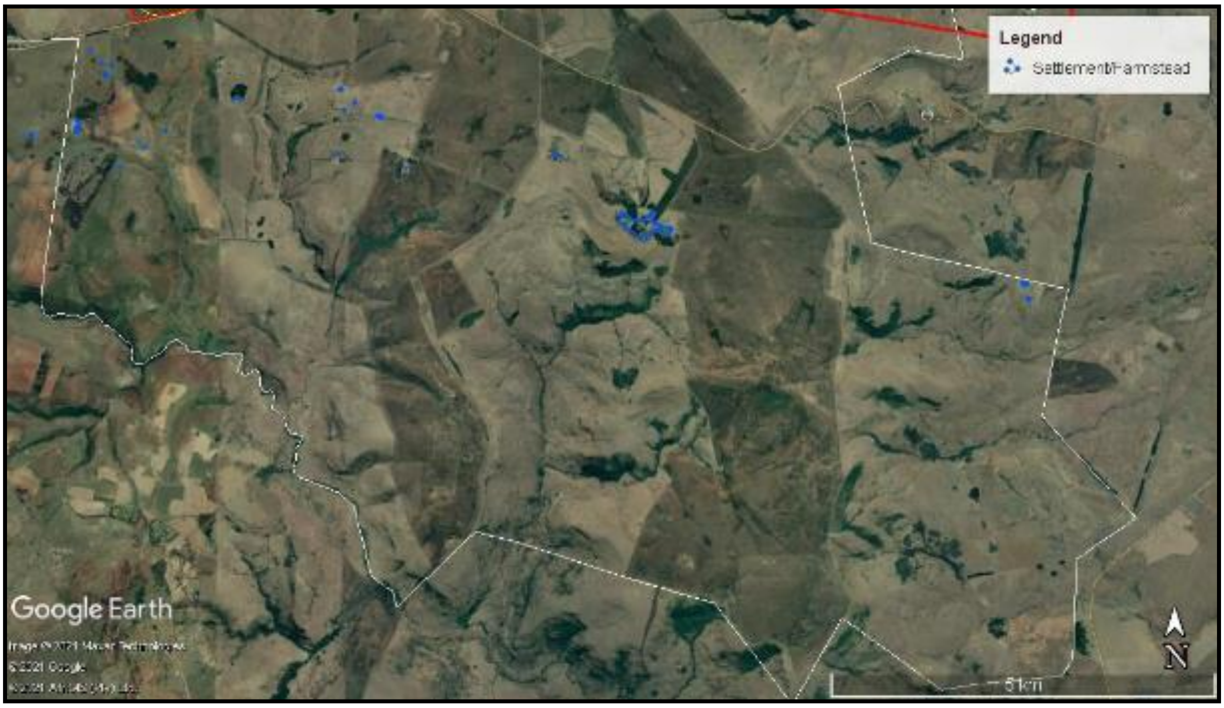

Figure 133: Sensitive receptors: Southern MR area

11 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

11.1 ENVIRONMENTAL FEATURES

The T4 project area and surrounding area consist of a landscape of undulating hills with flat to slightly sloped toe-slopes and valley bottoms. Some parts can be considered mountainous with steep slopes and short slope lengths. Between the hills are flatter areas with longer hillslopes where crop fields are located and where soil-water accumulation supports wetland habitats.

The area is characterised by rural land uses that include residential and agricultural activities. Traditional rural housing, small settlements and farmsteads with related farming infrastructure are scattered throughout the study area. Farming includes subsistence and intensive, commercial activities that produce high-value commodities including soya beans, mutton, wool and dairy.

11.2 EXISTING INFRASTRUCTURE ON THE STUDY AREA AND IN CLOSE PROXIMITY

This is a new application and no current infrastructure has been developed which is related to the Mining Right Application. The applicant holds Prospecting Right on the said properties included within the Mining Right.

11.3 WATER

Potable water is already supplied to the Kangra Mine (133 MR) complex from water extracted from the Heyshope Dam and treated in the existing water treatment plant. Water will also be supplied from the groundwater. All water uses will be licensed in terms of the National Water Act, 1998 (Act 36 of 1998).

11.4 ROADS

The Kangra Mine (133 MR) complex area is well served by paved provincial and district roads, as shown on the Figure 9. The main road serving the area is the N2 national road that runs in a north-west to south-east direction, approximately 20 km to the north-east of the Mine complex. The paved Heyshope road links the mine complex with the N2 national road.

Based on the roads that serve the T4 Project area and the existing access road to the Kangra Mine complex, no further access roads need to be constructed.

11.5 SEWAGE

Chemical and Portable toilets will be utilised and a Septic tank/Chemical ablution will be established at the change houses.

12 DESCRIPTION OF THE CURRENT LAND USES

(Show all environmental and current land use features)

Figure 134 indicates the various landuses within the Kangra Coal T4 Mining project and the surroudngin area.

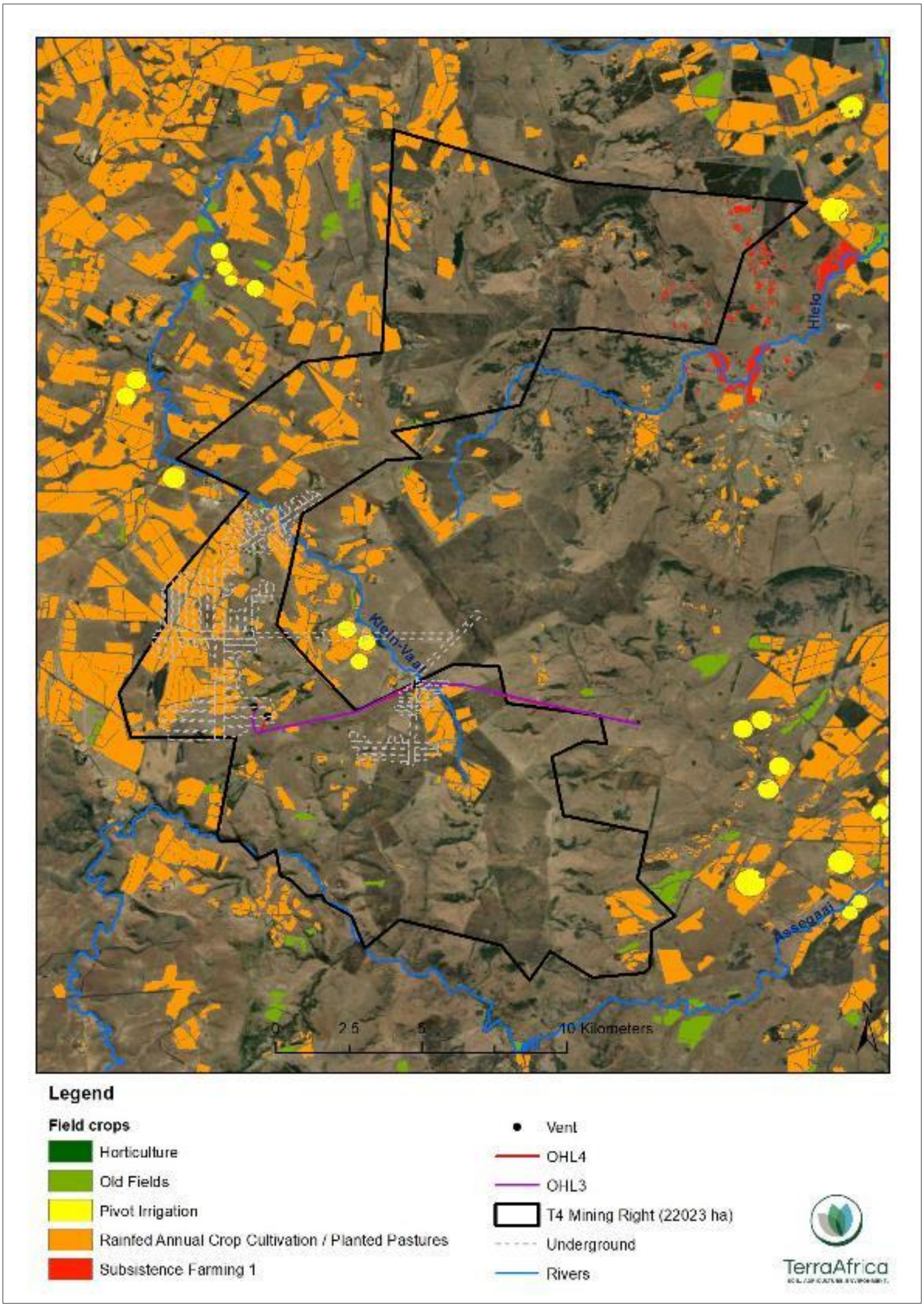

Figure 134: Land-use within and surrounding the site

12.1 SENSITIVE LANDSCAPES

The occurrence of possible sensitive landscapes at the project site is outlined in the Table 95 below.

Table 95: Sensitive Landscapes within the Mining Site

Types of sensitive landscapes	Occurrence at the Mining Site
Nature conservation or ecologically sensitive areas - indigenous plant communities (particularly rare communities and forests), wetlands, rivers, riverbanks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species.	The Mining Right falls within the Threatened Ecosystem; Wakkerstroom/Luneburg Grasslands (MP11), which has an Endangered status (NBA 2011). The most Northern point of the Mining Right Application area also falls within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA 2011 and NBA 2018). The area has already been disturbed by agricultural activities. Wetlands are also shown to occur on the FEPA Map, Refer to Section 10.7 above for the assessment and baseline findings regarding the wetlands found and assessed within the project area).
Sensitive physical environments - such as unstable soils and geo-technically unstable areas.	None known. A Hydropedological assessment has been undertaken as required for the WUL process and this will aim to connect the Surface water and Hydrogeological assessment and describe the movement between the two water environments.
Important natural resources - river systems, groundwater systems, high potential agricultural land.	The specialist report found that the high production potential soils are distributed throughout the farming surface; the balance consists of land that has little or no arable farming potential. It was also reported that the Department of Agriculture, Forestry and Fisheries (DAFF) has identified certain soil types of land as high potential agricultural land as described below. Agricultural land is considered to be of high potential if it may be cultivated in terms of Part 1 of the regulations of Conservation of Agricultural Resources Act 43 of 1983, and is: • under permanent irrigation, or • can be classified as Avalon, Bloemdal, Glencoe or Pinedene and is deeper than 600 mm or as Clovelly, Hutton, Oakleaf, Shortlands or Tukulu and is deeper than 700 mm. According to these criteria, the Hu1000 and Cv1000 is regarded as high potential soils for agriculture. Therefore, from a more detailed soil and land analysis than GAPA, but based on their criteria, that of the National Department of Agriculture, Forestry and Fisheries (DAFF) and by criteria established by the former Corporation for Economic Development (CED), STC (South Africa Trust Development Corporation), the following were found:

	• Approximately 50 hectares on the surveyed land qualified as high potential for arable farming. It consists of deep well-drained medium textured soil that is free of rock and other impediments that may inhibit root development. • A further 16 hectares have medium potential. • A further 16 hectares have low production potential but have been included in the production system. • The balance of the property consists of lower quality soils and waterlogged soils that are only suit-able for grazing.
Sites of special scientific interest	None known.
Sites of social significance - including sites of archaeological, historic, cultural, spiritual or religious importance and burial sites.	Fifty-one heritage sites were identified on historical aerial and topographical maps and pre-plotted. Fifteen of these sites were visited, seven could not be inspected due to access constraints, while recent aerial imagery indicate that 29 sites were demolished and were therefore not visited. An additional 20 sites were identified and plotted during the survey. Thirteen sites are likely to be impacted by the proposed powerline, while 22 sites might potentially be impacted should vibration or subsistence be caused by the proposed underground mining activities. Sites identified include historical building ruins, intact buildings, stone-walled enclosures and cemeteries. Demolished historical sites are considered sensitive from a heritage perspective and should be avoided by surface impacts. Subsurface cultural material might exist at these locations and care should therefore be exercised during construction and mining phases. Intact buildings and ruins dating to the Historic Period should be monitored by the mine's ECO (Environmental Control Officer) on a quarterly basis, as well as pre- and post-blasting. Should any impact be observed, or if impact cannot be avoided, a qualified archaeologist should be contacted to provide the required input to ensure the safeguarding of the sites. A fenced-off conservation buffer of 30 m (metre) must be established around graves or cemeteries that are at risk of being impacted by the proposed surface development and a qualified archaeologist must compile a Conservation Management Plan (CMP) to ensure the safeguarding of the burial sites. Also, access to the cemeteries/graves must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried at the concerned location. Graves/cemeteries located a significant distance from the proposed surface development, but within or within close proximity of the underground mining area, need to be monitored by the mine's ECO. Should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority. Should culturally significant material be discovered during the course of the said development, all activities must be suspended pending further investigation by a qualified archaeologist.
Sites of outstanding natural beauty, panoramic views and scenic drives	The T4 project area and surrounding area consist of a landscape of undulating hills with flat to slightly sloped toe-slopes and valley bottoms. Some parts can be considered mountainous with steep slopes and short slope lengths. Between the hills are flatter areas with longer hillslopes where crop fields are located and where soil-water accumulation supports wetland habitats.
Green belts or public open space in municipal areas	Not applicable.

13 LIMITATIONS AND ASSUMPTIONS

Assumptions and limitations applicable to specific to the assessment process and mitigation measures mentioned in specific specialist studies include the following:

13.1 LAND USE & SOIL POTENTIAL

During the course of the assessment, the following uncertainties have been identified:

- Although the position of the vent shafts (1, 3 and 4) was indicated in the project layout provided by the applicant, the exact area that will be disturbed by the construction of these vents shafts, were not provided. It is therefore uncertain whether an area less than 1 ha or a larger area (between 1 and 5 ha) will be impacted upon.
- The applicant did not provide a description of how construction materials will be delivered to the construction sites of the vent shafts and whether any provision will made for a temporary laydown area for these materials.
- The project description did not indicate whether the vent shafts will be fenced off.
- For the overhead powerlines, it was not indicated whether a service road will be established underneath the powerlines that will allow access to the line for maintenance during the operational phase of the project.
- The likelihood and extent of future subsidence of land in the areas where the proposed underground mining will be, is not known.

To address the current data gaps and uncertainties regarding the planned project activities and associated infrastructure, the following assumptions are made in the baseline description of the agro-ecosystems of the project area and the rating of the impact significance:

- It is assumed that there is good correlation between the available desktop data and the soil descriptions of the nearby Kusipongo project area and the soil properties of the soil in the areas to be affected by the surface infrastructure.
- It is assumed that a buffered area of at least 50m around the vent shafts and the powerline alignments, will be affected by construction activities.
- It is also assumed that materials for the construction of the vent shafts will be delivered with trucks to the areas where the vent shafts and the powerlines will be erected.
- It is assumed that the vent shafts will be fenced to avoid any injuries to livestock that may graze in the area around the shafts.
- It is further assumed that the position of the surface infrastructure components will remain as indicated and that the activities for the construction, operation and decommissioning of the infrastructure are limited to that typical for the installation of vent shafts and overhead powerlines.

13.2 AQUATIC BIODVIVERSITY

- No additional alternatives are applicable for the Kangra T4 Project activities at the time of the compilation of this report. It is known that the layout has changed several times during the project based on finalisation of details and sensitive features identified, which includes specifically changes to the vent shaft positions and powerline. The layout presented within this document is thought to be the final.

- The majority of activity occurs in C11C, which is associated with the Klein Vaal river, however, data from the Assegaai river in the Imkomati Usuthu Catchment had also been included were relevant since sections of the powerline cross over the catchment border into the adjacent W51 catchment.
- 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 sampled where possible, the area was in flood based on 4-5 weeks of rain received as part of Hurricane Eloise shortly before the assessments. The implications of this are that the condition of the rivers could differ under normal circumstances in terms of aquatic invertebrate biodiversity.
- No formal floodline, hydrological modelling or water balancing formed part of the scope of work for this report, however, these are the subjects of separate stand-alone reports and has been incorporated where appropriate. For detail regarding the aforementioned aspects, please refer to the separate report to be submitted.
- 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.

13.3 BIODIVERSITY ASSESSMENT

- No additional alternatives are applicable for the Kangra T4 Project activities at the time of the compilation of this report. It is known that the layout has changed several times during the project based on finalisation of details and sensitive features identified, which includes specifically changes to the vent shaft positions and powerline. The layout presented within this document is thought to be the final.
- It is assumed that species flowering only during specific times of the year could be confused with a very similar species of the same genus.
- Some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- 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 vegetation survey was conducted in one season. February 2021 equates a summer field assessment.
- Data collection in this study relied heavily on data from representative, homogenous sections of vegetation units, as well as general observations, analysis of satellite imagery from the past until the present, generic data and a desktop analysis.
- The floral assessment is confined to the surface infrastructure and activities footprint and 100 m extended footprint area related to the proposed project and does not include the neighbouring and adjacent properties nor the entire Mining Right Application. This is deemed sufficient since no surface impacts will occur other than the areas designated for the Ventilations shafts and the powerline.

- Due to safety and access constraints not all footprint areas could be surveyed. However, survey sites that could be accessed are considered to be representative of the general vegetation occurring on the project footprint.
- Riparian areas refer to watercourses, rivers or streams and does not specifically cater for wetland zones. For aspects related to wetlands, the Wetland Delineation Report will need to be referred to.
- No scientific calculated data was collected or analysed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigator.
- The 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.

13.4 HYDROGEOLOGICAL ASSESSMENT

- The modelling was done within the limitations of the scope of work of this study and the amount of data available.
- All efforts have been made to base the model on sound assumptions and has been calibrated to observed data, the results obtained should be considered in accordance with the assumptions made. Especially, the assumption that a fractured aquifer will behave as a homogeneous porous medium can lead to error. However, on a large enough scale (bigger than the REV, Representative Elemental Volume) this assumption should hold reasonably well.

13.5 HYDROPEDOLOGICAL ASSESSMENT

The impact on flow drivers of the wetland catchment is based on the following assumptions (status quo). A water balance4 on the wetland catchment is represented by:

- Rainfall 100% of flow input
- Evapotranspiration is 65 – 70% of rainfall (outflow)
- Runoff is 9% (outflow)5
- Groundwater recharge is 3%6 (outflow)
- 18 % of the water being left in or stored the unsaturated zone or interflow zone feeding the wetland

The impact assessment is only valid for the proposed mining activity, based on the site visit historic and agricultural activities has impacted on the wetland systems. Current flow driver impacts from existing and neighbouring mines/agricultural activities was not part of the impact assessment.

13.6 SURFACE WATER ASSESSMENT

- Use was made of aerial photographs, digital satellite imagery as well as provincial and national databases to identify areas of interest before the field survey.
- Although all possible measures were undertaken to ensure all riparian zones, and drainage lines were identified and assessed, some smaller ephemeral drainage lines may have been overlooked. The obtained buffer zones as calculated using the WRC Report No. TT 610/14 Tool was done on the practitioners own discretion and based on desktop and field assessments.

- The Surface Water Assessment is confined to the surface infrastructure and activities footprint and 500 m extended footprint area related to the proposed project and does not include the neighbouring and adjacent properties nor the entire MRA.
- Due to safety and access constraints not all footprint areas could be surveyed.
- Riparian areas refer to watercourses, rivers or streams and does not specifically cater for wetland zones. For aspects related to wetlands, the Wetland Delineation Report will need to be referred to.
- Aquatic and riparian ecosystems are dynamic and complex. Some aspects of the ecology of these systems, some of which may be important may have been overlooked. The findings of this study were largely based on a single site visit. A more reliable assessment would have required that seasonal assessments take place.
- The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Red Kite Environmental Solutions and its staff reserve the right to modify aspects of the report including the recommendations when new information may become available from on-going research or further work in this field or pertaining to this investigation.

13.7 WETLAND ASSESSMENT

The following limitations and assumptions apply to this assessment:

- Although all watercourses occurring within 500m of the proposed activities were mapped at a desktop level, field investigations were confined to only those potential wetland and riverine areas that stand to be measurably negatively affected. These areas constituted the study area of assessment.
- The mapping and classification of the watercourse units outside of the study area but occurring within a 500m radius of activities should be considered preliminary and coarse in resolution. These units were not verified in the field.
- Sampling by its nature means that not all parts of the study area were visited. The assessment findings are thus only applicable to those areas sampled, which were extrapolated to the rest of the study area. Furthermore, due to the time delays with gaining access to the wetland sites for assessment, the following watercourses units within the study area could not be sampled onsite: Units W08, W09, W10, W11, W12, W13, W14a, W14b, W15.
- A Soil Munsell Colour Chart was used to determine the soil matrix colour of the soil sampled. However, it is important to note that the recording of the colours using the soil chart is highly subjective and varies significantly depending on soil moisture and the prevailing light conditions. In this case, all the soils sampled were dry and sampling was undertaken in sunny conditions.
- Soil wetness indicators (i.e. soil mottles, grey soil matrix), which in practice are primary indicators of hydromorphic soils, are not seasonally dependent (wetness indicators are retained in the soil for many years) and therefore seasonality has no influence on the delineation of wetland areas.

- All vegetation information recorded was based on the onsite visual observations of the author and no formal vegetation sampling was undertaken. Furthermore, only dominant and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- Although every effort was made to correctly identify the plant species encountered onsite, wetland plants, particularly the Cyperaceae (sedge) family, are notoriously difficult to identify to species level. Every effort as made to accurately identify plants species but where identification to species level could not be determined, such species were only identified to genus level.
- Seasonality can also influence the species of flora encountered at the site, with the flowering time of many species often posing a challenge in species identification. Since the wetland vegetation in the study area was found to be largely secondary/degraded with low native plant diversity, seasonality would not be as significant a limitation when compared with a vegetation community that is largely natural or high in native plant diversity.
- The realistic good mitigation scenario impact assessment assumes that all the mitigation measures recommended in Section 7 will be adhered to.
- No information was provided by the applicant on the construction and operational activities associated with the establishment of the vent shafts.
- This impact assessment only considers the impacts of the mine surface infrastructure including the 3 vent shafts and the two powerline alternatives. The impacts of underground mining in terms of altering groundwater and subsurface water inputs to the wetlands was not assessed as part of this study.

13.8 ARCHAEOLOGICAL/HERITAGE ASSESSMENT

During the 1st site visit (August 2020) the general environment was characterised by dense vegetation that hampered site visibility and free movement. During this site visit only a section of the proposed powerline was surveyed and two pre-plotted sites were inspected. During the site visit it transpired that access was not allowed to any of the remaining farm portions due to ongoing court cases between Kangra Coal (Pty) Ltd and one of the farm owners (Mr. Greyling), who appears to own the majority of the farm portions on which mining is proposed. As a result of the court case the remaining farm owners also refused access. It was also noted that the local farm workers in the general area only speak Zulu, significantly hampering communication.

The 2nd site visit (November 2020) saw only access to the Farm Middelpan 44 HT, owned by Mr. Moller. Visibility was good at this time as the entire project area had recently been burnt. The court cases were still ongoing at this stage.

The final site visit was conducted in February 2021. Some areas, especially in mountainous regions, were characterised by dense grass cover that hampered site visibility and free movement. Vegetation cover at lower altitudes were relatively short that promoted site visibility. Also, heavy rains resulted in extremely wet and marshy conditions that hampered access and free movement . Accordingly, Kangra Coal (Pty) Ltd won two court cases against Mr. Greyling and the court ruled that specialists had to be allowed access to the properties to conduct their respective studies. Access, however, was still refused. At this stage Mr. Pierre Louw from Kangra Coal (Pty) Ltd accompanied the specialists and access was granted on the second day.

However, due to time constraints in terms of available fieldwork days and remaining time for submission of the

EIA, as well as the unavailability of some of the farm owners, not all pre-plotted sites could be reached. Personal communication with the owners to determine the location additional burial sites or the age of some of the structures was limited as well. During this site visit the author was accompanied by Mr. Simo Yende from Kangra Coal (Pty) Ltd to some of the pre-plotted sites. This significantly aided the process as Mr. Yende speaks Zulu and was therefore able to communicate with the local residents. This greatly helped in determining the location of cemeteries and graves on some of the farm portions inspected. Sites K02, K03, K08, K11, K19 could not be visited due to time restrictions and the unavailability of Mr. Greyling at the time of surveying. Access to site K21 was allowed, but due to a significant amount of rain and wet conditions, the site could not be reached in time. According to Mr. Yende, the property of which sites K04 and K23 are located, is communal property. At the time of surveying the gate was locked and access was not obtained. According to Mr. Yende, access would not be a problem, but would take time to arrange.

The lack of communication and access to land owners, as well as the language barrier with the local population resulted in a potential gap in locating burial sites and determining an accurate age of structures and buildings. It should be noted, however, that all surface impact areas were surveyed.

13.9 NOISE ASSESSMENT

Limitations were identified by the specialist in terms od modelled scenarios and for the project specifically as discussed below:

13.9.1 Modelled Scenarios

The assessment of the noise impact of the site on the surrounding receptors is based on a worst-case approach. The simulation conditions and variables were configured as follows:

- The noise point sources were positioned at approximate geometric centre of mass of the equipment above the ground plane (DGM in SoundPLAN) and approximate altitudes (e.g. rooftop condenser units). If the noise sources are situated closer to the ground, the impact may be less than if the sources are raised higher off the ground;
- The ground effect was considered by modelling the ground at each site with a sound absorption coefficient of 0.75 across mid-high frequencies. This approximation was made considering that the Concawe method suggests a fully absorptive (absorption coefficient of '1') characteristic for ground that consists of dense vegetation, with moist conditions. At the other end of the spectrum ('0'), a reflective characteristic is suggested where hard surfaces and minimal vegetation exist with dry conditions.
- To simulate the worst-case condition when low atmospheric sound absorption can be expected (for low to mid frequencies), the following parameters were used in the simulations: air temperature of 20 ºC; atmospheric pressure of 1013.25 mbar and humidity of 80 %;
- Dynamic factors such as meteorological conditions, which include wind velocity, temperature inversion and clouds, have not been considered in the simulations. Static calculations are presented only.
- Under temperature inversion conditions, sound propagation can extend much further afield. This condition is however difficult to cater for due to the number of variables and was not factored in during the simulation. An increase of up to 6 dBA from the predicted noise levels could result due to such conditions;

- The ground was modelled with elevation contours of 50 m intervals. These intervals provide sufficient detail over the distances encountered for modelling purposes;
- The presented noise contours are only one scenario based on an over engineered principal of the maximum capacity of the project. The contours will not be applicable during all times and is only a tool to assist with the potential worst-case impact assessment;
- Sound Power Levels (SPL) sourced for the modelled scenario made use of online resources, no
- measurements were conducted to determine the SPL of equipment;
- SPL used will likely represent a worst-case maximum output from the loudest point on the equipment (i.e., an exhaust port from a FEL) at maximum full load capacity. As such the modelled noise sources are a worst-case scenario for each piece of equipment; and
- Many models consider noise contours in a hemispherical fashion. Noise sources can be directional e.g., speakers or exhaust ports.

13.9.2 Project Specification Limitations

Project specific limitations included:

- The contours are developed as omni-directional (all directions). The calculated noise level is only relevant if the ventilation stack is pointed at this direction (and will be far lower should it not face in that receptors direction). This is done to ensure a comprehensive evaluation, with the primary mitigation option (should it be required) focusing on which direction is best to direct a vent stack (should it be required by project engineers); and
- Only one measurement was conducted 26 October 2020. The consultants had limited access, as the I&AP's lodge an objective against the project and site access was limited. A worst-case SANS10103:2008 Rural Rating will be used for assessment. The Rating level was also selected based on desktop assessment and historical data obtained from projects receptors in a similar environment.

13.10 BLASTING ASSESSMENT

The following assumptions have been made:

- The anticipated levels of influence estimated in the Blasting report have been calculated using standard accepted methodology according to international and local regulations;
- The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These will have to be confirmed with actual measurements once the operation is active;
- Blast Management & Consulting was not involved in the blast design. The information on blast design to be applied was provided by the client; and
- The work done was undertaken based on the specialist's knowledge and information provided by the project applicant.

13.11 PALEONTOLOGICAL ASSESSMENT

The following limitations were identified in the report:

- A large part of the development area has never been surveyed by a palaeontologist or geophysicist;
- The accuracy of geological maps and associated information is variable;
- Poor locality information on sheet explanations for geological maps.
- Lack of published data;
- Lack of rocky outcrops;
- Inaccessibility of site; and
- Insufficient data from developer and exact lay-out plan for all structures.

13.12 SOCIO-ECONOMIC

Baseline socio-economic data for this SEIA report was obtained from various sources, which include Census 2011, Community Survey ("CS") of 2016 and municipal planning documents, where more recent data could be obtained. Some of the statistics in the various sources contradict each other and, wherever relevant, was highlighted in the report. Data should therefore be used with cautiousness.

Technical and other information provided by the client is assumed to be correct. In some instances limited technical information was available (such as details with regards to access roads). These are limiting factors and assumptions were drawn to come to a conclusion.

Desktop study sources are not exhaustive and additional information can still come to the fore to influence the contents and findings of the SEIA study.

Comments, issues and concerns to be received during the following public participation phase of the EIA will be included and analysed and could influence the contents and findings of the SEIA.

All attempts were made to consult with stakeholders and include relevant sources. Additional information that could contradict the findings in this report may however exist and for this reason consultation with stakeholders could still take place during the review period of the EIA report.

Assessment of the impact on sense of place is based on the specialist's opinion as sense of place is a very personal experience and is not easily measurable.

A SIA aims to identify possible social impacts that could occur in future. These impacts are based on existing baseline information. There is thus always an uncertainty with regards to the anticipated impact actually occurring, as well as the intensity thereof. Impact predictions have been made as accurately as possible based on the information available at the time of the study.

Individuals view possible social impacts differently due to their association with the anticipated impact. Impacts could therefore be perceived and rated differently than those contained in the SEIA Report.

Socio-economic impacts associated with the eventual decommissioning of the mine at the end of its life are briefly discussed but are not subject to detail assessment. This omission is motivated by the fact that predictions concerning the characteristics of the receiving socio-economic environment at the time of decommissioning are subject to a large margin of error, thus significantly reducing the accuracy of the impact assessment.

13.13 CLOSURE REPORT

The Closure Report is based on the following assumptions and limitations:

- Current information available to Elemental Sustainability was used in the development of this report;
- The information contained within this report is based on current layout plans and proposed mine plans. If there is a significant change or addition of other infrastructure areas, this report will need to be updated to cater for this change;
- Mitigation measures and recommendations provided in this report is based on the specialist studies. All specialist studies have been completed prior to this report being completed; and
- This report must be considered as a living document and will be updated as additional information becomes available, and as monitoring and rehabilitation progresses. The report must be updated as required by legal requirements.

14 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 where 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.)

14.1 IMPACTS IDENTIFIED FOR THE PROJECT

The following cultural, environmental and socio-economic impacts associated with the project have been assessed in this document.

Associated activities during all phases will be relevant. Note that many aspects are not relevant in term of potential impacts as the project relating to this application has no new surface infrastructure (other than that already either authorised or implemented).

Potential impacts that may be/may have been caused by the development will be identified using input from the following:

- Views of I&APs;
- Existing information;
- Specialist investigations;
- Site visit with the project team; and
- Legislation.

The following potential major direct, indirect and cumulative impacts were identified:

- Land degradation
- Potential to alter the topography
- Loss of soil characteristics - erosion and compaction

- Potential for alien invasive establishment
- Reduced flow to downstream water catchment
- Potential pollution to water resources (surface and groundwater)
- Drawdown cone from dewatering activities (groundwater quantity)
- Increased dust and emissions
- Increased noise levels
- Damage to property/infrastructure from blast events
- Potential damage to heritage sites (grave and/or archaeological artefacts)
- Influx of job seekers to the area
- Potential increased traffic – haulage
- Health and safety impacts;
- Potential injury and loss of health and life of humans; and
- Altered Socio-Economic Environment (Positive or negative).

14.2 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

Minerals can only be mined where identified and verified, therefore it was not practical to select any other sites other than was included in the Prospecting Right. This fact will have guided the proposed positioning as well as utilising the transformed/impacted areas, which will limit surface impacts for the project (refer to Section 7 above).

14.3 ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

An Issues and Response Report has been compiled of all the comments received during the application as part of the Public Participation Process for the project (Comments received to date have been included in Table 16). This document records the issues of concern, questions and suggestions contributed by stakeholders during the course of the Environmental Authorisation Process. This report also includes the responses provided by relevant parties. The comments will be updated for the Final EIAR to be submitted to the DMRE.

14.4 SPECIALIST INVESTIGATIONS

Several specialist investigations formed part of the in the EIA Phase of the project. A description of the aspects assessed by the specialists if provided in Table 96.

Table 96: Summary of specialist investigations

Aspect	Specialist Study	Specialist	Terms of Reference
Surface water and Aquatic Ecology	Surface water and Aquatic Ecology Assessment	Red Kite Environmental Solutions (Pty) Ltd. (Enviridi Environmental Consultants (Pty) Ltd. undertook the Aquatic	The scope of the surface water baseline and impact assessment study was to: • Establish the water quality baseline by assessing water quality in the rivers/streams and comparing it to national water quality standards. • Field visit was done to survey the affected watercourses; • Use the information in the available reports to describe the prevailing surface water environment and climate in the study area;

Aspect	Specialist Study	Specialist	Terms of Reference
		Ecological Assessment)	• Developing a sensitivity map based on field visits and supported by appropriate regional information to inform the impact assessment; • Impact assessment of the proposed project on the surface water environment for the construction and operation phases of the project; • Recommendation of site-specific mitigation measures; and • Compilation of a specialist assessment report detailing the methodology and findings of the assessment. The surface water assessment was undertaken for the footprint of the mining activities, as provided by the client. The entire Mining Right area was not assessed. The overall purpose of the surface water assessment report is to evaluate the potential impacts that the proposed infrastructure, or activities might have on the surface water on the property. The impactable water resources, with their accompanying catchments, and sub-catchment areas will be noted as providing information on which measures and legislation will be applicable to the said property. The objectives and Scope of Work for the aquatic ecology component of the assessment were as follows: • Assess the ecological state of aquatic ecosystems; • Assess the spatial and temporal trends in ecological state; • Assess emerging problems; • Set objectives for rivers; • Assess the impact of developments; • Predict changes in the ecosystem due to developments; and • Contribute to the determination of the Ecological Reserve. The main long-term objective and goal of the biological assessment was to measure, assess and report on the health, status and possible trends related to the receiving environmental indicators representing the aquatic ecosystem associated with the project area.
Noise	Environmental Noise Impact Assessment	Enviroroots (Pty) Ltd.	The noise impact assessment determined: - If there are potential noise-sensitive receptors staying within 1,000 m from industrial activities (SANS 10328:2008). - It is a controlled activity in terms of the NEMA regulations and an ENIA is required, because it

Aspect	Specialist Study	Specialist	Terms of Reference
			may cause a disturbing noise that is prohibited in terms of section 18(1) of the Government Notice 579 of 2010. - It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of Regulation 2(d) of GN R154 of 1992. In South Africa the document that addresses the issues specifically concerning environmental noise is SANS 10103:2008. It has recently been thoroughly revised and brought in line with the guidelines of the World Health Organisation (WHO). It provides the maximum average ambient noise levels during the day and night to which different types of developments indoors may be exposed. This standard specifies the methodology to assess the potential noise impacts on the environment due to a proposed activity that might impact on the environment. This standard also stipulates the minimum requirements to be investigated. These minimum requirements are: • The purpose of the investigation; • A brief description of the planned development or the changes that are being considered; • A brief description of the existing environment; • The identification of the noise sources that may affect the particular development, together with their respective estimated sound pressure levels or sound power levels (or both); • The identified noise sources that were not taken into account and the reasons why they were not investigated; • The identified noise-sensitive developments and the estimated impact on them; • Any assumptions made with regard to the estimated values used; • An explanation, either by a brief description or by reference, of the methods that were used to estimate the existing and predicted rating levels; • The location of the measurement or calculation points, i.e. a description, sketch or map; • Estimation of the environmental noise impact; • Alternatives that were considered and the results of those that were investigated; • A list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation; • A detailed summary of all the comments received from interested or affected parties as well as the

Aspect	**Specialist Study**	**Specialist**	**Terms of Reference**
			procedures and discussions followed to deal with them; • Conclusions that were reached; • Recommendations, i.e. if there could be a significant impact, or if more information is needed, a recommendation that an environmental noise impact assessment be conducted; and • If remedial measures will provide an acceptable solution, which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant authority. If the remedial measures deteriorate after a certain time and a follow-up auditing or maintenance programme (or both) is instituted, this programme should be included in the final recommendations and accepted in the record of decision if the approval is obtained from the relevant authority.
Blasting and Vibration	Blast and Vibration Assessment	Blast Management & Consulting	The scope of the study were determined by the terms of reference to achieve the objectives: • Background information of the proposed site; • Blasting Operation Requirements; • Site specific evaluation of blasting operations according to the following: o Evaluation of expected ground vibration levels from blasting operations at specific distances and on structures in surrounding areas; o Evaluation of expected ground vibration influence on neighbouring communities; o Evaluation of expected blasting influence on national and provincial roads surrounding the blasting operations if present; o Evaluation of expected ground vibration levels on water boreholes if present within 1500 m from blasting operations; o Evaluation of expected air blast levels at specific distances from the operations and possible influence on structures; o Evaluation of fly rock unsafe zone; o Discussion on the occurrence of noxious fumes and dangers of fumes; o Evaluation the location of blasting operations in relation to surrounding areas according to the regulations from the applicable Acts. • Impact Assessment; • Mitigations; • Recommendations; • Conclusion.
Groundwater	Groundwater Impact	Geo Pollution Technologies	The following scope of work were condcuted according to best practice guidelines.

Aspect	**Specialist Study**	**Specialist**	**Terms of Reference**
	Assessment	– Gauteng (Pty) Ltd	Fieldwork: A hydrocensus/site visit is the most appropriate way of collecting information. The desktop study and fieldwork will consist of the following: • Conduct a desk study to apprehend the current state of knowledge. • Gathering of existing information such as previous groundwater balance studies, mine void volumes/geometry, inflow rates, previous general groundwater studies in the area, groundwater monitoring information, etc. • Gathering of monitoring data • Hydrocensus of the area (1-2km radius of the mining area) Numerical Modelling: Predictive modelling pre-mining for impact prediction will be done to quantify potential impacts from mining: • Groundwater flow, transport modelling to predict the impacts of the mining on groundwater quantity and quality in the region of the mine, • Spread of pollution will be determined, • Decant areas and volume will be determined, • Cone of depression and inflow rates will be determined, • A groundwater management and a monitoring network plan will be included in the report. Reporting: A report follows the format of regulations regarding the procedural requirements for water use licence applications and appeals, specialist groundwater study. March 2017. Project Objectives: Within the scope of work the groundwater study aimed to address the following: • Quantify the current groundwater status quo • Impact Predictions • Groundwater Risk Assessment • Groundwater Management Options and Mitigation Measures
Heritage	Heritage Impact Assessment	Tobias Coetzee Heritage Practitioner.	Assessment of the potential impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). The objective of the Phase 1 Heritage Impact Assessment (HIA) was to gain an overall understanding of the heritage sensitivities of the area and indicate how they may be impacted. In order to establish heritage significance the following method was followed: • Investigation of primary resources (archival information) • Investigation of secondary resources (literature and maps) • Physical evidence (site investigation)

Aspect	**Specialist Study**	**Specialist**	**Terms of Reference**
			• Determining Heritage Significance.
Terrestrial Ecology	Flora Impact Assessment	Enviridi Environmental Consultants (Pty) Ltd	The terms of reference for the Vegetation Assessment were as follows: • Describe the affected floristic environment from available literature and by means of a desktop study to identify a list of possible floral species that are likely to occur on site. • List and record endangered, red data and protected plant species found on site. • List exotic and invasive plant species found on site. • List plants found on site with medicinal properties • Identification of anticipated impact of the proposed project on the vegetation and ecosystem services. • Provide proposals for mitigation of identified impacts. • Draw up a sensitivity map indicating all sensitive areas, transformed areas and buffers around sensitive features.
	Fauna Habitat Assessment		The main objectives of the Faunal study were as follows: • To provide a description of the potentially affected fauna habitat by making use of available literature resources, and in so compiling a list of fauna species likely to occur on site; • To list and record endangered, red data or protected fauna species found or likely to occur on site; • To assess the condition of suitable habitat on site for sensitive fauna species; • To compile a sensitivity map indicating sensitive or non-sensitive or transformed areas and relevant buffer zones; • To identify anticipated impacts of the proposed development on fauna species; and • To provide mitigation measures to limit and/or eliminate the anticipated impacts. The study included the following data sources: • Bird distribution data of the Southern African Bird Atlas Project 1 (SABAP1) and 2 (SABAP2) (http://sabap2.adu.org.za/). The SABAP1 was conducted in the late 1980s to early 1990s. The SABAP2 data covers the period 2007 to present. • The Important Bird Areas (IBA) project data (Birdlife International data; Barnes 1998). • The national threatened status of all priority species was determined using the Red Data Book of Birds of South Africa (Taylor et al. 2014), and the updated Birdlife South Africa Checklist of Birds 2015 in South Africa. (http://www.birdlife.org.za/publications/checklists). • The global threatened status of all priority species was determined by consulting the latest (2015.1)

Aspect	**Specialist Study**	**Specialist**	**Terms of Reference**
			IUCN Red List of Threatened Species (Http://www.iucnredlist.org/). • Data on biomes, bioregions, vegetation types and rivers in the study area was obtained from the Vegetation Map of South Africa (Mucina & Rutherford 2006). • Google Earth satellite imagery was used to view the broader development areas and to identify specific bird habitats at ground level. • PlanetGIS Explorer online (www.planetgis.co.za) is used to compile and generate maps.
Wetlands	Wetland Impact Assessment	Verdant Environmental (Pty) Ltd	The main objectives of this study were as follows: • Delineate and classify wetlands within 500m of the development site; • Discusses drivers of wetlands; • Groundtruthed of desktop data; • Assessment of the PES or EIS scores and Recommended Ecological Category; • The Risk Assessment based on the 2016 version of the Risk Matrix Tool presented in appendix A of the Risk-Based Water Use Authorisation Approach and Delegation Protocol for Section 21(c) and (i); • To identify anticipated impacts of the proposed development on wetlands; and • To provide mitigation measures to limit and/or eliminate the anticipated impacts. The wetland assessment presented further aimed to provide information required for the NEMA as well as Department of Water and Sanitation (DWS) authorization process that were not addressed in the Bufo Technologies (2018) report, including: • Undertake functional and integrity assessment of wetlands areas within the area assessed as specified in General Notice 267 of 24 March 2017, particularly an assessment of ecosystem services following Kotze et al, 2005, • Undertake an impact assessment as specified in the NEMA 2014 regulations, • Undertake a risk assessment as specified in General Notice 509 in published in the Government Gazette 40713 of 24 March 2017, • Recommend suitable buffer zones, both generic (as required in GDARD, 2014) and scientific as specified in General Notice 267 of 24 March 2017, following Macfarlane et al 2015.
Hydro-pedological Assessment	Hydro-pedological Assessment	Geo Pollutions Technologies – Morne Burger	The main objectives of this study was the following: • Determine the flow drivers for the pan area; • Determine the catchment of the pan area.

Aspect	**Specialist Study**	**Specialist**	**Terms of Reference**
			• Link the wetland assessment, geohydrological assessment and soil assessment to understand soil-water interactions. • To understand the movement of water through the soil.
Agricultural Agro-Ecosystem Assessment	Assessment of the land Capability	Terra Africa Consult	The overarching purpose of the Agricultural Agro-Ecosystem Specialist Assessment (from here onwards also referred to as the Agricultural Assessment) that will be included in the Environmental Impact Assessment Report, is to ensure that the sensitivity of the site to the proposed land use change (from agriculture to establishment of mining infrastructure) is sufficiently considered. Also, that the information provided in this report, enables the Competent Authority to come to a sound conclusion on the impact of the proposed project on the food production potential of the site. To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives: • It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool. • It must contain proof of the current land use and environmental sensitivity pertaining to the study field. • All data and conclusions are submitted together with the Environmental Impact Assessment report for the proposed Kangra Coal T4 project. According to GN320, the Agricultural Agro-Ecosystem Assessment that is submitted must meet the following requirements: • It must identify the extent of the impact of the proposed development on the agricultural resources. • It has to 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.
Social economic	Social economic Impact Assessment	Index Social Services	The study aimed to characterise: • Baseline socio-economic environment with respect to the immediate area and broader municipal areas, identify and map land uses, liaise with other appointed specialists, as required, to understand the potential extent and significance of impacts (including health), provide input on the project plan, assess both potential positive and negative impacts associated

Aspect	Specialist Study	Specialist	Terms of Reference
			with each of the project phases, provide input into enhancing positive and minimising negative socio-economic impacts, provide input on the issue of property value, and develop related management plans. In the updated assessment, the Social Economic Assessment included questions as compiled from the Social Questionnaire and one-on-one meetings were included to specifically focus on the surrounding land owners based on their concerns gathered during the onset of the project and initial comment received during the Scoping Phase.
Financial Provision – Closure Cost Assessment and Plan	Financial Provision	Elemental Sustainability (Pty) Ltd	The financial provision for the proposed project will be determined by Elemental Sustainability and would be determined in accordance with the NEMA Regulations (1147 of 2015) pertaining to the financial provision for mining operations.

14.5 THE POSITIVE AND NEGATIVE IMPACTS THAT THE 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)

General impacts are provided below as per specialist investigations (refer to Appendix 7 – 15). The specialist investigations which included modelling, such as groundwater, noise, visual, air and blasting, included the modelling results below as per relevant heading.

14.5.1 Impact on Geology

The project may have an impact on the rock masses that influence the groundwater on the project site. No geological impacts such as sterilisation of mineral resources are expected as the proposed project is being planned in a manner that allows for the maximum extraction of the targeted commodities within the project area.

Other possible impacts in case of operation:

- Resultant impacts from blasting and vibrations may impact on geology if re-opening occurs. Drilling and blasting may cause unintended impacts.
- The extraction of ore and waste rock from the opencast workings will result in the permanent removal of geology/ lithology. Disturbance and removal of the geological strata due to excavation and subsequent removal of the reef.

14.5.2 Impacts on Topography

The topography of the project area would be altered by project related activities. However, as the Kangra t4 Coal Project is an underground mine, the impacts on topography will be low, unless subsidence occurs.

14.5.2.1 Risk of Subsidence

The legislation applicable for the mining area is Section 11, Regulation 17.7 (a) and 17.7 (b) of the Mines Health and Safety Act (Act 29 of 1996) which states:

Reg 17: The employer must take reasonable measures to ensure that –

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

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

Section 11 provides as follows:-

"(1) Every employer must-

(a) identify the hazards to health or safety to which employees may be exposed while they are at work;

(b) assess the risk to health or safety to which employees may be exposed while they are at work;

(c) record the significant hazards identified and risks assessed; and

(d) make those records available for inspection by employees.

14.5.2.1.1 Discussion

The effect that the proposed underground workings will have on the stability of the overlying surface, will be determined by the stability of the underground workings (which may result in subsidence) and to a lesser extent the blasting practices implemented (vibrations). Note that blasting will not be used as the primary development method and will only be used in areas where dykes, faults and other stonework will be required.

14.5.2.1.2 Stability of the Underground Workings

The stability of the underground workings is primarily dependent on the underground pillar design which should ensure long term pillar stability. In shallow mining areas (areas less than 40m below surface) (Madden and Canbulat, 2005), the pillar stability in collaboration with intersection and bord stability will determine if the resultant subsidence may affect the overlying surface structures. By ensuring pillar and roof stability, subsidence can be prevented and thus the stability of the surface ensured.

14.5.2.1.3 Pillar Stability

The underground mining area will be conducted in deeper lying areas (100m or more), there are several sets of controls that needs to be implemented to ensure the stability of the overlying surface structures, namely:

- Ensure to develop pillars below surface structures according to primary panel safety factor design criteria (being in excess of 2). Research conducted in 1976 Salamon and Oravecz recommended a safety factor of 2.0 for the design of main development pillars (Van der Merwe 2006). Hill (2005) suggests that pillars designed for long life in excess of 5 years such as primary development pillars should be designed with a margin of 20 percent in addition to the minimum design, the reason being that at some stage it can be assumed that the pillars will be subjected to full tributary area loading. Hill (2005) further recommended that pillars that required for the permanent protection of critical surface features must be designed to have a minimum probability of failure of 1 in a million pillars. The probability of failure is illustrated below in Figure 135.

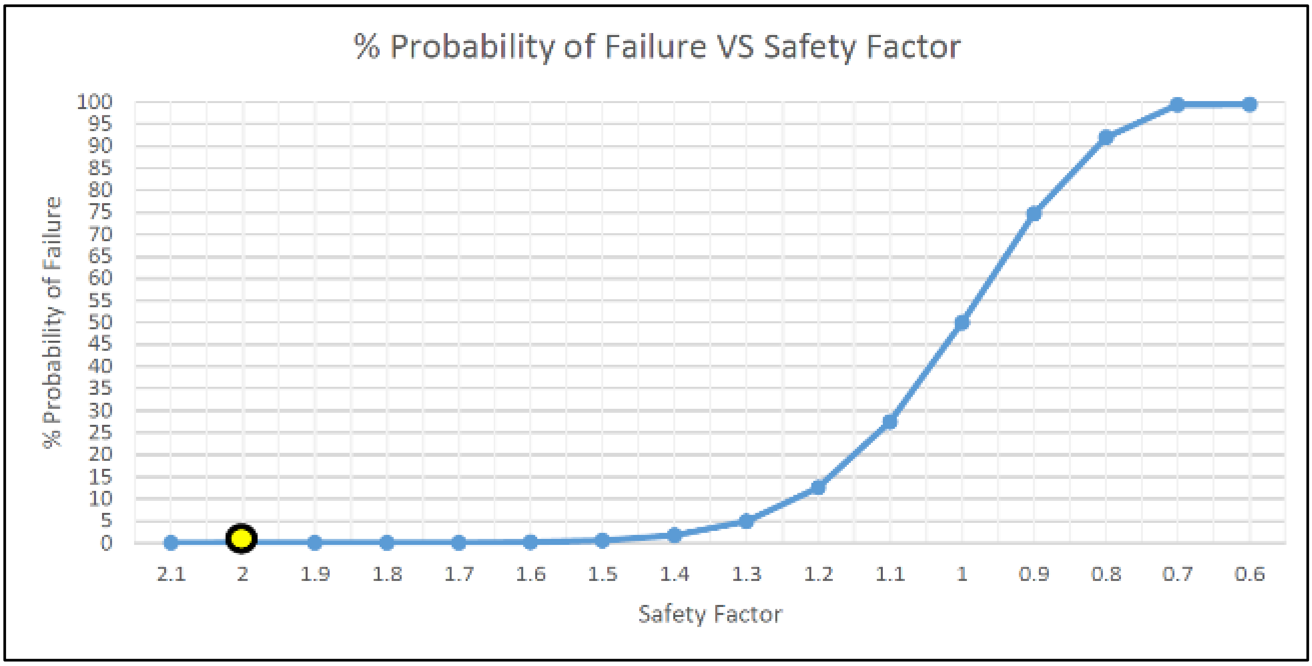

Figure 135: Illustration of the probability of failure

- The pillar width to mining height ratio should be at least 3 below surface structures. After Wagner (1974) investigated coal strength he determined that the modulus of elasticity was a true material property independent of geometry which indicated that post failure behaviour of a pillar is a structure property and not an inherent material property. I.e. larger width to height ratio equals increased stability.
- Since pillar extraction or any higher form of extraction is not allowed beneath surface structures it is not anticipated that the critical mining span (The mined-out span at which expected total roof collapse will occur) will be exceeded since the maximum mined open spans will not exceed that of the support design which is typically maximum 6m for bords and 9.4m for intersection diagonal distances.
- All pillar and support designs must be conducted according to the site-specific conditions and strengths. By incorporating site specific designs, the site-specific conditions can be catered for. Therefore, geotechnical strength analysis techniques must be utilised on the adjacent mining area to ensure that site specific strength parameters of the roof, floor and coal are incorporated into the designs.
- By using a continuous miner to create roadways in the proposed underground bord and pillar working, less damage to the pillar sides and roof will occur as opposed to blasting.

14.5.2.1.4 Probability of stability

Pillars are designed according to the three-tier process as developed van der Merwe (2016). To ensure long term stability the three-tier process consists of:

- Pillar factor of safety.
- Probability of stability.
- Pillar life index.

Kangra Coal's has developed a standard named the "Pillar Design and Mine Layout" to ensure all underground panels are designed to the required industry standards.

Interpanel pillars are designed according to the following criteria:

Table 97: Pillar Factor of Safety

Panel type	Minimum Factor of Safety
Tertiary Panels	1.6
Secondary and Pillar Extraction Panels	1.8
Main Development	2

Interpanel pillars are compartmentalized by separating each developed panel by incorporating continuous pillars as barriers.

Barrier pillars ensure that any pillar failure which may occur will not propagate to surrounding panels as well as control panel spans by limiting the load of the overburden onto the interpanel pillars.

If pillar failure would occur, the diameter of subsidence will be equal or less than the width of the panel, contained within the barrier pillars.

14.5.2.1.5 Probability of Stability or Failure

According to van der Merwe (2016), the link between probability of stability and pillar safety factor is less important than the link between actual pillar size and the probability of stability. Different pillar safety factor calculations will produce different physical pillar sizes. Probability of stability is thus a function of the pillar dimensions irrespective of the method used to determine pillar safety factor.

The proposed limits of probability of stability for the different categories of protection are illustrated in Table 98.

Table 98: Proposed limits of probability of stability

Category	Min POS (%)	
Tertiary Panel	99.0	Short term, limited access, low traffic.
Secondary Panel	99.5	Medium term, general access, medium traffic.
Main Development	99.9	Long term, general access, high traffic.
Surface Structure 1	99.99	Low sensitivity to subsidence.
Surface Structure 2	99.995	High sensitivity to subsidence, public access.

In areas where infrastructure is sensitive to the effects of subsidence, the probability of pillar stability is increased to ensure the life expectancy of pillars are increased.

14.5.2.1.6 Pillar life index

The pillar probability of failure was used to the derive the pillar life index. Pillar life index does not predict the time of failure in absolute terms, but the time at which the probability of failure or stability reaches a value of 50 percent. Pillars are designed to produce a minimum pillar life index of a thousand years.

14.5.2.1.7 Subsidence

Pillar failure is inevitable, whether it will occur in a thousand or a million years. To control the magnitude of subsidence is dependent on the following factors:

- Mining height or extraction height,
- Pillar width to height ratio, which determines the pillar behavior during the process of failure,
- Panel width to mining depth ratio, and
- The mechanism of subsidence.

The mechanism of subsidence is divided into the two categories:

- Mechanism of subsidence due to high extraction mining, and
- Mechanism of subsidence due to pillar system failure.

As mining depth increases the effect of vertical subsidence decreases, due to failed material settling and eventually compacting. Subsidence can be categorized into different classes due to the magnitude of vertical subsidence. Refer to Figure 136.

Class B $0.001 < S_m / H < 0.005$	
Class C $0.005 < S_m / H < 0.02$	
Class D $0.02 < S_m / H < 0.05$	
Class E $S_m / H > 0.05$	

Figure 136: Classes of Subsidence

The potential subsidence of pillar failure was determined and illustrated in Figure 137 to Figure 140.

Seam	h (mining height)	w (span)	H (depth)	S_m	Maximum subsidence and Classification		Comments
					(m)	Class	
Gus	5,0	180	40,0	3,16	0,079	E	Severe profile, almost vertical sides, Cracks wider than 50 cm, Compression ridges higher than 50 cm
Gus	5,0	180	60,0	2,77	0,046	D	Noticeable in most terrains, visible vertical displacements across Cracks 10 to 50 cm wide, Compression ridges 5
Gus	5,0	180	80,0	2,53	0,032	D	Noticeable in most terrains, visible vertical displacements across Cracks 10 to 50 cm wide, Compression ridges 5
Gus	5,0	180	100,0	2,35	0,024	D	Noticeable in most terrains, visible vertical displacements across Cracks 10 to 50 cm wide, Compression ridges 5
Gus	5,0	180	120,0	2,22	0,019	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	140,0	2,11	0,015	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	150,0	2,07	0,014	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	180,0	1,95	0,011	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	200,0	1,89	0,009	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	250,0	1,76	0,007	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	300,0	1,66	0,006	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	5,0	180	350,0	1,58	0,005	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	5,0	180	400,0	1,51	0,004	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	5,0	180	450,0	1,45	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	5,0	180	500,0	1,41	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide

Figure 137: The potential expected subsidence for the Gus Seam (5m) pillar failure

Seam	h (mining height)	w (span)	H (depth)	S_m	Maximum subsidence and Classification		Comments
					(m)	Class	
Gus	2,6	180	40,0	1,64	0,041	D	Noticeable in most terrains, visible vertical displacements across Cracks 10 to 50 cm wide, Compression ridges 5 to 50 cm high
Gus	2,6	180	60,0	1,44	0,024	D	Noticeable in most terrains, visible vertical displacements across Cracks 10 to 50 cm wide, Compression ridges 5
Gus	2,6	180	80,0	1,31	0,016	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	2,6	180	100,0	1,22	0,012	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	2,6	180	120,0	1,15	0,010	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	2,6	180	140,0	1,10	0,008	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	2,6	180	150,0	1,07	0,007	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	2,6	180	180,0	1,01	0,006	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	2,6	180	200,0	0,98	0,005	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	2,6	180	250,0	0,91	0,004	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	2,6	180	300,0	0,86	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	2,6	180	350,0	0,82	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	2,6	180	400,0	0,79	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	2,6	180	450,0	0,76	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	2,6	180	500,0	0,73	0,001	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide

Figure 138: T4 Potential expected subsidence for the Gus Seam (2,6m) - pillar failure

Seam	h (mining height)	w (span)	H (depth)	S_m	Maximum subsidence and Classification		Comments
					(m)	Class	
Gus	1,6	180	40,0	1,01	0,025	D	Noticeable in most terrains, visible vertical displacements across Cracks 10 to 50 cm wide, Compression ridges 5 to 50 cm high
Gus	1,6	180	60,0	0,89	0,015	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,6	180	80,0	0,81	0,010	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,6	180	100,0	0,75	0,008	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,6	180	120,0	0,71	0,006	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,6	180	140,0	0,68	0,005	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	150,0	0,66	0,004	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	180,0	0,62	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	200,0	0,60	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	250,0	0,56	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	300,0	0,53	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	350,0	0,50	0,001	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	400,0	0,48	0,001	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	450,0	0,47	0,001	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,6	180	500,0	0,45	0,001	A	Barely noticeable, smooth, continuous profile, hair-line cracks

Figure 139: T4 potential expected subsidence for the Gus Seam (1,6 m) - pillar failure

Seam	h (mining height)	w (span)	H (depth)	S_m	Maximum subsidence and Classification		Comments
					(m)	Class	
Gus	1,0	180	40,0	0,63	0,016	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,0	180	60,0	0,55	0,009	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,0	180	80,0	0,51	0,006	C	Noticeable in flat terrain, smooth, Cracks 2–10 cm wide, Compression ridges 1 to 5 cm high
Gus	1,0	180	100,0	0,47	0,005	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	120,0	0,44	0,004	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	140,0	0,42	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	150,0	0,41	0,003	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	180,0	0,39	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	200,0	0,38	0,002	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	250,0	0,35	0,001	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	300,0	0,33	0,001	B	Difficult to notice, smooth profile, Cracks 1–2 cm wide
Gus	1,0	180	350,0	0,32	0,001	A	Barely noticeable, smooth, continuous profile, hair-line cracks
Gus	1,0	180	400,0	0,30	0,001	A	Barely noticeable, smooth, continuous profile, hair-line cracks
Gus	1,0	180	450,0	0,29	0,001	A	Barely noticeable, smooth, continuous profile, hair-line cracks
Gus	1,0	180	500,0	0,28	0,001	A	Barely noticeable, smooth, continuous profile, hair-line cracks

Figure 140: T4 potential expected subsidence for he Gus Seam (1m) - pillar failure

14.5.2.2 Conclusion

The three-tier process is used to determine the regional stability when panels or underground workings are designed. The three-tier process allows the process of design to be less sensitive to the different methods to determine pillar safety factor and ensures the physical pillar dimensions will be adequate to produce long term stability.

The occurrence of subsidence is inevitable as any pillar system is subject to failure. Subsidence can thus only be controlled until the pillar system probability of stability reaches 50 percent.

14.5.3 Impacts on Land Use and Soil Potential

Impact: Soil erosion:

All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases

Impact: Soil compaction

All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction. During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction.

Impact: Soil pollution

All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing pollution. During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction.

Impact: Reduction of areas available for livestock grazing

The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.

Impact: Reduction of areas available for crop production

The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue.

14.5.4 Ecological Impacts

Most of the impacts on species and habitat will occur during the construction phase when removal of plant communities will take place on site:

- The construction activities might result in impacts to the natural environment due to increased traffic and construction personnel to the area. Construction activities and heavy construction vehicles will result in compaction of the soil and removal of vegetation and topsoil. Storing of construction material, mixing of concrete or collection and delivering could result in pollution. Sensitive areas will be severely impacted if not managed well.
- Invasive plant species may increase during the operational phase of the project. This will mostly take place in the remaining natural areas. Removal of these species is an ongoing process and if not managed regularly could result in severe changes and competition in plant communities.
- Endemic and/or SCC species could possibly occur within the area of construction and would then be destroyed without proper knowledge and/or mitigation measures.
- Fragmentation of habitat areas due to possible fencing and activity will fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds.
- The sudden increase in activity may lead to the migration of sensitive species from the site to a more favourable habitat.
- Anthropogenic influence stemming from staff, residents and visitors that infiltrate the natural veld areas will damage and impact on species communities within certain areas. Residents, visitors and employees of the development will also require access control regulations to prevent destruction of natural areas and manage entry and activities within recreational areas.
- Impacts to SCC may occur as part of the project, specifically the sensitive and specialised species identified within the framework of the study.

Impacts during closure and demolition will be likely similar to that of the Construction phase. Upon conclusion, the results may be positive, if invaders have been brought under control during the construction and operational phase of the project, the site may be rehabilitated back to a natural landscape. A formal Closure and Rehabilitation Plan should be devised and adhered to.

14.5.5 Impacts on Heritage

The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences.

A fundamental aspect in the conservation of a heritage resource relates to whether the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. There are many aspects that must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and if appropriate mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed.

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA (refer to Figure

141).

Rating	Field Rating/Grade	Significance	Recommendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3 A	High	Mitigation not advised
Local	Grade 3 B	High	Part of site should be retained
General protection A	4 A	High/Medium	Mitigate site
General Protection B	4 B	Medium	Record site
General Protection C	4 C	Low	No recording necessary

Figure 141: Field Ratings

Some of the areas demarcated for the proposed Kangra Coal T4 project are considered to be significant from a heritage perspective. The significance of the proposed areas and the observed sites are discussed here. The general study area is associated with a combination of historical buildings, settlements, building ruins, stonewalled enclosures, and burial sites. As the majority of the study area will consist of underground mining

methods, only the sites that might be impacted on by the proposed surface development and underground mining are indicated on Figure 110 and Figure 111. The field ratings for the sites are provided in **Error! Reference source not found.**.

Demolished historical sites – not visited.

The following 24 sites, consisting of buildings and structures, have been identified on historical aerial and topographical maps: K07 & K08, K10, K21, K24 & K25, K27 – K43, K45. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, these sites have completely been demolished and were not visited. No surface impact is envisaged.

Historical sites associated with surface remains – not visited

Seven historical sites associated with surface remains were identified on historical aerial imagery: K02 – K04, K11, K19, K23, K24. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, structures and buildings still exist at these sites. Due to access constraints, however, these sites could not be inspected. As these buildings/structures are likely to exceed 60 years of age, they are considered significant form a heritage perspective and are protected under the National Heritage Resources Act 25 of 1999.

Historical sites associated with surface remains – visited

The following 11 sites were identified on historical aerial imagery and were inspected during the site visits: K01, K05 & K06, K12 & K13, K16 – K18, K20 & K22, K69. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. The site visits confirmed that structures and buildings are still associated with these sites and it is therefore likely that these buildings and structures, or parts thereof, exceed 60 years of age and are considered significant form a heritage perspective. These sites are therefore protected under the National Heritage Resources Act 25 of 1999.

<u>Demolished historical sites – visited.</u>

Three sites (K09, K14, K15) recorded on historical aerial imagery and consisting of buildings and structures intersect the area planned for underground mining, but are not located within close proximity of planned surface development. These sites were visited and no surface material were observed. No surface impact is envisaged.

<u>Demolished contemporary sites – not visited.</u>

Five sites consisting of buildings and structures that date to contemporary times were identified on 1969 aerial imagery: K26, K46 – K49. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, these sites have completely been demolished, were not visited and are not considered significant form a heritage perspective.

<u>Contemporary sites – visited</u>

Two sites (K65 & K66) are located at the eastern end of the proposed powerline. One of the structures has been demolished, while the other is in a dilapidated state. Accordingly, these sites were constructed in recent years and are not considered significant from a heritage perspective.

<u>Historical sites in close proximity of surface development – visited.</u>

Eight sites (K50 & K51, K57, K60 – K64) associated with surface infrastructure were recorded in close proximity of the proposed powerline. Seven of these sites consist of stone-walled enclosures and based on surface remains and the combination of angular and circular building patterns, these sites date to historical times. The possibility, however, exists that some of the circular stone-walled enclosures might date to the Late Iron Age Farmer period. One of the sites, settlement K57, consists of a demolished homestead dating to historical times, as well as modern buildings and a cemetery. Because these buildings/structures, as well as the potential subsurface cultural material, exceed 60 years of age, they are considered significant form a heritage perspective and are protected under the National Heritage Resources Act 25 of 1999.

<u>Natural sites</u>

Sites K53 & K54 were recorded during the pedestrian survey and identified as natural rock outcrops as no evidence, whether material or archival, could be obtained to indicate otherwise.

<u>Graves/Cemeteries located outside of the areas demarcated for surface development but within the underground mining boundary</u>

The following graves/cemeteries fall outside of the area demarcated for surface development, but within the boundary of underground mining activity. These sites might therefore be at risk of suffering impact from the proposed underground mining activities: K55 & K56, K67, K70. Also, the burial dates of the majority of the graves could not be determined. As stated above, no graves could be observed at Site K70 due to access limitations, although the surface infrastructure suggests a cemetery. Therefore, the site should be regarded as a cemetery until proven otherwise. It is likely that the cemeteries contain graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply.

Graves/cemeteries located within close proximity of the areas demarcated for surface development.

Sites K52, K58, K59, K68, K71 are graves/cemeteries located within close proximity of the proposed powerline. These sites are therefore at risk of being negatively impacted by the proposed development. Also, Site K52 consists of stone cairn and should be regarded as a grave until proven otherwise. It is likely that the cemeteries contain graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply.

14.5.6 Impact on Paleonotology

No fossils were found onsite by the speciliast. However, the palaeontological sensitivity is vey high for the project due to the occurrence of the Volksrust Formation, and Vryheid Formation, Ecca Group, Karoo Supergroup within the project area. The following should be conserved:

- If any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures, especially shallow caves may contain palaeontological material.

14.5.7 Impact on Air Quality

Mining operations like drilling, blasting, hauling, and transportation are the major sources of emissions and air pollution. Emissions of particulate matter and nuisance dust will result from mineral plant operations such as crushing, screening and processing for final transportation. Fugitive emissions are also possible from roads and open stockpiles (the latter not applicable to Kangra T4 coal mine project).

Nuisance dust can reduce visibility; soil or damage buildings and other materials; and increase costs due to the need for washing, cleaning and repainting. Plants can be affected by dust fallout through reduced light transmission which affects photosynthesis and can result in decreased growth. Fallout dust can also collect in watercourse causing sedimentation and a reduction in the water quality and can also affect aquatic life through the smothering of riverine habitat and fish gill clogging. Coarse dust particles are produced during mining operations which can lead to an increase in fallout dust. There are very few activities taking place in the Kangra Coal T4 Project area that could contribute to atmospheric emissions. However, in the vicinity of the Project Area there are a number of activities taking place that could contribute to current atmospheric emissions. These include the following:

- Large Tree Plantation Blocks – could contribute some airborne dust during felling operations. The significance of these emissions contributing to the current air quality in the Kangra Coal T4 Project area is likely to be low.
- Cultivation of Land – airborne particulates are expected to be released during the cultivation of land and wind erosion of exposed areas. This would be more significant during drier periods.

- Current Kangra Mine complex mining activities – the majority of the fallout (resulting from current Kangra Coal mining activities) at the site of the proposed T4 Project area would be in the form of small particles (less than 10 micron in aerodynamic diameters), but may also consist of combustion products such as carbon dioxide, carbon monoxide, sulphur dioxide and oxides of nitrogen. Larger particles would deposit closer to the existing mining operations. Airborne dust emissions would also originate from existing discard and overburden heaps.
- Airborne particulates and diesel exhaust fumes are emitted along haul roads and public roads in the Kangra Mine complex area. Traffic on unpaved roads has the potential to generate significant fugitive dust. Although most of this dust has the propensity to deposit nearby the road, a significant portion remains airborne (PM10 and PM2.5) and may be carried over relatively large distances. Relatively little dust is generated along the existing conveyor route.
- Dust is, however, generated by vehicle traffic along the public haul road to the Panbult Siding. Chemical road surface mitigation measures to reduce fugitive dust from unpaved roads have been put in place. When dry, this becomes friable and a source of fugitive dust.
- Burning of Biomass – the burning of biomass can also be a significant contributor to airborne particulates. Large clouds of smoke can travel for a number of kilometres whilst still being highly concentrated.

A copy of the latest dust monitoring data for the Maquasa Mine is attached in Appendix 24.
Impacts on air quality include:

- Decline in Ambient Air Quality due to increased dust fall out; and
- Decline in Ambient Air Quality due to release of pollutants.

14.5.8 Impact on Noise Environment

14.5.8.1 Modelled Scenarios

The modelled scenario was designed and based on the layout as supplied by the main consultant. The significant noise sources were identified, and noise contours developed. The modelled scenario took into consideration the following:

- Corrections for ground conditions (obtained from Environmental Potential Altus, site observations) and metrological conditions.
- Ground elevation contours (if available).
- Building facades (if information available). Onsite investigations will be compiled to determine the design and acoustical corrections (both development and receptors) based on dwelling layouts/specifications (if feasible).
- Noise modelling based on future predicted noise climate. Sound Power Levels (SPL) will be sourced online.
- Numerous methodologies will be incorporated for modelling and calibration (increased confidence in findings). These include CoRTN: 1996 (UK), RLS90 (German), ISO 9613-2, SANS 10357:2008 etc.

Noise contour representation will be developed focusing on pre-mitigation and post-mitigation effectiveness (if required).

14.5.8.1.1 Planning Phase Assessment

No noise is envisaged during this phase however, an important phase in which to implement certain mitigation options. The planning phase could incorporate design elements or management mitigation options which could be applied to the various phases under investigation. The planning phase mitigation options will be identified (if required) once the impact assessment of other phases has been assessed.

14.5.8.1.2 Construction Phase Assessment

The noise source was then assessed in a linear fashion on the closest point of any footprint boundaries (or fixed infrastructure locality) in relation to the receptors.

It was selected to make use of a moderately high Sound Power Levels (SPL) equipment (see max operations of Jawcrusher diesel ca 250 kW or Pneumatic breaker) over a day period. A less noisy SPL equipment (- 6 dBA) was included for the assessment, illustrating a more realistic “light” construction scenario for the implementation of overhead power lines (light construction work for power lines). Thus, assessment would highlight the typical noise levels generated for the construction of the project, namely:

- The implementation of concrete and surface related infrastructure (foundations, concrete works, steel works, infrastructure placement (cranage), deliveries etc.). The following was considered: o General and civil construction related activities are generally kept to daytime hours (06:00 – 22:00).
    - Noisy construction equipment may include vibration, mixing and placing equipment (cranage etc.). Small construction equipment also include drilling, compaction (vibration), grinding etc.
    - During the night-times concrete and surface related infrastructure activities may be required as deadlines need to be met or pouring of concrete over extended hours may be required. These activities are usually short-term and occurring rarely.
- Increased road traffic in and around the site (site deliveries).

The linear noise project is presented below in Figure 142.

The outcome of the modelled scenario and impact assessment highlighted the following key points:

- During the day – Low Significance Rating for receptors R8, R12, R14 and R18.
- Construction activities could be audible at times and has the potential to exceed (for a shortterm construction period) 7 dBA limits at receptors.
- The Mitigation Efficiency is considered as “Medium” during construction, equipment will constantly move around and differ in specifications (i.e., not permanent fixtures).
- It should be noted, construction noise levels are “short-term” and only illustrative of the noisiest equipment/times (not the entire construction period).

Basic mitigation is recommended to ensure compliance with the Noise Control Regulations under all circumstances or to cover unforeseen circumstances.

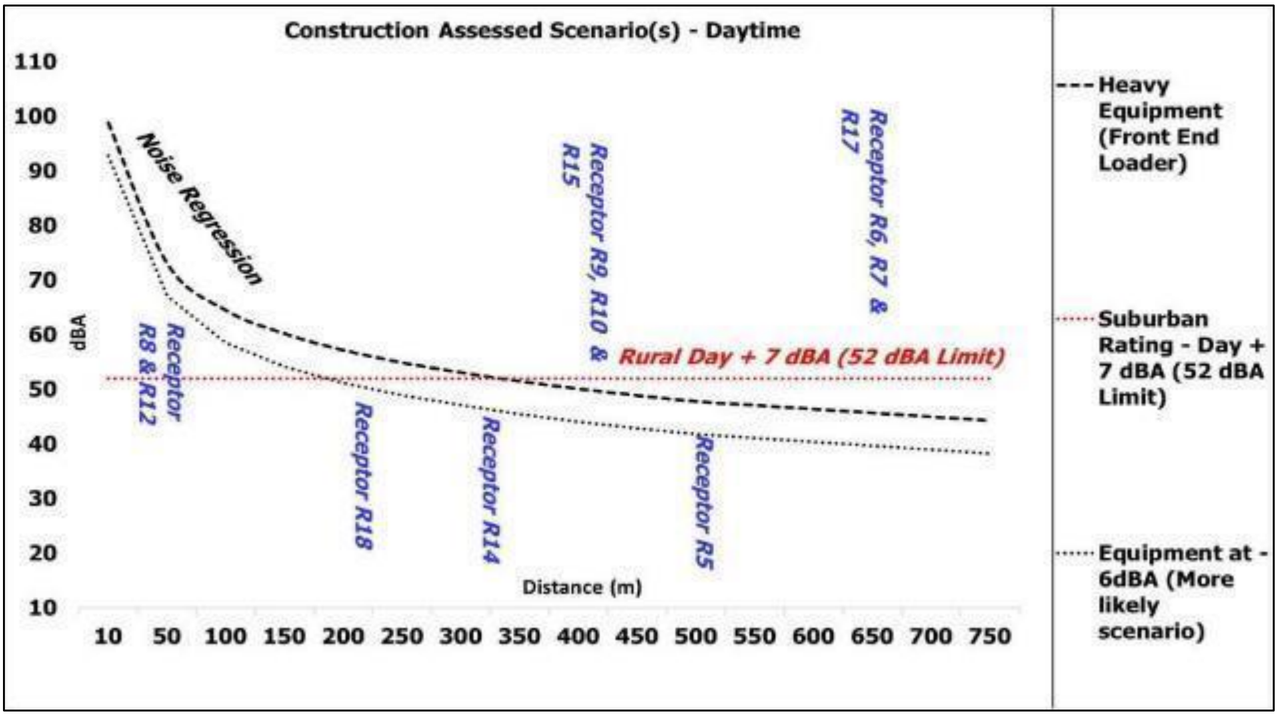

Figure 142:Construction noise levels – Linear representation of construction activities

Table 99: Calculated Noise and Baseline Rating Levels – Day Construction

Calculated Noise and Baseline Rating Levels					
I&AP	**Rating Level (Day dBA)**	**Calculated LReq,T (dBA)**	**Construction Activity**	**+ 7 above Rating? (dBA)**	**Comment**
R1	45	<52	N/a	No	Construction could be audible during worst-case scenarios, with a potential to increase the Rating level by 7 dBA (receptors based directly adjacent to the construction of overhead power lines). Construction scenarios will be short-term in duration, basic mitigation would be required.
R2	45	<52		No	
R3	45	<52		No	
R4	45	<52		No	
R5	45	<52		No	
R6	45	<52		No	
R7	45	<52		No	
R8	45	+52	Overhead power line	No	
R9	45	<52	N/a	No	
R10	45	<52		No	
R11	45	<52		No	
R12	45	+52	Overhead power line	Yes	
R13	45	<52	N/a	No	

R14	45	+52	Vent Shaft 3	Yes	
R15	45	<52	N/a	No	
R16	45	<52		No	
R17	45	<52		No	
R18	45	<52	Overhead power line	Yes	

14.5.8.1.3 Operational Phase Assessment

The assessment made use of online moderately high SPL equipment operating localities. The most important phase will be the operational phase. The two surface noise sources for assessment purposes included:

- Ventilation stacks (from underground mining operations):
  - SPL made use of data typical of Sound Power Levels (SPL) of Typical Equipment (refer to Appendix B of the Noise Assessment Report attached in Appendix 12 of the EIAR), as well as monitoring conducted by the consultant;
  - Note - the contours are developed as omni-directional (all directions). The calculated noise level is only relevant if the ventilation stack is pointed at this direction (and will be far lower should it not face in that receptors direction). This is done to ensure a comprehensive evaluation, with the primary mitigation option (should it be required) focusing on which direction is best to direct a vent stack (should it be required by project engineers).
- Corona discharge noise from overhead power lines. The corona discharge noise is not a definite noise source as:
  - High voltage overhead transmission lines can produce spontaneous, pulse-like corona discharges. It is unsure if the design or the portion of line near the receptors will produce corona discharge noise (it is highly dependent on many factors).
  - Thus, only mitigations will be made considering corona discharge noise (for attention to project engineers). In the impact assessment below a note to refer to the mitigation will be made (no impact assessment) which will assist in reducing corona related noises.

The main noise generating activities that were considered for a modelled operational investigated scenario(s) are provided in Table 100.

Table 100: Main noise generating activities during operational phase

Investigations	Modelled scenarios	
Point sources	Primary corrections	See section 10.14.1.3 and Appendix B of the Noise Assessment Typical of Sound Power Levels (SPL) of Typical Equipment (refer to Repiort attached in Appendix 12 of the EIAR
	Berm and barrier correction	No. The primary noise sources were considered as externally mounted, no building façade corrections considered.
	Tones or impulsive corrections,	None. Metrological conditions consisted of 200 at 80 kPA

Investigations	**Modelled scenarios**	
	metrological conditions	
	Height corrections, elevations contours and direction	No elevation data used. Noise source calculated at 8m from elevation. The ventilation was considered as omnidirectional (all directions) to ensure all directions covered.
Line sources	General consideration of transmission lines to create corona discharge noise (tonality etc.). Only mitigation to avoid this potential noise will be made.	

The assessed layout is presented in Figure 143.The outcome of the modelled contours is presented in Figure 144. Modelled contours are presented in increments of 5 dBA from the 40-dBA indicator (+5 dbA from the 35 dBA Rural Rating). The outcome of the assessment indicated the following:

- During the night – Medium Significance Rating for receptors R6, R7, R14, R15 (receptors within proximity of ventilation stack 1, 3 and 4).
- To ensure noise levels are kept below 7 dBA at receptors (legislation limits) and 61 dBA LAeq, 24-hour at the boundary, some design mitigation is proposed.
- The Mitigation Efficiency is considered as "Medium to High" as a stationary noise source during operational periods could be completely masked (e.g., by means of acoustical barriers, berms, enclosures etc. or by facing the vent stack away from a receptor, or by engineering designs (mitigating a noise source by design)).

The most important phase is the Operational Phase, with the outcome highlighting the requirements for mitigation (see EMPr proceeding section).

Table 101: Calculated Noise and Baseline Rating Levels –Operational Phase

Calculated Noise and Baseline Rating Levels (night-time Rating level selected)					
I&AP	**Rating Level (Day/Night dBA)**	**Calculated $L_{Req,T}$ (dBA)**	**Operational Activity**	**+ 7 above Rating (night)? (dBA)**	**Comment**
R1	45/35	40	Vent shaft	No	Mitigation options are presented in Section 8.
R2	45/35	35< $L_{Req,T}$		No	
R3	45/35	35< $L_{Req,T}$		No	
R4	45/35	35< $L_{Req,T}$		No	
R5	45/35	35< $L_{Req,T}$	Overhead power line	No	
R6	45/35	47 < 48	Vent shaft and Overhead power line	Yes	
R7	45/35	47 < 48		Yes	
R8	45/35	<40 Also see mitigation (overhead line)		No	

Calculated Noise and Baseline Rating Levels (night-time Rating level selected)					
R9	45/35	40		No	
R10	45/35	35< $L_{Req,T}$	Overhead power line	No	
R11	45/35	35< $L_{Req,T}$		No	
R12	45/35	See mitigation (overhead line)			
R13	45/35	35< $L_{Req,T}$	Vent shaft	No	
R14	45/35	+50		Yes	
R15	45/35	+50		Yes	
R16	45/35	35< $L_{Req,T}$		No	
R17	45/35	35< $L_{Req,T}$		No	
R18	45/35	See mitigation (overhead line)	Overhead power line		

14.5.8.1.4 Closure and Post Closure Phase Assessment

The impact will be similar/lower than the busier/noisier Construction Phase (refer to Section 10.14.4.1.3). While the Construction phase is deadline oriented (due to the proceeding Operational Phase), the Closure and Post-Closure Phases are usually less busy and noisier. The Post-Closure Phase may require infrequent activities to maintain rehabilitation and would be the least noisy Phase for consideration.

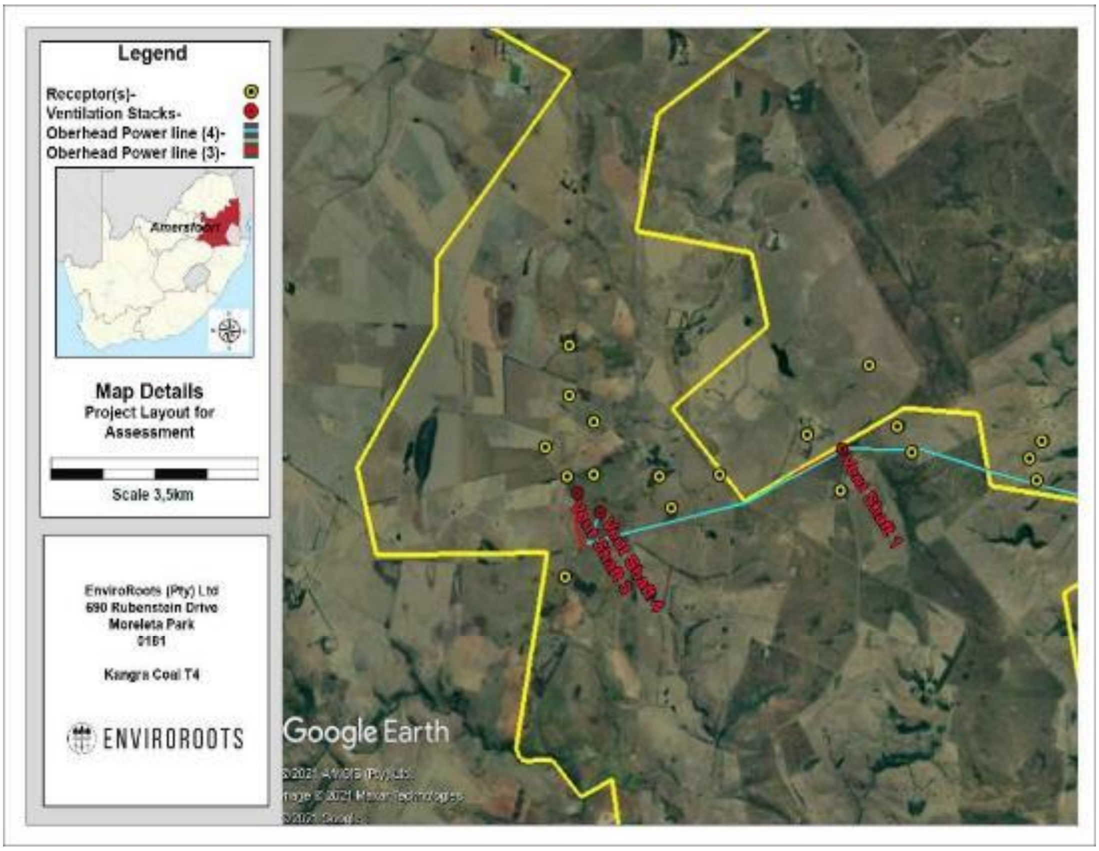

Figure 143: Assessed Layout – Operational Phase

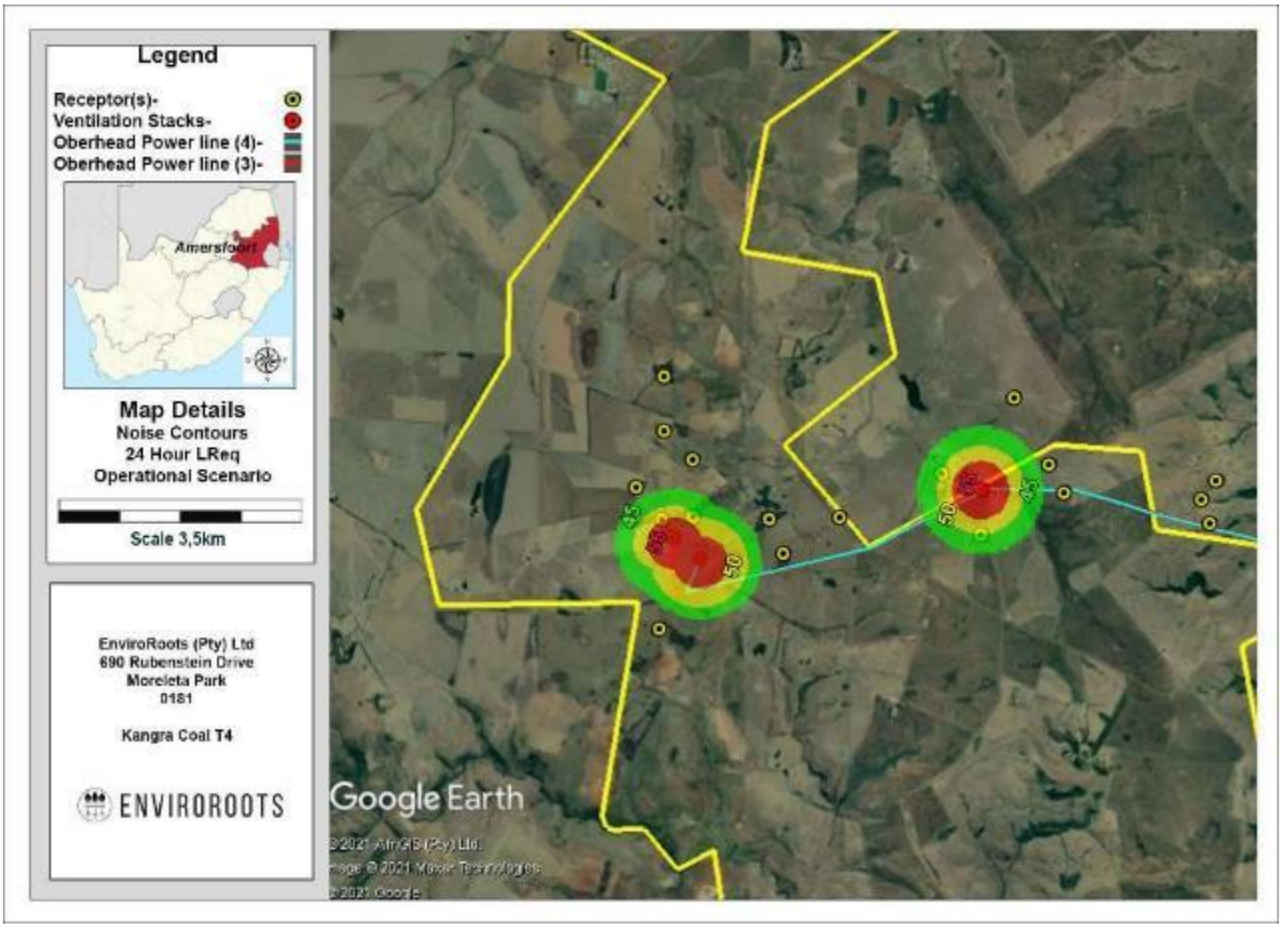

Figure 144: Equivalent Continuous Rating Level in terms of noise contours LReq,T – Operational Phase

14.5.8.2 Planning Phase Noise Impact

No noise is envisaged during this phase however, an important phase in which to implement certain mitigation options. The planning phase could incorporate design elements or management mitigation options which could be applied to the various phases under investigation. The planning phase mitigation options will be identified (if required) once the impact assessment of other phases has been assessed.

14.5.8.3 Proposed Construction Phase Noise Impact

A conceptual noise model was developed considering the activities. It is assumed that all equipment would be operating under full load (generate the most noise) at a number of locations and that atmospheric conditions would be ideal for sound propagation. The outcome of the modelled scenario and impact assessment highlighted the following key points:

- During the day – Low Significance Rating for receptors R8, R12, R14 and R18 (refer to Figure 142).
- Construction activities could be audible at times and has the potential to exceed (for a shortterm construction period) 7 dBA limits at receptors.
- The Mitigation Efficiency is considered as "Medium" during construction, equipment will constantly move around and differ in specifications (i.e., not permanent fixtures).
- It should be noted, construction noise levels are "short-term" and only illustrative of the noisiest

equipment/times (not the entire construction period).

14.5.8.4 Operational Phase Noise Impact

The two surface noise sources for assessment purposes included:

- Ventilation stacks (from underground mining operations):
  - SPL made use of data within Appendix_B of the Noise Assessment Report attached as Appendix 12 to the EIAR and EMPR, as well as monitoring conducted by the consultant
  - Note - the contours are developed as omni-directional (all directions). The calculated noise level is only relevant if the ventilation stack is pointed at this direction (and will be far lower should it not face in that receptors direction). This is done to ensure a comprehensive evaluation, with the primary mitigation option (should it be required) focusing on which direction is best to direct a vent stack (should it be required by project engineers).
- Corona discharge noise from overhead power lines. The corona discharge noise is not a definite noise source as:
  - High voltage overhead transmission lines can produce spontaneous, pulse-like corona discharges. It is unsure if the design or the portion of line near the receptors will produce corona discharge noise (it is highly dependent on many factors).

The outcome of the assessment indicated the following:

- During the night – Medium Significance Rating for receptors R6, R7, R14, R15 (receptors within proximity of ventilation stack 1, 3 and 4) (Refer to Figure 142).
- To ensure noise levels are kept below 7 dBA at receptors (legislation limits) and 61 dBA LAeq, 24-hour at the boundary, some design mitigation is proposed.
- The Mitigation Efficiency is considered as "Medium to High" as a stationary noise source during operational periods could be completely masked (e.g., by means of acoustical barriers, berms, enclosures etc. or by facing the vent stack away from a receptor, or by engineering designs (mitigating a noise source by design)).

14.5.9 Impacts of Blasting and Vibration

14.5.9.1 Construction Phase: Impact Assessment and Mitigation Measures

During the construction phase no mining, drilling and blasting operations is expected. No detail impact evaluation was done for the construction phase.

14.5.9.2 Operational Phase: Impact Assessment and Mitigation Measures

The area surrounding the proposed mining areas was reviewed for structures, traffic, roads, human interface, animal interface etc. Various installations and structures were observed. These are listed in **Error! Reference source not found.** and **Error! Reference source not found.**. This section concentrates on the outcome of modelling the possible effects of ground vibration, air blast and fly rock specifically to these points of interest or possible interfaces. In evaluation, the charge mass scenarios selected is considered with regards to ground vibration and air blast.

Ground vibration and air blast was calculated from the edge of the pit outline and modelled accordingly. Blasting further away from the pit edge will certainly have lesser influence on the surroundings. A worst case is then applicable with calculation from pit edge. As explained previously reference is only made to some structures and these references covers the extent of all structures surrounding the mine.

The following aspects with comments are addressed for each of the evaluations done:

- Ground Vibration Modelling Results
- Ground Vibration and human perception
- Vibration impact on national and provincial road
- Vibration will upset adjacent communities
- Cracking of houses and consequent devaluation
- Air blast Modelling Results
- Impact of fly rock
- Noxious fumes Influence Results

In terms of the Kangra T4 Coal mine project, possible blasting may need to be undertkane for the establishment of the ventilation shafts. The possible impacts with regards to blasting operations for the development of Vent Shaft 1, 3 and 4 on the proposed underground mine at Kangra Coal T4 in terms of ground vibration, air blast, fly rock and fumes are discussed in Section10.15 of this report.

The closest infrastructure to the Vent Shaft 1 area is the rivers and cultivated fields. Nearest houses or settlements areas are significantly further away at 702 m. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage.

The closest infrastructure to the Vent Shaft 3 area is the rivers, dam, buildings and cultivated fields. The nearest houses or settlements areas are significantly further away at 1000 m. The planned maximum charge evaluated showed that ground vibration levels of 1.8 and 1.9 mm/s could be acceptable for the buildings in terms of potential structural damage.

The closest infrastructure to the Vent Shaft 4 area is the rivers and gravel road. The nearest houses or settlements areas are significantly further away at 991 m. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage.

The impacts of blasting, ground vibrations, human perception, cracking of houses, fly rock and noxious fumes are considered to be low.

14.5.9.2.1 Mining Method (Vent Shafts)

Currently there are no designs for the shafts. The shafts will be constructed by drilling a hole from surface into the developed underground area. It will then be developed by either doing blasting from underground with a method called drop raising or it could be raise bored with a drill depending on how economical it will be at the time of construction.

14.5.9.2.2 Ground Vibration and Air Blast Predictions (Applies to all 3 shafts)

Explosives are used to break rock through the shock waves and gasses yielded from the explosion. Ground vibration and air blast is a result from blasting activities. Factors influencing ground vibration are the charge mass per delay, distance from the blast, the delay period and the geometry of the blast. These factors are controlled by planned design and proper blast preparation.

An aspect that is not normally considered as pre-operation definable is the effect of air blast. This is mainly because air blast is an aspect that can be controlled to a great degree by applying basic rules. Air blast is the direct result from the blast process, although influenced by meteorological conditions, the final blast layout, timing, stemming length, stemming material, accessories used, covered blast or not covered blast etc. all has an influence on the outcome of the result.

This project is a new operation with planned drill and blast designs. The following design information was applied to define expected ground vibration, air blast and fly rock influences and levels. The technical information for designs used is provided Table 102 below.

Table 102: Blast design technical information for Vent Shaft 1, 3 and 4

Blasting using Drill Rigs	
EXPLOSIVE	
Explosive type	Cartridge
Charge mass/metre (kg/m)	1.53
Explosive mass per hole (kg)	4.90
Effective charge diameter (mm)	40.25
Average in-hole density (g/cm3)	1.20
BLAST GEOMETRY	
Stemming length (m)	0.00
Column length (m)	3.20
Hole depth (m)	3.20
Face advance or bench height (m)	3.00
Sub-drill (m)	0.20
Hole diameter (mm)	45.00
Charge mass/delay expected (kg)	44.08 kg/delay equivalent to 9 x 45 mm holes per delay

The design information reported in Table 102 was applied to simulation in order to determine expected outcomes for Vent Shaft 1, 3 and 4. Simulation was done using JKSimblast blast design software.

To evaluate the possible influence from the blast; one charge masses that span the range of possible charge mass per delay were selected as per simulation. The selected charge mass for evaluation consists of a maximum charge of 44.08 kg. This maximum charge will span various alternatives that maybe possible. This charge mass was used for baseline modelling in this report. Applying the above charge mass, various ground vibration calculations were done and considered in this report. Attention is given to limit levels of 6 mm/s, 12.5 mm/s and 25 mm/s.

When predicting ground vibration and possible decay, a standard accepted mathematical process of scaled distance is used. The equation applied (Equation 1) uses the charge mass and distance with two site constants. In the absence of testing or monitoring standard constants are applied. These constants are applied in equation 1 below.

Equation 1:

$$PPV \ = \ a(\frac{D}{\sqrt{E}})^{-b}$$

Where:

PPV = Predicted ground vibration (mm/s)

a = Site constant

b = Site constant

D = Distance (m)

E = Explosive Mass (kg)

General factors applied for the constants a & b are:

a = 1143 and

b = -1.65.

Utilizing the abovementioned equation and the given factors, allowable levels for specific limits and expected ground vibration levels can then be calculated for various distances. Predicting the outcome of air blast is considered difficult in most circumstances. There are many variables that have influence on the outcome of air blast. In most cases mainly an indication of typical levels can be obtained. A standard cube root scaling prediction formula is applied for air blast predictions. The following Equation 2 was used to calculate possible air blast values in millibar. This equation does not take temperature or any weather conditions into account.

Equation 2:

$$\mathrm{P} = \mathrm{A} \times (\frac{\mathrm{D}}{\mathrm{E}^{\frac{1}{3}}})^{-B}$$

Where:

P = Air blast level (mB)

D = Distance from source (m)

E = Maximum charge mass per delay (kg)

A = Constant

-B = Constant

The constants for A and B were then selected according to the information as provided in Figure 145 below. Various types of mining operations are expected to yield different results. The information provided Figure 145 1259 is based on detailed research that was conducted for each of the different types of mining environments. In this report the data for “Construction (average)” was applied in the prediction or air blast – constants of 24.8 (A) and -1.1 (B) was applied.

[59] ISEE Blasters Handbook, 18th Edition, Little, January 2011, Ohio USA

Air Overpressure Prediction Equations				
Blasting	**Metric Equations mb**	**U.S. Equations psi**	**Statistical Type**	**Source**
Open air (no confinement)	$P = 3589 \times SD_3^{-1.38}$	$P = 187 \times SD_3^{-1.38}$	Best Fit	Perkins
Coal mines (parting)	$P = 2596 \times SD_3^{-1.62}$	$P = 169 \times SD_3^{-1.62}$	Best Fit	USBM RI 8485
Coal mines (highwall)	$P = 5.37 \times SD_3^{-0.79}$	$P = 0.162 \times SD_3^{-0.79}$	Best Fit	USBM RI 8485
Quarry face	$P = 37.1 \times SD_3^{-0.97}$	$P = 1.32 \times SD_3^{-0.97}$	Best Fit	USBM RI 8485
Metal Mine	$P = 14.3 \times SD_3^{-0.71}$	$P = 0.401 \times SD_3^{-0.71}$	Best Fit	USBM RI 8485
Construction (average)	$P = 24.8 \times SD_3^{-1.1}$	$P = 1 \times SD_3^{-1.1}$	Best Fit	Oriard (2005)
Construction (highly confined)	$P = 2.48 \times SD_3^{-1.1}$	$P = 0.1 \times SD_3^{-1.1}$	Best Fit	Oriard (2005)
Buried (total confinement)	$P = 1.73 \times SD_3^{-0.96}$	$P = 0.061 \times SD_3^{-0.96}$	Best Fit	USBM RI 8485

Table 26.7 - Air overpressure prediction equations.

Figure 145: Proposed prediction equations

The air pressure calculated in Equation 2 is converted to decibels in Equation 3. The reporting of air blast in the decibel scale is more readily accepted in the mining industry.

Equation 3:

$$p_s = 20 \text{ x } \log \frac{P}{P_o}$$

Where:

p_s = Air blast level (dB)

P = Air blast level (Pa (mB x 100))

P_o = Reference Pressure (2 x 10^{-5} Pa)

Although the above equation was applied for prediction of air blast levels, additional measures are also recommended to ensure that air blast and associated fly-rock possibilities are minimized as best possible.

Based on the designs presented on expected drilling and charging design, Table 103 shows expected ground vibration levels (PPV) for various distances calculated at the one maximum charge mass. A maximum charge mass as worst-case scenario. The charge mass is 44.08 kg.

Table 103: Expected Ground Vibration at Various Distances from Charge Applied in this Study

No.	Distance (m)	Expected PPV (mm/s) for 44.08 kg Charge
1	50.0	40.9
2	75.0	20.9
3	150.0	6.7
4	200.0	4.1
5	250.0	2.9
6	300.0	2.1
7	400.0	1.3
8	500.0	0.9

No.	Distance (m)	Expected PPV (mm/s) for 44.08 kg Charge
9	600.0	0.7
10	700.0	0.5
11	800.0	0.4
12	900.0	0.3
13	1000.0	0.3
14	1250.0	0.2
15	1500.0	0.1

Although above equations 2 and 3 was applied for prediction of air blast levels, additional measures are also recommended to ensure that air blast and associated fly-rock possibilities are minimised as best as possible. As discussed earlier the prediction of air blast is very subjective. Following in Table 104 below is a summary of values predicted according to Equation 2 and Equation 3.

Table 104: Air Blast Predicted Values at Various Distances from Charge Applied in this Study

No.	Distance (m)	Air blast (dB) for 44.08 kg Charge
1	50.0	136.5
2	100.0	132.6
3	150.0	126.0
4	200.0	123.3
5	250.0	121.1
6	300.0	119.4
7	400.0	116.7
8	500.0	114.5
9	600.0	112.8
10	700.0	111.3
11	800.0	110.1
12	900.0	108.9
13	1000.0	107.9
14	1250.0	105.8
15	1500.0	104.0

14.5.9.2.3 Review of Expected Ground Vibration

Ground vibration and air blast was calculated from the edge of the vent shaft outline and modelled accordingly. Blasting further away from the vent shaft's edge will certainly have lesser influence on the surroundings. A worst case is then applicable with calculation from vent shaft. As explained previously, reference is only made to some structures and these references covers the extent of all structures surrounding the mine.

The following aspects with comments are addressed for each of the evaluations done:

- Ground Vibration Modelling Results
- Ground Vibration and human perception

- Vibration impact on national and provincial road
- Vibration will upset adjacent communities
- Cracking of houses and consequent devaluation
- Air blast Modelling Results
- Impact of fly rock
- Noxious fumes Influence Results

This analysis does not take geology, topography or actual final drill and blast pattern into account. The data is based on good practise applied internationally and considered very good estimates based on the information provided and supplied in this document.

Presented herewith are the expected ground vibration level contours and discussion of relevant influences. Expected ground vibration levels were calculated for each POI identified surrounding the mining area and evaluated with regards to possible structural concerns and human perception. Tables are provided for each of the different charge models done with regards to:

- "Tag" No. is the number corresponding to the POI figures.
- "Description" indicates the type of the structure.
- "Distance" is the distance between the structure and edge of the open pit area.
- "Specific Limit" is the maximum limit for ground vibration at the specific structure or installation.
- "Predicted PPV (mm/s)" is the calculated ground vibration at the structure.
- The "Structure Response @ 10Hz and Human Tolerance @ 30Hz" indicates the possible concern and if there is any concern for structural damage or potential negative human perception, respectively. Indicators used are "perceptible", "unpleasant", "intolerable" which stems from the human perception information given and indicators such as "high" or "low" is given for the possibility of damage to a structure. Levels below 0.76 mm/s could be considered to have low or negligible possibility of influence.

In evaluation the one charge mass scenarios are considered with regards to ground vibration and air blast. Review of the charge per blast hole (9 x 45 mm holes per delay) and the possible timing of a blast, the maximum charge mass of 44.08 kg was selected to ensure proper source coverage.

Ground vibration is calculated and modelled for the vent shaft area at the maximum charge mass at specific distances. These levels are then plotted and overlaid with current mining plans to observe possible influences at structures identified. Structures or POI's for consideration are also plotted in this model. Ground vibration predictions were done considering distances ranging from 50 m to 1500 m around the vent shaft areas.

The simulation provided shows ground vibration contours only for a limited number of levels. The levels used are considered the basic limits that will be applicable for the type of structures observed surrounding the vent shaft areas. These levels are: 6 mm/s, 12.5 mm/s, 25 mm/s and 50 mm/s. This enables immediate review of possible concerns that may be applicable to any of the privately-owned structures, social gathering areas or sensitive installations.

Data is provided as follows: Vibration contours; a table with predicted ground vibration values and evaluation for each POI. Additional colour codes used in the tables are as follows:

Structure Evaluations:
Vibration levels higher than proposed limit applicable to Structures / Installations is coloured "Red"
People's Perception Evaluation:
Vibration levels indicated as Intolerable on human perception scale is coloured "Red"
Vibration levels indicated as Unpleasant on human perception scale is coloured "Mustard"
Vibration levels indicated as Perceptible on human perception scale is coloured "Light Green"
POI's that are found inside the pit area is coloured "Olive Green"

Simulations for Vent Shaft 1, 3 and 4 expected ground vibration levels from maximum charge mass are presented in Figure 146, Figure 147 and Figure 148.

During the site visit the structures were observed and the initial POI list ground-truthed and finalised as represented in this section (refer to

Table **105**, Table 106 and

Table **107**). Structures ranged from well-built structures to informal building styles.

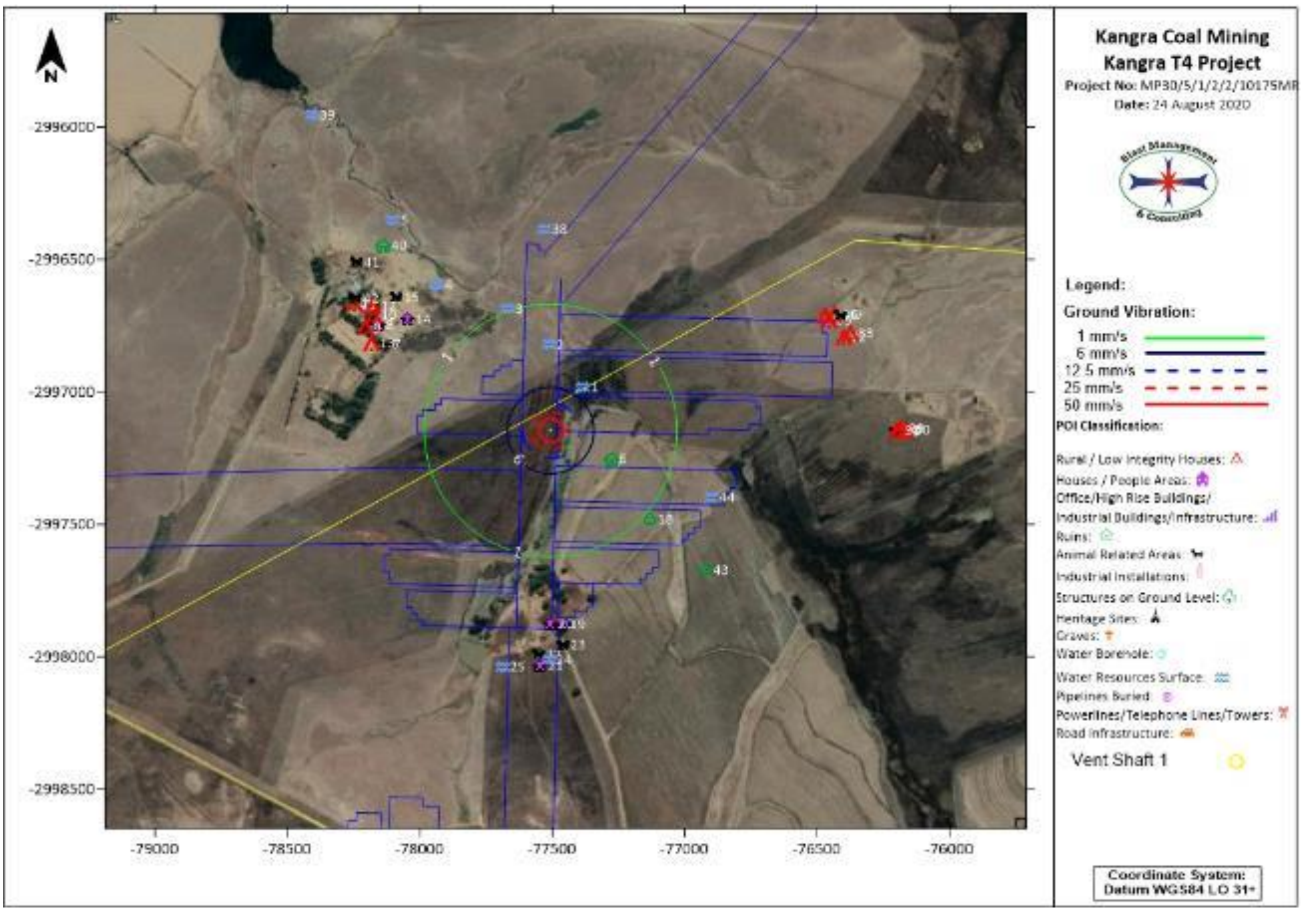

Figure 146: Ground vibration influence from maximum charge for Vent Shaft 1 area

Table 105: Ground vibration evaluation for maximum charge for Vent Shaft 1

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
1	River	200	203	44.08	4.06	Acceptable	Perceptible
2	River	200	322	44.08	1.89	Acceptable	Perceptible
3	River	200	485	44.08	0.96	Acceptable	Perceptible
4	River	200	694	44.08	0.53	Acceptable	Too Low
5	River	200	991	44.08	0.30	Acceptable	Too Low
6	Cultivated Fields	200	250	44.08	2.87	Acceptable	N/A
7	Farmstead	12.5	702	44.08	0.52	Acceptable	Too Low
8	Farm Buildings/Structures	12.5	761	44.08	0.46	Acceptable	Too Low
9	Farm Buildings/Structures	12.5	797	44.08	0.42	Acceptable	Too Low
10	Farm Buildings/Structures	12.5	796	44.08	0.42	Acceptable	Too Low
11	Farm Buildings/Structures	12.5	881	44.08	0.36	Acceptable	Too Low
12	Farm Buildings/Structures	12.5	817	44.08	0.41	Acceptable	Too Low
13	Farm Buildings/Structures	12.5	749	44.08	0.47	Acceptable	Too Low
14	Building	50	680	44.08	0.55	Acceptable	Too Low
15	Cattle Yard	50	768	44.08	0.45	Acceptable	N/A
16	Gravel Road	200	849	44.08	0.38	Acceptable	Too Low
17	Gravel Road	200	999	44.08	0.29	Acceptable	Too Low
18	Cultivated Fields	200	501	44.08	0.91	Acceptable	N/A
19	Farmstead	12.5	728	44.08	0.49	Acceptable	Too Low
20	Farmhouse	12.5	726	44.08	0.49	Acceptable	Too Low
21	Farm Buildings/Structures	12.5	884	44.08	0.36	Acceptable	Too Low
22	Cattle Yard	50	843	44.08	0.39	Acceptable	N/A
23	Cattle Yard	50	806	44.08	0.42	Acceptable	N/A
24	Water Reservoir	50	862	44.08	0.37	Acceptable	Too Low
25	Dam/Dam wall	50	907	44.08	0.34	Acceptable	Too Low
26	Gravel Road	200	882	44.08	0.36	Acceptable	Too Low
27	Gravel Road	200	1231	44.08	0.21	Acceptable	Too Low
28	Cattle Yard	50	1296	44.08	0.19	Acceptable	N/A
29	Rural Village/Houses	6	1321	44.08	0.18	Acceptable	Too Low
30	Rural Village/House	6	1343	44.08	0.18	Acceptable	Too Low
31	Informal Housing	6	1306	44.08	0.19	Acceptable	Too Low
32	Rural Village/House	6	1158	44.08	0.23	Acceptable	Too Low
33	Rural Village/Houses	6	1188	44.08	0.22	Acceptable	Too Low
34	Informal Housing	6	1121	44.08	0.24	Acceptable	Too Low
35	Informal Housing	6	1128	44.08	0.24	Acceptable	Too Low
36	Informal Housing	6	1155	44.08	0.23	Acceptable	Too Low
37	Kraal	50	1173	44.08	0.22	Acceptable	N/A
38	River	200	759	44.08	0.46	Acceptable	Too Low
39	River	200	1492	44.08	0.15	Acceptable	Too Low

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
40	Ruins	6	939	44.08	0.32	Acceptable	Too Low
41	Cattle Yard	50	969	44.08	0.31	Acceptable	N/A
42	Cattle Yard	50	887	44.08	0.36	Acceptable	N/A
43	Cultivated Fields	200	784	44.08	0.44	Acceptable	N/A
44	River	200	655	44.08	0.59	Acceptable	Too Low
45	Gravel Road	200	1489	44.08	0.15	Acceptable	Too Low

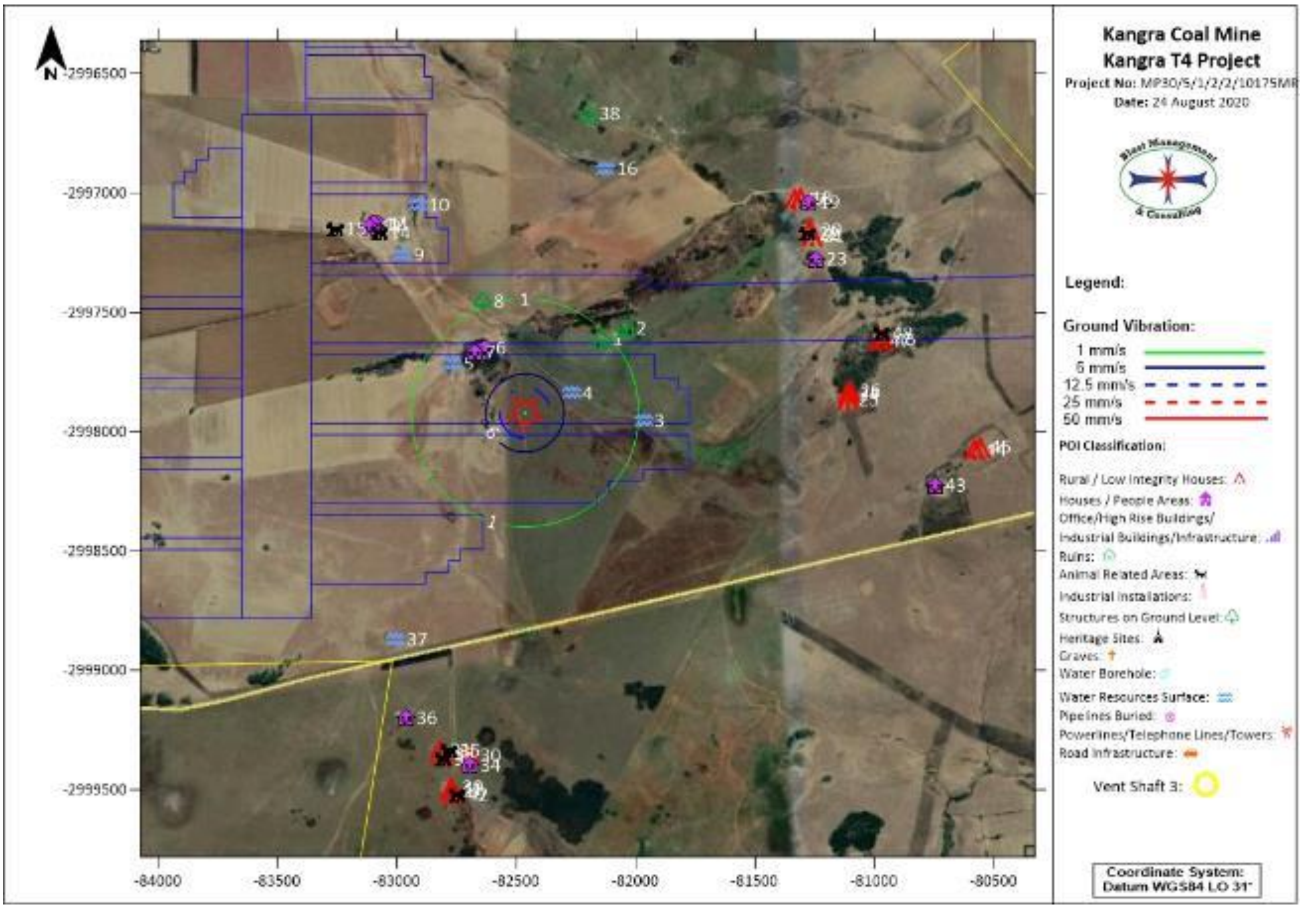

Figure 147: Ground vibration influence from maximum charge for Vent Shaft 3 area

Table 106: Ground vibration evaluation for maximum charge for Vent Shaft 3

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
1	Ruins	6	445	44.08	1.11	Acceptable	Perceptible
2	Ruins	6	549	44.08	0.78	Acceptable	Perceptible
3	River	200	494	44.08	0.93	Acceptable	Perceptible
4	River	200	211	44.08	3.79	Acceptable	Perceptible
5	Dam/Damwall	50	363	44.08	1.55	Acceptable	Perceptible

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
6	Building	12.5	317	44.08	1.94	Acceptable	Perceptible
7	Building	12.5	329	44.08	1.83	Acceptable	Perceptible
8	Cultivated Fields	200	497	44.08	0.92	Acceptable	N/A
9	Dam/Damwall	50	835	44.08	0.39	Acceptable	Too Low
10	Dam/Damwall	50	978	44.08	0.30	Acceptable	Too Low
11	Farmstead	12.5	1000	44.08	0.29	Acceptable	Too Low
12	Farm Buildings/Structures	12.5	1011	44.08	0.29	Acceptable	Too Low
13	Farm Building/Structures	12.5	1013	44.08	0.29	Acceptable	Too Low
14	Cattle Yard	50	968	44.08	0.31	Acceptable	N/A
15	Cattle Yard	50	1106	44.08	0.25	Acceptable	N/A
16	River	200	1076	44.08	0.26	Acceptable	Too Low
17	Informal Housing	6	1440	44.08	0.16	Acceptable	Too Low
18	Informal Housing	6	1462	44.08	0.16	Acceptable	Too Low
19	Kraal	12.5	1478	44.08	0.15	Acceptable	Too Low
20	Informal Housing	6	1418	44.08	0.16	Acceptable	Too Low
21	Informal Housing	6	1413	44.08	0.16	Acceptable	Too Low
22	Kraal	50	1401	44.08	0.17	Acceptable	N/A
23	Building	12.5	1375	44.08	0.17	Acceptable	Too Low
24	Informal Housing	6	1354	44.08	0.18	Acceptable	Too Low
25	Informal Housing	6	1351	44.08	0.18	Acceptable	Too Low
26	Informal Housing	6	1358	44.08	0.18	Acceptable	Too Low
27	Gravel Road	200	962	44.08	0.31	Acceptable	Too Low
28	Gravel Road	200	1036	44.08	0.28	Acceptable	Too Low
29	Gravel Road	200	1025	44.08	0.28	Acceptable	Too Low
30	Rural Village/House	6	1450	44.08	0.16	Acceptable	Too Low
31	Rural Village/House	6	1452	44.08	0.16	Acceptable	Too Low
32	Informal Housing	6	1466	44.08	0.16	Acceptable	Too Low
33	Kraal	50	1487	44.08	0.15	Acceptable	N/A
34	Building	12.5	1491	44.08	0.15	Acceptable	Too Low
35	Kraal	50	1447	44.08	0.16	Acceptable	N/A
36	Houses	12.5	1368	44.08	0.17	Acceptable	Too Low
37	Dam/Damwall	50	1088	44.08	0.25	Acceptable	Too Low
38	Ruins	6	1280	44.08	0.19	Acceptable	Too Low
39	Informal Housing	6	1593	44.08	0.14	Acceptable	Too Low
40	Informal Housing	6	1623	44.08	0.13	Acceptable	Too Low
41	Rural Village/House	6	1604	44.08	0.13	Acceptable	Too Low
42	Kraal	50	1620	44.08	0.13	Acceptable	N/A
43	Farm Buildings/Structures	12.5	1740	44.08	0.12	Acceptable	Too Low
44	Informal Housing	6	1888	44.08	0.10	Acceptable	Too Low
45	Rural Village/Houses	6	1908	44.08	0.10	Acceptable	Too Low

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
46	Rural Village/Houses	6	1532	44.08	0.14	Acceptable	Too Low
47	Informal Housing	6	1512	44.08	0.15	Acceptable	Too Low
48	Kraal	50	1527	44.08	0.14	Acceptable	N/A

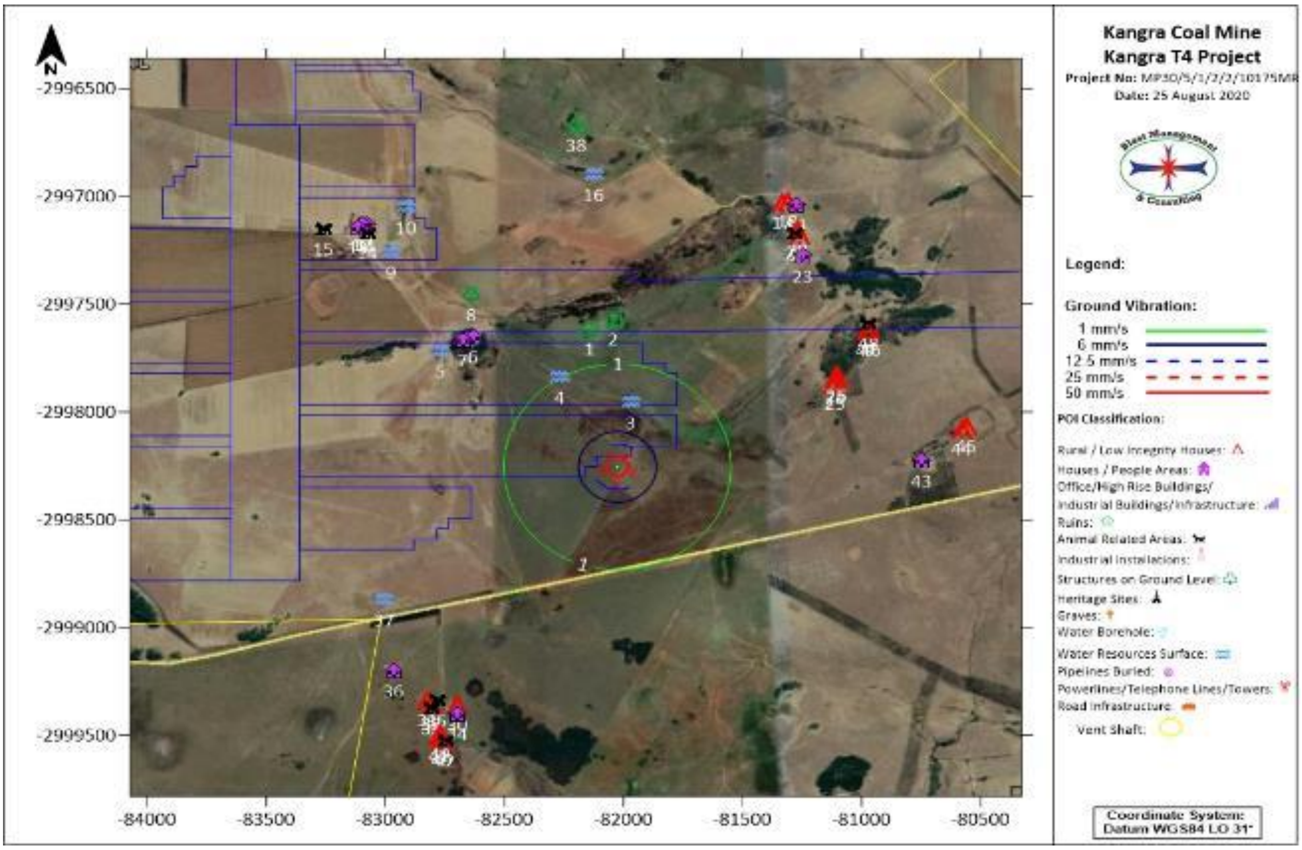

Figure 148: Ground vibration influence from maximum charge for Vent Shaft 4 area

Table 107: Ground vibration evaluation for maximum charge for Vent Shaft 4

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
1	Ruins	6	650	44.08	0.59	Acceptable	Too Low
2	Ruins	6	685	44.08	0.54	Acceptable	Too Low
3	River	200	303	44.08	2.09	Acceptable	Perceptible
4	River	200	478	44.08	0.98	Acceptable	Perceptible
5	Dam/Dam wall	50	913	44.08	0.34	Acceptable	Too Low
6	Building	12.5	852	44.08	0.38	Acceptable	Too Low
7	Building	12.5	873	44.08	0.36	Acceptable	Too Low
8	Cultivated Fields	200	1005	44.08	0.29	Acceptable	N/A
9	Dam/Dam wall	50	1373	44.08	0.17	Acceptable	Too Low
10	Dam/Dam wall	50	1493	44.08	0.15	Acceptable	Too Low

Tag	Description	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz	Human Tolerance @ 30Hz
11	Farmstead	12.5	1538	44.08	0.14	Acceptable	Too Low
12	Farm Buildings	12.5	1550	44.08	0.14	Acceptable	Too Low
13	Farm Building	12.5	1553	44.08	0.14	Acceptable	Too Low
14	Cattle Yard	50	1508	44.08	0.15	Acceptable	N/A
15	Cattle Yard	50	1653	44.08	0.13	Acceptable	N/A
16	River	200	1357	44.08	0.18	Acceptable	Too Low
17	Informal Housing	6	1408	44.08	0.17	Acceptable	Too Low
18	Informal Housing	6	1424	44.08	0.16	Acceptable	Too Low
19	Kraal	12.5	1426	44.08	0.16	Acceptable	Too Low
20	Informal Housing	6	1333	44.08	0.18	Acceptable	Too Low
21	Informal Housing	6	1319	44.08	0.18	Acceptable	Too Low
22	Kraal	50	1314	44.08	0.19	Acceptable	N/A
23	Building	12.5	1248	44.08	0.20	Acceptable	Too Low
24	Informal Housing	6	1003	44.08	0.29	Acceptable	Too Low
25	Informal Housing	6	991	44.08	0.30	Acceptable	Too Low
26	Informal Housing	6	1011	44.08	0.29	Acceptable	Too Low
27	Gravel Road	200	474	44.08	1.00	Acceptable	Perceptible
28	Gravel Road	200	502	44.08	0.91	Acceptable	Perceptible
29	Gravel Road	200	970	44.08	0.31	Acceptable	Too Low
30	Rural Village/House	6	1287	44.08	0.19	Acceptable	Too Low
31	Rural Village/House	6	1337	44.08	0.18	Acceptable	Too Low
32	Informal Housing	6	1342	44.08	0.18	Acceptable	Too Low
33	Kraal	50	1360	44.08	0.18	Acceptable	N/A
34	Building	12.5	1322	44.08	0.18	Acceptable	Too Low
35	Kraal	50	1317	44.08	0.19	Acceptable	N/A
36	Houses	12.5	1328	44.08	0.18	Acceptable	Too Low
37	Dam/Dam wall	50	1152	44.08	0.23	Acceptable	Too Low
38	Ruins	6	1593	44.08	0.14	Acceptable	Too Low
39	Informal Housing	6	1438	44.08	0.16	Acceptable	Too Low
40	Informal Housing	6	1462	44.08	0.16	Acceptable	Too Low
41	Rural Village/House	6	1449	44.08	0.16	Acceptable	Too Low
42	Kraal	50	1454	44.08	0.16	Acceptable	N/A
43	Farm Buildings	12.5	1276	44.08	0.19	Acceptable	Too Low
44	Informal Housing	6	1455	44.08	0.16	Acceptable	Too Low
45	Rural Village/Houses	6	1477	44.08	0.15	Acceptable	Too Low
46	Rural Village/Houses	6	1240	44.08	0.20	Acceptable	Too Low
47	Informal Housing	6	1221	44.08	0.21	Acceptable	Too Low
48	Kraal	50	1245	44.08	0.20	Acceptable	N/A

14.5.9.2.4 Summary of Ground Vibration Levels

The blasting operations were evaluated for expected levels of ground vibration from future mining operations. Review of the sites and the surrounding installations / houses / buildings / mine infrastructure showed that structures vary in distances from the various vent shafts. The evaluation considered a distance up to 1500 m from vent shaft areas.

The distances between structures and the vent shaft are the main contributing factor to the levels of ground vibration expected and the subsequent possible influences. The closest infrastructure to the Vent Shaft 1 area is the river and cultivated field at 203 m and 250 m, respectively. Nearest houses or settlements areas are significantly further away at 702 m. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage.

The closest infrastructure to the Vent Shaft 3 area is the river, dam and building at 211 m, 363 m and 329 m, respectively. The nearest houses or settlements areas are significantly further away at 1000 m. The planned maximum charge evaluated showed that ground vibration levels of 1.8 and 1.9 mm/s could be acceptable for the buildings in terms of potential structural damage. The closest infrastructure to the Vent Shaft 4 area is the rivers and gravel road at 303 m and 472 m respectively. The nearest houses or settlements areas are significantly further away at 991 m. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage. In view of the above it is believed that no specific mitigations will be required, as the POIs identified are all acceptable.

14.5.9.2.5 Ground Vibration and Human Perception

Considering the effect of ground vibration with regards to human perception, vibration levels calculated were applied to an average of 30Hz frequency and plotted with expected human perceptions on the safe blasting criteria graph (see Figure 149, Figure 150 and Figure 151 below). Data applicable to human response only is plotted. The frequency range selected is the expected average range for frequencies that will be measured for ground vibration when blasting is done. These POI's are found in a distance range between 474 m and 1630 m from the vent shaft boundaries. POI's up to 1630 m could experience ground vibration as too low and up at 482 m could experience ground vibration as perceptible. Structures at Vent Shaft 3 where people may be present will experience ground vibration levels as perceptible from distance of 200 m.

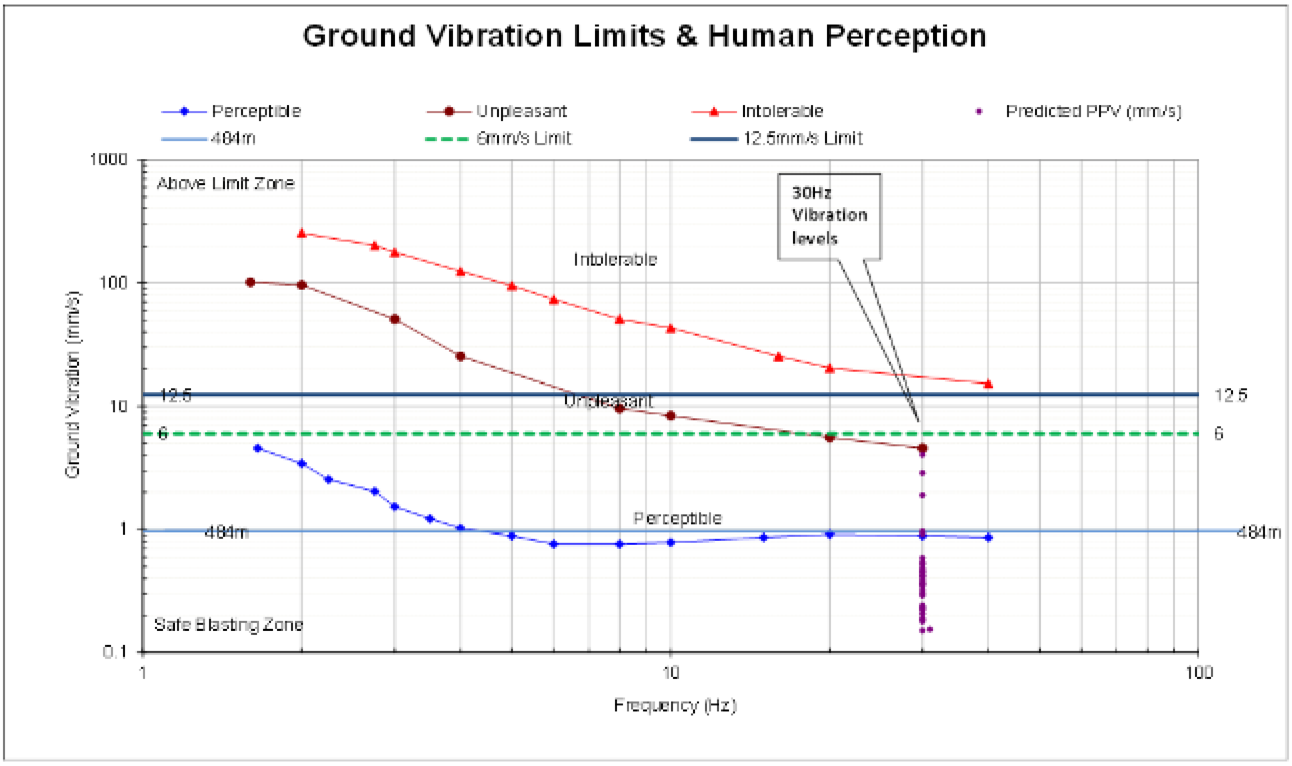

Figure 149: USBM Analysis with human Perception for Vent Shaft 1

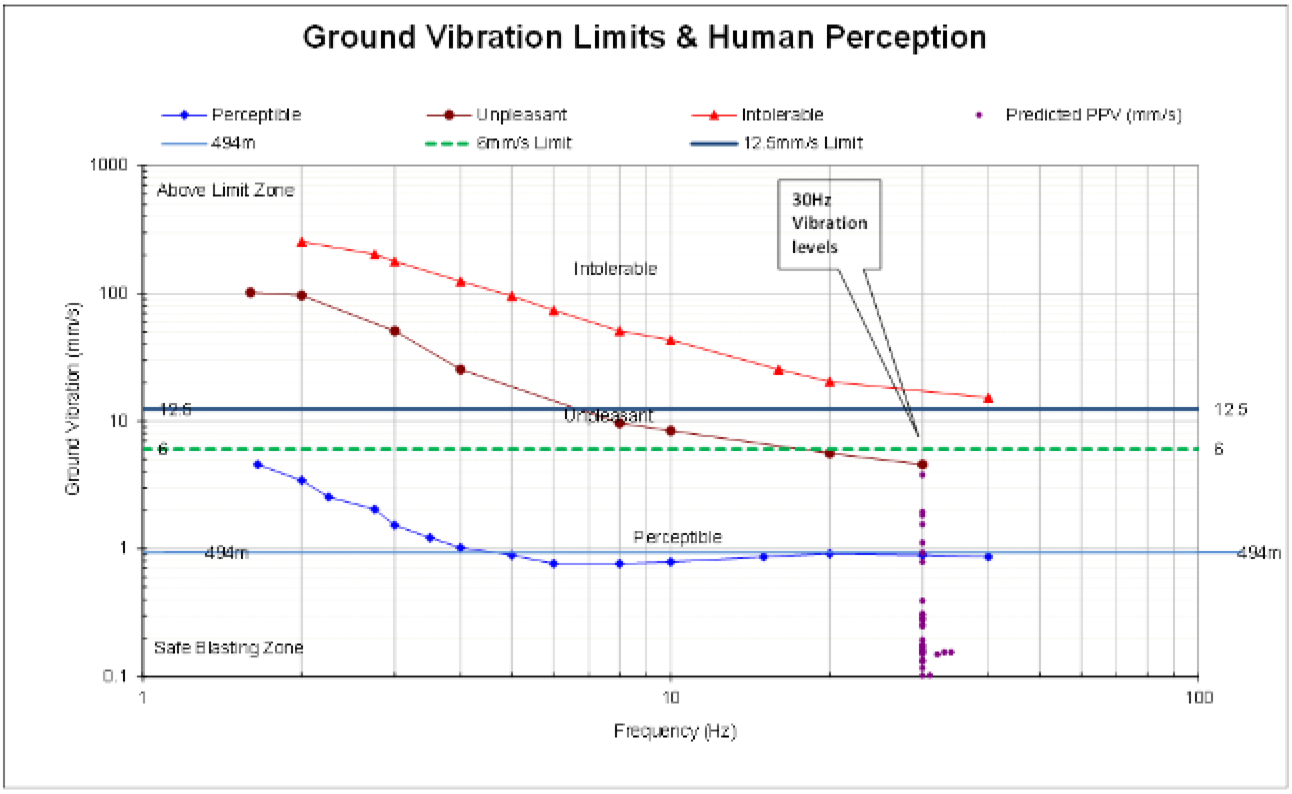

Figure 150: USBM Analysis with Human Perception for Vent Shaft 3

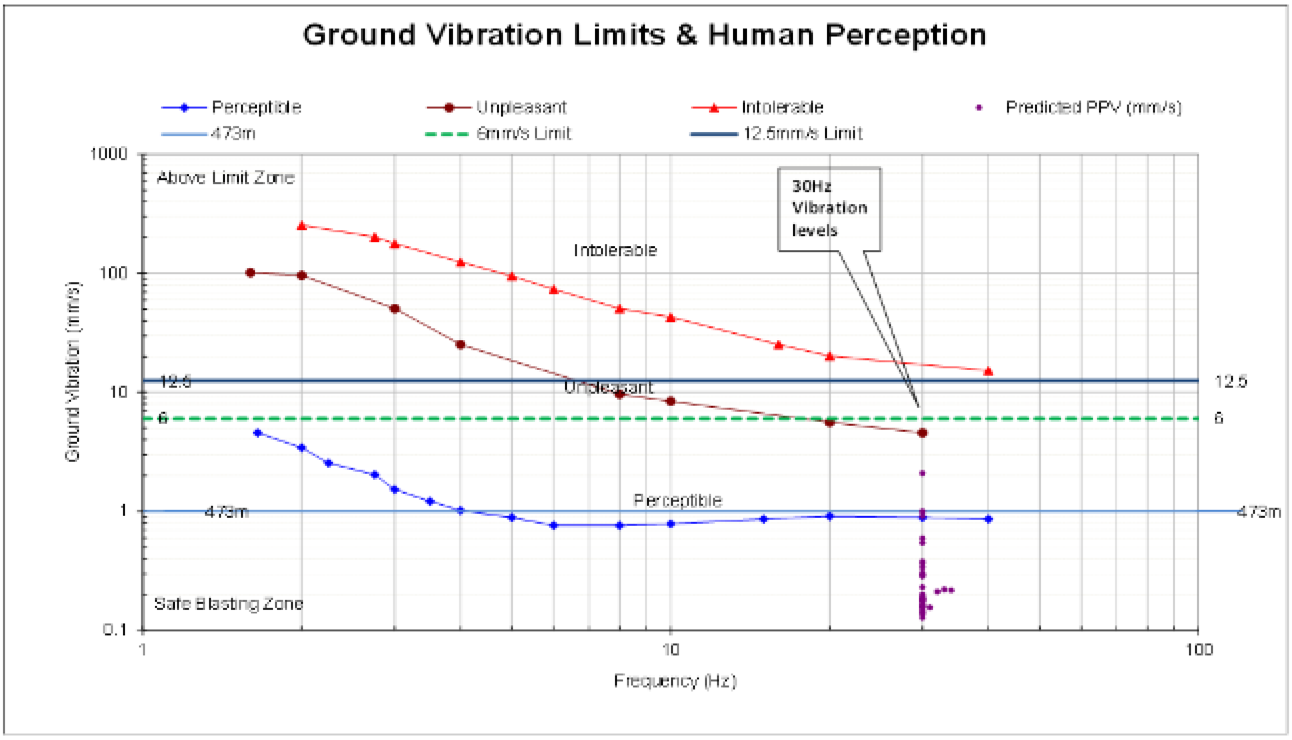

Figure 151: USBM Analysis with Human Perception for Vent Shaft 4

14.5.9.2.6 Potential that Vibration Will Upset Adjacent Communities

Ground vibration and air blast generally upset people living in the vicinity of mining operations. There are communities and roads that are within the evaluated area of influence. There are structures in proximity of the vent shaft areas. Ground vibration levels expected from maximum charge has possibility to be perceptible between 150 to 1630 m. Within these distance ranges there are informal settlements present. The anticipated ground vibration levels may have the possibility of upsetting the adjacent communities.

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

14.5.9.2.7 Cracking of houses and consequent devaluation

The structures found in the areas of concern ranges from informal building style to brick-and-mortar structures, industrial structures and various types of roads. There are various agricultural and rural community houses found within the 3500 m range from the mining area. Building style and materials will certainly contribute to additional cracking apart from influences such as blasting operations. Some of the structures i.e. corrugated iron structures are relatively safe from ground vibrations but brick and mortar or traditional built houses or houses in poor state should be considered.

The presence of general vertical cracks, horizontal and diagonal cracks that are found in typical brick structures does not need to indicate devaluation due to blasting operations but rather devaluation due to construction, building material, age, standards of building applied. Thus, damage in the form of cracks will be present. Exact costing of devaluation for normal cracks observed is difficult to estimate. Mining operations may not have influence to change the status quo of any property if correct precautions are considered.

Review of structures, distance from pit area and the expected levels of ground vibration from maximum charge, the problematic indicators was identified for structures up to a distance of 50 m. There are no structures within this range that could possibly be influenced. The proposed limits as applied in this document i.e. 6 mm/s, 12.5 mm/s and 25 mm/s are considered enough to ensure that additional damage is not introduced to the different categories of structures. It is expected that, should levels of ground vibration be maintained within these limits, the possibility of inducing damage is limited. Mitigation measures will be required to manage the levels of ground vibration.

14.5.9.2.8 <u>Vibration Impact on Roads</u>

The gravel road is in the vicinity of the vent shaft 4 area and needs to be considered. The gravel road is 474 m from the vent shaft area. Based on the ground vibration expected there is no concern for structural influences on this gravel road.

14.5.9.2.9 <u>Review of Expected Air Blast</u>

Presented herewith are the expected air blast level contours and discussion of relevant influences. Expected air blast levels were calculated for each POI identified surrounding the mining area and evaluated with regards to possible structural concerns. Tables are provided for each of the different charge models done with regards to:

- "Tag" No. is number corresponding to the location indicated on POI figures.
- "Description" indicates the type of the structure.
- "Distance" is the distance between the structure and edge of the pit area.
- "Air Blast (dB)" is the calculated air blast level at the structure.
- "Possible concern" indicates if there is any concern for structural damage or human perception. Indicators used are:
    - "Problematic" where there is real concern for possible damage – at levels greater than 134 dB.
    - "Complaint" where people will be complaining due to the experienced effect on structures at levels of 120 dB and higher (not necessarily damaging).
    - "Acceptable" if levels are less than 120 dB.
    - "Low" where there is very limited possibility that the levels will give rise to any influence on people or structures. Levels below 115 dB could be considered to have low or negligible possibility of influence.

Presented in Table 108 to

Table **110** and Figure 152 to Figure 154 are simulations for expected air blast levels from two different charge masses at each pit area. Colour codes used in tables are as follows:

Air blast levels higher than proposed limit is coloured “Red”
Air blast levels indicated as possible Complaint is coloured “Mustard”
POI’s that are found inside the pit area is coloured “Olive Green”

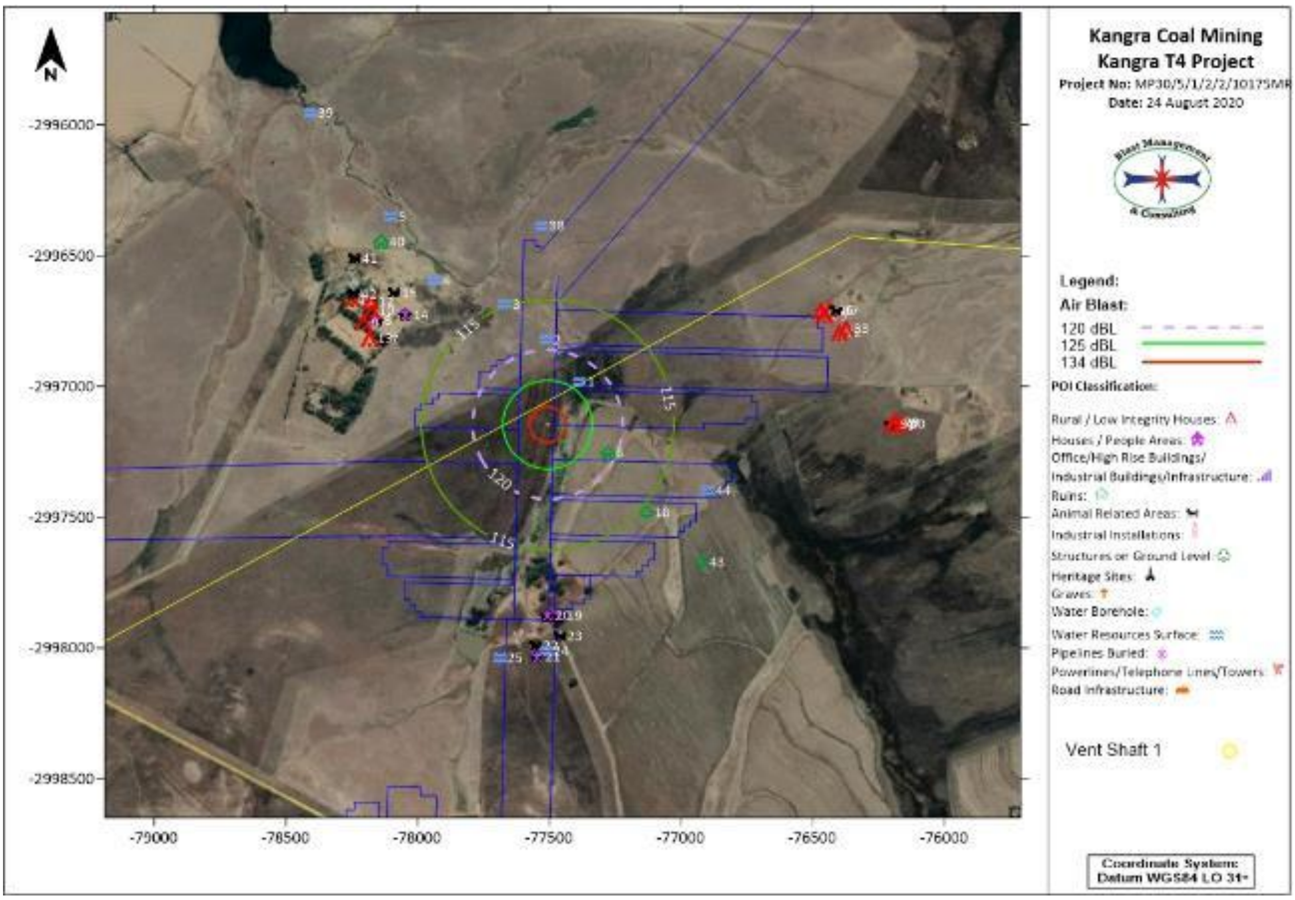

Figure 152: Air blast influence from minimum charge for Vent Shaft 1 area

Table 108: Air blast evaluation for maximum charge for Vent Shaft 1

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
1	River	202.6017	44.08	123.1	Complaint
2	River	321.6866	44.08	118.7	Acceptable
3	River	484.5226	44.08	114.8	Acceptable
4	River	693.95	44.08	111.4	Acceptable
5	River	991.4694	44.08	108.1	Acceptable
6	Cultivated Fields	249.7809	44.08	121.2	N/A
7	Farmstead	701.803	44.08	111.3	Acceptable
8	Farm Buildings/Structures	760.9517	44.08	110.6	Acceptable
9	Farm Buildings/Structures	796.9354	44.08	110.1	Acceptable
10	Farm Buildings/Structures	796.4948	44.08	110.1	Acceptable
11	Farm Buildings/Structures	880.8167	44.08	109.2	Acceptable
12	Farm Buildings/Structures	817.3007	44.08	109.9	Acceptable
13	Farm Buildings/Structures	749.3423	44.08	110.7	Acceptable
14	Building	680.3093	44.08	111.7	Acceptable
15	Cattle Yard	767.7888	44.08	110.5	N/A
16	Gravel Road	848.7684	44.08	109.5	Acceptable
17	Gravel Road	999.4623	44.08	107.9	Acceptable
18	Cultivated Fields	500.5093	44.08	114.5	N/A
19	Farmstead	727.9937	44.08	111	Acceptable
20	Farm House	725.6177	44.08	111	Acceptable
21	Farm Buildings/Structures	883.6208	44.08	109.2	Acceptable
22	Cattle Yard	842.7555	44.08	109.6	N/A
23	Cattle Yard	805.5448	44.08	110.1	N/A
24	Water Reservoir	861.5418	44.08	109.3	Acceptable
25	Dam/Dam wall	906.5531	44.08	108.9	Acceptable
26	Gravel Road	882.4075	44.08	109.2	Acceptable
27	Gravel Road	1231.43	44.08	106	Acceptable
28	Cattle Yard	1295.79	44.08	105.5	N/A
29	Rural Village/Houses	1320.866	44.08	105.3	Acceptable
30	Rural Village/House	1343.063	44.08	105.3	Acceptable
31	Informal Housing	1305.94	44.08	105.5	Acceptable
32	Rural Village/House	1157.52	44.08	106.6	Acceptable
33	Rural Village/Houses	1187.625	44.08	106.4	Acceptable
34	Informal Housing	1120.623	44.08	106.8	Acceptable
35	Informal Housing	1128.298	44.08	106.8	Acceptable
36	Informal Housing	1155.387	44.08	106.6	Acceptable
37	Kraal	1173.197	44.08	106.4	N/A
38	River	759.4219	44.08	110.6	Acceptable

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
39	River	1492.202	44.08	104.3	Acceptable
40	Ruins	939.0395	44.08	108.6	Acceptable
41	Cattle Yard	968.5564	44.08	108.2	N/A
42	Cattle Yard	887.1653	44.08	109	N/A
43	Cultivated Fields	783.6646	44.08	110.3	N/A
44	River	655.0385	44.08	112	Acceptable
45	Gravel Road	1488.554	44.08	104.3	Acceptable

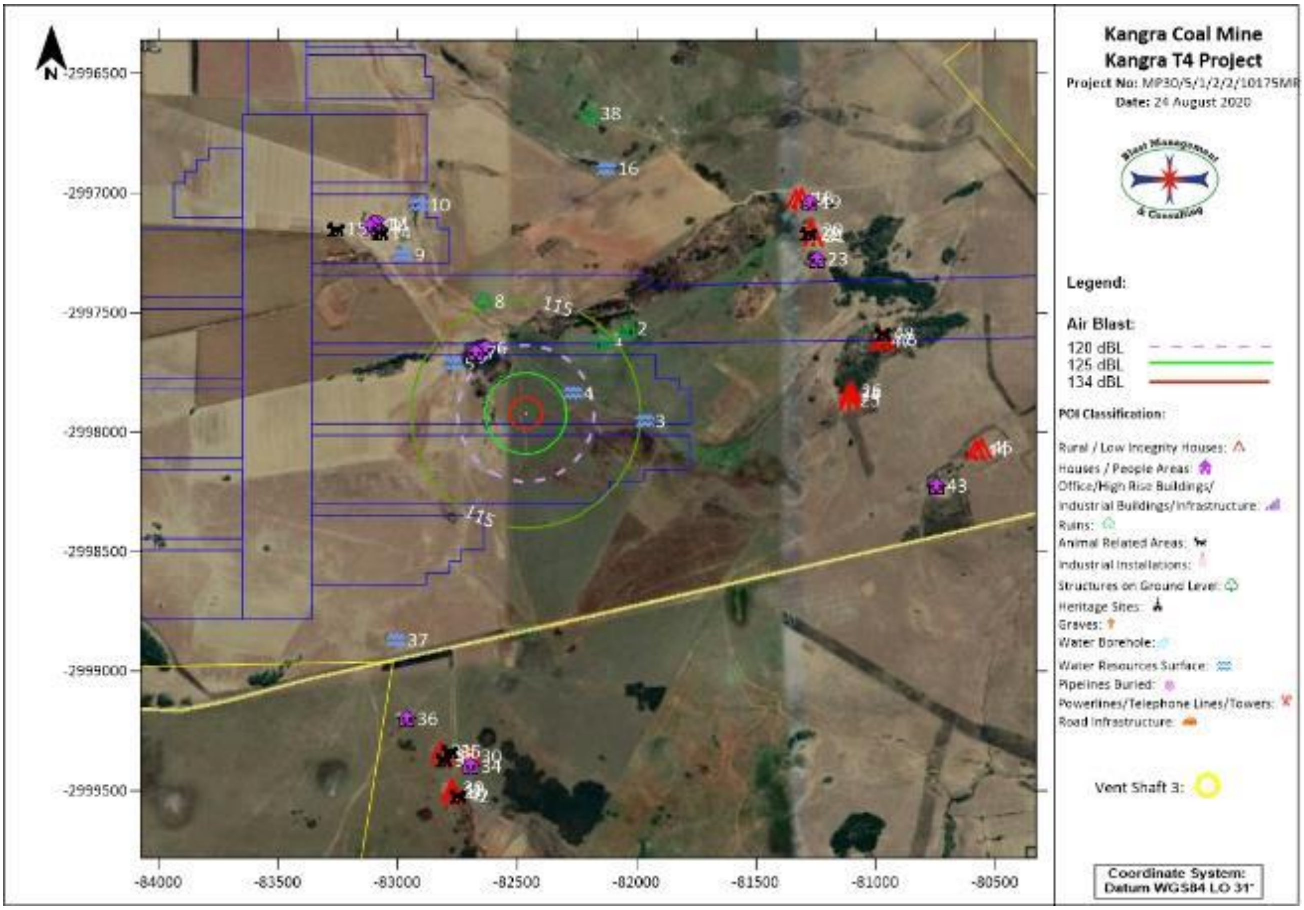

Figure 153: Air blast influence from maximum charge for Vent Shaft 3 area

Table 109: Air blast evaluation for maximum charge for Vent Shaft 3

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
1	Ruins	445	44.08	116	Acceptable
2	Ruins	549	44.08	114	Acceptable
3	River	494	44.08	115	Acceptable
4	River	211	44.08	123	Complaint

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
5	Dam/Dam wall	363	44.08	118	Acceptable
6	Building	317	44.08	119	Acceptable
7	Building	329	44.08	119	Acceptable
8	Cultivated Fields	497	44.08	115	N/A
9	Dam/Dam wall	835	44.08	110	Acceptable
10	Dam/Dam wall	978	44.08	108	Acceptable
11	Farmstead	1000	44.08	108	Acceptable
12	Farm Buildings/Structures	1011	44.08	108	Acceptable
13	Farm Building/Structures	1013	44.08	108	Acceptable
14	Cattle Yard	968	44.08	108	N/A
15	Cattle Yard	1106	44.08	107	N/A
16	River	1076	44.08	107	Acceptable
17	Informal Housing	1440	44.08	105	Acceptable
18	Informal Housing	1462	44.08	104	Acceptable
19	Kraal	1478	44.08	104	Acceptable
20	Informal Housing	1418	44.08	105	Acceptable
21	Informal Housing	1413	44.08	105	Acceptable
22	Kraal	1401	44.08	105	N/A
23	Building	1375	44.08	105	Acceptable
24	Informal Housing	1354	44.08	105	Acceptable
25	Informal Housing	1351	44.08	105	Acceptable
26	Informal Housing	1358	44.08	105	Acceptable
27	Gravel Road	962	44.08	108	Acceptable
28	Gravel Road	1036	44.08	108	Acceptable
29	Gravel Road	1025	44.08	108	Acceptable
30	Rural Village/House	1450	44.08	105	Acceptable
31	Rural Village/House	1452	44.08	105	Acceptable
32	Informal Housing	1466	44.08	104	Acceptable
33	Kraal	1487	44.08	104	N/A
34	Building	1491	44.08	104	Acceptable
35	Kraal	1447	44.08	105	N/A
36	Houses	1368	44.08	105	Acceptable
37	Dam/Dam wall	1088	44.08	107	Acceptable
38	Ruins	1280	44.08	106	Acceptable
39	Informal Housing	1593	44.08	104	Acceptable
40	Informal Housing	1623	44.08	104	Acceptable
41	Rural Village/House	1604	44.08	104	Acceptable
42	Kraal	1620	44.08	104	N/A
43	Farm Buildings/Structures	1740	44.08	103	Acceptable
44	Informal Housing	1888	44.08	102	Acceptable

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
45	Rural Village/Houses	1908	44.08	102	Acceptable
46	Rural Village/Houses	1532	44.08	104	Acceptable
47	Informal Housing	1512	44.08	104	Acceptable

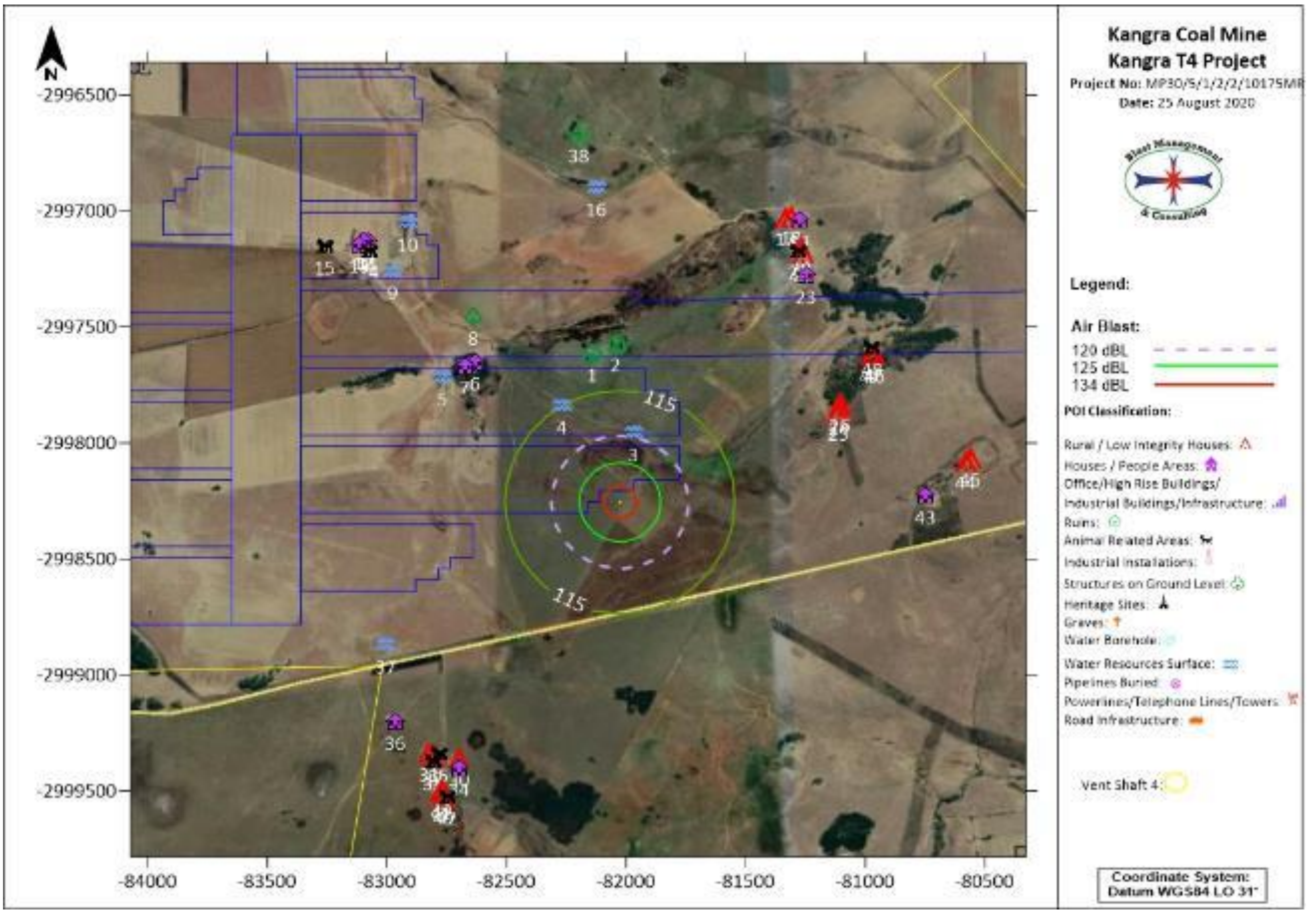

Figure 154: Air blast influence from maximum charge for Vent Shaft 4 area

Table 110: Air blast evaluation for maximum charge for Vent Shaft 4

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
1	Ruins	650	44.08	112	Acceptable
2	Ruins	685	44.08	112	Acceptable
3	River	303	44.08	119	Acceptable
4	River	478	44.08	115	Acceptable
5	Dam/Dam wall	913	44.08	109	Acceptable
6	Building	852	44.08	110	Acceptable
7	Building	873	44.08	109	Acceptable
8	Cultivated Fields	1005	44.08	108	N/A

Tag	Description	Distance (m)	Total Mass/Delay (kg)	Air blast (dB)	Possible Concern?
9	Dam/Dam wall	1373	44.08	105	Acceptable
10	Dam/Dam wall	1493	44.08	104	Acceptable
11	Farmstead	1538	44.08	104	Acceptable
12	Farm Buildings/Structures	1550	44.08	104	Acceptable
13	Farm Building/Structures	1553	44.08	104	Acceptable
14	Cattle Yard	1508	44.08	104	N/A
15	Cattle Yard	1653	44.08	103	N/A
16	River	1357	44.08	105	Acceptable
17	Informal Housing	1408	44.08	105	Acceptable
18	Informal Housing	1424	44.08	105	Acceptable
19	Kraal	1426	44.08	105	Acceptable
20	Informal Housing	1333	44.08	105	Acceptable
21	Informal Housing	1319	44.08	105	Acceptable
22	Kraal	1314	44.08	105	N/A
23	Building	1248	44.08	106	Acceptable
24	Informal Housing	1003	44.08	108	Acceptable
25	Informal Housing	991	44.08	108	Acceptable
26	Informal Housing	1011	44.08	108	Acceptable
27	Gravel Road	474	44.08	115	Acceptable
28	Gravel Road	502	44.08	115	Acceptable
29	Gravel Road	970	44.08	108	Acceptable
30	Rural Village/House	1287	44.08	106	Acceptable
31	Rural Village/House	1337	44.08	105	Acceptable
32	Informal Housing	1342	44.08	105	Acceptable
33	Kraal	1360	44.08	105	N/A
34	Building	1322	44.08	105	Acceptable
35	Kraal	1317	44.08	105	N/A
36	Houses	1328	44.08	105	Acceptable
37	Dam/Dam wall	1152	44.08	107	Acceptable
38	Ruins	1593	44.08	104	Acceptable
39	Informal Housing	1438	44.08	105	Acceptable
40	Informal Housing	1462	44.08	104	Acceptable
41	Rural Village/House	1449	44.08	105	Acceptable
42	Kraal	1454	44.08	104	N/A
43	Farm Buildings/Structures	1276	44.08	106	Acceptable
44	Informal Housing	1455	44.08	104	Acceptable
45	Rural Village/Houses	1477	44.08	104	Acceptable
46	Rural Village/Houses	1240	44.08	106	Acceptable
47	Informal Housing	1221	44.08	106	Acceptable

14.5.9.2.10 Summary of Findings for Air Blast

Review of the air blast levels indicates lesser concerns than with ground vibration. The nearest settlements are relative far away with limited influence from air blast. Infrastructure such as the graveyards, cultivated fields, dams and rivers are not specifically influenced by air blast.

It is not expected to observe levels that may contribute to effects such as rattling of roofs or door or windows but is not expected to be damaging. The current accepted limit on air blast is 134 dB. Damages are only expected to occur at levels greater than 134 dB. On prediction it is expected that air blast will be greater than 134 dB at a distance of less than 75 m and closer from all vent shaft boundaries. The nearest settlement (Buildings) is located 680 m from the Vent Shaft 1, 317 m from the Vent Shaft 3 and 852 m from Vent Shaft 4 areas. Air blast is not expected to be of concern at these buildings.

Complaints from air blast are normally based on the actual effects that are experienced due to rattling of roof, windows, doors etc. These effects could startle people and raise concern of possible damage.

The calculations for air blast are based on the use of basic rules for stemming length and stemming material. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The project area is located such that “free blasting” – meaning no controls on blast preparation – will not be possible. Controls will be required to maintain levels less than limits.

14.5.9.2.11 Fly-rock Unsafe Zone for Vent Shaft 1, 3 and 4

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

Calculations are used to help and assist determining safe distances. A safe distance from blasting is calculated following rules and guidelines from the International Society of Explosives Engineers (ISEE) Blasters Handbook. Using this calculation, the minimum safe distances can be determined that should be cleared of people, animals and equipment. Figure 155 shows the results from the ISEE calculations for fly rock range based on a 145 mm diameter blast hole and 3.0 m stemming length. Based on these values a possible fly rock range with a safety factor of 2 was calculated to be 492 m. The absolute minimum unsafe zone is then the 492 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100 % excluded. Best practices should always be implemented. The occurrence of fly rock can be mitigated but the possibility of the occurrence thereof can never be eliminated. Figure 156, Figure 157 and Figure 158 shows the area around the vent shafts that incorporates the 492 m unsafe zone.

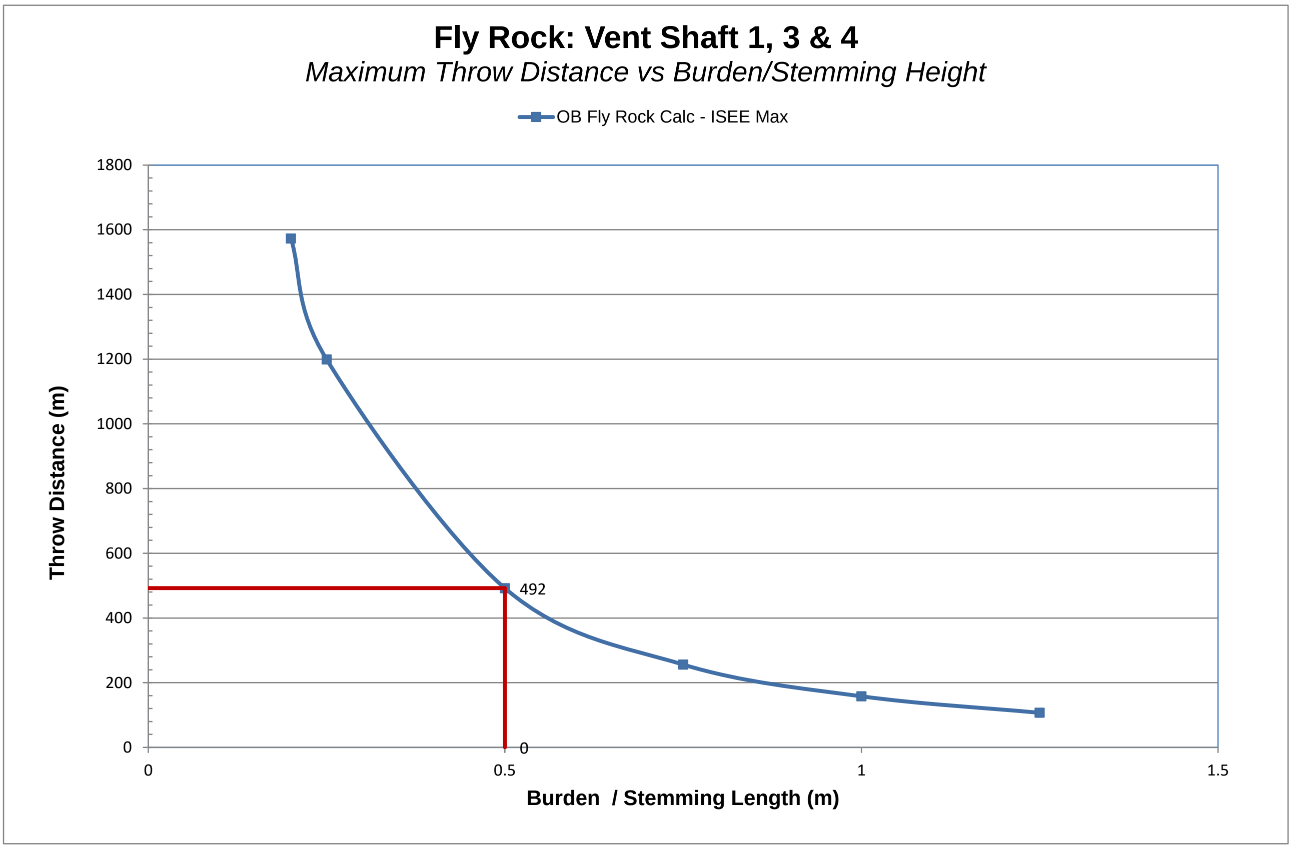

Figure 155: Fly rock prediction calculation for Vent Shaft 1, 3 and 4

Figure 156: Predicted Fly Rock Exclusion Zone for Vent Shaft 1

Review of the calculated unsafe zone showed no POI's for vent shaft 1 within the unsafe zone. Table 111 below shows the POI's of concern and coordinates.

Table 111: Fly rock concern POI's for Vent Shaft 1

Tag	Description	Classification	Y	X
None				

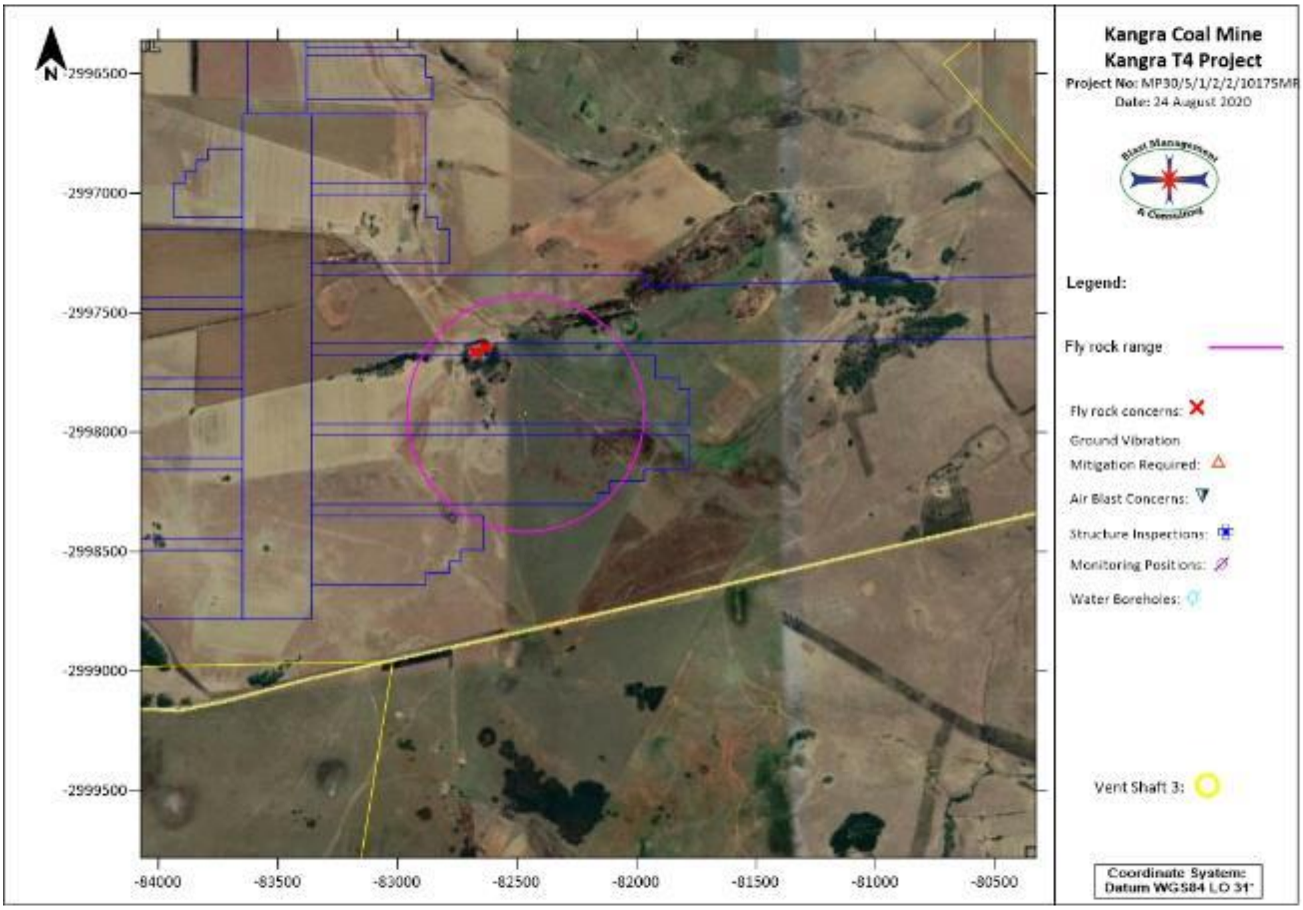

Figure 157: Predicted Fly Rock Exclusion Zone for Vent Shaft 3

Table 112: Fly rock concern POI's for Vent Shaft 3

Tag	Description	Classification	Y	X
6	Building	2	82630.4	2997648.791
7	Building	2	82674.6	2997665.602

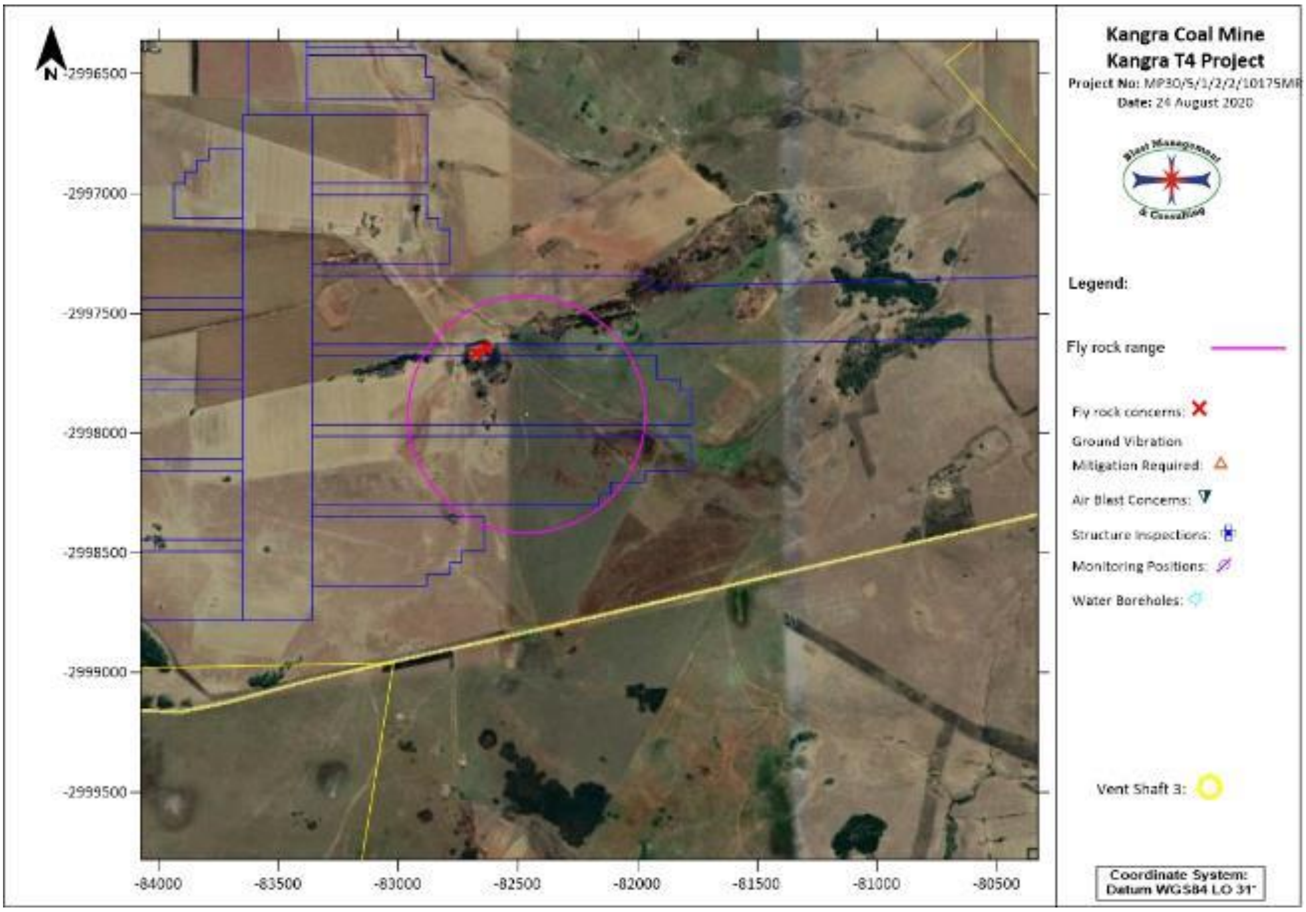

Figure 158: Predicted Fly Rock Exclusion Zone for Vent Shaft 4

Table 113: Fly rock concern POI's for Vent Shaft 4

Tag	Description	Classification	Y	X
27	Gravel Road	14	81919.8	2998719.217

14.5.9.2.12 <u>Noxious Fumes</u>

The occurrence of fumes in the form the NOx gas is not a given and very dependent on various factors and the occurrence of fumes should be closely monitored.

14.5.10 Impact on Visual Environment

The project is located in an area with undulating topography. As the surface infrastructure is limited to a powerline and ventilation shafts the visual impact will be low, except in the vicinity of the ventilation shafts.

14.5.11 Impact on Surface Water

The underground mining for the Kangra T4 project will take place 200 m to 300 m below ground. Therefore, impact to surface water resources is only expected from surface infrastructure.

The following Project activities (Table 114) are likely to cause an impact to surface water during the construction phase:

- Site clearing for construction of vent shafts, overhead powerline pylons and access / maintenance roads, including the removal of topsoil and vegetation.

Table 114: Activities and impacts during the Construction phase

Activity	Impact
Site clearing for construction of vent shafts, overhead powerline pylons and access / maintenance roads.	Deterioration of water quality in the Klein-Vaal River and Assegaai river and their tributaries due to increased erosion from site clearing activities and establishment of access and maintenance roads. Possible soil and thereby surface water runoff contamination due to spills or leaks form construction vehicles. Erosion from the establishment of access roads will be minor and the extent of the impact will be limited to receptors immediately downstream from the proposed construction areas. Construction impacts resulting in loss of Biodiversity and Ecological function – including Riparian zone activities or activities within buffer zones or regulated zones
Construction of surface infrastructure (vent shafts and overhead powerline). The powerline has to be installed over a number of stream crossings. Installation of the pylons and overhead powerline will require the use of heavy construction equipment and an access road. A maintenance road along the conveyor route will provide access to the conveyor for inspection and routine maintenance.	

The operation phase entails the period during which mining operations are in progress, specific to the impacts related to surface water resources, maintenance of surface infrastructure (vent shafts and powerline) will take place (Table 115). With the implementation of concurrent rehabilitation, the operational phase will overlap with the decommissioning phase. The following project activities are likely to cause an impact to surface water during the operation phase:

- Use and maintenance of access and maintenance roads; and
- Maintenance of vent shafts and overhead powerline.

Table 115: Activities and impacts during the Operation phase

Activity	Impact
Use of maintenance roads for inspection and routine maintenance of powerline and ventilation shafts.	Possible soil and thereby surface water runoff contamination due to spills or leaks form maintenance vehicles. Erosion of maintenance roads and subsequent siltation of surface water resources. Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.

The closure phase commences at the stage when all activities have ceased and entailed the following activities (Table 116):

- Demolition and removal of all infrastructures, including transporting materials off site.

- Rehabilitation, including spreading of soil and re-vegetation.
- Updating and implementing a monitoring programme appropriate for the closure phase.

Table 116: Activities and impacts during the Closure phase

Activity	Impact
Movement of heavy machinery and vehicles compacting soils during demolition of infrastructure and rehabilitation processes	Sedimentation of surface water resources leading to deteriorated water quality. Possible soil and thereby surface water runoff contamination due to spills or leaks form vehicles.
Loosening of soil during demolition of infrastructure and rehabilitation processes	
Rehabilitation and re-vegetation of disturbed areas	

14.5.12 Impact on Aquatic Ecology

Activities during Construction and Operation that could potentially create impacts to the aquatic ecological environment are indicated in Table 117.

Table 117: Activities and possible impacts during the Establishment (Construction) and Operation phase

Activity	Impact
Site preparation and activities in proximity or within buffer zones of water resources	Construction impacts resulting in impacts to Biodiversity and Ecological function – including Riparian zone activities or activities within bufferzones or regulated zones
All activities in the area – specifically the powerline establishment within areas associated with the ecological corridor and rivers as natural aquatic corridors	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning
Alteration of drainage patterns	Leading to decrease and changes in water quantity and availability in the Ecological Reserve
Water quality impacts due to improper waste management and movement of humans and vehicles - Nutrient increase if flow is reduced significantly	Deterioration of water quality in the Klein-Vaal River due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring
Sedimentation of water resources due to erosion and impacts in areas with steep topography, such as the powerline construction or Vent shaft 1, 3 & 4 close to the Klein Vaal river	Nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.
Deterioration in surface water quality and changes in PES	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).
Water Quantity (abstraction of groundwater and/or increased abstraction from Heyshope	Impacts to Streamflow Regulation

Activity	Impact
dam) impacts reducing water available to sustain Aquatic diversity	

14.5.13 Impact on Groundwater

14.5.13.1 Groundwater Modelling

Modelling was performed as a representation of a groundwater flow system and/or geochemical system that attempts to mimic the natural processes. It is therefore a simplified version of the natural system, compiled with geological, hydrogeological, hydrological and meteorological data, which utilises governing equations to incorporate all this data and simulates the hydraulic properties or geochemical properties of the system.

These models were utilised to provide a quantitative understanding of a groundwater system in terms of existing conditions as well as induced stresses, which inherently aids in the identification of cost-effective and efficient solutions to groundwater contamination and management challenges.

14.5.13.1.1 Numerical Modelling

Numerical groundwater modelling is considered to be the most reliable method of anticipating and quantifying the likely impacts on the groundwater regime. The finite difference numerical model was created using AquaVeo's Groundwater Modelling System (GMS10.0) as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes.

MODFLOW is a 3D, cell-centred, finite difference, saturated flow model developed by the United States Geological Survey. MODFLOW can perform both steady state and transient analyses and has a wide variety of boundary conditions and input options. It was developed by McDonald and Harbaugh of the US Geological Survey in 1984 and underwent eight overall updates since. The latest update (MODFLOW NWT) incorporates several improvements extending its capabilities considerably, the most important being the introduction of the new Newton formulation and solver, vastly improving the handling of dry cells which has proven to be problematic in the past.

14.5.13.1.2 Transport Modelling

Transport modelling was performed using MT3DMS. MT3DMS is a 3-D model for the simulation of advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems. MT3DMS uses a modular structure similar to the structure utilized by MODFLOW and is used in conjunction with MODFLOW in a two-step flow and transport simulation. Heads are computed by MODFLOW during the flow simulation and utilized by MT3DMS as the flow field for the transport portion of the simulation.

14.5.13.2 Groundwater Flow and Transport Modelling

The numerical groundwater flow model is constructed and simulated to aid in decision making processes and environmental management.

The groundwater regime of the study area is highly heterogeneous due to complex faulting and intrusions, which ultimately influence the groundwater flow patterns. Constructing a groundwater flow model with all the detail is close to impossible; however, assumptions are made based on data gathered and used to simulate different scenarios to conclude with management protocol.

Therefore, the purpose of the numerical model is to develop a tool than can be used to assess the impact of the proposed underground mine.

14.5.13.2.1 Software model choice

The finite difference numerical model was created using AquaVeo's Groundwater Modelling System (GMS10) as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes.

MODFLOW is a 3D, cell-centred, finite difference, saturated flow model developed by the United States Geological Survey. MODFLOW can perform both steady state and transient analyses and has a wide variety of boundary conditions and input options. It was developed by McDonald and Harbaugh of the US Geological Survey in 1984 and underwent eight overall updates since. The latest update (Modflow-NWT) incorporates several improvements extending its capabilities considerably, the most important being the introduction of the Newton formulation of Modflow. This dramatically improved the handling of dry cells that has been a problematic issue in Modflow in the past.

MT3DMS is a 3-D model for the simulation of advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems. MT3DMS uses a modular structure similar to the structure utilized by MODFLOW and is used in conjunction with MODFLOW in a two-step flow and transport simulation. Heads are computed by MODFLOW during the flow simulation and utilized by MT3DMS as the flow field for the transport portion of the simulation.

14.5.13.2.2 Model Set-up and Boundary

Boundaries were chosen to include the area where the groundwater pollution plume could reasonably be expected to spread and simultaneously be far enough removed from site boundaries not to be affected by groundwater abstraction. These boundaries are described in Figure 159.

These boundaries resulted in an area of about 7 to 20 km around the proposed mine, which is considered far enough for the expected groundwater effects not to be influenced by boundaries.

Model Parameter	Value	Unit	Reason
Recharge to the aquifer	0.00008	m/d	Previous hydrogeological report(Gradient Groundwater Consulting report HG-R-19-012)
Evapotranspiration	0.01	m/d	Calculated
Boundaries	Topographic water divides	-	No flow boundaries
Refinement	75	m	Smaller than the scale of the mining areas
Grid dimensions	330 x 270	Cell count	Product of the grid refinement
Hydraulic conductivity	0.05	m/d	Previous hydrogeological report (Gradient Groundwater Consulting report HG-R-19-012)
Hydraulic anisotropy (vertical)	10	-	Anderson et al. (2015)
Effective porosity	5 declining to 3 with depth in each layer	%	Wang et al. (2009)
Layers	4	Count	Mining depth is 20m
Longitudinal dispersion	50	m	Schulze-Makuch (2005)
Head error range	10	m	Calculated as 5% of the difference between the maximum and minimum calculated head elevations

Figure 159: Input parameters to the numerical flow model

14.5.13.2.3 <u>Groundwater Elevation and Gradient</u>

The calibrated static water levels as modelled have been contoured. Groundwater flow direction should be perpendicular to these contours and inversely proportional to the distance between contours. As can be expected, the groundwater flow is mainly from topographical high to low areas, eventually draining to the local streams.

14.5.13.2.4 <u>Groundwater Source and Sinks</u>

Although the most relevant aquifer parameters are optimised by the calibration of the model, many parameters are calculated and/or judged by conventional means. The fixed assumptions and input parameters were used for the numerical model of this area.

14.5.13.3 Conceptual Model Input

For the purpose of this project the subsurface was envisaged to consist of the following hydrogeological units:

- The upper few metres below surface consist of completely weathered material. This layer is anticipated to have a reasonable high hydraulic conductivity, but in general unsaturated. However, a seasonal aquifer perched on the bedrock probably does form in this layer, especially after high rainfall events. Flow in this perched aquifer is expected to follow the surface contours closely and emerge as fountains or seepage at lower elevations.

- The next few tens of metres comprise of slightly weathered, highly fractured bedrock with a lower hydraulic conductivity. The permanent groundwater level resides in this unit and is about 1 to 20 metres below ground level. The groundwater flow direction in this unit is influenced by regional topography and for the site flow would be in general from high lying areas to the local streams.
- Below a few tens of metres, the fracturing of the aquifer is less frequent and fractures less significant due to increased pressure. This results in an aquifer of lower hydraulic conductivity and very slow groundwater flow velocities. The flow direction is expected to be mostly eastterly. This trend was confirmed by modelling.

14.5.13.4 Calibration of the Numerical Model

Water level data was used to calibrate the steady state numerical groundwater flow model. The results obtained during the steady state scenarios were used as initial conditions to simulate dewatering and contaminant transport impacts. A good fit was obtained for the measured groundwater levels and concentrations (see Figure 160).

All other parameters were unchanged, with values as listed in the paragraphs above. The calibration error statistics can be seen in Table 119. The head error was below 1 metre, which can be regarded as good, especially given the steep topography and groundwater levels.

14.5.13.5 Results of the Numerical Model

Water level and quality data obtained during the hydrocensus was used to calibrate the steady state numerical groundwater flow model. The results obtained during the steady state scenarios were used as initial conditions to simulate dewatering and contaminant transport impacts. A good fit was obtained for the measured groundwater levels. The optimal calibrated aquifer parameters are provided in Table 118 and the calibration statistics ar given in Table 119.

Table 118: Optimal Calibrated Aquifer Parameters

Aquifer	Model Layer	Layer thickness (m)	Porosity (%)	Hydraulic conductivity (m/d)
Upper regolith aquifer	Layer 1	10	20	0.5
Highly fractured bedrock	Layer 2	40	5	0.05
Moderately fractured bedrock	Layer 3	50	4	0.005
Slightly fractured bedrock	Layer 4	250	3	0.0005

Table 119: Calibration Statistics

Description	Value
Mean Residual (Head)	3.147

Mean Absolute Residual (Head)	5.633
Root Mean SquaredResidual (Head)	6.890

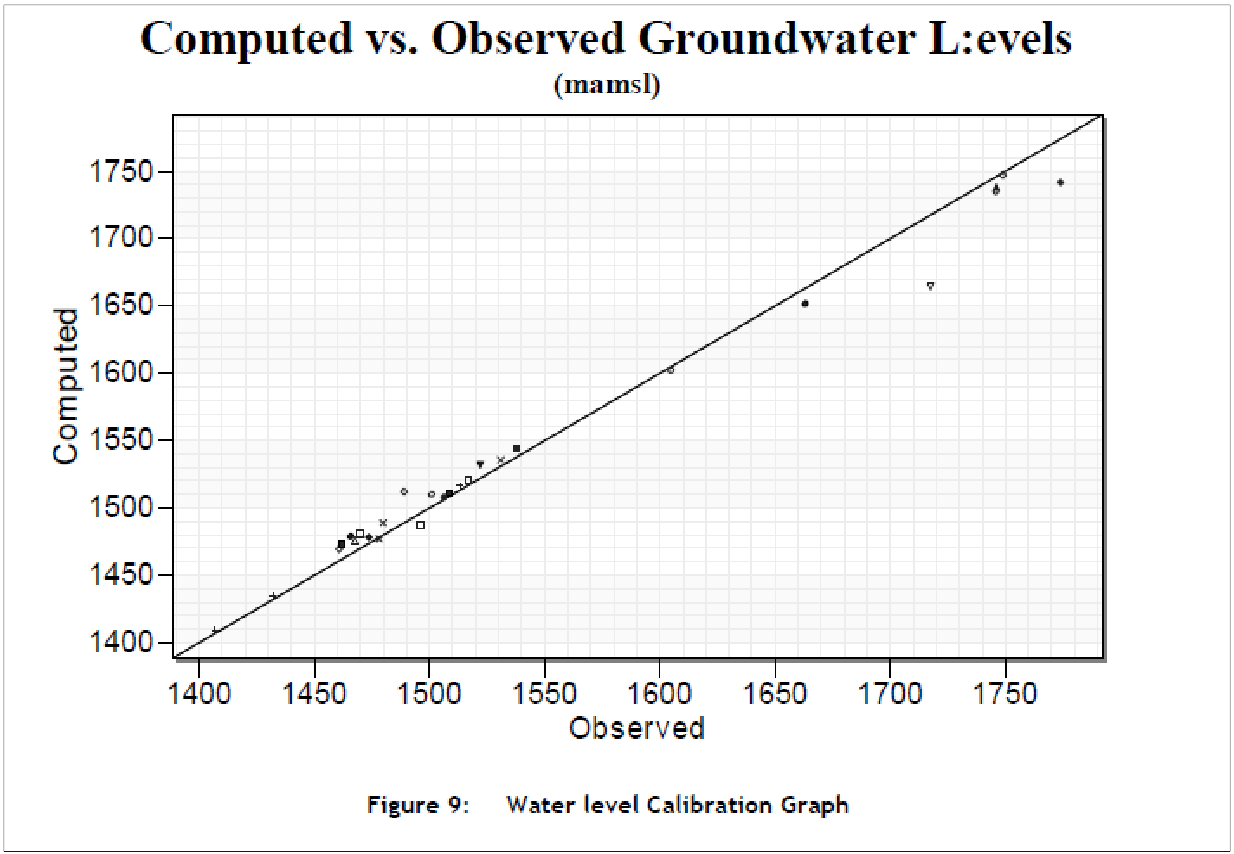

Figure 160: Water level calibration graph

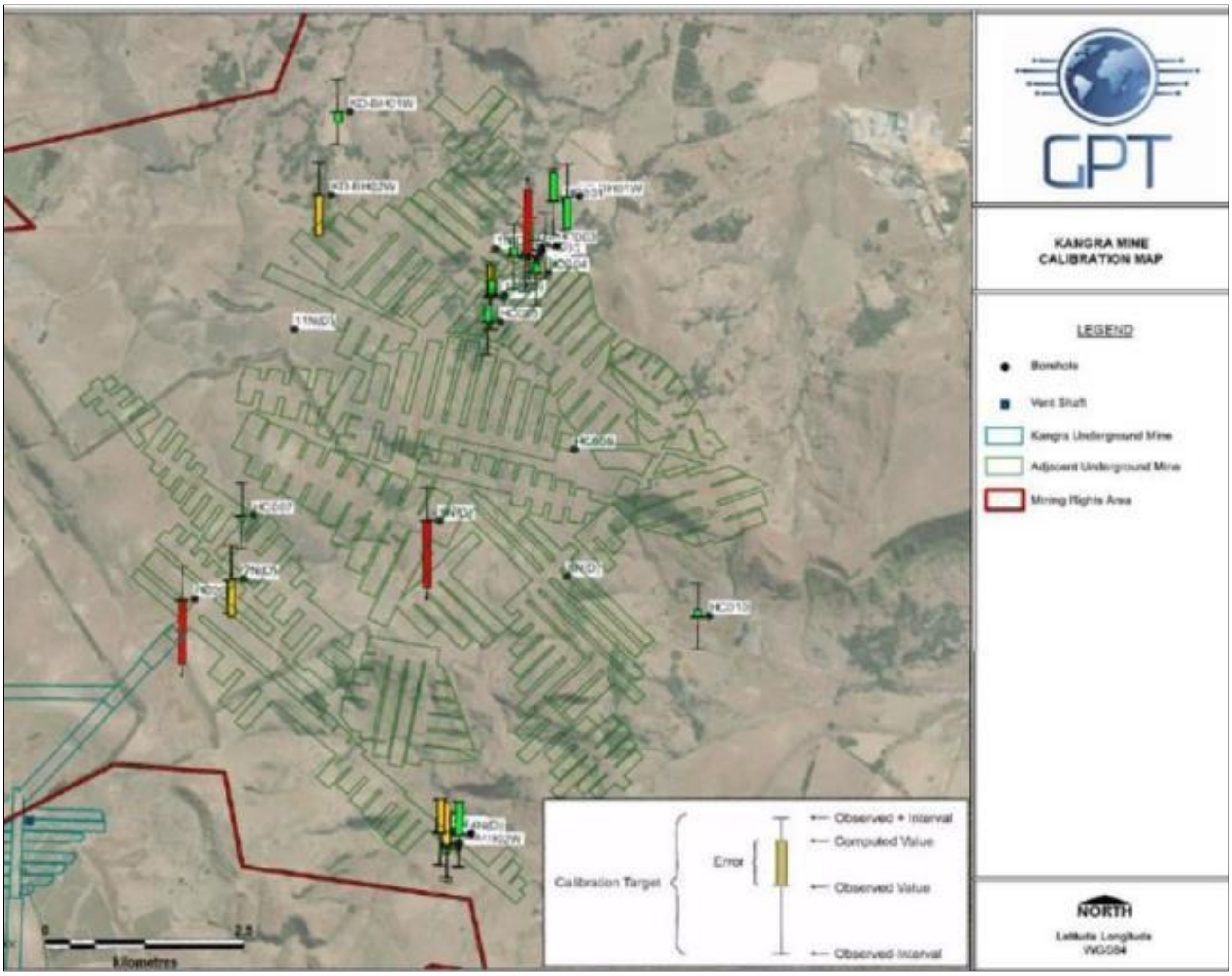

Figure 161: Water Level Calibration layout

14.5.13.5.1 <u>Pre-mining</u>

This model represents the pre-mining scenario and is used for calibration purposes. The model is representative of steady-state natural conditions prior to the application of stresses to the aquifer and provides a baseline from which all following calculations are performed. All required hydraulic parameters are defined and calibrated in this model as a simplified mathematical representation of the hydrogeological scenario on and around the site.

14.5.13.5.2 <u>During-mining</u>

This model represents the groundwater situation during operation of the proposed underground mine. For the purposes of this model a worst-case scenario was assumed, namely that the whole mine will be dewatered during the mining period. A drain was thus imposed under the mining area at mining depth. The modelling included the following transport and dewatering scenarios:

- **Dewatering**
  - Current Kangra underground mine; and

- Proposed T4 underground extension.

The numerical groundwater flow model indicates the associated flow directions and velocities and simulated inflow rates towards the mining activities. The numerical groundwater flow model indicates the associated flow directions and velocities and simulated inflow rates towards the mining activities.

14.5.13.5.3 Post-mining

This models the post-mining scenario. The modelling included the following transport and dewatering scenarios:

- **Discharge**
  - Current Kangra underground mine
  - Proposed T4 underground extension
- **Transport**
  - Current Kangra underground mine
  - Proposed T4 underground extension.

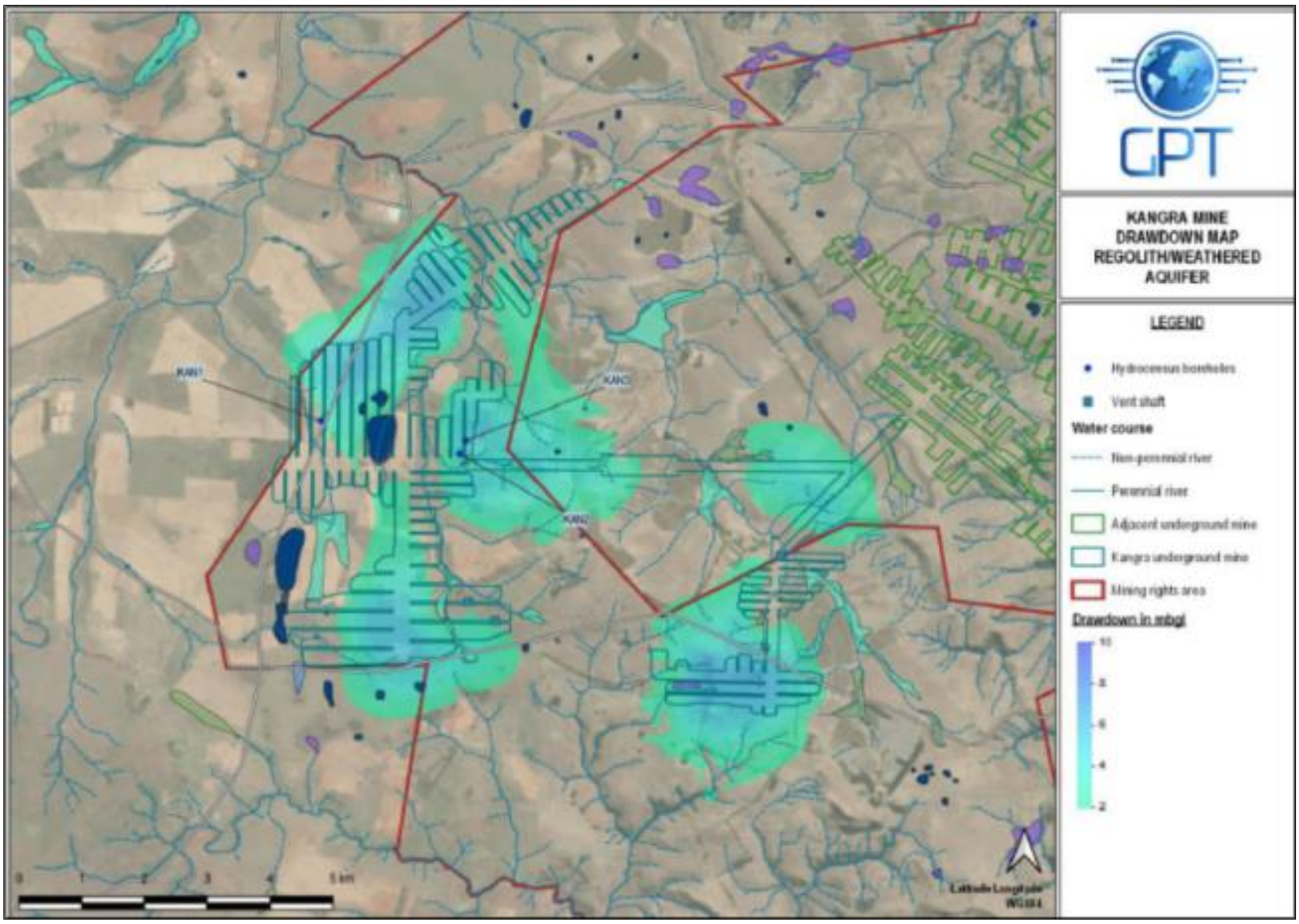

Figure 162: Cone of depression during mining ((Weathered/regolith aquifer))

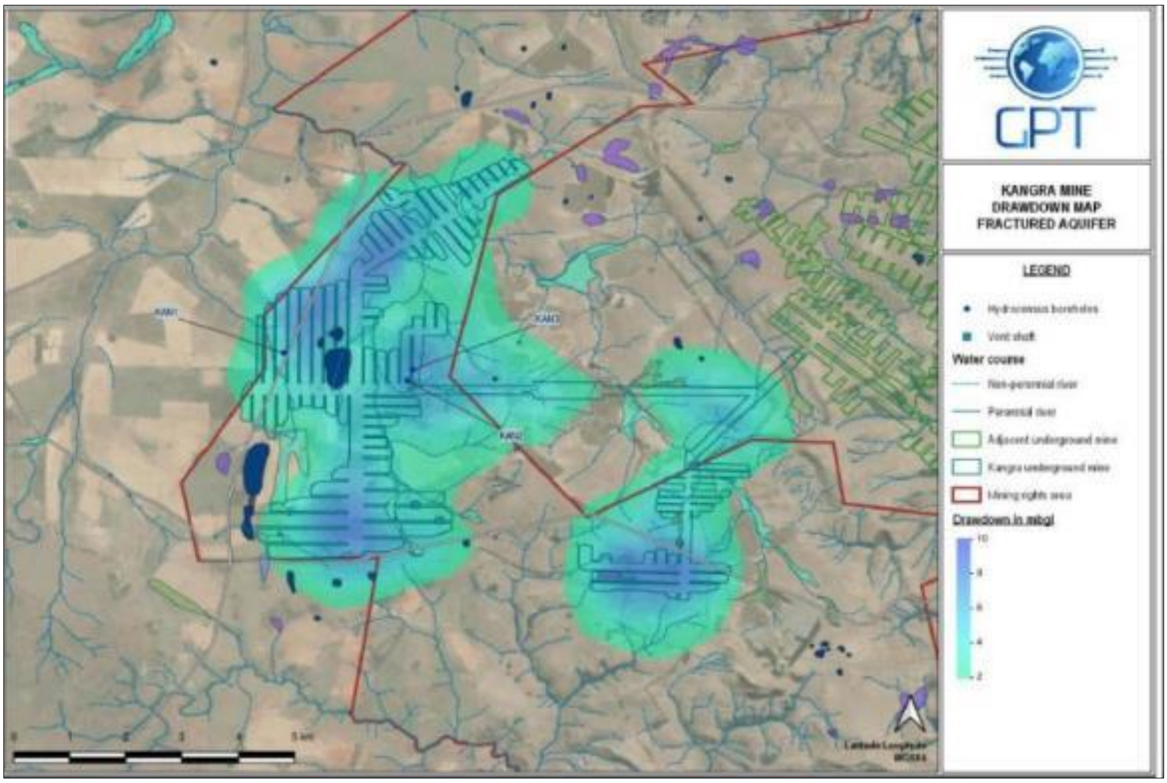

Figure 163: Cone of depression during mining (fractured aquifer)

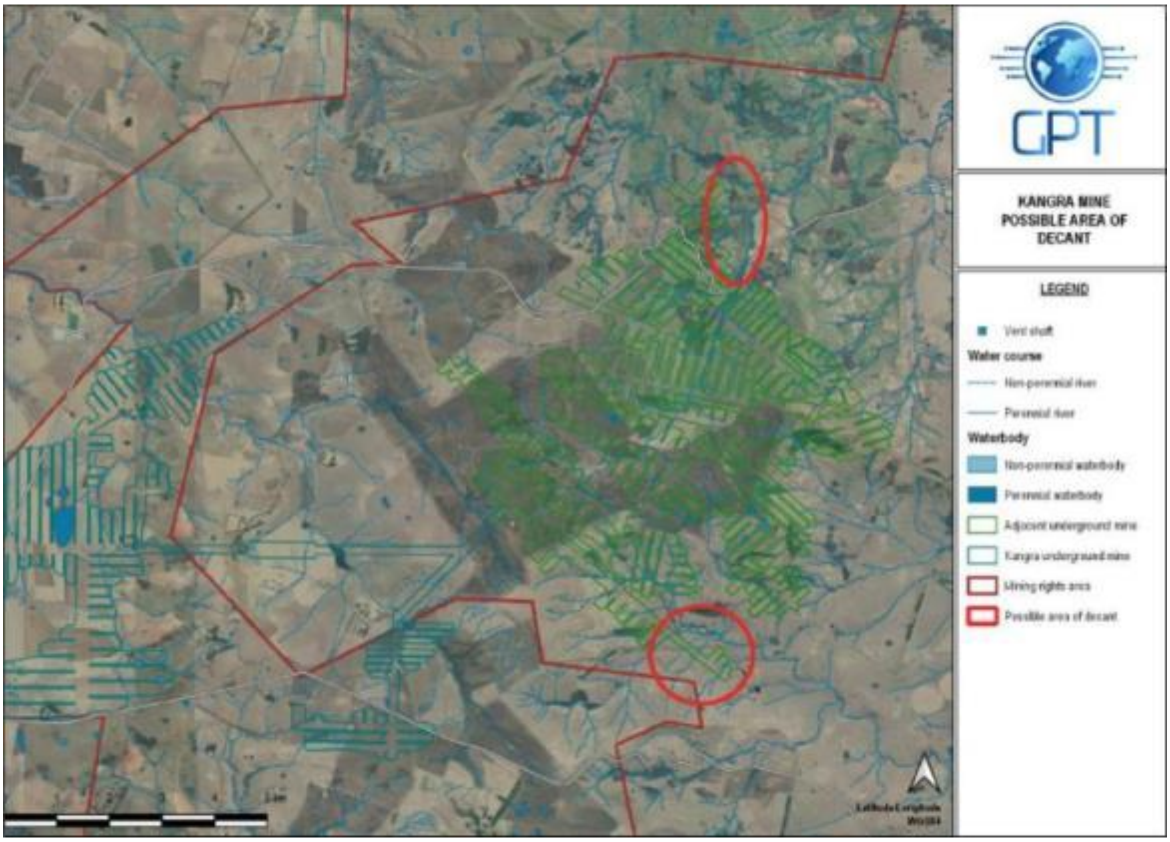

Figure 164: Predicted decant areas

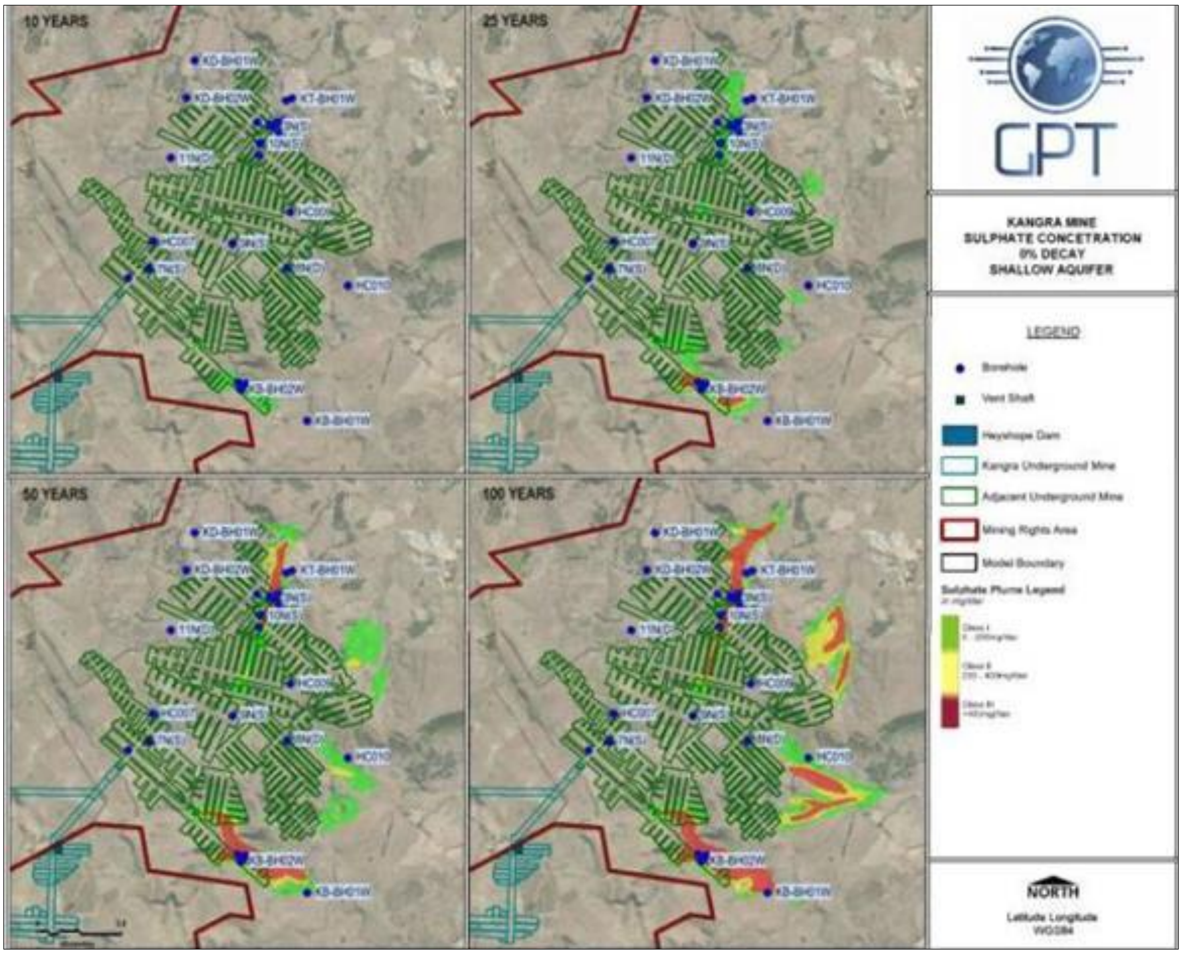

Figure 165: Predicted spread of pollution post-closure of mining (weathered aquifer)

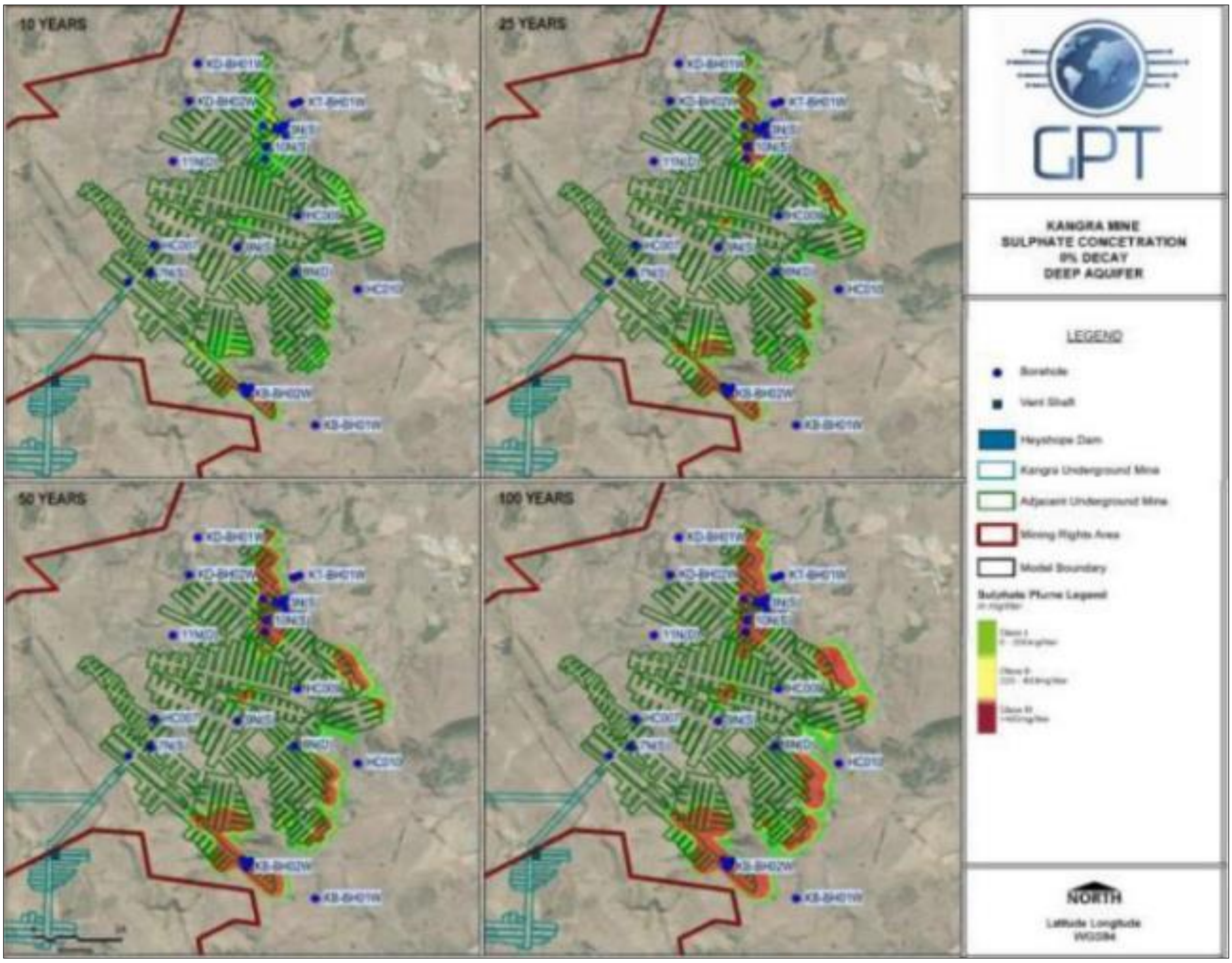

Figure 166: Predicted spread of pollution post-closure of mining (fractured aquifer)

Construction Phase Impacts

It is accepted for the purposes of this document that the construction phase will consist of preparations for the proposed underground mine, which is assumed to consist mainly of establishment of infrastructure on site, the mobilisation of earth moving equipment and the opening of the access corridors/haulages.

Impacts in groundwater quantity

This phase is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.

Impacts on groundwater quality

This phase should thus cause very little additional impacts in the groundwater quality. It is expected that the current status quo will be maintained.

Operational Phase Impacts

The operational phase is interpreted as the active mining of the underground mine. It is inevitable that these effects will impact on the groundwater regime. The potential impacts that will be considered are the groundwater quantity and quality. A summary of the potential impacts during operation can be seen in Table 11.

Impacts on groundwater quantity

During the operational phase, it is expected that the main impact on the groundwater environment will be de-watering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table in- and adjacent to the mine.

The dewatering of the aquifer has been calculated for the proposed underground mine, using the calibrated numerical model as described above. A worst-case scenario has been modelled, assuming that stopes would be dewatered simultaneously. This will obviously not be the case, and the actual drawdown could thus be less. However, as the recovery of groundwater is expected to be very slow, it could well be that the first stopes are still in an early stage of recovery at end of mining. Thus, the worst-case scenario could also be close to the actual scenario. The calculated drawdown of the worst case scenario is depicted in Figure 162 and Figure 163, as contours of drawdown for both the deep fractured aquifer where boreholes are extracting water from, as well as the shallow regolith (mostly perched) aquifer.

Despite the modelled predictions, it must again be stressed that structures of preferred groundwater flow have not been modelled. It is known by experience that dolerite will most likely transgress the area, but details are limited and not adequate to model this structure(s). If such a structure is dewatered, any boreholes drilled into the structure might be seriously affected. These effects cannot be predicted with the current knowledge and can only be established through continuous groundwater level monitoring.

The computed total inflow into each mine, assuming that all areas in the mine are dewatered simultaneously, was calculated as tabled below in Table 120. It must be cautioned that these calculations have been performed using simplified assumptions of homogeneous aquifer conditions. The reality could deviate substantially from this and the model should thus be updated as more information becomes available.

Table 120: Summary of potential impacts during operation – dewatering

Mining Area	Area (ha)	Mining Seam	Maximum Drawdown (m)	Cone of depression from edge of mine (m)	Estimated Inflow for the Total Area (m3/day)	Potential Impacted Receptor	Expected Water Level Decline (m)
T4 Underground	2 000	GUS	10	1 000	2 000 – 3 000	Privately owned borehole above underground	2 – 5

Decommissioning and Post-Closure Phase Impacts

During this phase it is assumed that dewatering of the proposed underground mining will be terminated, and the mine voids will be allowed to flood. The groundwater regime will return to a state of equilibrium once mining has stopped and the removal of water from the mining void has been discontinued.

The rise in groundwater level is predicted to be relatively slow and the water levels are expected to recover only in about 10 to 20 years. The slow recovery is ascribed to the low hydraulic conductivity of the surrounding bedrock. The following possible impacts were identified at this stage:

- Following closure of the mine, the groundwater level will rise to an equilibrium that will differ from the pre-mining level due to the disturbance of the bedrock. However, this change is likely to be minimal due to the depth of mining and no drawdown is anticipated close to surface.
- Groundwater within the mined areas is expected to deteriorate due to chemical interactions between the geological material and the groundwater. The resulting groundwater pollution plume is expected to commence with downstream movement.

A summary of the potential impacts during the closure of the mine is shown in Table 121 below.

Table 121: Potential impacts during closure

Mining Area	Area (ha)	Potential impacted receptor	Estimated increase in concentrations during closure (mg/l)	Rebound time (Years)	Potential Decant (Yes/No)	Potential decant area
T4 Underground	416705	Downstream boreholes	500 - 2000	10 - 20	Yes	To the east of the mining complex, at the current mine

Impacts on groundwater quantity

After closure, the water table will rise in the mine to reinstate equilibrium with the surrounding groundwater systems. However, the mined stopes will remain as water filled cavities with very large hydraulic conductivities. The underground mines (existing and proposed T4) will act as a single interconnected unit unless the long connection corridors are tightly sealed after mining.

Due to the high topographical gradient from west to east, and corresponding high groundwater gradient, there will thus be a piezometric gradient in the mine from east to west regardless of the shape and slope of the coal seam. Thus, while the coal seam slope slightly from east to west, groundwater will tend to flow from west to east through the water filled mining voids, with consequences as described below.

Rebound and Potential Decant

Following the closure of the underground mine and the cessation of the dewatering the groundwater levels will rebound. This estimated rebound time after cessation of pumping is estimated 15 to 20 years after mining has stopped.

After rebound has reached equilibrium, decant and/or seepage to streams has the potential to occur due to the very high hydraulic gradient as described above. If access shafts, vent shafts or boreholes drilled into the underground is left open, decant will occur from these structures in the lower laying areas in the east. If the shafts and boreholes are properly closed, some seepage might still occur through cracks in the bedrock and will surface at local streams.

Please note that predicted seepage areas may vary from exact real-world areas due to sub-surface heterogeneity, however the general areas of predicted seepage should hold true.

The predicted decant areas are shown in **Figure 164**.

Impact on Wetlands

Wetland ecosystem impacts can be grouped into the following broad impact types:

- **Direct ecosystem modification or destruction / loss impacts:**
  - This impact refers to the direct physical destruction and/or modification of wetland vegetation communities, habitat and associated biota. Such impacts may be attributed to a range of activities including vegetation / habitat clearing (stripping / grubbing), earthworks (i.e. excavation and infilling) and deep flooding by impoundments.

- **Alteration of hydrological and geomorphological processes:**
  - This impact refers to all the indirect impacts resulting from human activities within the watercourse or catchment that alter hydrological and geomorphological processes i.e. rates of erosion and sedimentation. This includes activities that: (i) modify landcover characteristics that alter the quantity and pattern of catchment runoff and sediment inputs e.g. earthworks, surface hardening, plantations, etc.; (ii) activities that regulate, reduce or increase flows e.g. impoundment / dams, abstraction, return flows and decant flows; and activities alter wetland flow hydraulics e.g. establishment of drains, flow canalisation, flow constrictions and flow diversions.

- **Water pollution impacts:**
  - This impact refers to the alteration of the chemical and biological characteristics of soil and water within watercourses and the associated ecological impacts. In the context of this impact assessment, water quality is assessed in relation to changes to its fitness for use (e.g. for domestic, recreational or agricultural purposes) and ability to maintain the health of aquatic ecosystems. This impact includes a full spectrum of activities ranging from direct inputs (e.g. spillages / point source discharges) through to diffuse source inputs from landuse activities that affects the quality of water entering watercourses (e.g. hazardous substances handling, storage & transport; urban stormwater management; irrigation return flows and acid mine drainage).

- **Ecological connectivity and edge disturbance impacts:**
  - This impact refers to the alteration of local and regional ecological processes resulting from the transformation of land and disturbance within and/or surrounding a watercourse. Key ecological processes of relevance in this regard include ecological connectivity and edge effects edge effects that are impacted by habitat fragmentation, patch size reduction, increased alien invasive plant invasion, noise pollution, vibrations, light pollution, and the occurrence of barriers to propagule and animal movement.

Construction and operation of the venitilation shafts may impact the following in terms of terms of impacts to water resource management and ecosystem conservation:

- Direct loss or modification of habitat
- Alteration of hydrological and geomorphological processes (i.e. flow modification, erosion and sedimentation)
- Water pollution impacts
- Habitat fragmentation, connectivity and disturbance impacts

Construction and operation powerline route may impact the following in terms of impacts to water resource management, ecosystem conservation and species conservation:

- Direct loss or modification of habitat
- Alteration of hydrological and geomorphological processes (i.e. flow modification, erosion and sedimentation)
- Water pollution impacts
- Habitat fragmentation, connectivity and disturbance impacts

It is also important to note that the impact of powerlines needs to also consider the establishment of service roads and servitudes. If poorly planned, these activities can also have significant direct and indirect impacts on local wetlands and rivers.

14.5.14 Impact on Hydropedology

The impact on flow drivers of the wetland catchment is detailed below and is based on the following assumptions (status quo). A water balance on the wetland catchment is represented by (Table 122):

- Rainfall 100% of flow input;
- Evapotranspiration is 65 – 70% of rainfall (outflow);
- Runoff is 9% (outflow);
- Groundwater recharge is 3%6 (outflow); and
- 18 % of the water being left in or stored the unsaturated zone or interflow zone feeding the wetland.

The impact assessment is only valid for the proposed mining activity, based on the site visit historic and agricultural activities has impacted on the wetland systems. Current flow driver impacts from existing and neighbouring mines/agricultural activities was not part of the impact assessment.

14.5.14.1 Modelled scenarios

The following scenarios were modelled:

- Impacts from adits with no subsidence; and
- Impacts from adits with 50% subsidence. Although subsidence is unlikely due to depth of mining, this scenario was still evaluated as worst case.

14.5.14.1.1 Flow driver impact

Based on the water balance the impact on the wetland flow drivers is expected to be in the order of (see Table

122 to Table 124.

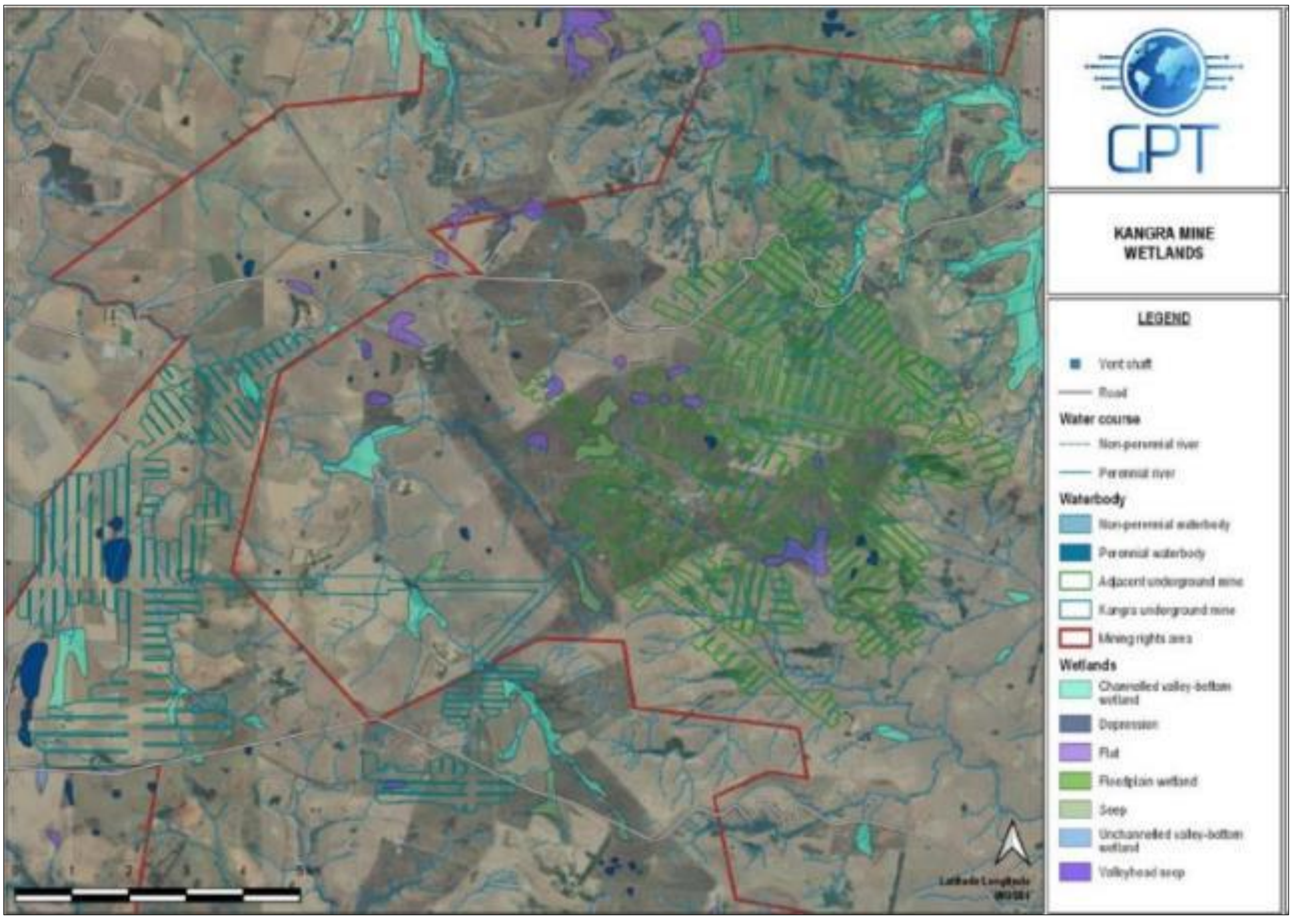

Figure 167: Kangra Wetlands Map

Table 122: Catchment water balance

Area Information				
Rainfall	0.680	m/annum	100	%
Evaporation	0.476	m/annum	70.0	%
Groundwater Recharge	0.020	m/annum	3.0	%
Mean Annual Runoff	0.068	m/annum	9.0	%
Water in wetland soils	0.122	m/annum	18.0	%

Table 123: Wetland flow driver impact only adits

Wetland System	**Pre-Development Total flows**	**Post Development Total Flow**	**Total loss of flow**	**Loss**
	m^3/a	**m^3/a**	**m^3/a**	**%**
Wetland system (west)	11274187.8	11233547.8	-40640.0	<1%

Wetland system (east)	5119438.1	5119438.1	0.0	<1%

Table 124: Wetland flow driver impact adits and 30-50% subsidence

Wetland System	Pre-Development Total flows	Post Development Total Flow	Total loss of flow	Loss
	m³/a	m³/a	m³/a	%
Wetland system (west)	11274187.8	7773866.515	-3500321.3	25 -35%
Wetland system (east)	5119438.1	4044356.1	-1075082.0	20 - 25%

The wetlands on site are a reflection of the behaviour of water, predominantly rainfall, and its behaviour following interception and infiltration into the soils. Thus, activities that affect the movement of water as well as its quality in the catchment areas supporting wetlands, translate into changes in the pans to which they are invariably linked. Expected impacts include:

- Change in hydrology;
- Change in water quality; and
- Loss of wetlands and the biodiversity supported by these wetlands.

Impacts that lead to a change in hydrology include all impacts that influence the quantity (e.g. increased or decreased run-off) and velocity (e.g. concentration of flows) of flows leaving the site.

Increased flows and increased velocity of flows could result in increased erosion within the receiving environment, while decreased flows could result in a decreased wetland functionality.

Impacts that lead to deteriorating water quality, together with the impacts that change the hydrology, are expected to be the most significant impacts on site. From a wetland perspective, mitigation measures and management plans should focus on these impacts and it will need to be clearly shown in the EIA and EMP how these impacts will be ameliorated to prevent significant deterioration of the quality and quantity of water discharged to downstream areas.

14.5.15 Impacts on Socio-Economic Environment

The discussion below considers and focuses on possible impact associated with the project.

In order to elaborate on the baseline social environment (social setting and characteristics of the study area, as well as the key economic activities) links are established with the public participation process ("PPP") done for the EIA phase of the Project. Minutes and the Comments and Responses Report (“CRR”) compiled for the PPP for EIA were scrutinized and provided valuable information. Issues that emerged during PPP and that were considered in the SIA were:

- Environmental degradation and impacts on ground and surface water resources;

- Land use and land capability impacts, impacts on farming activities and crops;
- Air and dust pollution and related health issues;
- Noise pollution;
- Potential damage to existing infrastructure;
- Sense of place;
- Visual impacts on residences;
- Impacts associated with blasting activities; and
- Traffic and intrusion impacts on the access roads.

Issue: Positive and negative socio-economic impacts

Mining projects have the potential to have positive and/or negative impacts on the following, regardless of the alternatives that are selected:

- employment for local communities;
- the local and national economy;
- social structures within communities;
- increased pressure on basic services;
- quality of life and health related issues; and
- livelihoods of businesses.

Socio-economic impacts would occur during all project phases. In the absence of mitigation that focuses on enhancing positive impacts and reducing negative impacts, the severity of unmitigated impacts would be medium for negative impacts and medium (positive) for positive impacts. The related unmitigated significance could be medium. Where the project planning takes into account and applies the necessary mitigation to avoid, minimises or remedy impacts in line with the mitigation hierarchy, the significance of potential negative impacts can be reduced and potential positive impacts can be increased.

14.5.15.1 Potential Impacts during Construction

14.5.15.1.1 Local economic impacts

Although limited and temporary in nature, possible positive impacts (short to medium-term) could manifest for the local economy during the construction period, which include:

- Impacts on local employment (limited);
- Local procurement of goods and services that benefits existing and new HDSA suppliers, SMMEs and othersmall businesses; and
- Possible economic spin-offs.

Employment

Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally available or potentially available, all new labour requirements will be sourced from within 40 km of the site (T4 MWP, 2020).

Impacts on HDSA suppliers, SMMEs and other small businesses as a result of local procurement of goods, services and consumables

Major components and engineering services during construction will likely be sourced from regional, national and possibly even international suppliers, with minimal impact on the local economy and HDSAs. Kangra Coal has however prioritised sourcing capital goods, services and consumables, wherever available, from HDSA empowered companies in line with the criteria and standards set by the Mining Charter (2018) and this practise will continue for the duration of the construction phase of the T4 Project.

General local economic impacts and economic spin-offs

An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; and so forth could occur.

The multiplier impact on the local economy due to local procurement of goods and services encourages further employment at downstream businesses, with positive impacts on disposable incomes and subsequently the cumulative demand in the economy would increase.

14.5.15.1.2 Impacts as a result of an influx of jobseekers

Impacts of an influx of jobseekers

No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.

Individual and family level impacts

Traffic related impacts

It is not anticipated that underground construction related activities will have significant traffic related impacts. Vehicles will make use of the existing transport routes to transport goods to and from the Kusipongo surface infrastructure area.

Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas:

- Dust on existing access roads and during the construction of new access roads on private properties, which impacts grazing and crops and settle on surface water;
- Degradation of gravel roads; and
- Potential road safety issues (reckless drivers).

Impacts associated with blasting

Blasting activities to establish Vent Shafts 1, 3 and 4 for the proposed underground mining of the T4 operations are planned. Ground vibration, air blast, fly rock and fumes are some of the aspects resulting from blasting operations. A Blast Impact Assessment was done to provide information, calculations, predictions, possible influences and mitigation of the blasting operations for the T4 Project (Blast Management & Consulting, September 2020). The evaluation of effects yielded by blasting operations was evaluated over an area as wide as a 1 500 m radius from where blasting will take place. The range of structures observed and considered in the evaluation ranged between informal housing, farmsteads, buildings, rural houses and roads. The following was concluded:

- Ground vibration:
  - Vent Shaft 1: Nearest sensitive receptors are rivers and cultivated fields. The nearest houses or settlements areas are significantly further away. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage.
  - Vent Shaft 3: Nearest sensitive receptors are rivers, dam, buildings and cultivated fields. Nearest houses or settlement areas are significantly further away. The planned maximum charge evaluated showed that ground vibration levels of 1,8 and 1,9 mm/s could be acceptable for the buildings in terms of potential structural damage.
  - Vent Shaft 4: Nearest sensitive receptor is the river and gravel road. Nearest houses or settlements areas are significantly further away. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage.
- Air blast:

The nearest settlement (building) is located 680 m from Vent Shaft 1, 317 m from the Vent Shaft 3 and 852 m from Vent Shaft 4 areas. Air blast is not expected to be of concern at these buildings.

- Fly rock:

The gravel road in the vicinity of Vent Shaft 4 (474 m) needs to be considered. Based on the ground vibration expected there is no concern for structural influences on this gravel road. Stop and Go will be required when blasting is done within 500 m from these roads. Road closure will be required with inspection for fly rock after blasting.

Security impacts

An increase in crime is often associated with construction activities when an area is ‘opened up’ for workers and an increase in movement occurs.

Intrusion impacts at the construction sites

Intrusion impacts refer to noise, visual pollution, aesthetic impacts and dust/air pollution during the construction phase as a result of emissions, movement of construction vehicles on site, earthworks and general construction activities. Although short-term in nature, the severity of the impact would increase if sensitive receptors are located close to the construction site.

- Powerline: Two (2) settlements within 500 m buffer; five (5) farmsteads/settlements within 500 to 1 000 m buffer.
- Vent Shaft 1: Two (2) farmsteads/settlements within 500 to 1 000 m buffer. (Cumulative impact, as these two (2) farmsteads are also impacted by the powerline buffer).
- Vent Shaft 3: Two (2) settlements/farmsteads within 500 m buffer; one (1) farmstead within the 500 to 1 000 m buffer.
- Vent Shaft 4: Three (3) settlements/homesteads within the 500 to 1 000 m buffer. (Cumulative impact, as these three settlements/homesteads are also impacted by Vent Shaft 3 buffer).

14.5.15.1.3 Health and safety impacts

Health and safety risks for workers

Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways:

- Construction related accidents due to structural safety of project infrastructure;
- Dust generation and air pollution causing respiratory diseases;
- High ambient noise levels caused by machinery and construction equipment, resulting in loss of hearing;
- Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and
- Possible increase in HIV/AIDS and other STDs due to prostitution activities and temporary sexual relationships with local women, unwanted pregnancies that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).

Community health and safety risks

- Surface construction activities at the three (3) downcast ventilation shafts, powerline and access roads and the transport of infrastructure components and workers could hold community health and safety risks if not managed adequately.
- Road accidents, subsequently placing pressure on local emergency, disaster management and health services (fire, ambulance, police services, etc.);
- Unauthorized access/trespassing at the construction sites, resulting in theft, public safety issues and accidents for humans and livestock;
- Fire hazards and the possibility of fires spreading and damaging surrounding farm land and infrastructure;
- Pollution problems, flies, rodents and pests and possible contamination of water sources (e.g. insufficient sanitation facilities, littering and refuse);
- High ambient noise levels that damage hearing (unlikely); and

- Dust generation and air pollution caused by gravel roads, construction activities and machinery resulting in respiratory diseases and negatively impacting crops and/or livestock.

14.5.15.2 Potential socio-economic impacts during the Operational phase

Positive and negative socio-economic impacts are anticipated to manifest for communities, landowners and the broader study area during the 22-year ROM. This section of the SEIA report aims to identify, analyse and rate the probable impacts before and after mitigation have been proposed.

The following variables are usually assessed for a SEIA:

- Population impacts, including population change (ethnic composition, size, etc.); inflow or outflow of temporary workers; presence of seasonal residents; and relocation of individuals and families.
- Socio-economic impacts, including job creation, enhanced economic equity; change in employment equity; impacts on women and possible economic and social vulnerabilities as a result of the Project; and changes in the industrial/commercial focus of the community.
- Individual and family level impacts, including disruption in daily living and movement patterns; disruption in social networks; introduction of new social classes and tourism and leisure impacts.
- Community/institutional arrangements, such as attitude formation; interest group activity; and alteration in size and structure of local government.
- Public health, safety and security impacts.
- Community infrastructure, including changes in community infrastructure; land acquisition and disposal; and effects on known cultural, historical and archaeological sites.
- Intrusion impacts, including noise pollution, light pollution, visual pollution, air pollution and malodour pollution.
- Only impacts relevant to this Project are analysed and should additional impacts emerge during the EIA's PPP those will be included in the final SEIA report.

14.5.15.2.1 Local economic impacts (positive)

Mining projects usually result in benefits for the local economy, which can be enhanced through the implementation of appropriate management measures and specifically by ensuring that locals benefit to the maximum.

Employment (Kangra Coal)

The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers; and (ii) the majority of the employees (60%) originate from the neighbouring Mkhondo LM. Only one (1) worker at the current Kangra Coal operations is from the DPKISLM (T4 SLP, 2017). It is recommended that any new recruits required be drawn from the DPKISLM (if available) to ensure that the local study area benefit economically from employment, albeit marginally.

Local procurement for HDSA's/SMMEs/local businesses

Kangra Coal has prioritised sourcing capital goods[60], services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.

The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses is currently unknown. However, at least 21% spent on SA manufactured goods (minimum of 70% of total mining goods) has to be produced by HDSAs; and at least 50% of the 80% of total spend on services sourced from SA based companies, has to be spent on services supplied by HDSAs (New Mining Charter, 2018).

Local economic spin-offs

During the operational phase, the local economy could benefit in the following ways:

- A possible increase in municipal rates and taxes, resulting in higher levels of rateable income;
- Local communities would benefit economically through the SLP programmes and LED projects (income generation, employment creation, etc.);
- New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine's procurement partners;
- Increasing spending power as a result of salaries and wages benefitting merchants, grocery stores and so forth in the local and regional areas. (Approximately R46 343 117 will be paid in salaries annually. and
- Multiplier impact on the local economy that increases the demand for goods and services, impacting both large suppliers and SMMEs, thereby encouraging employment, which will in turn affect disposable incomes and subsequently the cumulative demand in the economy will increase.
- The municipal IDP (2020/21) established that business and commercial activities are restricted to the larger towns and as such a substantial portion of the DPKISLM's income is being reinvested in the KZN Province and neighbouring local municipalities. The DPKISLM is therefore not anticipated to be the major recipient of potential economic spin-offs accrued through salaries and wages (economic spin-offs for general dealers, transport services, informal traders and so forth).

14.5.15.2.2 Local economic impacts (negative)

Loss of access to livelihoods

Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include:

- Potential to alter the topography due to surfaces that collapse over time;
- Reduction of groundwater supply due to the pumping of underground water;

[60] A total of R3,6 million per annum is budgeted for capital goods.

- Quality impacts on water resources and water that is not fit for human and livestock consumption as well as irrigation purposes; and
- Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.
- When mining projects are established future risks are carried by the landowners as mines do not usually provide guarantees that any negative impacts on natural resources, land uses and subsequently livelihoods can be ameliorated effectively.
- The farmers in the local study area contribute to food security in South Africa through large-scale crop and livestock production and employ a significant number of workers[61] with dependents[62] who will potentially lose their incomes if farming becomes unprofitable. The T4 Project has the potential to impact livelihoods of landowners, subsistence farmers and workers over the long-term, and potentially beyond the lifespan of this Project.

Potential job losses (Agricultural sector)

More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers[63] are employed on the farms affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices with financial impacts, subsequently resulting in fewer people being employed.

Impacts on land values

A variety of factors could impact land values of affected farms and those in the surrounds:

- The quality and availability of water for domestic and farming purposes;
- Negative impacts on topography (surfaces that collapse with time due to underground mining);
- Loss of soil characteristics (erosion and compaction);
- Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock;
- Visual impacts;
- Criminal activities (theft, vandalism, etc.);
- Occurrence of informal settlements, trespassing on private land, illegal grazing;
- Pre-requirements and restrictions set by the mining company in terms of new infrastructure developments on private properties;
- Fragmentation of agricultural land (subdivisions); and so forth.
- At present farms in the Wakkerstroom/Ermelo/Piet Retief vicinities are marketed between R20 000 and R30 000 per hectare (www.property24.com; www.homes.mitula.co.za). Land values of some of the farms in the primary area of impact could potentially be higher due to enhanced infrastructure

[61] Mr. Potgieter (180 permanent; 100 temporary workers); Mr. Möller (4 permanent); Mr. Greyling (120 permanent)
[62] Approximately 4 dependents per worker totalling 1 216 people that rely on salaries through the agricultural sector.
[63] Three of the landowners interviewed for purposes of this SEIA indicated that they employ 180, 120 and 4 permanent workers respectively.

developments and intensive production practices that also include crops and not only grazing as in the past.[64]

14.5.15.2.3 Population impacts

Influx of jobseekers/outside labour force

The existing workforce will be used for the T4 Project operations and an influx of outsiders/jobseekers is not anticipated. Negative impacts that would usually manifest for landowners and the local municipality (e.g. increase in the number and size of informal settlements; an increase in local unemployment and related social issues; an increase in crime levels, etc.) is therefore unlikely to occur.

Skills development, training and capacity building

The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. Refer to Section **Error! Reference source not found.**: **Error! Reference source not found.**, for a breakdown of the initiatives. Training will extend beyond the current workforce as a few bursaries will be offered to community members and a Community Skills Development and Capacity Development Programme is offered to SMMEs and small local businesses.

Financial provision of R67 163 041 has been made for HRD over the life-span of the T4 Project (R28 644 041 over the first five-year operational period) (T4 MWP, 2020).

Community development / Poverty alleviation projects

Two community projects focusing on infrastructure and income generation have been identified for the LED commitment of the T4 Project, i.e.:

- Agricultural support project (Donkerhoek): fencing, seeds, fertilizer, harvesting; and
- Infrastructure project: Construction of a Community Centre and provision of chairs and tables.

An investment of R7 000 000 over the first five years is planned. (T4 MWP, 2020)

Housing and living conditions

Although Kangra Coal does not provide housing, housing allowances are provided to employees to purchase homes. The majority of the employees reside within the Mkhondo LM where the surface infrastructure of the Project is located.

Impacts of failed processes for consultation and negotiations with the Community / institutional arrangements

[64] Land values are estimated as high as R50 000 per hectare. Consultation with Mr. Greyling, 17 February 2021.

Landowners and communities' experience with mines, including Kangra Coal, is not limited to the T4 Project as some of their farms (in the study area and beyond) are already impacted by mining operations. Issues documented in the Kusipongo EIA Report (January 2020) relate to water scarcity and the believe that water supply decreased since Kangra Mine began mining at the West Shaft; structural damages due to blasting; loss in grazing; impacts of dust on agriculture; impacts on water resources; and so forth. Other issues raised and documented during the public participation process were that the communities do not trust the mine and that inadequate consultation is done (Final Kusipongo EIA, January 2020).

Subsequent to the above, the Mine committed to:

- Investigate water supply options for water delivery to communities;
- Hold meetings to discuss community benefits and use existing forums to ensure that there is consensus about community needs (Final Kusipongo EIA, January 2020).
- The status of the above commitments are unknown. Landowners in the study area have however obtained legal representation and subsequently processes for the Kangra T4 Project's EIA were opposed and delayed (e.g. Specialists were initially not granted permission to access private land).
- During consultation for SEIA purposes, landowners indicated their readiness to oppose the Project in court should the Mine not be receptive to their needs and consider requests that would reduce the long-term financial and land use risks that landowners would carry as a result of mining.
- Failed processes for consultation and negotiations could then result in:
    - Disruptions for the Project, temporary mine closures and loss of income;
    - Financial implications for the mine, host communities and private landowners should legal resources be pursued.

Negative community mobilisation

The proposed T4 Project is located in Ward 10 of the DPKISLM, whereas Maquasa and Kusipongo and the mine surface infrastructure, which will also be used for T4 is located in the Mkhondo LM. About 60% of the current labour force originates from Mkhondo and the remaining employees from the broader Mpumalanga and KZN provinces. Only one (1) worker is from the DPKISLM.65

As discussed previously in this report, apart from SLP/LED commitments, the local study area (DPSIKLM and specifically Ward 10) benefits minimally from the T4 Project economically. Local communities and CPA members may therefore feel excluded from the processes and benefits, even though they are parties that could potentially, over the medium to long-term, carry the risks associated with underground mining.

To avoid conflict and negative community mobilisation it is recommended that any future recruits be sourced from the DPKISLM/Ward 10 and SLP/LED commitments (training, bursaries, community projects, etc.) for the T4 Project should target these locals.

Equity of minority groups

Employment equity of HDSAs / Women in Mining ("WIM")

[65] Information obtained from the T4 Project SLP (2017) and the data could therefore be outdated.

Under the MPRDA, an HDI/HDSA is defined as "any person, category of persons or community, disadvantaged by unfair discrimination before the constitution took effect". The Black population, youth, women and the disabled generally fall under the category of HDSAs.

In South Africa, despite the perception that women are more reliable and less likely to misuse drugs and alcohol while in employment, it is very rare that females are hired for more physically challenging jobs. Government has adopted several strategies aimed at opening up the mining sector for women and other PDI's as part of its economic empowerment policy and in line with the Employment Equity Act No. 55 of 1998. In addition, every mining company must achieve a minimum of 40% HDSA demographic representation at Executive, Senior, Middle and Junior Management level and Core and Critical skills by 2025.

The EE Plan for Kangra Coal and T4 is reflective of the requirement to achieve the 40% minimum requirement of HDSA in management by 2025 (T4 SLP, 2017). Also, the current profile of WIM and women at the mine at Kangra Coal is above the expected number. Currently the mine is complying above the 10% required with a total percentage of 16% according to the Department of Labour calculation and 14% in terms of DMRE calculations.

14.5.15.2.4 <u>Land use impacts</u>

<u>Impacts on agriculture</u>

The protection of food security is a national priority and keeping commercial farmers in the business of growing food is key to a nation's ability to feed itself. However, numerous obstacles influence farmers to abandon farming, such as tremulous markets, farm murders and high levels of crime, the prospect of climate change, uncertainty with inheritance and land being claimed for redistribution purposes, murmurs of nationalism of the land and so forth. Farming in itself is a tough business that requires commitment to be able to face the risks involved. Even for subsistence farmers, the prospects of making a living off the land has decreased, causing many (commercial and subsistence farmers) to leave the trade and move to the cities (www.southafrica.co.za/genertional-farming).

Regardless of the above mentioned challenges and risks, the study area has grown into a commercial farming "hub" producing high-value commodities including soya beans, mutton, wool and dairy. Agriculture is the DPKISLM's largest economic sector and one of the biggest employment contributors (refer Section 10.17.3.11). Irrigation and water for livestock and domestic purposes take place from groundwater (boreholes, fountains) and surface water resources (impoundments such as farm dams).

- The following impacts could have an adverse effect on agricultural production: (refer to the Specialist Groundwater and Surface Water Assessments (February 2021) for more detail in this regard)
- Drawdown from the mine is expected to influence water levels of privately owned boreholes directly above the underground and is expected to be high;
- It is likely that these boreholes will experience a loss in specific yield due to de-pressurization during mining dewatering;
- Contamination from the proposed underground mine is not expected have any impacts as the

groundwater flow will be towards the proposed underground mine;

- Coal has the potential to generate Acid Mine Drainage;
- Impacts on surface water structures are not likely as the mine lies underneath a mountainous area and there are no prominent streams or rivers that cross the area where groundwater drawdown is predicted;
- Since the Project consists of underground mining with limited surface infrastructure, any unwanted impacts on groundwater pollution can easily be managed; and
- Impacts on wetlands that include change in hydrology and impacts that lead to a deterioration of water quality are expected to be most significant impacts on site. From a wetland perspective, mitigation measures and management plans should focus on these impacts and it will need to be clearly shown in the EIA and EMP how these impacts will be ameliorated to prevent significant deterioration of the quality and quantity of water discharged to downstream areas.
- Other factors such as possible changes in soil characteristics, subsidence and intrusion impacts (dust, stock theft, etc.) could also impact farming practices. It is thus possible that impacts associated with mining activities could over time result in lowered production and unfeasible farming operations.

14.5.15.2.5 Individual and family level impacts

Impacts on human rights

Historically mining has caused significant environmental and social harm in South Africa. It depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment. These violations often harm the poorest and most vulnerable communities the greatest because they are frequently located close to mines (SAHRC, 2016). Landowners and communities usually carry the risks associated with mining operations, which then often lead to impacts on livelihoods and decline in food security.

Various factors could further exacerbated negative impacts on human rights:

- Government’s inaction to respond to environmental and social violations and their failure to monitor compliance with lease and compensation agreements;
- Lack of transparency and accountability in the mining sector;
- Communities and landowners are also often not meaningfully consulted during the mining approval process, resulting in uninformed and poor government; and industry decisions that do not reflect community perspectives or have their support;
- Circumstances in different communities necessitate different consultation procedures, which are not always considered and often disregarded; and
- The mining laws and regulations also allow mine operators to make decisions about the implementation, monitoring or amendment of SLPs without consulting affected communities. SLP commitments can thus be weakened without consulting the beneficiaries.
- Without access to information and meaningful consultation, communities/landowners cannot defend

their rights threatened by mines or exercise their rights to participate in government and have effective remedies for rights violations. This allows the potential for abuse of power and non-compliance.

Security impacts

Crime levels are currently relatively under control, but stock theft remains an issue. Due to the SAPS's lack of cooperation, landowners have been doing their own investigations and evidence is then handed to the police to ensure prosecution. To curb stock theft, the following is implemented:[66]

- Sheep are fitted with collar trackers;
- Livestock is counted daily; and
- Farms are patrolled by the farmers.

An increase in criminal activities is usually associated with an influx of people, an escalation in unemployment and an increase in movement patterns.

Impacts on the sense of place

'Sense of place' refers to the way that the communities/landowners experience their social and biophysical environments and to what extent this perception will alter as a result of the Project. The majority of the stakeholders in the project area (landowners, communities and workers) have been on the farms for decades and/or generations and rely on farming enterprises/subsistence farming for their livelihoods. The area has a rural/traditional landscape with relatively low levels of crime.[67]

Visual impacts (ventilation shafts that protrude above ground level, the powerline); an increase in traffic and movement on farm roads; safety and security issues; and pollution of air, water and other natural resources could impact sense of place.

Traffic and associated impacts

- The paved Heyshope road links the mine complex with the N2 national road and no main access roads need to be constructed. Movement of trucks and associated mine vehicles (workers etc.) on national and district roads are not anticipated to increase.
- Local access roads/servitudes that link existing gravel roads to the powerline and vent shafts will have to be negotiated with landowners and where required established for maintenance purposes.
- An increase in traffic may result in the following impacts:
- Degradation of road surfaces;
- Safety on roads due to speeding; and
- Dust that settles on crops, livestock, surface water and implements with negative impacts for agriculture.
- Intrusion impacts
- Impact description:
- Intrusion impacts that could impact landowner and communities' quality of life are dust (air pollution) and visual impacts. These would be limited to gravel roads and site specific in the vicinity of the new

[66] Messrs Potgieter and Greyling. Consultation done on 17 February 2021.
[67] Consultation with various landowners, dated 17 February 2021.

powerline and vent shafts.

- Powerline: Two (2) settlements within 500 m buffer; five (5) farmsteads/settlements within 500 to 1 000 m buffer.
- Vent Shaft 1: Two (2) farmsteads/settlements within 500 to 1 000 m buffer. (Cumulative impact, as these two (2) farmsteads are also impacted by the powerline buffer)
- Vent Shaft 3: Two (2) settlements/farmsteads within 500 m buffer; one (1) farmstead within the 500 to 1 000 m buffer.
- Vent Shaft 4: Three (3) settlements/homesteads within the 500 to 1 000 m buffer. (Cumulative impact, as these three settlements/homesteads are also impacted by Vent Shaft 3 buffer)

14.5.15.2.6 Impacts on Community infrastructure

Impacts on cultural and archaeological sites

A Phase 1 Archaeological Impact Assessment ("AIA") was compiled during February 2021 (Tobias Coetzee). It was established that thirteen (13) sites are likely to be impacted by the proposed powerline, while 22 sites might potentially be impacted should vibration or subsistence be caused by the proposed underground mining activities. Sites identified include historical building ruins, intact buildings, stone-walled enclosures and cemeteries. The possibility exists that unmarked burials might be associated with stone-walled enclosures.

Developing the areas associated with the proposed ventilation shafts are not at risk of damaging culturally significant material as these surface areas appear vacant of heritage sites.

14.5.15.2.7 Health and safety impacts

Health and safety risks for workers

Occupational health and safety guidelines aim to promote and maintain the highest degree of physical, mental and social well-being for workers; the prevention of departures from health caused by working conditions; the protection in their environment from health risks; and the placing and maintenance of workers in an occupational environment adapted to his/her physiological and psychological capabilities. Possible health and safety risks for workers at the Project would mainly revolve around respiratory diseases; exposure to machinery and high noise levels underground; and possible accidents on site that could result in death.

Community health and safety risks

Community safety is currently affected by the heavy machinery deployed at the existing Kangra Mine and trucks transporting coal from the Surface Infrastructure Area to the rail siding for the export markets. This will continue during the life of the T4 Project.

Other risks could include veld fires; possible contamination of ground and surface water resources impacting human and livestock heath; public safety issues at the vent shafts if exposed/uncovered; and electrocution at the powerline infrastructure.

14.5.15.3 Potential socio-economic impacts during Closure

Decommissioning would entail the rehabilitation of the access roads constructed to obtain access to the ventilation shafts and powerline; and the rehabilitation of the infrastructure. Socio-economic impacts associated with decommissioning and closure are expected to be similar to those experienced during the construction phase and can usually be mitigated successfully and include:

- Traffic and intrusion impacts;
- Potential security issues;
- Impacts on road infrastructure; and
- Health and Safety impacts.
- Redeployment and transfer of the 321 workers (or a portion of the workers) to other operations and the retrenchment of some of the workers are expected. To ameliorate the social and economic impacts on individuals and the economy the mine has made financial provision for mine closure and are implementing a number of strategies and measures such as training programmes (self-employment training, re-employment programme, portable skills development) and the future forum, which are represented by the Unions. Refer to Section 2.7 for more detail.
- At this stage detailed assessment of the socio-economic impacts likely to manifest during the decommissioning of the mine would be subject to a large margin of error, since the characteristics of the receiving environment at such time is unknown.

14.5.16 Cumulative Impacts

A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

The anticipated impacts resulting from the Kangra T4 Coal Mine Project could potentially result in cumulative effects such as:

- Increased ecological impacts to the environment already present and degraded nature of the surrounding landscape,
- Additional risk of soil, air and water pollution due to all the combined coal mining activities and agricultural activities of the region;

- Any additional surface infrastructure development in support of the Kangra T4 project, will result in additional areas where exposure to soil erosion through wind and water movement can occur, increase the risk of soil pollution, will and reduce the available high potential agricultural soil in the area

Regarding the hydrological environment, cumulative impacts in association with adjacent mines in the region will be mitigated by the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted.

14.6 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The Environmental Impact Assessment (EIA) 2014 Regulations [as amended] promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), requires that all identified potential impacts associated with the project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations (2014) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

The impact assessment methodology used to determine the significance of impacts prior and after mitigation is presented below.

Extent of the impact

The EXTENT of an impact is the physical extent/area of impact or influence.

Score	Extent	Description
1	Footprint	The impacted area extends only as far as the actual footprint of the activity.
2	Site	The impact will affect the entire or substantial portion of the site/property.
3	Local	The impact could affect the area including neighbouring properties and transport routes.
4	Region	Impact could be widespread with regional implication.
5	National	Impact could have a widespread national level implication.

Duration of the impact

The DURATION of an impact is the expected period of time the impact will have an effect.

Score	Duration	Description
1	Short term	The impact is quickly reversible within a period of less than 2 years, limited to the construction phase, or immediate upon the commencem of floods.
2	Short to medium term	The impact will have a short term lifespan (2–5 years).
3	Medium term	The impact will have a medium term lifespan (6 – 10 years)
4	Long term	The impact will have a medium term lifespan (10 – 25 years)
5	Permanent	The impact will be permanent beyond the lifespan of the development

Intensity of the impact

The INTENSITY of an impact is the expected amplitude of the impact.

Score	Intensity	Description
1	Minor	The activity will only have a minor impact on the affected environment in suc a way that the natural processes or functions are not affected.
2	Low	The activity will have a low impact on the affected environment.
3	Medium	The activity will have a medium impact on the affected environment, bı function and process continue, albeit in a modified way.
4	High	The activity will have a high impact on the affected environment which ma be disturbed to the extent where it temporarily or permanently ceases.
5	Very High	The activity will have a very high impact on the affected environment whic may be disturbed to the extent where it temporarily or permanently ceases

Reversibility of the impact

The REVERSIBILITY of an impact is the severity of the impact on the ecosystem structure

Score	Reversibility	Description
1	Completely reversible	The impact is reversible without any mitigation measures and manageme measures
2	Nearly completely reversible	The impact is reversible without any significant mitigation ar management measures. Some time and resources required.
3	Partly reversible	The impact is only reversible with the implantation of mitigation ar management measures. Substantial time and resources required.
4	Nearly irreversible	The impact is can only marginally be reversed with the implantation significant mitigation and management measures. Significant time ar resources required to ensure impact is on a controllable level.
5	Irreversible	The impact is irreversible.

Probability of the impact

The PROBABILITY of an impact is the severity of the impact on the ecosystem structure

Score	Probability	Description
1	Improbable	The possibility of the impact occurring is highly improbable (less than 5% of impact occurring).
2	Low	The possibility of the impact occurring is very low, due either to the circumstances, design or experience (5% to 30% of impact occurring).
3	Medium	There is a possibility that the impact will occur to the extent that provision must be made therefore (30% to 60% of impact occurring).
4	High	There is a high possibility that the impact will occur to the extent that provision must be made therefore (60% to 90% of impact occurring).
5	Definite	The impact will definitely take place regardless of any prevention plans, and there can only be relied on migratory actions or contingency plans to contain the effect (90% to 100% of impact occurring).

Calculation of Impacts – Significance Rating of Impact

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the Irreplaceability (Magnitude, Extent, Duration, and Intensity) multiplied by the Probability of the impact. The significance of an impact is rated according the scores a presented below:

Equation 1:

Significance = Irreplaceability (Reversibility + Intensity + Duration + Extent) X Probability

Significance Rating

Score	Significance	Colour Code
1 to 20	Very low	
21 to 40	Low	
41 to 60	Medium	
61 to 80	High	
81 to 100	Very high	

Mitigation Efficiency

Degree to which the impact can be mitigated: *The effect of mitigation measures on the impact and its degree of effectiveness:*

Equation 2:

Significance Rating = Significance x Mitigation Efficiency

High	0,2
Medium to High	0,4
Medium	0,6
Low to Medium	0,8
Low	1,0

Confidence rating: *Level of certainty of the impact occurring*.

- **Certain**
- **Sure**
- **Unsure**

Cumulative impacts: *The effect the combination of past, present and "reasonably foreseeable" future actions have on aspects.*

- Very Low cumulative impact
- Low cumulative impact
- Medium cumulative impact
- High cumulative impact

15 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS

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

15.1 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).

Please refer to discussions on identified impacts as well as to Table 125 and relevant Management Objectives and Mitigation types for each aspect is provided within Table 126. Mitigation measures are prescribed within the Environmental Management Programme (EMPR).

Table 125: Impact Assessment Table (Complete with Ratings used to obtain Significance)

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Socio- Economic																			
No-go option	Reduced period of development and upliftment of the surrounding communities and infrastructure.	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Medium	45	N/A	1	Medium	45
No-Go Option	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Medium	45	N/A	1	Medium	45
No-Go Option	**Positive:** No additional negative impacts on I&APs or surrounding land users	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Positive Medium	45	N/A	1	Positive Medium	45
Natural Environment																			
No-Go Option	**Positive:** No additional negative impacts on the environment	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Positive Medium	45	N/A	1	Positive Medium	45

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Hydrogeology																			
Underground mining	Underground mining may result in spread of pollution	Operational	Footprint	1	Long term	4	Low	2	Partly reversible	3	10	High	4	Medium	40	High	0,2	Very Low	8
Underground mining	Dewatering due to underground mining may lower water table	Operational	Region	4	Long term	4	High	4	Nearly Irreversible	4	16	Definite	5	Very High	80	Medium to high	0,4	Low	32
Closure of underground mine	Spread of pollution	Closure	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Definite	5	High	65	Medium to High	0,4	Low	26
Closure of underground mine	Decanting	Closure	Site	2	Permanent	5	Low	2	Irreversible	5	14	Definite	5	High	70	Medium	0,6	Medium	42
Hydrology																			
Construction of overhead powerlines and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Construction	Site	2	Short to medium term	2	Medium	3	Nearly Irreversible	4	11	Medium	3	Low	33	Medium to High	0,4	Very low	13,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of overhead powerlines and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Operational	Site	2	Short to medium term	2	Medium	3	Partly reversible	3	10	High	5	Medium	50	Medium to High	0,4	Very low	20
Operation of overhead powerlines and ventilation shafts	Surface water quantity - Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.	Operational	Site	2	Long term	4	Low	2	Partly reversible	3	11	Low	2	Low	22	Medium to High	0,4	Very low	8,8
Removal of powerlines and ventilation shaft and any other infrastructure	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality.	Closure	Site	2	Short to medium term	2	Minor	1	Nearly completely reversible	2	7	Low	2	Very low	14	Medium to High	0,4	Very low	5,6
Wetlands																			
Construction of powerlines	Accidental direct impacts to wetland vegetation by heavy machinery during construction. Wetland fauna fatalities.	Construction	Local	3	Long term	4	High	4	Partly reversible	3	14	Medium	4	Medium	56	Medium to High	0,4	Low	22,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of powerlines	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during construction.	Construction	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Construction of powerlines	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills	Construction	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Construction of powerlines	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance. Wetland avi-fauna fatalities.	Operation	Local	3	Long term	4	High	4	Partly reversible	3	14	High	4	Medium	56	Medium to High	0,4	Low	22,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of powerlines	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during repair and maintenance.	Operation	Local	3	Long term	4	High	4	Partly reversible	3	14	Medium	3	Low	42	Medium	0,6	Low	25,2
Operation of powerlines	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.	Operation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Operation of powerlines	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.	Closure	Local	3	Long term	4	High	4	Partly reversible	3	14	Definite	4	Medium	56	Medium to High	0,4	Low	22,4
Decommissioning powerline	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during decommissioning.	Closure	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Definite	5	Medium	65	Medium	0,6	Low	39

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Decommissioning powerline	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.	Closure	Local	3	Short term	1	Low	2	Partly reversible	3	9	Medium	3	Low	27	Medium	0,6	Low	16,2
Construction of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during construction.	Construction	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	Medium	3	Low	33	Medium to High	0,4	Very low	13,2
Construction of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during construction.	Construction	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium to High	0,4	Very low	14,4
Construction of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills.	Construction	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium to High	0,4	Very low	14,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.	Operation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Operation of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during repair and maintenance. Reduced water inputs to the wetlands fed by interflows due to interflow interception.	Operation	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Medium	3	Low	39	Medium	0,6	Low	23,4
Operation of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.	Operation	Site	2	Long term	4	Low	2	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very low	19,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Decommissioning ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.	Closure	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Decommissioning ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during decommissioning.	Closure	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Medium	3	Low	39	Medium to High	0,4	Very low	15,6
Decommissioning ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.	Closure	Site	2	Long term	4	Low	2	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very low	19,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence.	Operation	Local	3	Long term	4	High	4	Nearly irreversible	4	15	High	4	Medium	60	Medium	0,6	Low	36
Decommissioning of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence. Erosion and/or sedimentation of	Closure	Local	3	Long term	4	High	4	Nearly irreversible	4	15	High	4	Medium	60	Medium	0,6	Low	36

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	wetlands as a result of mine decant discharges once the water levels are reinstated.																		
Decommissioning of underground mining	Wetland pollution due to mine decant water once the water levels are reinstated.	Closure	Local	3	Long term	4	High	4	Nearly irreversible	4	15	High	4	Medium	60	Medium	0,6	Low	36
Noise																			
Construction of overhead powerlines and ventilation shafts	Construction of overhead powerlines and ventilation shafts will result in noise due to the use of vehicles and machinery used for construction	Construction	Footprint	1	Short term	1	Very High	5	Nearly completely reversible	2	9	High	4	Low	36	Medium	0,6	Low	21,6
Operation of powerline	Nuisance and health risks caused to close by receptors as identified, such as R8, R12 and R18	Operational and Closure	Footprint	1	Long term	4	Low	1	Nearly completely	2	8	Medium	3	Low	24	Medium to High	0,4	Very Low	9,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of ventilation shaft	Nuisance and health risks caused to close by receptors as identified, such as R6, R7, R8, R9, R14 and R15	Operational and Closure	Site	2	Long term	4	Very High	5	Nearly completely reversible	2	13	High	4	Medium	52	Medium	0,6	Low	31,2
Geology and Topography																			
Underground mining	Subsidence of surface due to failure of pillars	Closure	Footprint	1	Permanent	5	Medium	3	Irreversible	5	14	High	4	Medium	56	Medium	0,6	Low	33,6
Ecology																			
Construction of ventilation shafts and powerlines	The site has sections of habitat that has been transformed to an extent, specifically Ventilation shafts 3 & 4 footprint areas, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of	Construction and Operational	Regional	4	Long term	4	Medium	3	Nearly completely reversible	2	13	High	4	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	vegetation habitat which in turn will also impact on the animals that use the area as habitat. From the site visit, the areas where the Ventilation shafts and powerline will occur is the areas that will be impacted directly. No/limited direct impacts on the larger Mining Right are expected and therefore the impacts are rather localised and possible to ensure it remains well-managed. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area																		
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of floral species of conservation concern. Three (3) species listed by POSA for the	Construction and Operational	Local	3	Short to medium term	2	Medium	3	Nearly Irreversible	4	12	Low	2	Low	24	Medium	0,6	Very Low	14,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	area are classified as species of conservation concern (SCC), and have a moderate likelihood of occurrence on the project footprint. None of these species were sighted during the field assessment on the relevant footprints, but confirmation should be repeated before the onset of development since construction may take many years to start. The same will be applicable for the pylon placement during construction of the powerline. Sensitive features should be avoided best possible.																		
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of faunal species of conservation concern. The Blue crane calls heard during the field assessment could not be visually verified	Construction and Operational	Local	3	Short term	2	Medium	3	Nearly Irreversible	4	12	Definite	5	Medium to High	60	Medium to high	0,4	Low	24

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	and therefore, although it is certain that it has been correctly identified, the conclusion can be made that although likely utilising the regional area, these birds are likely focussed on the grassland patches and sections, and not specifically on the footprints itself (although may randomly occur). The area falls within an Important Birding Area, and hence other sensitive species may also occur in the area although not directly recorded during the field assessment. However, the same conclusion is likely to be made regarding the nature and extent of impacts to these species, as the mine is an underground mine with limited surface infrastructure.																		

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of powerlines and ventilation shafts	The onset of activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The natural grassland areas and wetland/aquatic associated terrain will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area. Impacts may lead to the increase of invasive species or introduction of such from the outside areas and may change the vegetation structure	Construction and Operational	Local	3	Long term	4	Medium	3	Nearly completely reversable	2	12	High	4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	and composition of this unit. 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																		
Construction of powerlines and ventilation shafts	Impacts on the water resources may occur. This may be due to pollutants entering the water resource, specifically petroleum related waste products, decant points, acid mine drainage (future and post closure), direct runoff from dirty footprints entering the surround water resources or could possibly also spread from the road access points, during construction or during operational phase		Local	3	Long term	5	Medi um	3	Nearly completely reversible	2	13	High	4	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	from sources such as the parking zones, or other vehicle related zones																		
Construction of powerlines and ventilation shafts	Faunal species could also be easily impacted by the powerline and extensive management measures have been prescribed to mitigate this based on electrocution risks for birds specifically.	Construction and Operational	Local	3	Long term	4	Medium	3	Nearly completely reversible	2	12	Definite	5	Medium	60	Medium	0,6	Low	36
Removal of powerlines and ventilation shaft and any other infrastructure	Rehabilitation could be ineffective if measures are not appropriately complied to. 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	Rehabilitation and Closure	Site	2	Long term	4	Low	2	Partly reversible	3	11	Low	2	Low	22	Medium	0,6	Very Low	13,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	such as wilderness, grazing and agriculture.																		
Aquatic Ecology																			
Site preparation and other construction impacts in proximity of water courses and wetland seeps	Loss of Biodiversity and Ecological function - Riparian zone impacts	Construction and Operational	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Construction and operation of ventilation shafts and powerlines and underground mining	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning	Construction and Operational	Regional	4	Long term	4	Medium	3	Partly reversible	3	14	High	4	Medium	56	Medium to high	0,4	Low	22,4
Construction and operation of ventilation shafts and powerlines and underground mining	Alteration of drainage patterns leading to decrease and changes in water quantity and availability in the Ecological Reserve	Construction and Operational	Regional	4	Long term	4	Medium	3	Partly reversible	3	14	High	4	Medium	56	Medium to high	0,4	Low	22,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilation shafts and powerlines and underground mining	Deterioration of water quality in the Klein-Vaal river due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring which will result in water quality impacts - Nutrient increases	Construction and Operational	Local	3	Long term	4	Low	1	Partly reversible	3	11	Medium	4	Medium	44	Medium to high	0,4	Very low	17,6
Construction and operation of ventilation shafts and powerlines	Sedimentation of water resources will result to nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Construction and Operational	Local	3	Short to mediu m term	2	Medi um	3	Nearly irreversibl e	4	12	Low	2	Medium	24	Medium to high	0,4	Very low	9,6
Construction and operation of ventilation shafts and powerlines and	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).	Construction and Operational	Local	3	Long term	4	Medi um	3	Nearly irreversibl e	3	13	High	4	Medium	52	Medium to high	0,4	Low	20,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
underground mining																			
Construction and operation of ventilation shafts and powerlines and underground mining	Water Quantity impacts by diverting and reducing water available or reaching applicable areas to feed Ecological Reserves to sustain Aquatic diversity due to Impacts to Streamflow Regulation and possible diversions or impedances	Construction and Operational	Local	3	Long term	4	Medium	3	Nearly irreversible	3	13	High	4	Medium	52	Medium to high	0,4	Low	20,8
Heritage and Palaeontology																			
Construction and operation of ventilation shafts	The identified heritage sites are considered to be outside of the boundary of the ventilation shafts and the impact of the construction and operation will be low	Construction and Operational	Site	2	Short term	1	Low	2	Nearly completely	2	7	Low	2	Very Low	14	High	0,2	Very Low	2,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of powerline route A	The proposed powerline route A will impact on site K57, K59, K60 -K63, K68 and K71	Construction and Operational	Site	2	Long term	4	High	4	Nearly completely	4	14	Definite	5	High	70	Medium	0,6	Medium	42
Construction and operation of powerline route B	The proposed powerline route B will impact on site K50 and K51	Construction and Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Definite	5	Medium	60	Medium	0,6	Low	36
Underground mining	Blasting impacts and subsidence may impact on heritage sites K01 - K06, K11-K13, K16 - K20, K23, K24 and K69	Operational	Local	3	Long term	4	Low	2	Nearly completely reversible	2	11	Medium	4	Medium	44	Medium	0,6	Low	26,4
Blasting																			
Construction of ventilation shaft 1 and 2	Blasting may result in ground vibrations, air blast and fly rock,	Constrution	Site	2	Short term	1	Low	2	Partly reversible	3	8	Low	2	Very low	16	Medium to high	0,4	Very low	6,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of ventilation shaft 3	Blasting may result in ground vibrations, air blast and fly rock and may impact on buildings, cultivated lands and a gravel road in the vicinity of this ventilation shaft site.	Construction	Site	2	Short term	1	High	4	Nearly Irreversible	4	11	High	4	Medium	44	Medium to high	0,4	Very low	17,6
Agriculture and Land Capability																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of powerline and ventilation shafts	All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases	Construction and operation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	construction	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4		48				0
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	Construction and Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium to high	0,4	Very low	19,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of powerline and ventilation shafts	The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.	Construction and Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium to high	0,4	Very low	19,2
Construction and operation of powerline and ventilation shafts	The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue	Construction and Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium to high	0,4	Very Low	19,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction	Closure		2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium to high	0,4	Very Low	19,2
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil pollution	Closure		2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium to high	0,4	Very Low	19,2
Construction and operation of ventilation shafts and powerline route	The construction and operation of the ventilation shaft and powerline route may result in loss of land capability	Construction and Operational	Site	2	Long term	4	Medium	3	Partly reversible	4	13	High	4	Medium	52	Medium	0,6	Low	31,2
Socio-Economic																			
Construction and operation of ventilation shafts and powerline route	Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally	Construction and Operational	Local	3	Short term	1	Low	2	Partly reversible	4	10	Low	2	Low Positive	20	NA	1	Low Positive	20

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	available or potentially available, all new labour requirements will be sourced from within 40 km of the site																		
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses for construction is currently unknown and a standard environmental principle of 'low' is assigned	Construction	Local	2	Long term	4	Low	2	Nearly completely	2	10	High	4	Medium Positive	40	NA	1	Medium Positive	40

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilation shafts and powerline route and underground mining	**<u>Positive:</u>** An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; etc. could have (limited) local economic spin-offs	Construction	Local	2	Long term	4	Low	2	Nearly completely	2	10	HIgh	4	Medium <u>Positive</u>	40	NA	1	Medium <u>Positive</u>	40
Construction and operation of ventilation shafts and powerline route and underground mining	No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.	Construction	Local	2		2	Low	2	Partly reversible	2	8	Medium	3	Low	24	Medium	0,6	Very Low	14,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilation shafts and powerline route and underground mining	Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas: Dust on existing access roads and during the construction of new access roads on private properties, which impacts grazing and crops and settle on surface water; Degradation of gravel roads; Potential road safety issues (reckless drivers).	Construction	Local	2		2	Low	3	Partly reversible	4	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Construction and operation of ventilation shafts and powerline route and underground mining	An increase in crime is often associated with construction activities when an area is 'opened up' for workers and an increase in movement occurs.	Construction and Operational	Local	2		2		3	Partly reversible	2	9	Medium	4	Low	36	Medium	0,6	Low	21,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilation shafts and powerline route and underground mining	Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways: Construction related accidents due to structural safety of project infrastructure; Dust generation and air pollution causing respiratory diseases; High ambient noise levels caused by machinery and construction equipment, resulting in loss of hearing; Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and Possible increase in HIV/AIDS and other STDs due to prostitution activities	Construction	Local	2	Short to medium term	2	Low	2	Nearly completely reversible	2	8	Low	2	Very Low	16	Medium	0,6	Very Low	9,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	and temporary sexual relationships with local women, unwanted pregnancies that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).																		
Operation of underground mining	The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers	Operational	Local	2	Short to medium term	2	Low	2	Nearly completely reversible	2	8	Low	2	Very Low Positive	16	NA	1	Very Low Positive	16

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	**Positive:** Kangra Coal has prioritised sourcing capital goods, services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.	Operational	Local	2	Short to medium term	2	Medium	3	Partly reversible	4	11	High	4	Medium Positive	44	NA	1	Medium Positive	44

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	During the operational phase, the local economy could benefit in the following ways: A possible increase in municipal rates and taxes, resulting in higher levels of rateable income; Local communities would benefit economically through the SLP programmes and LED projects; New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine's procurement partners,	Operational	Local	2	Short to medium term	2	Medium	3	Partly reversible	4	11	High	4	Medium Positive	44	NA	1	Medium Positive	44

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include: Potential to alter the topography due to surfaces that collapse over time; Reduction of groundwater supply due to the pumping of underground water; Quality impacts on water resources and water that is not fit for human and livestock consumption as well as irrigation purposes; and Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.	Operational	Site	2	Long term	4	Medium	3	Nearly Irreversible	4	13	High	4	Medium	52	Medium to high	0,4	Low	20,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers are employed on the farms that affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices, resulting in job losses.	Operational	Site	2	Long term	4	High	4	Nearly Irreversible	4	14	High	4	Medium	56	Medium to high	0,4	Low	22,4
Operation of underground mining	A variety of factors could impact land values of affected farms and those in the surrounds: The quality and availability of water for domestic and farming purposes; Negative impacts on topography (surfaces that collapse with time due to underground mining); Loss of soil	Operational	Local	3		2		3		4	12		4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	characteristics (erosion and compaction); Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock; Visual impacts; Criminal activities (theft, vandalism, etc.); Occurrence of informal settlements, trespassing on private land, illegal grazing; Pre-requirements and restrictions set by the mining company in terms of new infrastructure developments on private properties; Fragmentation of agricultural land (subdivisions); and so forth.																		

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. The community projects will also continue.	Operational	Site	2	Medium term	3	Medium	3	Nearly Irreversible	4	12	High	4	Medium	48	Medium to high	0,4	Very low	19,2
Operation of underground mining	Impacts due to lack of communication with landowners and communities can results in disruptions for the Project, temporary mine closures and loss of income; Financial implications	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Medium to high	0,4	Low	20,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	for the mine, host communities and private landowners should legal resources be pursued.																		
Operation of underground mining	Mining depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment.	Operational	Local	3	Long term	4	Medium	3	Partly reversible	3	13	High	4	Medium	52	Medium	0,6	Low	31,2
Operation of underground mining	Increased traffic and impact on road infrastructure	Operational	Local	3	Long term	4	Low	2	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Operation of underground mining	Impact on health and safety of workers and people living in the area	Operational	Site	2	Long term	4	Medium	3	Nearly completely reversible	2	11	Definite	5	Medium	55	Medium to high	0,4	Low	22
Closure of mining and dismantling of surface infrastructure	Increased traffic and impacts on road infrastructure	Closure	Local	3	Medium term	3	Low	2	Nearly completely reversible	2	10	High	4	Medium	40	Medium to high	0,4	Very low	16

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	Increased threat in security	Closure	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	Medium	3	Low	33	Medium to high	0,4	Very low	13,2
Operation of underground mining	Loss of work for labour force	Closure	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6

The supporting impact assessment conducted by the EAP must be attached as an appendix. **(Considerations used to inform the impact assessment was included in the section above. Please refer to the discussion in Section 14.5).**

15.2 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).

Management Objectives and Mitigation types for each aspect is provided here. Mitigation measures are prescribed within the Environmental Management Programme (EMPR).

Table 126: Summary of the key environmental impacts and Management Objectives and Mitigation Type

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Socio-Economic					
No-go option	Reduced period of development and upliftment of the surrounding communities and infrastructure.	No Additional Management Objectives if Project does not proceed	N/A	Medium	45
No-Go Option	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	No Additional Management Objectives if Project does not proceed	N/A	Medium	45
No-Go Option	**Positive:** No additional negative impacts on I&APs or surrounding land users	No Additional Management Objectives if Project does not proceed	N/A	Positive Medium	45
Environmental					
No-Go Option	**Positive:** No additional negative impacts on the environment	No Additional Management Objectives if Project does not proceed	N/A	Positive Medium	45

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Hydrogeology					
Underground mining	Underground mining may result in spread of pollution	Prevent hydrogeological impacts and prevent contamination of water resources	Institute water level and water quality monitoring programmes to confirm rate of water rise and water quality as the mine floods. Maintain an ability to access the underground workings until long term discharge and quality predictions have been confirmed. Service boreholes need to be plugged from the bottom where they intersect the workings and then grouted through to surface. It would be advantageous if the bord can be backfilled (e.g. with ash) to give further support to the roof to reduce the risk of bord failure which could destroy the plug and grouting thus allowing water to ingress into the workings. Shafts should be sealed Should monitoring indicate the passive methods employed during the rehabilitation of the underground are ineffective and the decant water quality is unacceptable for release the following can be implemented. **Passive Method:** Should low volumes of water be encountered (< 5 ℓ/s) an interception trench can be designed as follows: The depth of the trench should be at least 4 mbgl (or 2 m below the groundwater level) to intercept polluted seepage that resulting from the opencast pit The design of the trench gradient must be such that the water is free-flowing without eroding the channel; The water from the trench must be captured, retained and managed within the mine water systems i.e. lined evaporation dams until the decant water quality reached equilibrium. A passive wetland treatment option could also be investigated. **Active Method:** Should high volumes of water be encountered (> 5 ℓ/s), Treatment strategies may include a greater or lesser degree of water treatment in order to render the water suitable for reuse. If there is still a residual water management problem, then the operation could evaluate and negotiate options with DWS~~A~~ for the discharge of such water to the water resource. Should the piezometric pressure be such that water in the underground mine is forced to surface and results in decant the following should be done:	Very Low	8
Underground mining	Dewatering due to underground mining may lower water table	Prevent hydrogeological impacts and prevent contamination of water resources		Low	32
Closure of underground mine	Spread of pollution	Prevent hydrogeological impacts and prevent contamination of water resources		Low	26
Closure of underground mine	Decanting	Prevent hydrogeological impacts and prevent contamination of water resources		Medium	42

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Monitoring of the water quality and volumes on frequency high enough to establish seasonal trends. Risk assessment on the effect of the water qualities on the most critical receptor must be done to establish if passive treatment such as a wetland or active treatment processes is required. All corridors between the current underground mine and the proposed T4 extension should be thoroughly sealed to prevent additional cumulative impacts. Such an action should effectively prevent any additional environmental impacts from the new T4 mine due to the depth of mining of up to 300 metres below surface.		
Hydrology					
Construction of overhead powerlines, access roads and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Prevent hydrological impacts and prevent contamination of water resources	During design and construction of the access roads, storm water control measures (viz. flow retardation structures) should be provided to minimise the impact associated with erosion. Flow retardation structures will control run-off velocities (and subsequent erosion) by converting the flow pattern to sheet flow. During the construction phase, temporary stormwater control berms should be placed on the downstream perimeter of the ventilation shaft footprint, so as to minimise silt ingress into the receiving tributaries. Construction of the powerline, ventilation shafts and associated access / maintenance roads should take place during the winter months. The ventilation shafts' access roads should follow the alignment of existing tracks to the greatest extent possible. The footprint of the ventilations shafts should be kept as small as possible. During construction, laydown areas for construction equipment, vehicles etc. are to be demarcated and no access outside of the demarcated area should be allowed. All construction vehicles should be maintained regularly and checked for leaks. Drip trays should be placed under construction vehicles when parked overnight and all hazardous material should be stored in appropriately bunded areas, to prevent potential soil and surface water run-off contamination. The location of the actual ventilation adit should be located outside of the calculated 1:100-year floodline.	Very low	13,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			The service road should be narrowed to one lane (approximately 4m) over water crossings. River crossings should be designed to reduced flow velocity and erosion. The use of gabions and reno mattresses should be considered. River crossings should be designed to allow for hydrological connectivity and avoidance of ponding and flow reduction in the streams and rivers. Appropriately sized culverts should be designed and installed. Ongoing rehabilitation of disturbed areas should be undertaken, including, shaping, revegetation and Alien Invasive Plant (AIP) removal. Appoint a specialist to assist in riverbank or wetland rehabilitation as necessary if the powerline pylons impacts on these sensitive areas. Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread within or beyond the footprint. A management plan and proper follow-up strategy for the prevention of the establishment and/or further spread of new populations of such species should be developed and enforced.		
Operation of overhead powerlines and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Prevent hydrological impacts and prevent contamination of water resources	All maintenance vehicles should be maintained regularly and checked for leaks. Regular inspection of maintenance and access roads should be scheduled to ensure that no erosion is taking place. All areas of erosion identified must be repaired. Regular inspection of road crossing structures should be scheduled to ensure structures are in good repair, functioning as intended and that there are no blockages. Ongoing rehabilitation of disturbed areas should be undertaken, including, shaping, revegetation and Alien Invasive Plant removal.	Very low	20
Operation of overhead powerlines and ventilation shafts	Surface water quantity - Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.	Prevent hydrological impacts and prevent contamination of water resources		Very low	8,8

<table>
<tr><th>ACTIVITY</th><th>POTENTIAL IMPACT</th><th>MANAGEMENT OBJECTIVE</th><th>MITIGATION TYPE</th><th colspan="2">SIGNIFICANCE WITH MITIGATION / RESIDUAL</th></tr>
<tr><td>Removal of powerlines and ventilation shaft and any other infrastructure</td><td>Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality.</td><td>Prevent hydrological impacts and prevent contamination of water resources</td><td>Soils compacted by heavy machinery can be ripped to allow infiltration.
Rehabilitation processes such as restoring the topography to a pre-activity state, and re-vegetation of disturbed areas will assist in returning natural surface water drainage patterns.
Implement free draining rehabilitation.</td><td>Very low</td><td>5,6</td></tr>
<tr><td colspan="6">Wetlands</td></tr>
<tr><td>Construction of powerlines and access roads</td><td>Accidental direct impacts to wetland vegetation by heavy machinery during construction.
Wetland fauna fatalities.</td><td rowspan="4">To minimise impacts on wetlands and the associated ecological functions of the wetlands</td><td rowspan="4">The number of wetland and stream / river crossings must be minimised as far as practically possible. Unnecessary watercourses crossings (i.e. proposed crossings that can be re-aligned) must be re-aligned and avoided.
No pylons or towers must be established within any wetlands or riparian areas.
A section of the powerline should be re-aligned to cross Unit W05a perpendicular to flow and avoid crossing Unit W07.
Where wetland and stream / river crossings are required, every effort should be made to minimize the impacts by considering the following:
• Crossing points should be aligned along areas or corridors of existing disturbance e.g. along existing road crossings.
• The length of wetlands and rivers / streams crossed at each crossing must be minimised by adjusting alignments to coincide with narrower sections and ensuring that crossings cross perpendicular to flow.
No new road watercourse crossings should be established as part of the development of the service roads.
All service roads should follow the existing road network as far as practically possible.
The new watercourse crossings are required, the number of new wetland and stream / river crossings must be minimised as far as practically possible.</td><td>Low</td><td>22,4</td></tr>
<tr><td>Construction of powerlines and access roads</td><td>Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during construction.</td><td>Low</td><td>21,6</td></tr>
<tr><td>Construction of powerlines and access roads</td><td>Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills</td><td>Low</td><td>21,6</td></tr>
<tr><td>Construction of powerlines and access roads</td><td>Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.
Wetland avi-fauna fatalities.</td><td>Low</td><td>22,4</td></tr>
</table>

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Operation of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during repair and maintenance.		Unnecessary watercourses crossings (i.e. proposed crossings that can be re-aligned) must be re-aligned and avoided. Except at planned watercourse crossings, where new service roads are aligned near wetlands and streams / rivers, a minimum buffer of 30m should be maintained between the wetland / riparian edge and the edge of the road as far as practically possible. Where new wetland and stream / river crossings are required, every effort should be made to minimize the impacts by considering the following: • For all crossing types and designs, flow through road crossings should not be unnecessarily concentrated (or impeded) and flow velocity should not be increased. In this regard, wetland and stream / river crossings should be via box / portal culverts established across the entire width of the wetland or riparian zone to avoid flow narrowing and concentration. Open bottom box culverts should be used and they should be sized to transport not only water, but the other materials that might be mobilized (i.e. debris). Pipe culverts should be avoided. • Erosion protection and energy dissipation measures should be established at all road crossing outlets e.g. stilling basins and reno-mattresses. • All culvert inlets and outlets and associated outlet erosion protection structures must not be raised above the wetland/riparian surface and/or stream/river bed and must be established to reflect the natural downstream slope of the wetland / riparian surface and/or stream / river bed. • Crossing points should be aligned along areas or corridors of existing disturbance e.g. along existing informal road crossings or cattle crossing routes. • The length of wetlands and rivers / streams crossed at each crossing must be minimised by adjusting alignments to coincide with narrower sections	Low	25,2
Operation of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.			Low	21,6
Operation of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.			Low	22,4
Decommissioning powerline	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during decommissioning.			Low	39

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Decommissioning powerline	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.		and ensuring that crossings are straight and do not involve using long curves and are aligned at right angles to flow. • If any road fill is utilised at wetland crossings, a porous layer should be established within the road fill at the appropriate elevation to ensure that wetland interflow and overland flow is able to pass through the road fill. • For existing watercourse crossings, every effort should be made to minimize the impacts by considering the following: o Undersized or under-designed pipe culverts must be replaced with sufficiently sized box or pipe culverts. • Erosion protection and energy dissipation measures should be established at all road crossing outlets e.g. stilling basins and reno-mattresses. • Every effort must be made to minimise the upgraded footprint of the existing roads at watercourse crossings. The following road stormwater management measures are recommended: • Stormwater generated by the upgraded and new roads should be discharged at regular intervals and many small outlets should be favoured over few large. • Stormwater outlets must not be established within wetlands or riparian zones. • As far as practically possible, stormwater conveyance should be via open drains rather than pipes and conveyance from the road drains to the outlets should via open drains with vegetated or rough surfaces that are armoured with erosion protection. • All outlets must be designed to dissipate the energy of outgoing flows to levels that present a low erosion risk. In this regard, suitably designed energy for gravel roads will need to be installed at appropriate locations. • All erosion protection measures must be established to reflect the natural slope of the surface and located at the natural ground-level. Flight diverters should be established at the following locations: • Where the powerline occurs within 50m of Unit W01a.	Very Low	16,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			• Crossing of Unit W04 and a 50m buffer zone. • Crossing of Units W05a and W05b and a 50m buffer zone. • Crossing of Unit W07 and a 50m buffer zone. • Crossing of Unit W14a, W14b and W15 and a 50m buffer zone. Prior to the commencement of any construction activities, the following features must be staked out by a surveyor and demarcated using brightly coloured shade cloth: • Outer edge of the delineated wetland and riparian areas occurring within 100m of the proposed vent shafts footprints. • Outer edge of the delineated wetland and riparian areas occurring within 32m of the proposed powerlines and associated pylons / towers. • The outer edges of the entire construction corridor / right-of-way for the vent shafts and powerlines. At all watercourse crossings the construction corridor must be as narrow as practically possible and should only include the proposed road footprint and a one-way running track. • Access to and from the project area should be either via existing roads or within the construction servitude. • Demarcation of all identified access, haulage and service roads. The alignment and routes for these roads need to be reviewed by the wetland ecologist. • All excavated soils and soil stockpiles must be stored / sited outside of the watercourses. • The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences. • Demarcations are to remain until construction and rehabilitation is complete. • All areas outside of this demarcated working servitude must be considered no-go areas for the entire construction phase. Any		

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			contractor found working within No-Go areas must be fined as per fining schedule/system setup for the project. • No equipment laydown or storage areas must be located within delineated wetland or riparian habitats. • No equipment laydown or storage areas must be located within delineated wetland and riparian areas. • All disturbed areas beyond the construction site that are intentionally or accidentally disturbed during the construction phase must be rehabilitated immediately to the satisfaction of the ECO. A detailed method statement for the construction activities within all watercourses must be compiled and appended to the construction (EMPr) prior to construction commencing. The final method statement must be reviewed by a wetland specialist prior to commencement and must include all measures provided in this section where relevant and applicable. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed. Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows. Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately. If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence. All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when		

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas. After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area. The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. Drip trays should be utilised at all dispensing areas. No refuelling, servicing or chemical storage should occur within 30m of any watercourse. No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site. Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose. Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.		

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal Temporary noise pollution due to construction works should be minimized by ensuring the proper maintenance of equipment and vehicles and tuning of engines and mufflers as well as employing low noise equipment where possible. Water trucks will be required to suppress dust by spraying water on affected areas producing dust. This will likely be required daily in the drier months or during dry periods. No lights must be established within the construction area near the watercourses and buffer zones. The handling and/or killing of any animal species present is strictly prohibited and all staff/personnel must be notified of such incidents. Wetland fauna (e.g. snakes, frogs, small mammals) that are encountered during the construction phase must be relocated to other parts of the wetland under the guidance of the EO or ECO.		
Construction of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during construction.	To protect wetlands and ensure their ecological function continues.	All vent shafts must be protected from the ingress and interception of surface runoff and subsurface interflow through the establishment of adequate berms and subsoil drains. The vent shaft walls should be sealed to minimise interflow and groundwater interception	Very low	13,2
Construction of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during construction.		The duration of construction work within the watercourses must be minimised as far as practically possible through proper planning and phasing. Construction work within the watercourses should be limited to the dry winter season wherever possible.	Very low	14,4

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			When working within watercourses, downstream silt traps / curtains should be installed to capture sediment eroded from the working area prior to construction activities commencing within the watercourses. These silt traps must be regularly monitored and maintained and replaced / repaired immediately as and when required. These measures regularly checked, maintained and repaired when required to ensure that they are effective.		
Construction of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills.		The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. Drip trays should be utilised at all dispensing areas. No refuelling, servicing or chemical storage should occur within 30m of any watercourse. No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site. Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose. Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.	Very low	14,4

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Operation of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.		Refer to mitigation measures provided in construction of ventilation shafts.	Low	21,6
Operation of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during repair and maintenance. Reduced water inputs to the wetlands fed by interflows due to interflow interception.		Refer to mitigation measures provided in construction of ventilation shafts	Low	23,4
Operation of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.		Refer to mitigation measures provided in construction of ventilation shafts	Very low	19,8
Decommissioning ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.		Refer to mitigation measures provided in construction of ventilation shafts	Low	21,6
Decommissioning ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during decommissioning.		Refer to mitigation measures provided in construction of ventilation shafts	Very low	15,6
Decommissioning ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.		Refer to mitigation measures provided in construction of ventilation shafts	Very low	19,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Operation of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence.		Best practice underground pillar safety factors must be applied to ensure that void collapse and subsidence risks are reduced. Total extraction should not occur. The design of the underground pillars will have to have a safety factor that will ensure no collapse of pillars or surface subsidence is anticipated. Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source in order that it can be pumped out of the mine before its quality can deteriorate through contact with sulphide minerals.	Low	36
Decommissioning of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence. Erosion and/or sedimentation of wetlands as a result of mine decant discharges once the water levels are reinstated.			Low	36
Decommissioning of underground mining	Wetland pollution due to mine decant water once the water levels are reinstated.	To protect wetlands and ensure their ecological function continues.		Low	36
Noise					
Construction of overhead powerlines and ventilation shafts	Construction of overhead powerlines and ventilation shafts will result in noise due to the use of vehicles and machinery used for construction	To limit the nuisance of noise pollution.	-Recommended (not compulsory) – Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. When constructing the overhead powerlines within 200 m from receptors R8, R12, R14 and R18, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9 pm,	Low	21,6

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			e.g., concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.		
Operation of powerline	Nuisance and health risks caused to close by receptors as identified, such as R8, R12 and R18		– Corona discharge from overhead power lines can cause light/moderate buzzing noises that has the potential to be a noise nuisance with a potential tone within the 50 – 60 Hz range at up to 50 Should a receptor be within 200 m of the overhead power line, project engineers should consider discussing the potential for mitigation with an acoustical engineer/electrical engineer or project engineer (depending on the design of the overhead line. Engineers should assess the potential for corona discharge, if no potential, then no further mitigation for assessed receptor required).	Very Low	9,6
Operation of ventilation shaft	Nuisance and health risks caused to close by receptors as identified, such as R6, R7, R8, R9, R14 and R15		The developer must implement acoustical mitigation regarding ventilation stacks. The reason why these stacks are so important for further mitigation consideration is that: • Ventilation stacks are externally mounted (i.e., their exit port is open and not covered within a building). • Aerodynamic noises are usually constant and have a higher low frequency content to them. Low frequency has the potential to travel further and “over” barriers easier than higher frequencies (SANS10328:2008 recommends acoustical investigation of up to 2 km for low frequency noise sources). • High SPL low frequency noise sources have the potential to curve downwards back towards a receptor. Ventilation stacks pointing upwards can refract back to a receptor. • An acoustical consultant/specialist or engineer can be consulted on mitigation. The following could be considered: • Silencers/sound attenuator, duct silencer, sound trap, muffler - Noise can be redirected or lowered by means of above-mentioned design implementation. • Direction (to be discussed with project engineers) NOTE this can be achieved with the duct silencer, mufflers stipulated above – The ventilation stacks could be directed away from receptors within 1 km (see constraints and mitigation map below). The following should be noted about the direction (in terms of	Low	31,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			• acoustics) should it be selected as a mitigation option • Vent Shaft 3 and 4 – Considered to be directed/re-directed (by any mentioned option) towards the southern direction. • Vent Shaft 1 – Considered to be directed/re-directed (by any mentioned option) towards the south-eastwards or upwards direction. • Vent Shaft 1, 3 and 4 If feasible the vent could be obscured (acoustical berm or shield) if pointing towards receptor R6, R7, R14 and R15 (Note this depends on engineering design and requires engineering inputs). The berm/acoustical barrier should consider the following: • The berms should be solid (aggregate, brick etc. no foliage e.g. trees). • The height should be a minimum of two (2) meters higher than top of the vent shaft. Recommended (not compulsory) – Should the project operations require alarms (e.g., when an operation ceases), an acoustical consultant/engineer should be consulted to ensure minimal alarm noise direction into the direction of receptors (north-west direction). Although these alarms are exempt from this acoustical assessment (see above point) these alarms (should they go off frequently) have a potential to cause a noise nuisance should it be measurable/audible at receptors. Should the layout change as assessed in the report, the report layout must be reviewed in terms of environmental acoustics. It is highly recommended that the Environmental Coordinator keep continuous communication with receptors regarding noises and potential loud noise events (including blasting or a potential situation whereby some noisy activity will commence near a receptor for some unforeseen circumstance). Prior knowledge of a noise event will be far more ideal than a receptor been unaware of a loud noise circumstance. A contact line should be made available to receptors, should a valid noise complaint arise, whereby receptors could lodge a complaint (and documented). Should a valid noise complaint be lodged, it is advised that the Environmental Co-ordinator contact an acoustical consultant with experience in noise monitoring to evaluate the complaint. The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. Although heavy vehicle reverse alarms are exempt		

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			from noise legalisation (GN R154) and needs to meet occupational health and safety standards, certain reverse alarms are less intrusive (less tonal more broadband character etc.). Recommended (not compulsory) - If the project proposes to extend or expand on local municipality routes, a noise assessment should be conducted (GN R154 legislation requirement). Expansion or extend refers to a municipal road that the project engineers require to add an extra lane or change the specifications of the road paving etc.		
Topography and Geology					
Underground mining	Subsidence of surface due to failure of pillars	To ensure that subsidence does not occur.	Ensure the underground mining implements the correct mining methods and leaves sufficient pillars.	Low	33,6
Terrestrial Ecology					
Construction of ventilation shafts and powerlines	The site has sections of habitat that has been transformed to an extent, specifically Ventilation shafts 3 & 4 footprint areas, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. From the site visit, the areas where the Ventilation shafts and powerline will occur is the areas that will be impacted directly. No/limited direct impacts on the larger Mining Right are expected and therefore the impacts are	Early detection of impacts and remediation thereof.	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within other specialist reports and Environmental Management Programme (EMPr). To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. Continuous rehabilitation of the area should occur, immediate closure and rehabilitation. This will entail the spreading of topsoil, revegetation, and management of invasive species. Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment. This will be prudent in this development, since petroleum and other hydrocarbons associated with the trucks and vehicle-based activities are likely to be spilled in the environment if not managed well.	Low	31,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
	rather localised and possible to ensure it remains well-managed. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area				
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of floral species of conservation concern. Three (3) species listed by POSA for the area are classified as species of conservation concern (SCC), and have a moderate likelihood of occurrence on the project footprint. None of these species were sighted during the field assessment on the relevant footprints, but confirmation should be repeated before the onset of development since construction may take many years to start. The same will be applicable for the pylon placement during construction of the powerline. Sensitive features should be avoided best possible.		Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. All footprint areas should remain as small as possible. A survey for SCC species on the project footprint area should be undertaken by a suitably qualified specialist prior to the start of construction. If any SCC are encountered within the subject property in the future, the following should be ensured: ○ If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property. ○ 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. Human and vehicle movement should be restricted from taking place in sensitive habitats.	Very Low	14,4
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of faunal species of conservation concern. The Blue crane calls heard during the field assessment could not be visually verified and therefore, although it is certain that it has been correctly identified, the conclusion can be made that although likely utilising		Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Implement the approved EMP and adhere to all management features described in this report. Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora and/or fauna. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered	Low	24

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
	the regional area, these birds are likely focussed on the grassland patches and sections, and not specifically on the footprints itself (although may randomly occur). The area falls within an Important Birding Area, and hence other sensitive species may also occur in the area although not directly recorded during the field assessment. However, the same conclusion is likely to be made regarding the nature and extent of impacts to these species, as the mine is an underground mine with limited surface infrastructure.		with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees		
Construction of powerlines and ventilation shafts	The onset of activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The natural grassland areas and wetland/aquatic associated terrain will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area. Impacts may lead to the increase of invasive species or introduction of such from the outside areas and may change the vegetation structure and		The development areas should be well demarcated and contractors should not enter into adjacent areas. Access to certain development areas need to be planned wisely, avoiding aquatic terrain and other sensitive features. Unmanaged development is not ideal as it will increase the expected impact on the natural grassland vegetation type and will destroy the aquatic habitats and change the soil indefinitely. 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. Continuous rehabilitation of the area should occur, immediate closure of trenches and excavation areas and spreading of topsoil. Re-vegetation practices may be required to ensure success and seed mixes should match the surrounding vegetation structures.	Low	28,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
	composition of this unit. 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				
Construction of powerlines and ventilation shafts	Impacts on the water resources may occur. This may be due to pollutants entering the water resource, specifically petroleum related waste products, decant points, acid mine drainage (future and post closure), direct runoff from dirty footprints entering the surround water resources or could possibly also spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones		Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within the surface water and wetland specialist report. If possible, find an alternative placement for features where possible as to prevent placement within a wetland or wetland soils. The wetlands or associated buffer should be sufficient to protect ecological functioning of the area. Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater management systems, which should include oil traps. Continuous rehabilitation of the area should occur in accordance with the WUL, as well as monitoring as prescribed. Ensure proper stormwater management around the Ventilation shaft footprints and maintenance of this system. Stormwater management will prevent impacts reaching the natural environment.	Low	31,2
Construction of powerlines and ventilation shafts	Faunal species could also be easily impacted by the powerline and extensive management measures have been prescribed to mitigate this based on electrocution risks for birds specifically.		Positions to fall outside the high sensitivity zones (100 m buffer of drainage lines) or license these positions in terms of Section 21 (c) and (i) in terms of the National Water Act, 1998 (Act 36 No. of 1998). These areas will then be subjected to the appropriate rehabilitation of riparian zones and ecological rehabilitation in terms of vegetation to ensure habitat stays favourable for species that may have specialised niches that depend on these aquatic systems. 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 or any other party associated with the drilling activities.	Low	36

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			Adhere to all management and mitigation measures as prescribed within the wetland specialist report (and other specialist reports) and Environmental Management Programme. Prevent impacts from reaching downstream water resources by ensuring no spillage and proper handling of infrastructure during removal. Continuous rehabilitation of the area should occur in accordance with the WUL, as well as monitoring as prescribed. Ensure proper stormwater management and that it remains functioning by regular inspection and maintenance.		
Removal of powerlines and ventilation shaft and any other infrastructure	Rehabilitation could be ineffective if measures are not appropriately complied to. 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.		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. Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase. 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. 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. • <u>If closure does occur:</u> ○ Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. ○ Adhere to all management and mitigation measures as prescribed within the wetland specialist report and Environmental Management Programme.	Very Low	13,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			○ Prevent impacts from reaching downstream water resources by ensuring no spillage and proper handling of infrastructure during removal. ○ Continuous rehabilitation of the area should occur in accordance with the WUL (specifically to the wetlands and pans), as well as monitoring as prescribed. Annual monitoring of the vegetation and habitat types should be instigated until it is sure that the areas have naturally regrown and vegetation is self-sustainable. If the regrowth is unsuccessful, it will be the applicant's responsibility to restore damaged and degraded habitat areas until it reached sustainability.		
Aquatic Ecology					
Site preparation and other construction impacts in proximity of water courses and wetland seeps	Loss of Biodiversity and Ecological function - Riparian zone impacts	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Avoidance of unnecessary disturbance or destruction of natural habitat is an important mitigation tool for flora and thereby associated fauna. Avoid encroaching on natural areas directly adjacent to proposed activities in close proximity or within buffer areas. Rehabilitation must include planting of indigenous local species, preferably suitable riparian species if banks and beds are affected and as per approved rehabilitation plan for Section 21 (c) & (i) activities - focussing on species native to the river. Appoint a specialist to assist in riverbank or wetland rehabilitation as necessary if the powerline pylons impacts on these sensitive areas. All river (including non-perennial) crossings along the powerline will need to be authorised and remediated in accordance with approved WUL and Section 21(c) &(i) rehabilitation for beds and banks. A wetland assessment is recommended, as some of the non-perennial drainage lines are separated by dams/pan features, which may indicate seepage along and between and therefore the occurrence of wetlands, which was prevalent in the field during the assessment. Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread within or beyond the footprint.	Low	26,4

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			A management plan and proper follow-up strategy for the prevention of the establishment and/or further spread of new populations of such species should be developed and enforced. To prevent the erosion of soil, management measures may include structures to protect areas and soil from areas susceptible to erosion. Water control structures should be constructed and well maintained to minimize erosion and to create a favourable habitat for the establishment of vegetation.		
Construction and operation of ventilation shafts and powerlines and underground mining	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning		Corridor movement associated with water resources should not be hampered by the development. No sections of the river should be cordoned off and avoidance of these sensitive areas is recommended. Unnecessary movement of workers need to be prevented at the site during all phases of the mining development. Continuous monitoring is important to ensure the baseline environmental condition is not impacted. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees; Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act. No fishing, hunting or trapping should be allowed by the employees or other parties on the Mining Right footprint and the land should be closely monitored regularly. No waste will be disposed of in or around the project area, which can attract rodents or other types of fauna; waste will be managed correctly.	Low	22,4
Construction and operation of ventilation shafts and powerlines and underground mining	Alteration of drainage patterns leading to decrease and changes in water quantity and availability in the Ecological Reserve		Define the runoff/flood characteristics of the study site and floodline analysis accordingly. Adherence to the Engineered Storm Water Management Plan as compiled by an accredited engineer is crucial.	Low	22,4

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Construction and operation of ventilation shafts and powerlines and underground mining	Deterioration of water quality in the Klein-Vaal river due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring which will result in water quality impacts - Nutrient increases		Erosion protection and appropriate energy dissipation structures should be implemented where crossings are proposed, thereby stabilising and protecting the banks. Prevent any over abstraction of either ground or surface water (depending on where water will be obtained) as this will negatively impact water quality (surface water) and/or quantity (surface- and groundwater). Decreased Dissolved Oxygen will also result if nutrients increase and impacts reach water resources, leading to possible eutrophication and algae and a decline in PES, which will decrease the aquatic ecology integrity and thereby further affecting the streams. Monitor Water Quality and Aquatic Health (Biomonitoring) regularly - every month and Aquatic Health bi-annually (wet and dry season).	Very low	17,6
Construction and operation of ventilation shafts and powerlines	Sedimentation of water resources will result to nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.		Protect soil resource, beds and banks therefore, preventing erosion and increased sedimentation in the resource. This will prevent increased sedimentation and smothering of aquatic ecosystems. Implement appropriate Stormwater Management Plan, which will include erosion prevention measures and sediment trapping systems or measures.	Very low	9,6
Construction and operation of ventilation shafts and powerlines and underground mining	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).		There will be no discharges of dirty water from the construction site and mobile chemical toilets to be provided for workers during construction. Avoid contamination of soils and implement appropriate remedial measures if incidents of spillage occur. Protect and prevent unnecessary impacts within the riparian and 32m zone (or otherwise delineated buffer as per surface water assessment) of the watercourse. Rehabilitate affected areas immediately to prevent sedimentation and protect against erosion.	Low	20,8

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Construction and operation of ventilation shafts and powerlines and underground mining	Water Quantity impacts by diverting and reducing water available or reaching applicable areas to feed Ecological Reserves to sustain Aquatic diversity due to Impacts to Streamflow Regulation and possible diversions or impedances		Monitor amount of water abstracted carefully and keep a record of daily abstractions. Flow meters will be installed in the mine water circuit to enable refinement of the water balance. A water balance should be developed and updated on an annual basis based on water readings observed and monitored. Protect or license impacts to wetlands, to ensure proper management and prevention of unnecessary impacts. An annual report on the project water balance will be submitted to DHSWS. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall. Optimise water use by means of reuse and recycling. Implement divergences or impedances if these are applicable (crossings specifically) as per designs and formal management plans.	Low	20,8
Heritage and Palaeontological					
Construction and operation of ventilation shafts	The identified heritage sites are considered to be outside of the boundary of the ventilation shafts and the impact of construction and operation will be low	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	**Powerline option A** Sites K65 (demolished structure) & K66 (dilapidated building) are of contemporary origin and therefore not of heritage significance. No further action is required. Sites K62, K63 & K64 consist of stone-walled enclosures dating to the historical / LIA period. Option A of the powerline runs between Site K62 & K63, while Site K64 is located further to the south. It is recommended that these sites be avoided by the proposed powerline. Site K61 and Cemetery K58 is located a significant distance to the north of the proposed powerline and should therefore not be at risk. It is recommended that these sites be avoided by the proposed powerline. Site K60, a stone-walled enclosure directly in the path of the proposed powerline, dates to the Historic Period / LIA, exceeds 60 years of age and is protected by	Very Low	2,8
Construction and operation of powerline route A	The proposed powerline route A will impact on site K57, K59, K60 - K63, K68 and K71			Medium	42

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Construction and operation of powerline route B	The proposed powerline route B will impact on site K50 and K51		the National Heritage Resources Act 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline. Cemeteries K59 & K68 are located in close proximity of the proposed powerline. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemeteries and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemeteries. Site K57 (settlement) falls directly in the path of the proposed powerline. It is recommended that this site be avoided by the proposed powerline as potential subsurface remains associated with a demolished structure at the centre of the settlement might be impacted during construction. The settlement is also associated with a cemetery, Site K71. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemetery and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemetery must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemetery. Site K53 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required. Should impact to sites K62, K63, K64, K60 and K61 be unavoidable, destruction permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stonewalled enclosures. Due to the high number of heritage sites, Option A is not advised, unless altered to avoid the specified heritage resources. This, however, will require a revision of the recommendations made for the specific heritage sites in the vicinity of the powerline. **<u>Powerline option B</u>** Site K50, consisting of several stone-walled enclosures directly in the path of the proposed powerline, exceeds 60 years of age and is protected by the National	Low	36
Underground mining	Blasting impacts and subsidence may impact on heritage sites K01 - K06, K11- K13, K16 - K20, K23, K24 and K69			Low	26,4

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Heritage Resources Act 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline as per the indicated sensitive area. Site K51, a small stone-walled enclosure is located to the south of the proposed powerline and should therefore not be at risk of impact from the construction of the proposed powerline. Impact to Site K52, a potential grave (stone cairn), should be avoided during the construction of the proposed powerline. Should this not be possible, the potential grave may be inspected using Ground Penetrating Radar employed by a professional specialising in human remains. Site K54 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required. Should impact to sites K50 and K51 be unavoidable, destructions permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stone-walled enclosures. Due to fewer heritage sites, Option B is preferred. Should the route be altered to avoid the affected heritage sites, a revision of the recommendations must be made. Sites falling outside of the proposed surface development area, but within the proposed underground mining boundary. Sites K01 – K06, K11 – 13, K16 – 20, K22, K23, K44 and K69 consist of historical buildings or structures associated with surface infrastructure that fall within the area demarcated for underground mining. It is therefore recommended that the mine's ECO (Environmental Control Officer) quarterly, as well pre- and post-blasting, inspect these structures. Should any impact be observed, or if impact cannot be avoided, all buildings and structures associated with the demarcated areas must be adequately recorded by a qualified archaeologist and destruction permits be obtained from the relevant heritage authority. Sites K55, K56, K67 and K70 are cemeteries located within the boundary of the area demarcated for underground mining. These cemeteries may be impacted by the proposed underground mining. Therefore, it is recommended that the mine's ECO quarterly, as well as pre- and post-blasting, inspect these graves. Should any impact be observed, or if impact cannot be avoided, a qualified archaeologist should be contacted to provide the required input to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. Sites K07, K08, K09, K10, K14, K15, K21, K24, K25, K27 – K43 and K45 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. The structures, however, no longer exist and no surface impact is expected. No further action is required. Sites K26, K46, K47, K48 and K49 are located on the demarcated underground mining area		

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			and was identified using historical aerial and topographical datasets. These sites, however, date to contemporary times and were subsequently demolished. No further action is required **General Recommendations** The above recommendations are based on the specific powerline route options and underground mining boundaries as indicated in this report. Should the proposed development expand to any area outside of the proposed surface or underground boundaries, a qualified archaeologist must revise the recommendations made in this report to ensure the safeguarding of heritage sites. Also, should the proposed surface impact areas be changed, a qualified archaeologist must conduct a pedestrian survey on the new areas and amend the report accordingly. As the following historical sites associated with surface infrastructure could not be visited due to access constraints, it is recommended that a qualified archaeologist inspect and verify these sites prior to mining: K02 – K04, K11, K19, K23 & K24. Access constraints caused by ongoing court cases, the language barrier and limited time also resulted in a lack of communication with the land owners. Since land owners and local farm workers are the most reliable and efficient source for locating burial sites, it is recommended that this information be gathered, mapped, inspected and the required recommendations be made to ensure the safeguarding of heritage sources. As archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).		
Blasting					
Construction of ventilation shaft 1 and 2	Blasting may result in ground vibrations, air blast and fly rock,	To prevent impacts on people and animals and to avoid damage to structures.	Control through management (third-party monitoring), blast design and communication. Cover blast.	Very low	6,4

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Construction of ventilation shaft 3	Blasting may result in ground vibrations, air blast and fly rock and may impact on buildings, cultivated lands and a gravel road in the vicinity of this ventilation shaft site.	To prevent impacts on people and animals and to avoid damage to structures.	Control through management (third-party monitoring), blast design and communication. Cover blast.	Very low	17,6
Agriculture and Land Capability					
Construction and operation of powerline and ventilation shafts	All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases	To avoid the onset of soil erosion that can spread into other areas	Limit vegetation clearance to only the areas where the surface infrastructure will be constructed. Avoid parking of vehicles and equipment outside of designated parking areas. Plan vegetation clearance activities for dry seasons (late autumn, winter and early spring). Design and implement a Stormwater Management System where run-off from surfaced areas are expected. Re-establish vegetation around the vent shafts and underneath the powerlines.	Low	28,8
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	To limit compaction of soil.	Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint; Materials must be delivered to a designated laydown area; Revise infrastructure layout to reduce or avoid the construction of new access roads to the powerline and vent shafts; and Limit trips to the vent shaft and powerline during the operational phase to only that required for maintenance.		0

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Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	To avoid soil pollution that can harm the surrounding environment and human health.	Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills; Any waste generated during construction, must be stored into designated containers and removed from the site by the construction teams. Any left-over construction materials must be removed from site.	Very low	19,2
Construction and operation of powerline and ventilation shafts	The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.	Reduce areas used for construction of infrastructure	Vegetation clearance must be restricted to the vent shaft areas and within the power line servitude. Removal of obstacles to allow for access of construction vehicles must be kept to only where essential. Prior arrangements must be made with the landowners to ensure that livestock are moved to areas where they cannot be injured by vehicles traversing the area. No boundary fence must be opened without the landowners' permission. All left-over construction material must be removed from site once construction on a land portion is completed. No open fires made by the construction teams are allowable during the construction phase.	Very low	19,2
Construction and operation of powerline and ventilation shafts	The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue	Prevent the loss of land suitable for crop production.	Vegetation clearance must be restricted to the vent shaft areas and within the power line servitude. Removal of obstacles to allow for access of construction vehicles must be kept to only where essential. Prior arrangements must be made with the landowners to ensure that livestock are moved to areas where they cannot be injured by vehicles traversing the area. No boundary fence must be opened without the landowners' permission. All left-over construction material must be removed from site once construction on a land portion is completed. No open fires made by the construction teams are allowable during the construction phase.	Very Low	19,2

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Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction	To limit compaction of soil.	Refer to mitigation measures proposed for the construction phase under Agriculture and Land Capability.	Very Low	19,2
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil pollution	To avoid soil pollution that can harm the surrounding environment and human health.		Very Low	19,2
Construction and operation of ventilation shafts and powerline route	The construction and operation of the ventilation shaft and powerline route may result in loss of land capability	Reduce areas used for construction of infrastructure		Low	31,2
Socio- Economic					
Construction and operation of ventilation shafts and powerline route	Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally available or potentially available, all new labour requirements will be sourced from within 40 km of the site	To enhance local economic impacts during the construction phase	Maximise the local content of the construction phase by (i) employing new recruits from the DPKISLM; and (ii) continue implementing the existing Procurement Policy but ensure that SMMEs and HDSAs from the DPKISLM are contracted and empowered wherever feasible. Include minimum thresholds for local employment, BEE procurement, SMME targets, local service providers, etc. in the Contractor Services Management Plan ("CSMP") for any contractors that might be used. Once appointed, monitor the social performance of contractors and determine how contractors fair on each key performance Area ("KPA"). Continue with the existing Community Training Programmes that target SMMEs and local businesses and make it compulsory for larger suppliers to form	Very Low Positive	12

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Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses for construction is currently unknown and a standard environmental principle of 'low' is assigned		partnerships with HDSAs and local SMMEs to provide mentorship and ensure skills transfer.	Low Positive	24
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; etc. could have (limited) local economic spin-offs			Very Low	24
Construction and operation of ventilation shafts and powerline route and underground mining	No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.	To prevent loss of jobs for current employees.	The Community Liaison Officer ("CLO") and mine manager to communicate details of the construction phase with community leaders and Ward Councillors to ensure that no unrealistic job expectations are created.	Very Low	14,4

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<tr><th>ACTIVITY</th><th>POTENTIAL IMPACT</th><th>MANAGEMENT OBJECTIVE</th><th>MITIGATION TYPE</th><th colspan="2">SIGNIFICANCE WITH MITIGATION / RESIDUAL</th></tr>
<tr><td>Construction and operation of ventilation shafts and powerline route and underground mining</td><td>Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas: Dust on existing access roads and during the construction of new access roads on private properties, which impacts grazing and crops and settle on surface water; Degradation of gravel roads; Potential road safety issues (reckless drivers).</td><td rowspan="3">To address individual and family level impacts</td><td rowspan="3"><u>Awareness and communications</u>:
Appoint a Community Liaison Officer (CLO) for the duration of the construction phase. The person should be accustomed to local customs and speak the local languages.
The mine to consult with surrounding communities/landowners whose private residences, crops and other infrastructure could be affected by dust, noise and other impacts that result from traffic movement, construction activities and basting (noise). Provide a schedule of the construction activities to landowners and relevant I&APs.
Ensure that landowners are aware of procedures to raise complaints and attend to issues as a matter of priority.
Erect signboards indicating accesses to the construction site.
Display a contact number on the construction vehicles where motorists can report reckless driving.
Consider circulating summaries of monitoring results (dust, ambient noise levels, etc.) to the local Councillor and landowners, especially those that raised complaints. Make use of the Environmental Monitoring Committee (“EMC”) to distribute information.
<u>Road safety and security measures</u>:
Impose penalties for reckless drivers to enforce compliance to traffic rules.
Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could lead to accidents.
Repair and maintain access roads that have been damaged as a result of construction vehicles.
Fence off the development footprint of the construction site prior to the commencement of site-clearing and other construction activities.
Limit all activities to the development footprint of the proposed construction sites.
Provide workers with identity tags and instate strict security measures at the access points to discourage unauthorised people entering the construction sites.
Workers should not be allowed to remain in the construction area when they are off duty.
Use existing Kangra Coal employees for construction related activities wherever possible.
Make it compulsory for the main and sub-contractors to use local labour wherever possible and reflect minimum thresholds in the CSMP.</td><td>Very Low</td><td>19,8</td></tr>
<tr><td>Construction and operation of ventilation shafts and powerline route and underground mining</td><td>An increase in crime is often associated with construction activities when an area is ‘opened up’ for workers and an increase in movement occurs.</td><td>Low</td><td>21,6</td></tr>
<tr><td>Construction and operation of ventilation shafts and powerline route and underground mining</td><td>Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways: Construction related accidents due to structural safety of project infrastructure; Dust generation and air pollution causing respiratory diseases; High ambient noise levels caused by machinery and construction</td><td>Very Low</td><td>9,6</td></tr>
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ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
	equipment, resulting in loss of hearing; Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and Possible increase in HIV/AIDS and other STDs due to prostitution activities and temporary sexual relationships with local women, unwanted pregnancies that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).		Impacts related to blasting: Implement all mitigation and monitoring requirements of the Blast Specialist Report (September 2020), such as to cover blasts and monitor the farmstead/building near Vent Shaft 1 during vent shaft development and implement the required monitoring programme, photographic survey, etc. for all structures up to 1 000 m from the vent shaft areas. Inform landowners and communities of blasting schedules in advance. Intrusion impacts: Ensure that all construction machinery has the required silencers. Dust alleviation methods: Vehicles carrying dusty materials should be securely covered before leaving the site; water gravel and dirt roads regularly; temporarily cover earthworks if possible and minimize drop heights; monitor the dust fall out concentrations; etc.		
Operation of underground mining	The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers	To enhance the positive impacts on the local economy during the operational phase	To maximise the local content of the T4 Project, it is strongly advised to: Develop and implement a strategy of recruiting from the DPKISLM area when positions become available; Work with the DPKISLM LED Unit to identify and train local SMMEs and HDSAs that would be required during the course of the operational phase; Supply a Value Chain Analysis and needs requirement to the DPKISLM so that they can assist in preparing the youth, women and entrepreneurs. Implement the Community Skills Development and Capacity Development Programme for	Very Low Positive	9,6

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Operation of underground mining	**Positive:** Kangra Coal has prioritised sourcing capital goods, services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.		the duration of the operational phase to increase the Mine's positive legacy once decommissioning takes place; Provide feedback to the communities and the DPKISLM when tenders have been awarded to ensure transparency throughout the process.	Low Positive	26,4
Operation of underground mining	During the operational phase, the local economy could benefit in the following ways: A possible increase in municipal rates and taxes, resulting in higher levels of rateable income; Local communities would benefit economically through the SLP programmes and LED projects; New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine's procurement partners,			Low Positive	26,4
Operation of underground mining	Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include: Potential to alter the topography due to surfaces that collapse over time; Reduction of groundwater supply due to the pumping of underground water;	To address negative local economic impacts during the operational phase	Implement all the mitigation and management measures as proposed in the various Specialist Reports and in the EIA compiled for this Project. Reduce the underground mining area to the smallest area possible. Place the vent shafts and power lines at localities where agricultural practices are the least influenced. It is recommended that negotiations take place with landowners. Ensure that all surrounding landowners are familiar with the procedures to lodge complaints and attend to the issues at hand expediently. Implement all efforts to maintain good relations with the land owners.	Low	20,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
	Quality impacts on water resources and water that is not fit for human and livestock consumption as well as irrigation purposes; and Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.		Establish an EMC (consisting of landowners, mine representatives, Ward Councillor, etc.) for the duration of the operational phase that meet on a quarterly basis. Use this forum to: • Raise complaints/concerns; • Provide feedback and solutions on previous issues documented; • Provide monitoring results of water/dust fallout levels etc.; • Provide historic and current data to the mine that relate crop yields, livestock illnesses that was not previously present, reduction in turnovers, cutbacks of farm workers, etc. This data would indicate any potential negative impacts on farming and livelihoods to encourage the mine to address these proactively.		
Operation of underground mining	More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers are employed on the farms that affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices, resulting in job losses.			Low	22,4
Operation of underground mining	A variety of factors could impact land values of affected farms and those in the surrounds: The quality and availability of water for domestic and farming purposes; Negative impacts on topography (surfaces that collapse with time due to underground mining); Loss of soil characteristics (erosion and compaction); Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock; Visual impacts; Criminal activities (theft,			Low	28,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
	vandalism, etc.); Occurrence of informal settlements, trespassing on private land, illegal grazing; Pre-requirements and restrictions set by the mining company in terms of new infrastructure developments on private properties; Fragmentation of agricultural land (subdivisions); and so forth.				
Operation of underground mining	The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. The community projects will also continue.	To enhance impacts associated with skills development and social Responsibility during the operational phase	Implement all mitigation and management measures proposed in previous sections of this report that would address transparency and communication with role-players. Resume existing road upgrade initiatives implemented for the existing Kangra Coal operations on national, provincial, district and/or local roads (if any). Inspect vehicles regularly to avoid oil spillages and un-roadworthy vehicles that could result in accidents. Impose penalties for reckless drivers. Display contact numbers on vehicles (especially those that travel on gravel roads in the local study area) so that landowners and community members can report reckless driving. Maintain internal access roads constructed for maintenance purposes and do dust suppression for the duration of the operations; upgrade stormwater management measures where required.	Very low	19,2
Operation of underground mining	Impacts due to lack of communication with landowners and communities can results in disruptions for the Project, temporary mine closures and loss of income; Financial implications for the mine, host communities and private landowners should legal resources be pursued.	To address negative community / institutional arrangements during the operational phase	Negotiate financial and land use options with landowners in advance as recommended in the previous sections of this report. Ensure that all surrounding landowners are familiar with the procedures to lodge complaints and attend to the issues at hand expediently. Implement all efforts to maintain good relations with the land owners, be transparent and use the EMC and community forums to transfer information that would impact stakeholders. To limit conflict and negative community mobilisation it is recommended that any future recruits be sourced from the DPKISLM/Ward 10 and SLP/LED	Low	20,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	MITIGATION TYPE	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			commitments (training, bursaries, community projects, etc.) for T4 should target these locals. It is imperative and in the mine's best interest to take their environmental and social responsibilities serious and to maintain open communication channels with surrounding land owners and communities.		
Operation of underground mining	Mining depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment.	To address health and safety risks during the operational phase	Operational Health and Safety procedures and requirements of the Mining Right as well as the WUL to be implemented and monitored as prescribed by the guidelines of the MPRDA and the National Water Act 36 of 1998 (NWA). Impose penalties for reckless drivers. Display contact numbers on vehicles (and those that travel on gravel roads in the study area) so that landowners and community members can report reckless driving. Fire breaks to prevent the spreading of veld fires where required. Cover and maintain ventilation shafts in the appropriate manner. Danger warning signboards in English and the local languages in the vicinity of the vent shafts and powerline infrastructure and at the access roads leading to the infrastructure.	Low	31,2
Operation of underground mining	Increased traffic and impact on road infrastructure			Low	21,6
Operation of underground mining	Impact on health and safety of workers and people living in the area			Low	22
Closure of mining and dismantling of surface infrastructure	Increased traffic and impacts on road infrastructure			Very low	16
Operation of underground mining	Increased threat in security			Very low	13,2
Operation of underground mining	Loss of work for labour force			Low	21,6

15.3 SUMMARY OF SPECIALIST REPORTS

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

Table 127: Specialist Recommendations Summarised

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
Blasting and Vibration	Blast Management & Consulting (BMC) was contracted as part of the Environmental Impact Assessment (EIA) to perform review of possible impacts with regards to blasting operations for the development of Vent Shaft 1, 3 and 4 on the proposed underground mine at Kangra T4, Mpumalanga province in South Africa. Ground vibration, air blast, fly rock and fumes are some of the aspects resulting from blasting operations. The report concentrates on the possible influences of ground vibration, air blast and fly rock. It intends to provide information, calculations, predictions, possible influences and mitigation of blasting operations for the project. The evaluation of effects yielded by blasting operations was evaluated over an area as wide as a 1500 m radius from where blasting will take place. The range of structures observed and considered in this evaluation ranged between informal housing, farmsteads, buildings, rural houses and roads. The distances between structures and the vent shaft areas is the main contributing factor to the levels of ground vibration expected and the subsequent possible influences. It is observed that for the maximum charge mass evaluated will also have an influence on the ground vibration levels, showing greater possibility of influence. The closest infrastructure to the Vent Shaft 1 area is the rivers and cultivated fields. Nearest houses or settlements areas are significantly further away at 702 m. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage. The closest infrastructure to the Vent Shaft 3 area is the rivers, dam, buildings and cultivated fields. The nearest houses or settlements areas are significantly further away at 1000 m. The planned maximum charge evaluated showed that ground vibration levels of 1.8 and 1.9 mm/s could be acceptable for the buildings in terms of potential structural damage. The closest infrastructure to the Vent Shaft 4 area is the rivers and gravel road. The nearest houses or settlements areas are significantly further away at 991 m. The planned maximum charge evaluated showed that ground vibration levels could be acceptable in terms of potential structural damage. In view of the above it is believed that no specific mitigations will be required, as the POIs identified are all	**X**	Baseline Environment (Section 10.13, Impacts described as per specialist report in Section 14.5.9, Imnpact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	acceptable. The nearest settlements are relative far away with limited influence from air blast. Infrastructure such as the graveyards, cultivated fields, dams and rivers are not specifically influenced by air blast. It is not expected to observe levels that may contribute to effects such as rattling of roofs or door or windows but is not expected to be damaging. The current accepted limit on air blast is 134 dB. Damages are only expected to occur at levels greater than 134 dB. On prediction it is expected that air blast will be greater than 134 dB at a distance of less than 75 m and closer from all vent shaft boundaries. The nearest settlement (Buildings) is located 680 m from the Vent Shaft 1, 317 m from the Vent Shaft 3 and 852 m from Vent Shaft 4 areas. Air blast is not expected to be of concern at these buildings. An exclusion zone for safe blasting was also calculated. The exclusion zone was established to be at least 492 m. A minimum exclusion zone of 500 m is rather recommended. The gravel road is in the vicinity of Vent Shaft 4 area and needs to be considered. The gravel road is 474 m from the vent shaft area. Based on the ground vibration expected there is no concern for structural influences on this gravel road. Stop and Go will be required when blasting is done within 500 m from these roads. Road closure will be required with inspection for after blast fly rock. The option of photographic survey of all structures up to 1000 m from the vent shaft areas is recommended. This will give advantage on any negotiations with regards to complaints from neighbours. This process can however only succeed if done in conjunction with a proper monitoring program while the vent shafts are being blasted. The farmstead/farm buildings that is closest to the Vent Shaft 1 should be monitored during the vent shaft development Recommendations were made and should be considered. Specific actions will be required for all pit areas such as Mine Health and Safety Act requirements when blasting is done within 500 m and 100 m from private structures. Specific blast design that will consider the installations around the vent shaft areas will be needed. The vent shaft areas are located such that specific concerns were identified and addressed in the report. The author is however of the opinion that the blasting of the vent shafts and necessary permissions, blasting operations will be possible. This concludes this investigation for the proposed Vent Shaft development at proposed Kangra T4 Mine Project. There is no reason to believe that this operation cannot continue if attention is given to the recommendations made.		
Land Capability and Agricultural	Following the data analysis and impact assessment above, it is concluded that the proposed	**X**	Baseline Environment (Section 10.11 , Impacts described as per

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
Economic Assessment	Kangra T4 project area has high agricultural potential, especially as a result of the moderate-high suitability of the climate and the high average annual rainfall. The proposed underground mining infrastructure will be located in an area where there are livestock farming (both sheep and cattle) as well as rainfed production of maize and soybeans. While the areas to be affected by surface infrastructure will be limited to the three vent shafts and the powerline, it is assumed that unsurfaced access roads will also be created to enable the construction team(s) to access the areas. The surface infrastructure areas will be at risk of soil erosion, soil compaction and soil pollution. It is also anticipated that it will reduce the areas with productive land (where vent shafts will be fenced off) and temporary exclude livestock grazing during the construction of the powerline. However, the main impacts of the proposed T4 project to agricultural production, are the impacts on the surface water and groundwater quality and availability. For this version of the report, these impacts could not be quantified (especially for each production unit) and therefore the losses of agricultural income and employment cannot be calculated. It is my professional opinion that this project presents some risk to the long-term sustainability of food production in the area unless the studies on the impacts on the water resources, can confirm with a high level of confidence, that water resources of the project area and surrounding area will not be at risk of degradation. It is therefore recommended that all specialist report that address these questions, be reviewed and the results incorporated into the final version of this report. It is further recommended that the applicant (Kangra Coal Mine) provide alternative layout options for consideration of their relative agricultural sensitivity. Also, that the project description includes any access roads that will be required to access the proposed construction areas from the existing roads.		specialist report in Section 14.5.2.1, Imnpact Assessment and Management Tables
Heritage Assessment	The following recommendations are made in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the areas demarcated for development: **<u>Powerline option A</u>** • Sites K65 (demolished structure) & K66 (dilapidated building) are of contemporary origin and therefore not of heritage significance. No further action is required.	**X**	Baseline Environment (Section 10.15 , Impacts described as per specialist report in Section 14.5.5, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	• Sites K62, K63 & K64 consist of stone-walled enclosures dating to the historical / LIA period. Option A of the powerline runs between Site K62 & K63, while Site K64 is located further to the south. It is recommended that these sites be avoided by the proposed powerline. • Site K61 and Cemetery K58 is located a significant distance to the north of the proposed powerline and should therefore not be at risk. It is recommended that these sites be avoided by the proposed powerline. • Site K60, a stone-walled enclosure directly in the path of the proposed powerline, dates to the Historic Period / LIA, exceeds 60 years of age and is protected by the National Heritage Resources Act 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline. • Cemeteries K59 & K68 are located in close proximity of the proposed powerline. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemeteries and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemeteries. • Site K57 (settlement) falls directly in the path of the proposed powerline. It is recommended that this site be avoided by the proposed powerline as potential subsurface remains associated with a demolished structure at the centre of the settlement might be impacted during construction. The settlement is also associated with a cemetery, Site K71. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemetery and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemetery must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemetery. • Site K53 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required. • Should impact to sites K62, K63, K64, K60 and K61 be unavoidable, destruction permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stonewalled enclosures. • Due to the high number of heritage sites, Option A is not advised, unless altered to avoid the specified heritage resources. This, however, will require a revision of the recommendations made for the specific heritage sites in the vicinity of the powerline.		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	Powerline option B • Site K50, consisting of several stone-walled enclosures directly in the path of the proposed powerline, exceeds 60 years of age and is protected by the National Heritage Resources Act 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline as per the indicated sensitive area. • Site K51, a small stone-walled enclosure is located to the south of the proposed powerline and should therefore not be at risk of impact from the construction of the proposed powerline. • Impact to Site K52, a potential grave (stone cairn), should be avoided during the construction of the proposed powerline. Should this not be possible, the potential grave may be inspected using Ground Penetrating Radar employed by a professional specialising in human remains. • Site K54 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required. • Should impact to sites K50 and K51 be unavoidable, destructions permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stone-walled enclosures. • Due to fewer heritage sites, Option B is preferred. Should the route be altered to avoid the affected heritage sites, a revision of the recommendations must be made. Sites falling outside of the proposed surface development area, but within the proposed • underground mining boundary. • Sites K01 – K06, K11 – 13, K16 – 20, K22, K23, K44 and K69 consist of historical buildings or structures associated with surface infrastructure that fall within the area demarcated for underground mining. It is therefore recommended that the mine's ECO (Environmental Control Officer) quarterly, as well pre- and post-blasting, inspect these structures. Should any impact be observed, or if impact cannot be avoided, all buildings and structures associated with the demarcated areas must be adequately recorded by a qualified archaeologist and destruction permits be obtained from the relevant heritage authority. • Sites K55, K56, K67 and K70 are cemeteries located within the boundary of the area demarcated for underground mining. These cemeteries may be impacted by the proposed underground mining. Therefore, it is recommended that the mine's ECO quarterly, as well as pre- and post-blasting, inspect these graves. Should any impact be observed, or if impact cannot be avoided, a qualified archaeologist should be contacted to provide the required input to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. • Sites K07, K08, K09, K10, K14, K15, K21, K24, K25, K27 – K43 and K45 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. The structures, however, no longer exist and no surface impact is expected. No further action is required. Sites K26, K46, K47, K48 and K49 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. These sites,		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	however, date to contemporary times and were subsequently demolished. No further action is required **General Recommendations** • The above recommendations are based on the specific powerline route options and underground mining boundaries as indicated in this report. Should the proposed development expand to any area outside of the proposed surface or underground boundaries, a qualified archaeologist must revise the recommendations made in this report to ensure the safeguarding of heritage sites. Also, should the proposed surface impact areas be changed, a qualified archaeologist must conduct a pedestrian survey on the new areas and amend the report accordingly. • As the following historical sites associated with surface infrastructure could not be visited due to access constraints, it is recommended that a qualified archaeologist inspect and verify these sites prior to mining: K02 – K04, K11, K19, K23 & K24. • Access constraints caused by ongoing court cases, the language barrier and limited time also resulted in a lack of communication with the land owners. Since land owners and local farm workers are the most reliable and efficient source for locating burial sites, it is recommended that this information be gathered, mapped, inspected and the required recommendations be made to ensure the safeguarding of heritage sources. • As archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)). • From a heritage point of view, development may proceed on the demarcated areas, subject to the abovementioned conditions, recommendations and approval by the South African Heritage Resources Agency. The AIA found several sites of heritage significance intersecting the proposed underground mining section. The buildings, structures and burial sites associated with these sites might potentially be damaged by the proposed underground mining activities as a result of vibration and subsistence, should these occur. Therefore, it is recommended that these sites be monitored. Developing the areas associated with the proposed ventilation shafts are not at risk of damaging culturally significant material as these surface areas appear vacant of heritage sites. The proposed powerline options leading to these areas, however, intersect several culturally significant sites that include cemeteries and		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	stonewalled enclosures. Due to the sensitive nature of the sites, the preferred course of action would be to alter the route of the proposed powerline to avoid these localities. It should also be noted that assessing the sites that could not be inspected due to access constraints, as well as filling the data gaps caused by the language barrier and limited communication with the land owners, will only aid in obtaining a more comprehensive account of the heritage associated with the project aera, thereby allowing for the management of heritage resources and the protection thereof. Cognisance should also be taken of the fact that archaeological artefacts generally occur below surface and may be exposed during the development and construction phases. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Kangra Coal T4 project may proceed.		
SASS Assessment	• ASPT and SASS5 Scores applicable for the Ecoregion and future monitoring data should be compared against these (to obtain the Health Class applicable for the sections subjected to biomonitoring. The current classes as per Biomonitoring are as follows: • Most US points were found to be seepage or channelled valley bottom systems with intermittent wetland sections and not suitable for SASS at the time of the assessment; • Both Upstream and Downstream point sampled in the Klein-Vaal river compare well, the Upstream point scoring a Class A, and the Downstream scoring a Class A. Therefore, based on variables such as the recent rainstorms and abnormal amount of rainfall, the results are deemed to be similar and the Klein-Vaal reach applicable deemed to have a Present Ecological Status (PES) of natural with very little impacts at the time of the assessment. • If future monitoring is conducted, it is recommended that all sites be revisited and monitored regularly to obtain seasonal data. The Assegaai river downstream could also be included in future studies if is becomes applicable, although it is foreseen that the main areas where surface impacts could occur, will be the Klein-Vaal river associated with C11C. • Two upstream sites assessed and one sampled for aquatic invertebrates fell in the Eastern Escarpment Mountains (Ecoregion 15). If the Assegaai river is sampled during future events, it's result should be compared against the reference scores available for Ecoregion 15. No change should occur in the PES of this watercourse and prevented with proper stormwater management, including acid mine drainage and decant monitoring and remediation if it is confirmed. Volumes abstracted (if relevant) should be closely monitored, done in accordance with the reserve determination and water balance and the water balance should be updated regularly to ensure over abstraction/utilisation of the groundwater or make-up water is not occurring.	**X**	Baseline Environment (Section 10.7 , Impacts described as per specialist report in Section 14.5.4, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	The findings should be confirmed during the several seasons, since the results of one assessment cannot be taken as a standard indefinitely. Therefore, several baseline follow-up assessments should be undertaken once the project received approval to ensure a trend has already been established as a baseline (ideally across both seasons) before construction begins.		
Ecological Assessment	**Pre-Construction Phase** • Generally, preference in terms of layout will be outside those areas delineated as having High sensitivity. In this case it is difficult since the area is deemed in good condition. Grassland will always have elevated sensitivity, especially if it is still considered to have a natural composition to an extent. Preference should be given in avoiding all aquatic and wetland associated areas, as well as the cliffs and mountainous area towards the east of the Mining Right. • A WUL in terms of the National Water Act, 1998 (Act No. 36 of 1998) (Water Use Licence) for activities within 500 metres of wetlands or within 100 m of drainage lines may be required. • A survey for SCC species on the project footprint area should be undertaken by a suitably qualified specialist/ECO prior to the start of construction to ensure the status quo as captured in the baseline is relevant. • If any SCC are encountered within the subject property in the future, the following should be ensured: ○ If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property. ○ 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. • No current relocation of species will be required for the development based on the findings and the details of the project provided. Close management and access restriction is however encouraged of the footprint areas if the development is to be continued. Access to the natural areas outside of the proposed footprints should be prohibited. • Community involvement and projects (added benefit work creation) could also stimulate awareness and swing the favour towards conservation instead of illegal harvesting of the environment. • Design and develop infrastructure in accordance with Best practice Guidelines to avoid both collisions and electrocutions as best possible for the implementation of the powerlines, and the applicant could even consider implementing infrastructure underground where possible. This will be important since the area falls within an Important Birding Area and a section of the development is a powerline planned towards the east to connect to the Kusipongo areas.	**X**	Baseline Environment (Section 10.9 and Section 10.10 , Impacts described as per specialist report in Section 14.5.4, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.

	Construction and Operational Phases
	
	<u>Aims and Objectives</u>
	
	• A responsible person (with environmental knowledge) should also be appointed during construction to prevent other unnecessary ecological impacts that could occur, or animal is harmed and also ensure no breeding ground or unexpected discovery of red listed/sensitive animals that may require relocation is handled incorrectly by uninformed personnel;
	• Prevent the needless loss of or damage to flora particularly with regard to protected, endemic, near-endemic and rare species to keep the specific habitat type as unaltered as possible. This will include the active management of Alien and Invasive species as well.
	• Prevent death, injury or hindrance to any fauna encountered during the project phases, and particularly with regard to any protected or endemic species;
	• Prevent significant alteration to the ecosystems in the area, specifically, the wetland zones, adhere to all measures as described in the specialist wetland assessment and specialist delineations made in this regard.
	• All infrastructure that could possibly impact the birds and raptors associated with the IBA, and this should be prevented which may require special adaptations to the powerline infrastructure to reduce electrocutions and collisions with power-line infrastructure (Boshoff and Michael 2009, Boshoff et al. 2011). Existing pylons and overhead lines need to be replaced or retro-fitted, on a carefully prioritised basis, and new infrastructure needs to designed and routed, to minimise the risks from electrocution and collisions.
	• The electrical infrastructure should investigate the use of insulators to be placed on conductors to prevent the bird from touching the conductor while landing or taking off and thus reducing the risk of an electric shock. The length of the isolators is adapted to the size of large birds of prey. Popular mitigation measures (Dixon, 2017) include:
	  ○ Methods for mitigation: Insulation
	    ▪ Existing high-risk electricity infrastructure can be retrofitted with insulation materials to prevent bridging between live cables or between cables and grounded hardware. Insulation can be fitted to conductor wires and insulators supporting the cables or to the grounded crossarms. Insulating materials need to be of appropriate specification for the voltage and the regional environment of the power line and must be correctly		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	installed by competent engineers. Insulation fitted retrospectively requires monitoring and maintenance to ensure that it continues to function effectively. o Methods for mitigation: Perch deterrents and deflectors. ▪ Electrocution rates can potentially be reduced by deterring birds from perching in dangerous positions on power distribution lines. Some deterrents, such as rotating mirrors, are aimed at deterring birds from perching nearby, while others, such as spikes, act as physical barriers to prevent birds perching close to live cables. Deterrent methods can differ in their efficacy, and inappropriate placement may even increase electrocution risk. It is important to ensure that the chosen deterrent or deflector is appropriate for the specific circumstance, is correctly installed, and that a programme of monitoring and maintenance is in place. o Methods for mitigation: Reconfiguration ▪ Retrofitted mitigation such as insulation covers and perch deflectors are best regarded as temporary until a permanent solution can be installed. ▪ Consequently, the best option is to reconfigure the hardware of a power line to a 'bird safe' design that minimises the risk of electrocution. Simple reconfiguration can take the form of changing jumper wires so that they pass under the crossarm rather than over it and switching from upright pin insulators to suspended chain insulators. ▪ Reconfiguration is not necessarily a more expensive option as it requires no further maintenance beyond that normally scheduled for the line. Furthermore, there are no additional outage risks that can be associated with retrofitted mitigation such as insulation covers. However, it must be noted that certain equipment cannot be reconfigured e.g., transformers, regulators and capacitors, which require insulating materials to be used. o Prevention: Ensure all new power infrastructure is bird safe ▪ The risk of bird electrocution should be a core consideration when selecting hardware configurations for electricity distribution lines. Key elements are • (a) to ensure that the phase cables are spaced far enough apart to reduce the risk of large birds touching both simultaneously, • (b) preferably use of non-conducting materials for support structures, such as wooden poles or fibre-reinforced composite crossarms and		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	• (c) on grounded structures, such as reinforced concrete poles with metal crossarms, phase cables should be suspended from chain insulators rather than supported by upright pin insulators. Additional bird safe alternatives include using insulated cables and burying cables underground. ▪ Additional details have also been discussed in AEWA Conservation Guidelines (AEWA Conservation Guidelines, 2012). • Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora that is endemic and serve as habitat for the animals inhabiting the area. • No injured animals should be handled by the community under any circumstance. Clear protocol should be developed on the matter. • All activity should be avoided in restricted areas and possible wetland zones after construction, incorporating those findings from the wetland assessment done for the project, unless authorisations are obtained for this, then management of these activities will be important. • A management plan for the control of invasive/alien weed species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment. The cleared areas after removal should be re-vegetated with indigenous naturally occurring species to decrease large patches of bare soil. The best mitigation measure in this regard is avoiding invasive and/or exotic species from being established. This should not only be conducted within the direct location of the development but also into surrounding area which may be impacted by the development. It is vital that the control of alien invasive species is ongoing. • Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act 71 of 1962). • The vegetation removal (and associated fauna) should be controlled and should be very specific. • Ensure linear structures, such as roads and pipelines, are well managed to reduce the degradation of vegetation due to edge effects. This will be facilitated by ensuring vehicles remain on roads and alien invasive species introduction is controlled along road verges. <u>Monitoring</u> Monitoring framework should be instigated and managed by their responsible body and the following system may enforce good practice:		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	• Implement an "Observe and report" approach which will enable employees to report any disturbance of flora/fauna or degradation that they encounter. • Alien invasive awareness, eradication and control programme on an annual basis. It's the reasoned opinion of the specialists that the development may continue if all mitigation measures are implemented. Wetlands, pans, hydrophytic and grassland vegetation habitat constitute valuable habitat and has floristic significance. As also recommended, the wetland buffers as delineated by the wetland specialist should be sufficient in terms of also protecting ecological integrity and therefore maintained as guidance for the development as the calculated buffer will reflect the enforceable area in terms of legislation and constitute the delineation based on natural wetlands and pans, which has many environmental services, not only ecological importance.		
Surface Water Assessment	Based on observation during the site assessment, the dominant land uses within the study area are wilderness, wetlands, plantations, small-scale and commercial farming, including livestock grazing and residences in a rural setting. The area was found to be largely natural and impacted areas (such as agricultural fields) well managed. The surface water use within the affected sub-catchments takes place in the form of impoundments such as farm dams. Surface water within the sub-catchments, is mainly used for agricultural purposes, such as crop irrigation and livestock watering. A number of impoundments have been erected within the affected streams, which are in the form of farm dams and mined out opencast pits. Water quality analysis results found that the Klein-Vaal River has good water quality. Two of the analysed constituents were found to exceed target ranges, i.e., aluminium and iron. The current classes as per Biomonitoring are as follows: • Most US points were found to be seepage or channeled valley bottom systems with intermittent wetland sections and not suitable for SASS at the time of the assessment; • Both Upstream and Downstream point sampled in the Klein-Vaal river compare well, the Upstream point scoring a Class A, and the Downstream scoring a Class A. Therefore, based on variables such as the recent rainstorms and abnormal amount of rainfall, the results are deemed to be similar and the Klein-Vaal reach applicable deemed to have a Present Ecological Status (PES) of natural with very little impacts at the time of the assessment. • If future monitoring is conducted, it is recommended that all sites be revisited and monitored regularly to obtain seasonal data. The Assegaai river downstream could also be included in future studies if it	**X**	Baseline Environment (Section 10.6, Impacts described as per specialist report in Section 14.5.11, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	becomes applicable, although it is foreseen that the main areas where surface impacts could occur, will be the Klein-Vaal river associated with C11C. • A 20 m operational buffer is recommended for the water resources associated (within 500 m) of the Kangra T4 Mining Project surface infrastructure. Based on the above, it is the reasoned opinion of the specialist that the project may continue without significant impacts to surface water resources, specifically based on considerations that the project consists of underground mining with limited surface infrastructure that could be easily managed to prevent any unwanted impacts.		
Noise Assessment	• Operational Phases – The developer must implement acoustical mitigation regarding ventilation stacks. The developer should also consider mitigation regarding overhead power lines within proximity of receptors (corona line discharge). The most important mitigation proposed is the direction/redirection of the ventilation stacks, design specifications and the use of acoustical berms/barriers (see report EMPr). • An annual noise measurements programme is recommended during all phases. The annual report is to ensure a documented and comprehensive evaluation of the development of the mine (and its noise levels at receptors), future surrounding residential area development encroachment onto the mine footprint, as well as to ensure limits at the boundary are achieved. With mitigation measures implemented the mine would comply to GN R154 legislation. In terms of noise the project does not present a fatal flaw. International Finance Corporation (IFC) guidelines (Noise Level Guidelines) targets will also be achieved should mitigation be implemented. The project should be authorised in terms of noise, with mitigation measures adhered to.	**X**	Baseline Environment (Section 10.12 , Impacts described as per specialist report in Section 14.5.8, Impact Assessment and Management Tables

Geohydrological Assessment and Hydropedological Assessment	• Mining should only commence if an agreement with landowners above the underground is made in terms of borehole yield reduction due to potential dewatering impacts
	• Access to existing boreholes above the underground should be allowed to gather baseline, water quality, water levels and current yields/use.
	• The boreholes above the underground mine should be pump tested prior to the development of the mine in order to determine the yield of these boreholes. It is likely that these boreholes will experience a loss in specific yield due to de-pressurization during mining dewatering. Information to be derived from these pump tests are:
	    ○ Water levels
	    ○ Available drawdown
	    ○ Specific yield
		X	Baseline Environment (Section 10.4, Impacts described as per specialist report in Section 14.5.12, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	• Update the numerical and geochemical model against monitored data during operations. • Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, via the CMA. • The hydrocensus and risk assessment should be conducted every 2 years in order to determine any new property owners, possible new uses of boreholes, to detect any possible new boreholes within the surrounding area and abstraction volumes of these boreholes. • Total extraction should not occur at any stage of mining. • The mine should plan for post closure water treatment based on available monitoring data to be implemented during mining. • Mining should only commence if an agreement with landowners above the underground is made in terms of borehole yield reduction due to potential dewatering impacts.		
Wetland Assessment	It is understood that due to time and cost constraints, the undertaking and conducting of additional assessments to better understand the impacts of the underground mining activities on the local wetlands within the study area will be made conditions of approval and undertaken prior to any mining activities commencing. The following additional assessments are recommended as conditions of approval to be completed prior to mining activities commencing: • The location, extent, PES and EIS of all wetlands fed by springs within cone of depression areas for the weathered / regolith aquifer as mapped GPT (2021) must be confirmed in the field prior to the commencement of any mining activities. • Update the groundwater model by undertaking onsite borehole testing to confirm the intensity of the impacts to the weathered / regolith aquifer as well as confirm the underground water source of the onsite springs. • If it is confirmed that the springs are fed by the weathered / regolith aquifer, undertake modelling of the predicted relative contribution of the springs to the total water budget of the spring fed wetlands to inform an assessment of the predicted reduction in wetland PES and ecosystem services provision. • Following the completion of the above, the impact significance assessment for Impacts O2-1 and D2-1 should be updated to confirm if there are any residual impacts that require offsets / compensation. • The location, extent, PES and EIS of Units W08, W09, W10, W11, W12, W13, W14a, W14b, W15 must be confirmed in the field prior to the construction of the powerlines. For the Vent Shafts, the potential impacts to wetlands were assessed as being of low significance under the	**X**	Baseline Environment (Section 0, Impacts described as per specialist report in Section 14.5.11, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	realistic poor and good mitigation scenarios. This is due to the large buffer between the wetlands and the vent shafts. Proper demarcation of the working areas and access / haulage / service roads will be the most important mitigation measure to adhere to in this regard. However, it is important to note that the potential impacts to groundwater and subsurface water inputs to the wetlands was not assessed as part of this study. If the vent shafts or underground mining activities are predicted to impact on wetland hydrology, then this impact assessment will need to be revised. The Groundwater Impact Assessment (GPT, 2021) indicates that there is a possibility that there could be a reduction in subsurface water inputs to wetlands as a result drawdown effect of the dewatering of the underground workings, as well as a possibility of mine decant. Considering the lack of data to enable a confident prediction and quantification of the hydrological and water quality impacts to wetlands, the significance of these impact in the operational and decommissioning phases (Impacts O2-1, D2-1 and D2-2) on wetlands was assessed as being moderate in line with the precautionary principle. This assumes that the impact will be local in extent and have a moderately-high intensity. The impact was assessed the same under the poor and good mitigation scenarios due to there being limited mitigation measures to avoid and minimize such an impact. The construction of powerlines across wetlands could have significant impacts on the wetlands and wetland avi-fauna. In particular, the direct wetland disturbance impacts (Impact C2-1) and indirect erosion and sedimentation impacts (Impact C2-2) of developing pylons in the wetlands were assessed as being of moderate significance under a realistic poor mitigation scenario. Although the area of wetland to be impacted will be small, the affected wetlands are of high importance and sensitivity and are critically endangered wetland types. It is also important to note that the proposed crossing of Units W05a/05b and W07 is not in line with the best practice of avoiding important wetlands and minimising the area of wetland crossed. Furthermore, Grey Crowned Cranes (Endangered) and Blue Cranes (Vulnerable) are known to frequent the local wetlands regularly and thus the crossing of large areas of wetlands will pose a serious mortality risk to the local cranes even if flight diverters are implemented to reduce the intensity of the impact. The impact of bird fatalities under a poor mitigation scenario is thus also considered significant. It is also important to note that the impact of powerlines needs to also consider the establishment of service roads and servitudes. If poorly planned, these activities can also have significant direct and indirect impacts on local wetlands and rivers. With these impacts in mind, a suite of planning, construction and operational phase measures have been recommended to avoid and/or minimise the potential impacts. If all of these mitigation measures are adopted and effectively implemented, the significance of all of the impacts can be reduced to low or moderately-low under a realistic good mitigation scenario.		

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	In conclusion, the impacts of the proposed development under a good mitigation scenario for the vent shafts and the powerlines should be considered acceptable and there are no fatal flaws, on condition that the mitigation measures provided are strictly adhered to. However, the impacts of the underground workings were assessed as being of moderate significance, which represents a significant residual impact although not a fatal flaw. Considering the potential moderate significance of Impacts O2-1, D2-1 and D2-2, it is also concluded that the significance assessments for these impacts be updated and finalised following the undertaking of additional specialist work to better confirm the extent and intensity of the drawdown impacts on the local spring-fed wetlands within the mapped cone of depressions areas and the mine decant impacts on the hydrology and water quality drivers of the wetlands within the mapped mine decant areas. It is understood that due to time and cost constraints, the undertaking and conducting of additional assessments to better understand the impacts of the underground mining activities on the local wetlands within the study area will be made conditions of approval and undertaken prior to any mining activities commencing.		
Paleontological Assessment	a. There is no objection (see Recommendation Section B) to the development. It was necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity of the shale is VERY HIGH and MODERATE. A Phase 2 Palaeontological Mitigation is only required if the Phase 1 Palaeontological Assessment identified a fossiliferous formation (Karoo Supergroup) and fossils or if fossils are found during construction or mining. b. This project may benefit the economy, the life expectancy of the community, the growth of the community and social development in general. c. Preferred choice: The only Alternative presented is possible. d. The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. A sample of shale / mudstone should be set aside if mined. e. Consultation with parties was not necessary	**X**	Baseline Environment (Section 10.7, Impacts described as per specialist report in Section 14.5.11, Impact Assessment and Management Tables
Social Impact Assessment	From a socio-economic perspective it is recommended that: • Kangra Coal engages with the landowners to negotiate options and reach mutually agreeable solutions. • Wherever possible, Kangra Coal ensures that LED programmes and benefits, training programmes and SMME development focus on the DPKISLM to enhance the positive local content of the T4 Project; and • Mitigation and management measures, as proposed in this SEIA report, be implemented and included in the EMPr where required and where feasible.	**X**	Baseline Environment (Section 10.17, Impacts described as per specialist report in Section 14.5.15, Impact Assessment and Management Tables

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
Closure and Financial Provisioning	This closure plan was compiled in alignment to the NEMA GNR.1147 Regulations, the NEMA Appendix 5 (Closure Plan) and based on information provided by client, and specialist work. It is recommended that the next update of this closure plan be annually, after approval. Closure and rehabilitation are a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation. Rehabilitation and closure objectives have been tailored to the project at hand with the objective of assisting Kangra T4 project in carrying out successful rehabilitation. Kangra Coal (Pty) Ltd would need to provide adequate financial assurance through the required financial instrument to provide for their decommissioning and closure liability cost.	**X**	Closure Objectives and Financial Provisioning within the EMP is aligned with the findings of this report.

Attach copies of Specialist Reports as appendices.

15.4 ENVIRONMENTAL IMPACT STATEMENT

15.5 SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The findings of the specialist studies undertaken for this EIA/EMP process provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed future re-opening and existing project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that should prevent the proposed project from proceeding.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA/EMP will form part of the contract with the contractors appointed to construct and maintain the mine and associated infrastructure. The EIA/EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA/EMP for key cycle phases (i.e. operation and closure/decommissioning) of the project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

As described previously, construction-based impacts are not expected as the mine is an existing mine. For a detailed impact assessment layout specifying all the ratings used to obtain Significance of impacts with and without mitigation, refer to Table 125 above.

For a summary giving only the Significance obtained, refer below. Impacts have been discussed in detail within Section 14.5.

Table 128: Summary of Key findings in terms of Impact Significance

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
No-go option	Socio-Economic	Reduced period of development and upliftment of the surrounding communities and infrastructure.	Medium	45	N/A	1	Medium	45
No-Go Option	Socio-Economic	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	Medium	45	N/A	1	Medium	45
No-Go Option	Socio-Economic	**Positive:** No additional negative impacts on I&APs or surrounding land users	Positive Medium	45	N/A	1	Positive Medium	45
No-Go Option	Natural Environment and Wetlands	**Positive:** No additional negative impacts on the environment	Positive Medium	45	N/A	1	Positive Medium	45
Underground mining	Hydrogeology	Underground mining may result in spread of pollution	Medium	40	High	0,2	Very Low	8
Underground mining	Hydrogeology	Dewatering due to underground mining may lower water table	Very High	80	Medium to high	0,4	Low	32
Closure of underground mine	Hydrogeology	Spread of pollution	High	65	Medium to High	0,4	Low	26
Closure of underground mine	Hydrogeology	Decanting	High	70	Medium	0,6	Medium	42
Construction of overhead powerlines and ventilation shafts	Hydrology	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Low	33	Medium to High	0,4	Very low	13,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of overhead powerlines and ventilation shafts	Hydrology	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Medium	50	Medium to High	0,4	Very low	20
Operation of overhead powerlines and ventilation shafts	Hydrology	Surface water quantity - Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.	Low	22	Medium to High	0,4	Very low	8,8
Removal of powerlines and ventilation shaft and any other infrastructure	Hydrology	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality.	Very low	14	Medium to High	0,4	Very low	5,6
Construction of powerlines	Wetlands	Accidental direct impacts to wetland vegetation by heavy machinery during construction. Wetland fauna fatalities.	Medium	56	Medium to High	0,4	Low	22,4
Construction of powerlines	Wetlands	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during construction.	Low	36	Medium	0,6	Lo	21,6
Construction of powerlines	Wetlands	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills	Low	36	Medium	0,6	Low	21,6
Construction of powerlines	Wetlands	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance. • Wetland avi-fauna fatalities.	Medium	56	Medium to High	0,4	Low	22,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of powerlines	Wetlands	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during repair and maintenance.	Low	42	Medium	0,6	Low	25,2
Operation of powerlines	Wetlands	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.	Low	36	Medium	0,6	Low	21,6
Operation of powerlines	Wetlands	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.	Medium	56	Medium to High	0,4	Low	22,4
Decommissioning powerline	Wetlands	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during decommissioning.	Medium	65	Medium	0,6	Low	39
Decommissioning powerline	Wetlands	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.	Low	27	Medium	0,6	Very Low	16,2
Construction of ventilation shafts	Wetlands	Accidental direct impacts to wetland vegetation by heavy machinery during construction.	Low	33	Medium to High	0,4	Very low	13,2
Construction of ventilation shafts	Wetlands	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during construction.	Low	36	Medium to High	0,4	Very low	14,4
Construction of ventilation shafts	Wetlands	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills.	Low	36	Medium to High	0,4	Very low	14,4
Operation of ventilation shafts	Wetlands	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.	Low	36	Medium	0,6	Low	21,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of ventilation shafts	Wetlands	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during repair and maintenance. Reduced water inputs to the wetlands fed by interflows due to interflow interception.	Low	39	Medium	0,6	Low	23,4
Operation of ventilation shafts	Wetlands	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.	Low	33	Medium	0,6	Very low	19,8
Decommissioning ventilation shafts	Wetlands	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.	Low	36	Medium	0,6	Low	21,6
Decommissioning ventilation shafts	Wetlands	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during decommissioning.	Low	39	Medium to High	0,4	Very low	15,6
Decommissioning ventilation shafts	Wetlands	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.	Low	33	Medium	0,6	Very low	19,8
Operation of underground mining	Wetlands	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence.	Medium	60	Medium	0,6	Low	36

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Decommissioning of underground mining	Wetlands	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence. Erosion and/or sedimentation of wetlands as a result of mine decant discharges once the water levels are reinstated.	Medium	60	Medium	0,6	Low	36
Decommissioning of underground mining	Wetlands	Wetland pollution due to mine decant water once the water levels are reinstated.	Medium	60	Medium	0,6	Low	36
Construction of overhead powerlines and ventilation shafts	Noise	Construction of overhead powerlines and ventilation shafts will result in noise due to the use of vehicles and machinery used for construction	Low	36	Medium	0,6	Low	21,6
Operation of powerline	Noise	Nuisance and health risks caused to close by receptors as identified, such as R8, R12 and R18	Low	24	Medium to High	0,4	Very Low	9,6
Operation of ventilation shaft	Noise	Nuisance and health risks caused to close by receptors as identified, such as R6, R7, R8, R9, R14 and R15	Medium	52	Medium	0,6	Low	31,2
Underground mining	Geology and Topography	Subsidence of surface due to failure of pillars	Medium	56	Medium	0,6	Low	33,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of ventilation shafts and powerlines	Ecology	The site has sections of habitat that has been transformed to an extent, specifically Ventilations shaft 3 & 4 footprint areas, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. From the site visit, the areas where the Ventilation shafts and powerline will occur is the areas that will be impacted directly. No/limited direct impacts on the larger Mining Right are expected and therefore the impacts is rather localised and possible to ensure it remains well-managed. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of ventilation shafts and powerlines	Ecology	Development related activities may lead to the loss of floral species of conservation concern. Three (3) species listed by POSA for the area are classified as species of conservation concern (SCC), and have a moderate likelihood of occurrence on the project footprint. None of these species were sighted during the field assessment on the relevant footprints, but confirmation should be repeated before the onset of development since construction may take many years to start. The same will be applicable for the pylon placement during construction of the powerline. Sensitive features should be avoided best possible.	Low	24	Medium	0,6	Very Low	14,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of ventilation shafts and powerlines	Ecology	Development related activities may lead to the loss of faunal species of conservation concern. The Blue crane calls heard during the field assessment could not be visually verified and therefore, although it is certain that it has been correctly identified, the conclusion can be made that although likely utilising the regional area, these birds are likely focussed on the grassland patches and sections, and not specifically on the footprints itself (although may randomly occur). The area falls within an Important Birding Area, and hence other sensitive species may also occur in the area although not directly recorded during the field assessment. However, the same conclusion is likely to be made regarding the nature and extent of impacts to these species, since the mine is an underground mine with limited surface infrastructure.	Medium to High	60	Medium to high	0,4	Low	24

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of powerlines and ventilation shafts	Ecology	The onset of activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The natural grassland areas and wetland/aquatic associated terrain will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area. Impacts may lead to the increase of invasive species or introduction of such from the outside areas and may change the vegetation structure and composition of this unit. 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	Medium	48	Medium	0,6	Low	28,8
Construction of powerlines and ventilation shafts	Ecology	Impacts on the water resources may occur. This may be due to pollutants entering the water resource, specifically petroleum related waste products, decant points, acid mine drainage (future and post closure), direct runoff from dirty footprints entering the surround water resources or could possibly also spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of powerlines and ventilation shafts	Ecology	Faunal species could also be easily impacted by the powerline and extensive management measures have been prescribed to mitigate this based on electrocution risks for birds specifically.	Medium	60	Medium	0,6	Low	36
Removal of powerlines and ventilation shaft and any other infrastructure	Ecology	Rehabilitation could be ineffective if measures are not appropriately complied to. 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.	Low	22	Medium	0,6	Very Low	13,2
Site preparation and other construction impacts in proximity of water courses and wetland seeps	Aquatic Ecology	Loss of Biodiversity and Ecological function - Riparian zone impacts	Medium	44	Medium	0,6	Low	26,4
All	Aquatic Ecology	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning	Medium	56	Medium to high	0,4	Low	22,4
Construction and operation of ventilatiion shafts and powerlines and underground mining	Aquatic Ecology	Alteration of drainage patterns leading to decrease and changes in water quantity and availability in the Ecological Reserve	Medium	56	Medium to high	0,4	Low	22,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilatiion shafts and powerlines and underground mining	Aquatic Ecology	Deterioration of water quality in the Klein-Vaal river due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring which will result in water quality impacts - Nutrient increases	Medium	44	Medium to high	0,4	Very low	17,6
Construction and operation of ventilation shafts and powerlines	Aquatic Ecology	Sedimentation of water resources wil result to nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Medium	24	Medium to high	0,4	Very low	9,6
Construction and operation of ventilation shafts and powerlines and underground mining	Aquatic Ecology	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).	Medium	52	Medium to high	0,4	Low	20,8
Construction and operation of ventilation shafts and powerlines and underground mining	Aquatic Ecology	Water Quantity impacts by diverting and reducing water available or reaching applicable areas to feed Ecological Reserves to sustain Aquatic diversity due to Impacts to Streamflow Regulation and possible diversions or impedances	Medium	52	Medium to high	0,4	Low	20,8
Construction and operation of ventilation shafts	Heritage	The identified heritage sites are considered to be outside of the boundary of the ventilation shafts and the impact of construction and operation will be low	Very Low	14	High	0,2	Very Low	2,8
Construction and operation of powerline route A	Heritage	The proposed powerline route A will impact on site K57, K59, K60 -K63, K68 and K71	High	70	Medium	0,6	Medium	42

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of powerline route B	Heritage	The proposed powerline route B will impact on site K50 and K51	Medium	60	Medium	0,6	Low	36
Underground mining	Heritage	Blasting impacts and subsidence may impact on heritage sites K01 - K06, K11- K13, K16 - K20, K23, K24 and K69	Medium	44	Medium	0,6	Low	26,4
Construction and operation of powerline and ventilation shafts	Agriculture	All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases	Medium	48	Medium	0,6	Low	28,8
Construction and operation of powerline and ventilation shafts	Agriculture	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	Medium	48	Medium	0,6	Low	28,8
Construction and operation of powerline and ventilation shafts	Agriculture	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	Medium	48	Medium to high	0,4	Very low	19,2

ACTIVITY	**ASPECTS AFFECTED**	**POTENTIAL IMPACT**	**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**	
Construction and operation of powerline and ventilation shafts	Agriculture	The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.	Medium	48	Medium to high	0,4	Very low	19,2
Construction and operation of powerline and ventilation shafts	Agriculture	The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue	Medium	48	Medium to high	0,4	Very Low	19,2
Decommissioning of powerline and ventilation shafts	Agriculture	During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction	Medium	48	Medium to high	0,4	Very Low	19,2
Decommissioning of powerline and ventilation shafts	Agriculture	During the decommissioning phase, the movement of vehicles and equipment will again result in soil pollution	Medium	48	Medium to high	0,4	Very Low	19,2
Construction and operation of ventilation shafts and powerline route	Land capability	The construction and operation of the ventilation shaft and powerline route may result in loss of land capability	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilation shafts and powerline route	Socio-Economic	Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally available or potentially available, all new labour requirements will be sourced from within 40 km of the site	Low Positive	20	Medium	0,6	Very Low Positive	12
Construction and operation of ventilation shafts and powerline route and underground mining	Socio-Economic	The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses for construction is currently unknown and a standard environmental principle of 'low' is assigned	Medium Positive	40	Medium	0,6	Low Positive	24
Construction and operation of ventilation shafts and powerline route and underground mining	Socio-Economic	An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; etc. could have (limited) local economic spin-offs	Medium Positive	40	Medium	0,6	Very Low	24
Construction and operation of ventilation shafts and powerline route and underground mining	Socio-Economic	No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.	Low	24	Medium	0,6	Very Low	14,4

ACTIVITY	**ASPECTS AFFECTED**	**POTENTIAL IMPACT**	**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**	
Construction and operation of ventilation shafts and powerline route and underground mining	Socio-Economic	Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas: Dust on existing access roads and during the construction of new access roads on private properties, which impacts grazing and crops and settle on surface water; Degradation of gravel roads; Potential road safety issues (reckless drivers).	Low	33	Medium	0,6	Very Low	19,8
Construction and operation of ventilation shafts and powerline route and underground mining	Socio-Economic	An increase in crime is often associated with construction activities when an area is 'opened up' for workers and an increase in movement occurs.	Low	36	Medium	0,6	Low	21,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation of ventilation shafts and powerline route and underground mining	Socio-Economic	Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways: Construction related accidents due to structural safety of project infrastructure; Dust generation and air pollution causing respiratory diseases; High ambient noise levels caused by machinery and construction equipment, resulting in loss of hearing; Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and Possible increase in HIV/AIDS and other STDs due to prostitution activities and temporary sexual relationships with local women, unwanted pregnancies that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).	Very Low	16	Medium	0,6	Low	9,6
Operation of underground mining	Socio-Economic	The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers	Very Low Positive	16	NA	1	Very Low Positive	16

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	Socio-Economic	Kangra Coal has prioritised sourcing capital goods, services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.	Medium Positive	44	NA	1	Medium Positive	44
Operation of underground mining	Socio-Economic	During the operational phase, the local economy could benefit in the following ways: A possible increase in municipal rates and taxes, resulting in higher levels of rateable income; Local communities would benefit economically through the SLP programmes and LED projects; New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine’s procurement partners,	Medium Postive	44	NA	1	Medium Postive	44

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of underground mining	Socio-Economic	Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include: Potential to alter the topography due to surfaces that collapse over time; Reduction of groundwater supply due to the pumping of underground water; Quality impacts on water resources and water that is not fit for human and livestock consumption as well as irrigation purposes; and Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.	Medium	52	Medium to high	0,4	Low	20,8
Operation of underground mining	Socio-Economic	More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers are employed on the farms that affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices, resulting in job losses.	Medium	56	Medium to high	0,4	Low	22,4

ACTIVITY	**ASPECTS AFFECTED**	**POTENTIAL IMPACT**	**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**	
Operation of underground mining	Socio-Economic	A variety of factors could impact land values of affected farms and those in the surrounds: The quality and availability of water for domestic and farming purposes; Negative impacts on topography (surfaces that collapse with time due to underground mining); Loss of soil characteristics (erosion and compaction); Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock; Visual impacts; Criminal activities (theft, vandalism, etc.); Occurrence of informal settlements, trespassing on private land, illegal grazing; Pre-requirements and restrictions set by the mining company in terms of new infrastructure developments on private properties; Fragmentation of agricultural land (subdivisions); and so forth.	Medium	48	Medium	0,6	Low	28,8
Operation of underground mining	Socio-Economic	The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. The community projects will also continue.	Medium	48		0,4	Very low	19,2
Operation of underground mining	Socio-Economic	Impacts due to lack of communication with landowners and communities can results in • Disruptions for the Project, temporary mine closures and loss of income; Financial implications for the mine, host communities and	Medium	52	Medium to high	0,4	Low	20,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
		private landowners should legal resources be pursued.						
Operation of underground mining	Socio-Economic	Mining depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment.	Medium	52	Medium	0,6	Low	31,2
Operation of underground mining	Socio-Economic	Increased traffic and impact on road infrastructure	Low	36	Medium	0,6	Low	21,6
Operation of underground mining	Socio-Economic	Impact on health and safety of workers and people living in the area	Medium	55	Medium to high	0,4	Low	22
Closure of mining and dismantling of surface infrastructure	Socio-Economic	Increased traffic and impacts on road infrastructure	Medium	40	Medium to high	0,4	Very low	16
Operation of underground mining	Socio-Economic	Increased threat in security	Low	33	Medium to high	0,4	Very low	13,2
Operation of underground mining	Socio-Economic	Loss of work for labour force	Low	36	Medium	0,6	Low	21,6
Construction of ventilation shaft 1 and 2	Blasting	Blasting may result in ground vibrations, air blast and fly rock,	Very low	16	Medium to high	0,4	Very low	6,4
Construction of ventilation shaft 3	Blasting	Blasting may result in ground vibrations, air blast and fly rock and may impact on buildings, cultivated lands and a gravel road in the vicinity of this ventilation shaft site.	Medium	44	Medium to high	0,4	Very low	17,6

15.6 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.

Please refer to Appendix 4.

15.7 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 authorization.

Specialist recommendations which could be included as conditions have been discussed in Table 96 Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Table 125 and contained in the respective studies.

Table 129: Impact management objectives and the impact management outcomes for inclusion in the EMPr

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Socio-Economic			
No-go option	Reduced period of development and upliftment of the surrounding communities and infrastructure.	No Additional Management Objectives if Project does not proceed	No management possible
No-Go Option	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	No Additional Management Objectives if Project does not proceed	No management possible
No-Go Option	**Positive:** No additional negative impacts on I&APs or surrounding land users	No Additional Management Objectives if Project does not proceed	No management possible
Environmental			
No-Go Option	**Positive:** No additional negative impacts on the environment	No Additional Management Objectives if Project does not proceed	No management possible
Hydrogeology			
Underground mining	Underground mining may result in spread of pollution	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)
Underground mining	Dewatering due to underground mining may lower water table	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)
Closure of underground mine	Spread of pollution	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
			usage, water conservation strategies, optimization of water usage and recycling)
Closure of underground mine	Decanting	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. AMD mitigation strategy, mine design and progressive rehabilitation) Remedy through water treatment when required
Hydrology			
Construction of overhead powerlines, access roads and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Prevent hydrological impacts and prevent contamination of water resources	Avoid through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management) Control through implementation of mitigation measures (water treatment when required)
Operation of overhead powerlines and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Prevent hydrological impacts and prevent contamination of water resources	Avoid through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management). Control through implementation of mitigation measures (water treatment when required)
Operation of overhead powerlines and ventilation shafts	Surface water quantity - Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.	Prevent hydrological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Removal of powerlines and ventilation shaft and any other infrastructure	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality.	Prevent hydrological impacts and prevent contamination of water resources	Avoid through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management) Control through implementation of mitigation measures (water treatment when required).
Wetlands			
Construction of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during construction. Wetland fauna fatalities.	To minimise impacts on wetlands and the associated ecological functions of the wetlands	Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation.
Construction of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during construction.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Construction of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Construction of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance. Wetland avi-fauna fatalities.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Operation of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during repair and maintenance.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Operation of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Operation of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Decommissioning powerline	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during decommissioning.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Decommissioning powerline	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.

ACTIVITY AND PHASE	**POTENTIAL IMPACT**	**MANAGEMENT OBJECTIVE**	**Outcome**
Construction of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during construction.	To protect wetlands and ensure their ecological function continues.	Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Construction of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during construction.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Construction of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation.
Operation of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation.
Operation of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during repair and maintenance. Reduced water inputs to the wetlands fed by interflows due to interflow interception.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Operation of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation.
Decommissioning ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation.
Decommissioning ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during decommissioning.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Decommissioning ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation
Operation of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Decommissioning of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence. Erosion and/or sedimentation of wetlands as a result of mine decant discharges once the water levels are reinstated.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Decommissioning of underground mining	Wetland pollution due to mine decant water once the water levels are reinstated.		Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas) Remedy/modify through wetland rehabilitation.
Noise			
Construction of overhead powerlines and ventilation shafts	Construction of overhead powerlines and ventilation shafts will result in noise due to the use of vehicles and machinery used for construction	To limit the nuisance of noise pollution.	Avoid through preventative measures (e.g. communication with landowners, timing of activities). Control through implementation of EMPR mitigation measures (e.g. Noise abatement measures).
Operation of powerline	Nuisance and health risks caused to close by receptors as identified, such as R8, R12 and R18		
Operation of ventilation shaft	Nuisance and health risks caused to close by receptors as identified, such as R6, R7, R8, R9, R14 and R15		
Topography and Geology			
Underground mining	Subsidence of surface due to failure of pillars	To ensure that subsidence does not occur.	Control through site planning and design.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Terrestrial Ecology			
Construction of ventilation shafts and powerlines	The site has sections of habitat that has been transformed to an extent, specifically Ventilation shafts 3 & 4 footprint areas, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. From the site visit, the areas where the Ventilation shafts and powerline will occur is the areas that will be impacted directly. No/limited direct impacts on the larger Mining Right are expected and therefore the impacts are rather localised and possible to ensure it remains well-managed. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area	Early detection of impacts and remediation thereof.	Control through implementation of EMPR mitigation measures (e.g. limit area of disturbance, training) Avoid/Stop through relocation of threatened or protected species Control through implementation of ESMS.
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of floral species of conservation concern. Three (3) species listed by POSA for the area are classified as species of conservation concern (SCC), and have a moderate likelihood of occurrence on the project footprint. None of these species were sighted during the field assessment on the relevant footprints, but confirmation should be repeated before the onset of development since construction may take many years to start. The same will be applicable for the pylon placement during construction of the powerline. Sensitive features should be avoided best possible.		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of faunal species of conservation concern. The Blue crane calls heard during the field assessment could not be visually verified and therefore, although it is certain that it has been correctly identified, the conclusion can be made that although likely utilising the regional area, these birds are likely focussed on the grassland patches and sections, and not specifically on the footprints itself (although may randomly occur). The area falls within an Important Birding Area, and hence other sensitive species may also occur in the area although not directly recorded during the field assessment. However, the same conclusion is likely to be made regarding the nature and extent of impacts to these species, as the mine is an underground mine with limited surface infrastructure.		
Construction of powerlines and ventilation shafts	The onset of activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The natural grassland areas and wetland/aquatic associated terrain will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area. Impacts may lead to the increase of invasive species or introduction of such from the outside areas and may change the vegetation structure and composition of this unit. 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		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction of powerlines and ventilation shafts	Impacts on the water resources may occur. This may be due to pollutants entering the water resource, specifically petroleum related waste products, decant points, acid mine drainage (future and post closure), direct runoff from dirty footprints entering the surround water resources or could possibly also spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones		
Construction of powerlines and ventilation shafts	Faunal species could also be easily impacted by the powerline and extensive management measures have been prescribed to mitigate this based on electrocution risks for birds specifically.		
Removal of powerlines and ventilation shaft and any other infrastructure	Rehabilitation could be ineffective if measures are not appropriately complied to. 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.		
Aquatic Ecology			
Site preparation and other construction impacts in proximity of water courses and wetland seeps	Loss of Biodiversity and Ecological function - Riparian zone impacts	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Early detection and prevention of possible impacts.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction and operation of ventilation shafts and powerlines and underground mining	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning		Ensure biodiversity and ecological function is maintained. Early detection and prevention of possible impacts.
Construction and operation of ventilation shafts and powerlines and underground mining	Alteration of drainage patterns leading to decrease and changes in water quantity and availability in the Ecological Reserve		Control through proper soil management procedures. Early detection and prevention of possible impacts.
Construction and operation of ventilation shafts and powerlines and underground mining	Deterioration of water quality in the Klein-Vaal river due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring which will result in water quality impacts - Nutrient increases		Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Construction and operation of ventilation shafts and powerlines	Sedimentation of water resources will result to nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.		Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Construction and operation of ventilation shafts and powerlines and underground mining	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).		Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Construction and operation of ventilation shafts and powerlines and underground mining	Water Quantity impacts by diverting and reducing water available or reaching applicable areas to feed Ecological Reserves to sustain Aquatic diversity due to Impacts to Streamflow Regulation and possible diversions or impedances		Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Heritage and Palaeontological			

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction and operation of ventilation shafts	The identified heritage sites are considered to be outside of the boundary of the ventilation shafts and the impact of construction and operation will be low	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief) Modify through removal and curation of fossils.
Construction and operation of powerline route A	The proposed powerline route A will impact on site K57, K59, K60 -K63, K68 and K71		
Construction and operation of powerline route B	The proposed powerline route B will impact on site K50 and K51		
Underground mining	Blasting impacts and subsidence may impact on heritage sites K01 - K06, K11- K13, K16 - K20, K23, K24 and K69		
Blasting			
Construction of ventilation shaft 1 and 2	Blasting may result in ground vibrations, air blast and fly rock,	To prevent impacts on people and animals and to avoid damage to structures.	Avoid and control through implementation of preventative measures (e.g. Fire breaks, Blasting procedures, hazardous substances management).
Construction of ventilation shaft 3	Blasting may result in ground vibrations, air blast and fly rock and may impact on buildings, cultivated lands and a gravel road in the vicinity of this ventilation shaft site.	To prevent impacts on people and animals and to avoid damage to structures.	

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction and operation of powerline and ventilation shafts	All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases	To avoid the onset of soil erosion that can spread into other areas	Avoid and control through preventative measures (Soil placement, storm water infrastructure, erosion control structures). Early detection and prevention of possible impacts.
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	To limit compaction of soil.	Avoid through implementation of EMPR mitigation measures Remedy through application of treatment measures (e.g. ripping). Early detection and prevention of possible impacts.
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	To avoid soil pollution that can harm the surrounding environment and human health.	Avoid through preventative measures (e.g. bunding, spill kits) Remedy through clean-up and waste disposal. Early detection and prevention of possible impacts Modify through soil treatment if required.
Construction and operation of powerline and ventilation shafts	The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.	Reduce areas used for construction of infrastructure	Avoid through implementation of EMPR mitigation measures. Implement rehabilitation where possible (powerline) and adhere to Final Closure and Rehabilitation Plan.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction and operation of powerline and ventilation shafts	The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue	Prevent the loss of land suitable for crop production.	Avoid through implementation of EMPR mitigation measures. Implement rehabilitation where possible (ventilation shaft) and adhere to Final Closure and Rehabilitation Plan.
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction.	To limit compaction of soil.	Avoid through implementation of EMPR mitigation measures. Remedy through application of treatment measures (e.g. ripping). Early detection and prevention of possible impacts.
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil pollution.	To avoid soil pollution that can harm the surrounding environment and human health.	Avoid through preventative measures (e.g. bunding, spill kits) Remedy through clean-up and waste disposal Modify through soil treatment if required. Early detection and prevention of possible impacts
Construction and operation of ventilation shafts and powerline route	The construction and operation of the ventilation shaft and powerline route may result in loss of land capability	Reduce areas used for construction of infrastructure	Avoid through implementation of EMPR mitigation measures.
Socio- Economic			
Construction and operation of ventilation shafts and powerline route	Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally available or potentially available, all new labour requirements will be sourced from within 40 km of the site	To enhance local economic impacts during the construction phase	Increased Employment Opportunities in the Long term, Increased employment for the surrounding communities. Implementation of the Social and Labour Plan Implement Social and Labour Plan with the specific objectives:

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses for construction is currently unknown and a standard environmental principle of 'low' is assigned		To ensure effective transformation as envisaged in the Minerals and Petroleum Resources Development Act (28/2002) the Regulations, and the Mining Charter To promote fair and equitable employment practices as prescribed in the Employment Equity Act (55/1998). The social and economic advancement of the community influenced and affected by Kangra Coal (Pty) Ltd. The positively strive towards equitable practices in accordance with the procurement plan. Supporting, utilising and building local economy.
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; etc. could have (limited) local economic spin-offs.		
Construction and operation of ventilation shafts and powerline route and underground mining	No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.	To prevent loss of jobs for current employees.	Ensure current employees are skilled to find work opportunities in other occupational fields.
Construction and operation of ventilation shafts and powerline route and underground mining	Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas: Dust on existing access roads and during the construction of new access roads on private properties, which impacts grazing and crops and settle on surface water; Degradation of gravel roads; Potential road safety issues (reckless drivers).	To address individual and family level impacts	Ensure Health and Safety Compliance and Environment.
Construction and operation of ventilation shafts and powerline route and underground mining	An increase in crime is often associated with construction activities when an area is 'opened up' for workers and an increase in movement occurs.		Ensure Health and Safety Compliance and Environment.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Construction and operation of ventilation shafts and powerline route and underground mining	Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways: Construction related accidents due to structural safety of project infrastructure; Dust generation and air pollution causing respiratory diseases; High ambient noise levels caused by machinery and construction equipment, resulting in loss of hearing; Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and Possible increase in HIV/AIDS and other STDs due to prostitution activities and temporary sexual relationships with local women, unwanted pregnancies that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).		Prevent impacts on farmers labourers and surrounding landowners at all stages of the development. Ensure health and safety of mine workers within the underground sections as well as the surrounding environment.
Operation of underground mining	The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers	To enhance the positive impacts on the local economy during the operational phase.	Supporting, utilising and building local economy.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Operation of underground mining	**Positive:** Kangra Coal has prioritised sourcing capital goods, services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.		
Operation of underground mining	During the operational phase, the local economy could benefit in the following ways: A possible increase in municipal rates and taxes, resulting in higher levels of rateable income; Local communities would benefit economically through the SLP programmes and LED projects; New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine's procurement partners,		
Operation of underground mining	Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include: Potential to alter the topography due to surfaces that collapse over time; Reduction of groundwater supply due to the pumping of underground water; Quality impacts on water resources and water that is not fit for human and livestock consumption as well as irrigation purposes; and Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.	To address negative local economic impacts during the operational phase	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability, adhere to management outcomes/mitigation measures as described for Operational phase.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Operation of underground mining	More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers are employed on the farms that affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices, resulting in job losses.		Prevent impacts on farmers labourers and surrounding landowners at all stages of the development.
Operation of underground mining	A variety of factors could impact land values of affected farms and those in the surrounds: The quality and availability of water for domestic and farming purposes; Negative impacts on topography (surfaces that collapse with time due to underground mining); Loss of soil characteristics (erosion and compaction); Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock; Visual impacts; Criminal activities (theft, vandalism, etc.); Occurrence of informal settlements, trespassing on private land, illegal grazing; Pre-requirements and restrictions set by the mining company in terms of new infrastructure developments on private properties; Fragmentation of agricultural land (subdivisions).		Early detection and prevention of possible impacts. Restoration of Landscape function and Capability adhere to management outcomes/mitigation measures as described for Operational phase. Reducing disturbing noise/light and vibration to outside boundaries.
Operation of underground mining	The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. The community projects will also continue.	To enhance impacts associated with skills development and social Responsibility during the operational phase	To make people aware of the environment and their own safety.

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT OBJECTIVE	Outcome
Operation of underground mining	Impacts due to lack of communication with landowners and communities can results in disruptions for the Project, temporary mine closures and loss of income; Financial implications for the mine, host communities and private landowners should legal resources be pursued.	To address negative community / institutional arrangements during the operational phase	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development.
Operation of underground mining	Mining depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment.	To address health and safety risks during the operational phase	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development and to prevent impacts on the natural environment.
Operation of underground mining	Increased traffic and impact on road infrastructure		Prevent deterioration of road infrastructure.
Operation of underground mining	Impact on health and safety of workers and people living in the area		Ensure health and safety of mine workers within the underground sections as well as the surrounding environment
Closure of mining and dismantling of surface infrastructure	Increased traffic and impacts on road infrastructure		Traffic Control and prevention of impacts
Operation of underground mining	Increased threat in security		Avoidance and control through preventative measures (e.g. site security, code of conduct)
Operation of underground mining	Loss of work for labour force		To enhance the socio-economic benefits of the project. Focus on skill-transfer.

15.8 FINAL ALTERNATIVES

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

Alternatives have been described within Section 7. The positioning current mining areas was informed by the position of the mineable resource and ensuring a feasible access point to the mineable resource. Alternatives were assessed and changes were made hence the current layout proposed is the most preferred option.

16 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORIZATION

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

The following aspects are highlighted and should be included as conditions of authorization:

- The boreholes above the underground mine should be pump tested prior to the development of the mine in order to determine the yield of these boreholes. It is likely that these boreholes will experience a loss in specific yield due to de-pressurization during mining dewatering. Information to be derived from these pump tests are:
  - Water levels
  - Available drawdown
  - Specific yield
- Groundwater levels should be monitored on a monthly basis and if there is any decrease this should be reported to the competent authority.
- A water use licence in terms of Section 21 of the National Water Act (Act 36 of 1998) needs to be applied for before mining may commence.
- As the following historical sites associated with surface infrastructure could not be visited due to access constraints, it is recommended that a qualified archaeologist inspect and verify these sites prior to mining: K02 – K04, K11, K19, K23 & K24.
- If any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. A sample of shale / mudstone should be set aside if mined.
- All monitoring programmes as recommended by the specialists (groundwater monitoring, surface water monitoring, biomonitoring, noise monitoring, blasting monitoring) should be undertaken as discussed in Section 30 of the EIAR and EMPR.
- An Environmental Noise Measurement Programme (Monitoring Programme) needs to be implemented. See Section 8.2 (annual measurement programme). An independent acoustical consultant should investigate operations. Monitoring must be done to assess for a disturbing noise or a noise nuisance, identifying any potential acoustical issues (e.g., equipment that is broken that could be creating exceeding noise levels). This will also ensure that future community/receptor encroachment or

development can be tracked (documentation of development of the area and environmental acoustics). The compliance in terms of noise levels at the project boundary is also required.

- All specialist recommentations included in Table 128 should be included in the authorization.

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

(Which relate to the assessment and mitigation measures proposed?)

Please refer to Section 13 giving a description of all the "Limitations and Assumptions" of the study. No other uncertainties are known at this stage relating to the assessment or the mitigation measures.

18 REASONED OPINION AS TO WHETHER THE ACTIVITY SHOULD OR SHOULD NOT BE AUTHORIZED

18.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

Please refer to Section 15.4 for the impact statements. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that post the provided mitigation, should prevent the proposed project from proceeding.

18.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORIZATION

Please refer to Section 16, which states that conditions which could possibly be included is provided in Table 128.

18.3 REHABILITATION REQUIREMENTS: CLOSURE OBJECTIVES

Adhere to the Closure and Rehabilitation Plan (Appendix 18). Specific rehabilitation and closure actions forming the basis of the rehabilitation and closure operations have been considered. The actions are aligned with the mitigations defined in the comparative risk assessment (as per Closure report – refer Appendix 18. These actions are planned to comply with the requirements of the vision and objectives. The closure actions form the basis for the closure liability assessment.

19 FINANCIAL PROVISION

Environmental management infrastructure that is required at the outset will be financed out of the project capital. On-going environmental management and rehabilitation as identified in this document and as set out in the EMP will be funded from working costs during the life of the project.

19.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED

This section provides details on the closure cost. The outlined assumptions and limitations also underpin the basis of this closure cost determination. It is important to note that the estimation is based on existing information. The closure cost calculation has been performed in accordance with NEMA GNR 1147 financial provision.

Due to the current uncertainty surrounding the change in the financial provision regulations, this report has utilised the current existing regulations but has only calculated the final rehabilitation cost and no concurrent rehabilitation cost is included based on the mine schedule.

Concurrent annual environmental costs will be included into the operating budget of the mine. The closure costs of the aspects linked with the project have been determined using current contractor costs.

Costing calculations referred to the specific rehabilitation actions, areas and type of disturbance that requires rehabilitation. The bill of quantities (BoQ) for each of the closer items have been developed based on information obtained from the client. The volume estimations are based on preliminary design and mining schedules provided by Kangra Coal. The method employed is deemed acceptable for the level of accuracy required in terms of the regulations.

The costing methodology applied is summarized as follows:

- Developed an itemised plan indicating an inventory of closure aspects based on the proposed mine schedule and discussions with mine personnel;
- Defined specific rehabilitation actions for each through reviewing specialist studies, impact assessment outcomes, industry guidelines, conceptual modelling and rehabilitation experience;
- Calculated monitoring and maintenance costs and
- Compiled a dedicated closure spreadsheet to determine the closure costs of the quantified actions through applicable rates.

A rate sheet has been developed and aligned to the specific infrastructure in the BoQ. The rates sheet has been developed using the following datasets:

- DMR guidelines (2005).
- Tender and pay rates from contractors that are available.
- Rates from operations recently evaluated by Elemental Sustainability.
- Associations and industry oversight entities average rate sheets.

19.2 ASSUMPTIONS

The following qualifications and assumption were made for the closure assessment:

- The financial provision calculation for the proposed mine is based on the mine works program and is for a period of 10 years (year 1 – year 10). The Latent Liability Cost is based on the current closure scenario and available information.
- Input in this report is based on information obtained from the mine, reference documents, specialist studies, site visits and interviews.
- This report is based on prescribed legal methodologies and applications, the report contains interpretations and assumptions documented and contextualized to the best ability of the writer. Particularly, with relation to futuristic and predictive matters associated with scheduled closure.
- Notice is taken of changing circumstances and associated report qualifications, which at the time of the report might be different to the time of the assessment. This report therefore represents a snapshot

view of the operation at the time and date of the assessment.

- No warranty is included with this report, either express or implied, that the actual described conditions will conform exactly to the assessment and results contained in this report.
- No scheduled cost is included in the quantum calculations for financial provision.
- This report addresses rehabilitation costs required at closure and the post closure monitoring and maintenance.
- Contractor rates were utilised to determine the applicable rates and other rates as stated above.
- Calculations for infrastructure such as plant infrastructure, concreted areas and steel structures were based on estimates received from the client.
- A contingency of 10% has been included to allow for unforeseen costs associated with contractors or rate increases in the closure phase and post closure phase.
- Preliminary and general of 10% has been included to allow for unforeseen costs associated with the project.
- It was assumed that 3 years is adequate for the monitoring and maintaining of vegetation after rehabilitation. After the 3-year period the need for additional morning and maintenance will be established.
- For post-closure monitoring, costs of groundwater and surface water has been assumed to take place for a period of 10 years with sampling taking place on a biannual basis.
- Specialist studies, professional fees and project management has not been included in the closure cost as these will form part of the operational cost for closure, only specialist studies as indicated in the report have been included in the closure cost.
- Long-term decant from workings and its treatment costs is included in the provision, however, the cost is based on the assumption that decant (if any) will take place on the adjacent mining area and the infrastructure for the treatment of the decant have been included in the closure cost of the adjacent mining area also operated by Kangra Coal.
- In this assessment the current aspects and activities will be considered to determine the environmental liability, excluding planned aspects for the next financial year which were not considered.
- Cost estimates will have an accuracy of ± 50 per cent for operations, or components of operations, 30 or more – GNR 1147.
- The accuracy of the assessment and confirmation of the assumptions made as part of this report will be increase as the life of mine decreases.
- No treatment plant of tailings will be stored on the mining area and all treatment will be undertaken at the existing approved facility operated by Kangra Coal.
- At mine closure, all infrastructure will be removed from the site;
- All concrete will be utilised in the sealing of the ventilation shafts.
- No provision has been made for removal of powerline infrastructure;
- Drilling of monitoring boreholes during the closure phase is included in the closure cost and not part of operational cost. It is estimated that and additional 12 monitoring boreholes will be drilled during the

closure phase.

- Treatment of decant - Cost associated with chemical treatment of mine water calculated over 10 years of operation post-closure. Based on an estimated volume of 250m^3/day.

19.3 ACCURACY LEVEL

Notwithstanding the above, the reflected costs provide a good indication of the costs for the proposed operation. Providing a sound basis for making the financial provision for the planned LoM, to an accuracy level of 50%. The accuracy will be increase throughout the life of the mine based on the requirements as set out in GNR 1147 and as more information becomes available.

19.4 CLOSURE COST

The 2021 quantum for closure-related financial provision for Kangra T4 project was undertaken by Elemental Sustainability (Pty) Ltd. The summary of the closure cost calculated for the mine is presented in Table 131. below.

The estimated financial provision required for the rehabilitation and closure of the Kangra T4 Project is R 9 084 888.22 (Final Closure) excl. VAT. Latent Liability Cost includes maintenance and re-vegetation of rehabilitated areas, estimated at R 1 932 381.00 excl. VAT and water treatment post-closure estimated at R 2 920 000 excl. VAT. A summary of the financial provision estimates associated with the Kangra T4 Project is included in Table 130 below.

Table 130: Scheduled Closure Cost

	Kangra Coal - T4 Project Financial Provision 2021				
Date	2021/03/09				
Assessor	DuToit Wilken				
				Latent Liability Cost	
Closure Aspect (Item)		Premature Closure Cost	Final Closure Cost	Maintenance	Water Treatment
1.	Infrastructure Areas	R670 464,00	R670 464,00		
2.1	Rehabilitation including final voids, ramps and haul roads	R126 130,00	R126 130,00		
2.2	Underground rehabilitation	R651 639,00	R651 639,00		
2.3	Sealing of adits and shafts	R504 375,00	R504 375,00		
3.	General Surface rehabilitation and placement of Topsoil	R270 802,40	R270 802,40		
4.	P&G's, Contingencies and Additional Allowances	R1 574 096,82	R1 574 096,82		
5.	Residual and Latent Liability Cost				R2 920 000,00
6.	Pre-Site Relinquishment Monitoring and Aftercare			R1 568 550,00	
Total (excl vat)		R3 797 507,22	R3 797 507,22	R1 568 550,00	R2 920 000,00
Vat @ 15%		R569 626,08	R569 626,08	R235 282,50	R438 000,00
Grand Total (incl vat)		R4 367 133,30	R4 367 133,30	R1 803 832,50	R3 358 000,00

Table 131: Quantum of Financial Provision

Closure Component		Applicable	Unscheduled Closure			
			Quantity	Unit	Unit Rate	Total Cost
1.	**Infrastructure Areas**					
1.1	Dismantling of Ventilation Shaft and related infrastructure	Yes	6	Ton	R4 500,00	R27 000,00
1.2	Dismantling of Concrete and steel structures	Yes	1200	m^2	R536,22	R643 464,00
1.3	Removal of containers and removal structures	No	0	m^2	N/A	R0,00
Sub-total for Infrastructure Areas						R670 464,00
2.	**Mining Areas**					
2.1	Open pit rehabilitation including final voids, ramps, and haul roads					
2.1.1	Concurrent backfill	o	0	m^3	R0,00	R0,00
2.1.2	Backfill final void from stockpile	No	0	m^3	R20,17	R0,00
2.1.3	Dozing of overfill	No	0	m^3	R15,34	R0,00
2.1.4	Gravel Roads	Yes	0,4	ha	R315 325,00	R126 130,00
2.2	**Underground rehabilitation**					
2.1.1	Backfill of Voids and shafts (Dozing)	Yes	9 600	m^3	R15,34	R147 264,00
2.1.2	Sealing of underground Walkways (40MPa concrete + Steel)	Yes	75	m^3	R6 725,00	R504 375,00
Sub-total for Infrastructure Areas underground rehabilitation including final voids, ramps, and haul roads						R777 769,00
2.3	**Sealing of adits and shafts**					
2.3.1	Sealing of Vent shafts - (40MPa concrete + 1ton Steel/10m3)	Yes	75	m^3	R6 725,00	R504 375,00
Sub-total for Sealing of adits and shafts						R504 375,00
3.	**General Surface rehabilitation and placement of Topsoil**					
3.1	Topsoil placement over rehabilitation area	Yes	8	ha	R10 365,30	R82 922,40
3.2	Rip and scarify	Yes	8	ha	R4 250,00	R34 000,00
3.3	Hydroseed areas	Yes	8	ha	R19 235,00	R153 880,00

Sub-total for General Surface rehabilitation and placement of Topsoil						R270 802,40
					Subtotal 1:	**R2 223 410,40**
4.	**P&G's, Contingencies and Additional Allowances**					
4.1	Preliminaries and general	Yes	7,5	/sum	R166 755,78	R166 755,78
4.2	Contingencies	Yes	10	/sum	R222 341,04	R222 341,04
4.3	Specialist Studies - Engineering design	Yes	1	/sum	R250 000,00	R250 000,00
4.4	Specialist Studies - Geohydrological and Geochemical	Yes	1	/sum	R250 000,00	R250 000,00
4.5	Specialist Studies - Stability Assessment	Yes	1	/sum	R250 000,00	R250 000,00
4.6	Installation of boreholes for monitoring	Yes	6	/sum	R72 500,00	R435 000,00
					Subtotal 2:	**R1 574 096,82**
5.	**Residual and Latent Liability Cost**					
5.1	Treatment of Decant Water	Yes	200	m^3/day	R4,00	R2 920 000,00
					Subtotal 3:	**R2 920 000,00**
6.	**Pre-Site Relinquishment Monitoring and Aftercare**					
6.1	Surface Water Quality Monitoring and Reporting	Yes	10	/yr	R59 750,00	R597 500,00
6.2	Groundwater Quality Monitoring and Reporting	Yes	10	/yr	R74 500,00	R745 000,00
6.3	Rehabilitation Monitoring (Vegetation, soil, land capacity)	Yes	3	/yr	R75 350,00	R226 050,00
					Subtotal 4:	**R1 932 381,00**
					Grand Total Excl. Vat. (or Subtotal 1+2+3+4)	**R8 286 057,22**

19.5 DESCRIBE THE CLOSURE OBJECTIVES AND THE EXTENT TO WHICH THEY HAVE BEEN ALIGNED TO THE BASELINE ENVIRONMENT DESCRIBED UNDER REGULATION 22 (2) (D) AS DESCRIBED IN 2.4 HEREIN

Closure and rehabilitation are a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation.

The preliminary closure vision is proposed for the underground mining, is as follows:

- To create non-contaminating, secure and physically stable landforms and rehabilitated areas that contribute to the selected land use mix, biodiversity of the area and which are aesthetically acceptable

19.5.1 Land Use Objective

The land use objective must be realistic, achievable and must be established through consultation with the landowners and I&AP's. The final land use is essential the end land use to which Kangra T4 project can be return the land affected by mining related activities.

In support of achieving this post closure vision there are certain key rehabilitation, decommissioning and closure objectives. 'Well-conceptualised rehabilitation objectives will allow assessment of the risks associated with achieving these objectives and guide the setting of suitable rehabilitation actions to be taken to mitigate these risks at every stage of the mine's life. Rehabilitation objectives describe 'what' needs to be achieved to reach the mine's rehabilitation goal. These objectives should be aligned to site-specific characteristics that are within the mine's control. Rehabilitation objectives should be as specific, measurable, achievable, and realistic as possible. They should also define a period against which they can be measured. Driven by the closure vision and with due consideration of the project context, the closure objectives are presented below.

To progressively reinstate a post mining landscape that:

- Is physically and chemically stable and supports the pre-mining land capability.
- Slopes are stable and non-erosive.
- Focus on establishing a functional post-mining landscape.
- Utilise closure strategies that promote a self-sustaining condition with little or no need for ongoing care and maintenance.
- Comply with local, district and national regulatory requirements.

The ventilation shafts will be sealed, and the area will be rehabilitated to be in line with the surrounding areas.

19.5.2 Closure Options

The current mine closure plan is focussed on establishing a future land use that can be economically viable. As the mine will be an underground mine with very limited surface infrastructure, limited alternative closure options exist. The following alternatives were considered:

- Continuing mining by identifying further resources and subsequently extending the life of the project;
- Sealing of the underground workings leave the voids to naturally recharge with groundwater.
  - Walkway between the mining areas is not sealed, leaving water to drain to adjacent mining area for the T4 project area
  - Sealing of walkway between mining areas and limiting the flow of water to adjacent mining area.
- Removing of surface infrastructure and rehabilitating areas to be in line with surrounding land use.
- Water Treatment Plant. Poor water quality as a result of decant emanating post closure is of concern. A potential therefore exists to consider various water treatment alternatives (Active vs passive treatment options).

19.5.3 Motivation for preferred Closure Option

The project, from a closure perspective, is complex even though the risks and impacts associated with the project are understood. A preliminary best fit post closure land use option has been proposed within the context described. The rehabilitation measures proposed for this project are consistent with legislation and what is considered industry good practice in restoring the desired post mining land use. The preferred closure option is a combination of the options as listed above:

Rehabilitation of Surface Infrastructure

The surface infrastructure associated with the project will be removed and the areas rehabilitated to be in line with the surrounding land-use. The only surface infrastructure that will be constructed consist out of three ventilations shafts and a powerline to provide electricity to the ventilation shafts.

The ventilation shaft and associated infrastructure will be removed and the shaft into the underground area will be sealed with concrete, to ensure that no water ingress can take place. The surface area will be rehabilitated with topsoil and subsoil that was stripped from the site during construction. The area will be rehabilitated to be in line with the land use of the area.

Sealing of underground area

The natural groundwater gradient is from the T4 mining area towards the Kusipongo mining area. Based on the geohydrological model it is likely that decant will take place from the Kusipongo mining area. By sealing the walkway between the two mining area and limiting the water flow towards the Kusipongo mining area the likelihood and volume of decant can be reduced.

For this reason, the current preferred closure option will be to seal the walkway between the two mining areas and leave the voids to naturally recharge with groundwater. This will take place in 15-20 years.

Treatment of water

The preferred closure option will be to seal the walkway between the two mining areas. This will result in minimal interflow between the two mining areas. The likelihood and volume of decant predicted to take place at the Kusipongo mining to be reduced.

The assumptions and limitations associated with the preferred closure options should be investigated in more details during the operational and closure phases of the project. During the operational and closer phase, the preferred closure option must be refined.

The Closure and Rehabilitation Plan compiled for the specific project is attached in Appendix 18.

19.5.4 Closure Scenario

Leading on from the closure option analysis and the motivation of the preferred option, the closure scenario is formulated to provide the context within which decommissioning, and closure activities will occur, i.e. a "snapshot" view of the last day of operations, taking account of operational mine and rehabilitation planning. Refer to Table 132 for the closure scenario.

Table 132: Closure Scenario

Aspect	Description
Sealing of underground area	• Final roof supports will be installed and historical section will be inspected to ensure that roof support is still intact. • Pillar stability test to be performed on a number of area to ensure that no pillar failure will take place. • All equipment and material will be removed from the underground area. • The walkway between the mining areas and between the difference sections to be sealed to ensure that no water migrates to the adjacent mining area. • The cap that will be utilised to seal the underground areas will be designed by an engineer to ensure that the cap can withstood the pressure associated with the water.
Removal of surface infrastructure	• All structures should be demolished to 1m below ground level • The rubble generated to be utilised for the sealing of the ventilation shaft. • The areas should be shaped, top soiled with between 300mm to 600m of topsoil and vegetated to be in line with the surrounding land use. • The steel structure to be removed from the site and disposal to be at a registered disposal site or the material should be re-used. • Any hazardous waste
Sealing of ventilation shafts and adits	• The sealing of vertical and incline shafts is primarily a safety consideration and this should be conducted in such a manner that potential safety risks are largely obviated. • Inert building rubble arising from the demolition of surface infrastructure should be deposited into the shafts • A mass concrete cap of 1 000 mm thickness is placed onto the building rubble deposited into the ventilations shaft • The cap that will be utilised to seal the ventilation shaft will be design by an engineer to ensure that no water can flow into the shaft and that the shaft hold now safety risk.
Powerlines	• The powerline will remain on the area
General surface rehabilitation	• Surface topography that emulates the surrounding areas and aligned to the general landscape character. Steep slopes in excess of 6 percent should also be avoided if possible. • Landscaping that would facilitate surface runoff and result in free draining areas. If possible, the drainage lines should be reinstated. • Vegetation to be re-instated as provided by the biodiversity management plan

Installation of monitoring boreholes	• Monitoring boreholes will be installed into the underground area. The boreholes will be specifically installed before and after each of the sealed off areas. • Additional monitoring boreholes to be drilled.

19.5.5 Operational Rehabilitation

A key mine closure principle is concurrent (progressive) rehabilitation. This includes the development and implementation of rehabilitation plans aligned with mining programmes. The specific aim is to minimise closure costs and liabilities and reduce environmental risks during operation and at closure of the mine through to post mining. As the mine is an underground mine with limited surface infrastructure, very limited concurrent rehabilitation can be performed. However, a number of actions can be taken during the operational phase to ensure that a successful closure can be achieved.

19.5.6 Vision for the Operational Period

The operational period will include rehabilitation activities and management measures that have a direct impact on the quality of rehabilitation attained at closure, particularly the management of soils. A proposed vision for the development and operation of the opencast pits are:

- To limit the development footprint as far as possible;
- Implement stormwater measures according to GNR 704;
- Strip and store soils prior to any development;
- Prevent mixing of soil profiles;
- Re-vegetate topsoil stockpiles and berm to maintain soil fertility;
- Prevent contamination of topsoil.
- Undertake extensive monitoring (ground and surface water)
- Ensure roof stability and pillar stability
- Update geochemical and geohydrological models with new information and closure scenarios; and
- Refine and update closure scenarios

19.5.7 Planned Rehabilitation

19.5.7.1 Steps for the next Year (year 1-5)

The preliminary implementation plan (annual plan - Table 133) for rehabilitation is unfeasible for an underground mining area as very limited rehabilitation can be formed during the annual periods. It is however proposed that the plan should be for the first 5 years of the operational phase. During the first years of mining the underground walkway and conveyer belt will be established. The first of the ventilation's shafts will be installed within the first 5 years of mining. As part of the ventilation shaft the topsoil, subsoil and overburden will be stripped for the ventilation shafts areas. It is recommended that the subsoil and topsoil be stored in berms on the area and that the berms be utilised as stormwater management. During the first 5-year period the vegetation should be establish on the topsoil berms.

Powerlines will be established during the first 5-year period to supply electricity to the ventilation shafts. The area impacted by the establishment of the powerline should be rehabilitated and the area should be revegetated.

An extensive monitoring program should be established as part of the first 5 years. Additional boreholes should be drilled. The boreholes must be drilled into the different aquafers. A surface water monitoring program included bio motoring should also be established. The monitoring program should be established in year 1 before any extraction of coal has taken place to ensure that at least 2 years of baseline monitoring has taken place before mining takes place.

The following mitigation and management measures should for part of the first 5-year period:

- Roof support to be installed
- Site specific pillar safety factor to be developed and implemented to ensure that no pillar's collapse in future; and
- No stooping of coal should take place.

The plan should be audited on an annual basis and should be updated as required.

Table 133: Annual Rehabilitation Plan

Aspect	**Task/Action**	**% completed**	**Responsible person**
1. Re-vegetation of topsoil berms	The topsoil berms should be re-vegetated with species present within the area as described in the Biodiversity management plan		Environmental Officer
2. Establishing of stormwater measures	The topsoil and subsoil to be utilised to implement stormwater measures surrounding the ventilations shafts.		Environmental Officer
3. Rehabilitation of powerline area	Some clearance of vegetation will take place during the installation of the powerline. The areas impacted on should be re-vegetated with vegetation as specified in the Biodiversity Management plan		Environmental Officer
4. Installation of monitoring boreholes	Monitoring boreholes to be installed and the monitoring program must be established		Environmental Officer
5. Underground roof support installation	As part of the rehabilitated and to ensure that the underground area remains stable the installation of roof support to be tracked.		Mine Engineer
6. Site specific pillar safety factors	The mining area have safety factors that will be complied with to ensure that no pillar failure takes place. The mine should test the coal strength of the area and the safety factor should be refined for the site.		Mine Engineer

19.5.8 Infrastructure and Rehabilitation

19.5.8.1 Ventilation Shafts

During the final rehabilitation and decommissioning phase, the ventilation shafts and associated infrastructure will be removed. No salvage value for any of the steel structures, scrap steel and equipment that can be re-used or sold are permitted. The quantity item provided for is presented in Table 33, all infrastructure and concrete structures associated with the ventilation area is included. However, none of the movable equipment or structure have been included. During the first 10 years of operation all three (3) ventilations shaft will be established and thus it will form part of the un-schedule closure cost. The surface area that will be disturbed by the ventilation shaft will be rehabilitated as general surface rehabilitated. The areas that will be disturbed by the installation of the ventilation shaft areas will be around 2ha, with a 20m x 20m reinformed concrete base.

Table 134: Ventilation shaft

Ventilation shaft and associated infrastructure	Unit
Removal of Steel structures	6 Tons
Removal of concrete base (reinforced concrete)	1 200m^3
Reinforced Concrete (Steel and 40 MPa concrete) – Sealing of shaft	75 m^3

19.5.8.2 Access and Service Roads

Access and service roads will be constructed during the construction and operational phases. The roads will be constructed to ensure access to the areas where the ventilation shaft is to be installed. The total road areas were calculated at 4 000 m^2. It is important to note that some of the roads will remain in place after closure, for the next land-use and to access the area during monitoring and aftercare. For the rehabilitation of roads, a cost has been allocated to rip the area, add 150-300 mm topsoil, and vegetate. None of the roads constructed will been surfaced with tar or any form of hydrocarbons. For this reason, the roads will be rehabilitated as general surface rehabilitation.

Table 135: Access and service roads

Roads	Area (m^2)
Rehabilitation of Access and Service Roads	4 000.00
Roads to be rehabilitated as General surface rehabilitation	4 000.00

19.5.8.3 General Surface Rehabilitation

General surface rehabilitation will consist out of the cross ripping of all areas, placement of topsoil ripping of any compacted topsoil and seeding of topsoil. All areas impacted during mining, apart from the areas/ infrastructure that will remain after closure requires general rehabilitation.

The following estimated surface areas are included to be rehabilitated as part of the General Surface rehabilitation

- Ventilation Shafts – 2ha each
- Additional 2 ha have been included for any disturbance associated with the powerline.

All the disturbed will be prepared for planting. The recommended approach, for which this costing has been derived, is as follows:

- Lime and superphosphate are applied to the surface;
- These ameliorants are then incorporated by deep ripping, which penetrated 100 mm through the soil into the underlying overburden material;
- Compound (NPK + Zn) fertilizer is applied, and disced in as part of seedbed preparation;
- A grass seed mix is then planted, usually with first rains, or after rains have commenced;
- The site is then mulched using locally obtained grass; this is to stimulate the long-term establishment of indigenous vegetation and to reduce erosion during early plant growth; and

Table 136: Rehabilitation of disturbed areas

Mined areas	Area (ha) and Volume
General Surface Rehabilitation	8 ha

19.5.8.4 Sealing of Underground Areas

During the final phases of closure, the underground areas will be sealed off to prevent any water movement between the mining areas. As the number of points where the underground area will be sealed off the following cost have been included:

- Estimated Specialist cost - Engineering design work; and
- Sealing of two walkway areas consisting of 5m (L) x 5m (W) x 5m (H).

Table 137: Sealing of underground area

Mined areas	Unit
Engineering Design	R 350 000.00
Sealing of Walkways – Reinforced concrete (40 MPa)	50m^3

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

The environmental objective in relation to closure will be made available to all registered I&APs for comment. All comments received and the relevant meeting minutes will be appended to this report.

19.7 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

Refer to Section 18.3 above. All infrastructure established will be removed and rehabilitated in accordance with the approved Closure Plan and Final Land Use attached as Appendix 18.

19.8 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES

The rehabilitation plan will be compiled in accordance with the objectives and goals according to the Mine and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) as amended and GNR 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998). Refer to Section 19.5. A preliminary Closure Plan has been drafted and is included in Appendix 18.

19.9 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT IN ACCORDANCE WITH THE APPLICABLE GUIDELINE

The Closure Quantum was conducted in 2021 for the new application and in accordance with regulations. Refer to Table 131.

19.10 CONFIRM THAT THE FINANCIAL PROVISION WILL BE PROVIDED AS DETERMINED

Kangra Coal (Pty) Ltd. will provide the amount/financial guarantee as specified to the DMRE. These guarantees are audited on a yearly basis.

20 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

Elemental Sustainability (Pty) Ltd. was appointed by Kangra Coal in terms of Regulation 12(1) (EIA Regulation, 2014 (GNR982)) to take over the application from GCS – Water and Environmental Consultants, appointed as the previous Environmental Assessment Practitioner (EAP) and subsequently removed from the project.

During the Scoping phase comments were received from commenting authorities, which required that the scope of work for some of the specialist studies be expanded. A review of the scoping report was undertaken by the EAP and additional specialist studies have been identified.

Additional infrastructure, including ventilation shafts and powerlines to these ventilation shafts were included in the EIAR and have been assessed by the specialists. Refer to Section 10, which provides a description of all specialist studies undertaken for the project.

20.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

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

Several changes have been made since the Scoping Report, including the removal of the farm Mooihoek from the application as the DMRE did not include this farm in the acceptance of the application form. Also refer to the section discussing Alternatives assessed for more details (Section 7). Additional specialist studies not identified during the scoping phase have been undertaken, which has allowed for a better desciption of the baseline environment and the opportunity for identification of potential impacts and risks of the project.

20.2 MOTIVATION FOR THE DEVIATION

The farm Mooihoek was specifiifically exlcuded by the comepetent authority from the application, while the additional specialist studies allowed for a beter understanding of the baseline environment.

21 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

21.1 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, 1998 (ACT NO. 107 OF 1998) THE EIA REPORT MUST INCLUDE THE

21.1.1 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 Appendix*.

A Socio-Economic Impact Assessment report was undertaken for the proposed project and Socio-Economic aspects have been adequetly assessed and addressed within this document. One-on-one interviews were also held by the Social Impact Assessment specialist to ensure that all specific concerns could be included in the Social Impact Assessment and ensure impacts on the landowners and surrounding landowners could be adequetly addressed.

The socio-economic impacts during the operational period are more complex to rate, as many of these impacts will be influenced by the degree of the impact that will potentially manifest on natural resources, such as on groundwater and soil. Anticipated impacts are summarised below:

- Local economic impacts (positive): Employment; Local procurement for HDSA/SMMEs; Local economic spin-offs:
  - Low to Medium overall significance (positive).
  - The DPKISLM is not anticipated to benefit significantly (existing SMMEs are from the Mkhondo LM area) and it is recommended that cooperation takes place with the DPKISLM LED Unit to maximise the local content of the T4 Project (new recruits, local procurement, training benefits, etc.).
- Local economic impacts (negative): Loss of access to livelihoods; Potential job losses in the agricultural sector; Impacts on land values:
  - Medium overall significance (negative) that cannot be mitigated effectively.
  - It is recommended that negotiations take place with landowners that are impacted by the mine to decide on amicable solutions/options that would increment incomes/reduce impacts on livelihoods and potential job losses.
- Population impacts: Influx of jobseekers/outside labour force:

  - Very low overall significance (negative).
- Skills development and social responsibility: Skills development, training; Community development; Housing and living conditions:
  - Medium overall significance (positive).
- Equity of minority groups: Employment equity of HDSAs/WIM:
  - Low overall significance (positive).
- Community / institutional arrangements: Impacts of failed processes for consultation and negotiations; Negative community mobilisation:
  - Low to medium overall significance (negative).
  - Mitigation can effectively be done.
- Land use impacts: Impacts on agriculture:
  - Medium overall significance (negative).
  - Low mitigation potential, as the impacts on water resources cannot be eliminated.
- Individual and family level impacts: Impacts on human rights; Security impacts; Sense of place; Traffic and associated impacts; Intrusion impacts:
  - Low to medium impacts (negative) that can generally be mitigated.
- Impacts on community infrastructure: Impacts on cultural and archaeological sites:
  - High negative significance for several culturally significant sites that include cemeteries and stonewalled enclosures at the proposed powerline options.
  - The preferred course of action would be to alter the route of the proposed powerline to avoid these localities.
- Health and safety impacts: Health and safety risks for workers; Community health and safety impacts
  - Medium to low overall significance (negative) that can be mitigated.

The DPKISLM's LED and Tourism Strategy of 2015 is currently under review and it has been identified that the agriculture and tourism sectors have comparative advantages to enhance the economy of the municipality. The municipal IDP (2020/21) further states that economic plans and opportunities focusing directly on these areas (i.e. agriculture, agro-processing and tourism) should be developed on finalisation of the overall Local Development Strategy. The proposed Kangra T4 Project has the potential to impact agricultural land uses negatively, which would not only result in potential negative local economic impacts for landowners but would also contradict the goals and plans set in the municipal Strategies.

This SEIA also investigated the 'No-go option', which would in all likelihood result in retrenchments or the redeployment of Kangra Mine workers once the Kusipongo reserves are depleted. Kangra Coal has, as prescribed by the MPRDA, made financial provision and has an existing strategy to manage job losses in its effort to ameliorate the social and economic impact on the workforce in the event of mine closure. This strategy includes training programmes that encourage self-employment, re-employment and portable skills development.

As there are no regulations that make provision for job losses in the agricultural sector and workers are generally less qualified and skilled, these farm workers are less equipped and therefore less likely to obtain alternative employment/incomes when they are retrenched. The cumulative negative socio-economic impacts for farm workers that lose their employment can thus be expected to be higher than for mine workers.

21.1.2 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 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Some of the areas demarcated for the proposed Kangra Coal T4 project are considered to be significant from a heritage perspective. The significance of the proposed areas and the observed sites are discussed here. The general study area is associated with a combination of historical buildings, settlements, building ruins, stonewalled enclosures, and burial sites. As the majority of the study area will consist of underground mining methods, only the sites that might be impacted on by the proposed surface development and underground mining are indicated on the heritage assessment.

Demolished historical sites – not visited

The following 24 sites, consisting of buildings and structures, have been identified on historical aerial and topographical maps: K07 & K08, K10, K21, K24 & K25, K27 – K43, K45. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, these sites have completely been demolished and were not visited. No surface impact is envisaged.

Historical sites associated with surface remains – not visited

Seven historical sites associated with surface remains were identified on historical aerial imagery: K02 – K04, K11, K19, K23, K24. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, structures and buildings still exist at these sites. Due to access constraints, however, these sites could not be inspected. Because these buildings/structures are likely to exceed 60 years of age, they are considered significant form a heritage perspective and are protected under the National Heritage Resources Act 25 of 1999.

Historical sites associated with surface remains – visited

The following 11 sites were identified on historical aerial imagery and were inspected during the site visits: K01, K05 & K06, K12 & K13, K16 – K18, K20 & K22, K69. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. The site visits confirmed that structures and buildings are still associated with these sites and it is therefore likely that these buildings and structures, or parts thereof, exceed 60 years of age and are considered significant form a heritage perspective. These sites are therefore protected under the National Heritage Resources Act 25 of 1999.

Demolished historical sites – visited

Three sites (K09, K14, K15) recorded on historical aerial imagery and consisting of buildings and structures intersect the area planned for underground mining, but are not located within close proximity of planned surface development. These sites were visited and no surface material were observed. No surface impact is envisaged.

Demolished contemporary sites – not visited

Five sites consisting of buildings and structures that date to contemporary times were identified on 1969 aerial imagery: K26, K46 – K49. These sites intersect the area planned for underground mining, but are not located within close proximity of planned surface development. Based on recent aerial imagery, these sites have completely been demolished, were not visited and are not considered significant form a heritage perspective.

Contemporary sites – visited

Two sites (K65 & K66) are located at the eastern end of the proposed powerline. One of the structures has been demolished, while the other is in a dilapidated state. Accordingly, these sites were constructed in recent years and are not considered significant from a heritage perspective.

Historical sites in close proximity of surface development – visited

Eight sites (K50 & K51, K57, K60 – K64) associated with surface infrastructure were recorded in close proximity of the proposed powerline. Seven of these sites consist of stone-walled enclosures and based on surface remains and the combination of angular and circular building patterns, these sites date to historical times. The possibility,however, exists that some of the circular stone-walled enclosures might date to the Late Iron Age Farmer period. One of the sites, settlement K57, consists of a demolished homestead dating to historical times, as well as modern buildings and a cemetery. As these buildings/structures, as well as the potential subsurface cultural material, exceed 60 years of age, they are considered significant form a heritage perspective and are protected under the National Heritage Resources Act 25 of 1999.

Natural sites

Sites K53 & K54 were recorded during the pedestrian survey and identified as natural rock outcrops as no evidence, whether material or archival, could be obtained to indicate otherwise.

Graves/Cemeteries located outside of the areas demarcated for surface development but within the underground mining boundary

The following graves/cemeteries fall outside of the area demarcated for surface development, but within the boundary of underground mining activity. These sites might therefore be at risk of suffering impact from the proposed underground mining activities: K55 & K56, K67, K70. Also, the burial dates of the majority of the graves could not be determined. As stated above, no graves could be observed at Site K70 due to access limitations, although the surface infrastructure suggests a cemetery. Therefore, the site should be regarded as a cemetery until proven otherwise. It is likely that the cemeteries contain graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply.

Graves/cemeteries located within close proximity of the areas demarcated for surface development

Sites K52, K58, K59, K68, K71 are graves/cemeteries located within close proximity of the proposed powerline. These sites are therefore at risk of being negatively impacted by the proposed development. Also, Site K52 consists of stone cairn and should be regarded as a grave until proven otherwise. It is likely that the cemeteries contain graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply.

21.2 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.).

Please refer to Section 7 where alternatives have been discussed in detail.

22 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 Environmental Impact Assessment Report and the Environmental Management Programme report.

The signed undertaking is included in Section 33 of Part B and is valid for both the Environmental Impacts Assessment (Part A) and the Environmental Management Programme (Part B).

PART B ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

23 DETAILS OF THE EAP

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

The information can be found in Section 0. Also refer to Appendix 1 and Appendix 2.

24 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).

Please refer to Section 3 above.

24.1 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 Appendix 22.

24.2 DETERMINATION OF CLOSURE OBJECTIVES

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

The overall closure vision for the Kangra T4 Coal Mine Project is to progressively re-instate the natural landscape areas to a safe, stable and non-polluting environment, mimicking some of the pre-mining land use, and managing the unavoidable residual mining impacts and/or disturbances. The closure vision is to leave behind a positive post-mining legacy.

The closure objectives are presented below.

- To progressively reinstate a post mining landscape that:
- Is physically and chemically stable and supports the pre-mining land capability.
- Slopes are stable and non-erosive.
- Focus on establishing a functional post-mining landscape.
- Utilise closure strategies that promote a self-sustaining condition with little or no need for ongoing care and maintenance.
- Comply with local, district and national regulatory requirements.

The ventilation shafts will be sealed, and the area will be rehabilitated to be in line with the surrounding areas.

Also refer to Section 19.5.

24.3 THE PROCESS FOR MANAGING ANY ENVIRONMENTAL DAMAGE, POLLUTION, PUMPING AND TREATMENT OF EXTRANEOUS WATER OR ECOLOGICAL DEGRADATION AS A RESULT OF UNDERTAKING A LISTED ACTIVITY

Refer to Table 138 for the mitigation measures.

Any activity that results in damage or pollution to the environment will be rated and signed a value to determine the risk. An environmental emergency is defined as an unplanned situation or event resulting in potential pollution of the environment. A pollution incident means an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur.

Kangra is required to conform with the polluter pays principle. This principle provides for “the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.” The Polluter Pays Principle must be rigorously applied throughout all phases of the project.

24.3.1 Roles and Responsibilities

In order to implement the environmental management programme (EMPr) and monitoring protocol Kangra need to provide human resources and an operational budget for environmental management. The following resources are required:

1. Environmental control officer during construction

2. Environmental manager during operations and closure

The environmental human resources will need to ensure the EMPr is implemented to manage environmental impacts. Kangra should also ensure these positions are filled by people with the necessary competence and experience to not only assist with the implementation of the EMPr but are also capable of interpreting environmental monitoring results to identify any impacts or incidents. Any environmental damage or pollution needs to be registered as an environmental incident and investigated. The investigation must focus on identifying the root cause of the incident and also consider how to ensure no-repeat of these incidents. The management of extraneous water will take place during operations but also post closure. Kangra need to identify a vehicle or entity capable of managing water treatment post closure. The rehabilitation plan must be updated annually to allow and plan for concurrent rehabilitation (annual rehabilitation). The financial provision must also be updated annually to cater of rehabilitation of the mine’s impacts.

All employees and its contractors working for the mine are responsible for reporting any accident/emergency to their supervisor immediately, and if required notifying the emergency response teams. Personnel must be nominated as response team members and must receive appropriate training to manage emergencies. All other personnel must be made aware of potential emergencies and trained in emergency response. Management must be aware of their responsibilities in case of emergency.

24.3.2 Response to Environmental Emergencies

24.3.2.1 Emergency Plan

Kangra Coal T4 must identify potential emergencies and develop procedures for preventing and responding to them. There are several options for dealing with high priority impacts and risks, as the paradigm has two components, probability and consequence. The design of control measures is a function of understanding the cause and effect. Best practise is to intervene with the ultimate factors where feasible, rather than treat the outcomes. Emergency response is therefore aimed to reducing the probability or reducing the consequence although reducing the probability of an emergency is the preferred option.

Residual impacts are those impacts that despite reducing the probability and consequence might still occur. In these cases, parties will have to be compensated, pollution cleaned up and damage to the environment remediated. Kangra shall be required to develop and implement an Emergency Preparedness and Response Plan prior to commencing work. The Emergency Preparedness and Response Plan should be based on a baseline Hazard and Risk Assessment and should provide for the following as a minimum:

- Risk assessment (identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted);
- Response procedures;
- Provision of equipment and resources;
- Designation of responsibilities;
- Communication and reporting (including that with potentially Affected Communities);
- Periodic training to ensure effective response; and
- Periodic review and revision, as necessary, to reflect changing conditions.

Kangra must ensure that the Emergency Preparedness and Response Plan makes provision for environmental emergencies, including, but not limited to;

- Fire Prevention;
- Fire Emergency Response;
- Spill prevention;
- Spill Response;
- Contamination of a water resource;
- Accidents to employees; and
- Use of hazardous substances and materials, etc

Kangra must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the lifespan of the mine.

24.3.2.2 Classification of Emergencies

The following incidents will be classified as an emergency:

- Natural Disasters;
- Damage to radiological/nuclear sources equipment;
- Strikes, protest or unrest;
- Information Management System Failure (plc systems);
- Health and Disease Outbreaks;
- Serous Incident or Fatality;
- High Potential Risk Incidents (Fatality, serious environmental pollution); and
- Other emergencies.

24.3.2.3 Reporting Emergencies

Kangra Coal (Pty) Ltd. will establish standard operating procedures (SOPs). These procedures will aim to identify the potential for, and response to, incidents and emergency situations and for preventing and mitigating the illness, injury or environmental hazard that may be associated with them. It will review its emergency preparedness and response plans and procedures, in particular, after the occurrence of incidents or emergency situations. The mine shall also periodically test such procedures where and when practicable.

In the event of a serious incident or fatality occurring it is of the utmost importance to not only ensure the Health and Safety of every person involved but also to ensure that certain evidence is protected and gathered for use, with the aim of the prevention of a similar incident/accident occurring in the future.

A “No Blame Fixing” approach to incident investigation will be implemented and it must be stressed that the gathering of information must be seen as preventative action and not as blame fixing. In light of the above, and in addition to the emergency procedure that is relevant to the specific area where the incident/accident occurred, and in relation to the notifying of person and first aid treatment/safety of any person involved, the following steps must be taken immediately after an incident/accident classified above has occurred.

In the event of a reportable/major environmental incident that could lead to danger to the public or the environment (death or sustaining impact on the environment) the appointee of that specific section, in consultation with Environmental Manager, is responsible for communicating with and drafting an external report (in terms of Section 30 of National Environmental Management Act, 1998 (Act No. 108 of 1998) and Sections 19 and 20 of the National Water Act, 1998 (Act No. 36 of 1998) to the national and provincial department and the municipality containing the:

- Nature of the incident;
- Substances and quantities and accurate effect on persons and environment;
- Initial measures to minimise impacts;
- Causes of the incident;
- Accordance measures;

- When an environmental incident occurs, the following should be adhered to:
  - Report incident as per Incident Reporting Flow Diagram;
  - Measures to clean up any spillage/pollution must be taken as per Emergency Procedure.
  - It is important to ensure that no secondary pollution is caused by incorrect handling of an environmental incident, e.g. incorrect disposal of absorbent material use to clean up a spill; and
- For high potential risk incident (HPRI) / reportable environmental incidents, the Environmental Manager will conduct a closeout investigation prior to closure of the incident. This will be done one month after all actions has been completed to verify the effectiveness of the actions.

24.3.2.4 Formalise Policies

The following layout is recommended:

Objectives

To formalise and sign off on company policies.

To include all proposed infrastructure as presented within this document into policies. Make sure the policies are updated on an ongoing basis to ensure validity.

Actions

Compile Health and Safety Policy; and

Compile Environmental Policy.

When

Before construction/operational phase starts for the Kangra Coal T4 Mine Project area.

The notification process has six main steps in managing an emergency, from the identification of the situation to final close off. These are as follows:

- Find and identify;
- Ensure human safety;
- Reporting;
- Containment and clean-up;
- Corrective action; and
- Monitoring.

24.3.2.5 Environmental Emergency Incidents

The Environmental Manager must, within 14 days of the incident, report information on the incident to enable initial evaluation to the following:

- Director-General of Environmental Affairs;
- Provincial Head of Department (DMR);

- Provincial Head of Department (DWS); and
- Local Municipality.

The report must include:

- Nature of the incident;
- Substance involved and an estimation of quantity released and their possible acute effects on persons and the environment;
- Initial measures taken to minimise impacts;
- Cause of incident, whether direct or indirect; and
- Measures taken to avoid recurrence of such incident.

24.3.2.6 Water Pollution Emergency Incident

Water Pollution Emergency Incident is any accident /incident in which a substance pollutes or has the potential to pollute a water resource or a substance that has or is likely to have a detrimental effect on a water resource. The responsible person who was in control of the substance involved in the incident at the time or responsible for the section the incident occurred will immediately inform the superior of the area where the incident occurred. The information with regard to the incident is communicated to the Business Manager, Environmental Manager and Security Personnel immediately by the superior of the area. The Environmental Manager and the General Manager must, as soon as reasonably practicable after obtaining the knowledge of the incident, (i.e. within 14 days) report to:

- DHSWS (Regional Manager);
- South African Police Services or relevant fire department;
- The Catchment Management Agency; and
- The Environmental Manager and crisis management team must:
    - Take all reasonable measures to contain and minimise the effects of the incident;
    - Undertake clean-up procedures;
    - Remedy the effects of the incidents; and
    - Sample the water together with the responsible person of the area.

24.3.2.7 Fire

Fires represents a significant risk to mining operations and requires special attention in the Emergency Response Plan. Sparks generated during welding, spontaneous combustion, cutting of metal or gas cutting can result in fires. Every possible precaution shall therefore be taken when working with this equipment near potential sources of combustion. Kangra must take all reasonable measures to ensure that fires are not started as a result of activities on site. No smoking is allowed near containers with flammable contents or in proximity of areas that are highly flammable. Smoking is only permitted at areas designated for smoking. No open fires are permitted on site and no burning of waste is to be allowed on site. Kangra shall ensure that there is sufficient firefighting equipment available on site at all times. Such precautions include having an approved fire extinguisher immediately available at the site of any such activities. Kangra is to ensure that he/she has the contact details of the nearest fire station in case of an emergency. Appropriate and correctly serviced equipment must be available for all activities that are likely to generate fire. It is further anticipated that firebreaks will be required around the site perimeter. It is recommended that such fire prevention measures are implemented in consultation with adjacent landowners and where necessary coordinate fire prevention efforts with local Fire Protection Agency (FPA).

24.3.2.8 Spill Response Procedure

All employees, staff and labourers must be instructed regarding implementation of spill prevention measures and spill response procedures. In the event of a spill, the following general requirements shall apply, and the detailed spill procedure must cater for these requirements:

- Immediately reporting of spills by all employees and/or visitors to the relevant supervisor and ECO (this requirement must be including in induction training);
- Take immediate action to contain or stop the spill where it is safe to do so;
- Contain the spill and prevent its further spread (e.g. earth berm or oil absorbent materials for spill to land or by deploying booms and/or absorbent material for a spill to water);
- Dispose of any contaminated soil or materials according to appropriate waste disposal procedure (waste from spills of hazardous materials shall be disposed of as hazardous waste at a suitably licensed waste disposal facility);
- The Mine EO shall record details of the spill in their respective incident registers; and
- Photographic evidence shall be obtained of the spill clean-up.

In the case of large spills, the services of a specialist spill response agency shall be required, who shall advise on appropriate clean-up procedures and follow-up monitoring (if required). In the event of any spills which are classified as medium or major incidents, the Mine supervisor shall immediately inform the ECO/EM. The ECO/EM shall record the incident in the non-conformance and incident register and advise on the appropriate measures and timeframes for corrective action. Environmental incident reports shall be completed and submitted to the Mine Manger and ECO/EM within 5 working days for all medium and major incidents. If there is a requirement to report the incident to the authorities, this shall be done in consultation with the ECO/EM. The Applicant must also, (as per Section 30 of the NEMA) notify the Director-General (DWS, DEA and DMR), South African Police Services and Local Municipality and any persons whose health may be affected of the nature of an incident including:

- Any risks posed to public health, safety and property,
- Toxicity of the substance or by products released by the incident; and
- Any step taken to avoid or minimise the effects of the incident on public health and the environment.

Kangra must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the lifespan of the project.

24.3.2.9 Air Pollution Emergency Incidents (If relevant)

- Record of any non-compliance must be kept;
- The non-compliance with conditions will be reported telephonically, by fax or by email to the Chief Air Pollution Control Officer as soon as possible but not later than 24 hours after violation will start to occur. The particulars of such violation, including details of measure is put in place to prevent it happening in the future, will be included respective or in the weekly or monthly report;
- If the utilization and/or efficiency of air pollution control fail to meet requirements as specified in the certificate then the process is managed under emergency procedures until such time as it will be possible to operate in compliance with the conditions of this certificate; and
- Record is kept of periods of upset and abnormal emissions, e.g. off-gas vented directly to the atmosphere or excess thereof due to the faults or limited capacity of air pollution control equipment or limits for process parameters being exceeded, etc. and the Chief Air Pollution Control Officer is notified immediately should it occur.

24.3.2.10 Environmental Impact Register

All non-conformances pertaining to safety, health, environmental, quality of project activities and employees shall be documented as identified by according to documented procedures. The mine will make provision for recording and reviewing the nature and extent of any non-conformance that may be encountered during the Project Execution phase.

24.3.2.11 Records

Records must be kept of all environmental emergencies and non-conformances.

25 WASTE CLASSIFICATION

Section 7 of the National Norms and Standards for the Assessment of Waste for Landfill Disposal Regulations (Government Notice 635 as listed in Government Gazette No 36784), lists the conditions to which the results must be compared to determine the type of waste to ultimately determine the barrier requirements for landfill disposal, for the specific waste type.

Regulation 636 of the National Norms and Standards for the Assessment of Waste for Landfill Disposal contains the standard containment barriers for the various waste types, namely Types 1 to 4.

Based on the above and the prescriptions for containment barriers contained in Article 636 of Regulation 36784, the specified barrier for Waste Type 3 waste is a Class C Liner.

Type 3 waste may only be disposed of at a Class C landfill designed in accordance with Section 3(1) and (2) of these Norms and Standards, or, subject to section 3(4) of these Norms and Standards, may be disposed of at a landfill site designed in accordance with the requirements for a GLB+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998).

According to GNR 635 all the chemicals that could reasonably be expected to occur in the waste should be tested for:

"The TC of all the elements and chemical substances specified in section 6 of these Norms and Standards that are known to occur, likely to occur or can reasonably be expected to occur in the waste must be determined". According to GNR 635 the test results should be compared to the total and leachable concentration thresholds as follows: *"The total concentration (TC) and leachable concentrations (LC) limits of the chemical substances in the waste must be compared to the threshold limits specified in section 6 of these Norms and Standards for total concentrations (TCT) and leachable concentrations (LCT) of specific elements and chemical substances. Based on the TC and LC limits of the elements and chemical substances in the waste exceeding the corresponding TCT and LCT limits respectively, the specific type of waste for disposal to landfill must be determined in terms of section 7 of these Norms and Standards"*.

As the Kangra Coal T4 project will be utilising the waste facilities at the existing Kusipongo mine, no waste classification was underaken. A copy of the waste classficiation done for the Kusipongo mine is attached as Appendix 23 to this EIR.

26 ACID MINE DRAINAGE

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

26.1 POTENTIAL RISK OF ACID MINE DRAINAGE

As it is a coal mine there is potential for AMD from pyrite coal being exposed to oxygen and water. The potential contaminants that may emanate from the mining activities are Ca, Mg, Cl and SO4. There may be a possibility of acid generation. This can be confirmed or disproved by performing geochemical sampling and analysis as well as constructing a geochemical model.

26.1.1 Steps Taken to Investigate, Assess, and Evaluate the Impact of Acid Mine Drainage

As it is a coal mine there is potential for AMD from pyrite coal being exposed to oxygen and water. The potential contaminants that may emanate from the mining activities are Ca, Mg, Cl and SO_4. There may be a possibility of acid generation. This can be confirmed or disproved by performing geochemical sampling and analysis as well as constructing a geochemical model.

A model needs to be constructed to quantify potential impacts on receptors such as groundwater users and rivers. Kangra Coal T4 has been advised to undertake a study closer to the development of the mine. This model will as an important step be undertaken once sufficient chemical information is available on the coal. Once this is available the applicant will undertake the necessary specialist inputs to address the problem.

In terms of Acid Mine Drainage (AMD) Potential, AMD potential per lithology evaluated (refer to Figure 168). It is evident that the hangingwall sandstone and mudstone samples have a very low to no potential for acid generation whereas the coal sample suggest low to medium potential to acid generation capacity, however due to the low sulphide concentrations observed, there exist insufficient oxidisable sulphides to sustain long term acid generation.

Acid – Base Accounting Modified Sobek (EPA-600)	KB01 (Sandstone)	KB02 (Carbonaceous shale)	KD01 (Carbonaceous shale)	KD02 (Sandstone)	KT01 (Coal)	KT02 (Sanstone)
Paste pH	7.27	7.96	7.06	8.3	8.05	7.6
Total sulphur (%)	0.14	0.11	0.06	0.01	0.64	0.16
Total Sulfide (%)	0.11	0.04	0.03	0.01	0.27	0.09
Acid Potential (AP) (kg/t)	4.34	3.41	2.02	0.41	19.9	4.94
Neutralization Potential (NP) (kg/t)	28	10.5	1.91	12.7	4.81	3.52
Nett Neutralization Potential (NNP) (kg/t)	23.7	7.1	-0.1	12.3	-15.1	-1.4
Neutralising Potential Ratio (NPR) (NP : AP)	6.45	3.07	0.95	31.1	0.24	0.71

Figure 168: Acid Base Accounting

26.1.2 Engineering Or Mine Design Solutions To Be Implemented To Avoid Or Remedy Acid Mine Drainage

Acid Mine Drainage should be monitored for. Since this is a standard Coal Mining operation, standard methods will be utilised to manage, prevent and detect AMD from the onset of the operation and well after closure. Both active and passive measures will be devised if and when AMD presents itself. A groundwater model should be developed and updated to ensure monitoring and management of acid mine drainage begins with the onset of the project.

The following has been suggested as an aspect for inclusion in the conditions of the EA (Section 16 and Section 18.2):

"The updating and further development of Geohydrological modelling with special reference to Acid Mine Drainage during the different phases of the development should be done. The groundwater model predictions should be verified once time dependant groundwater monitoring data become available. Predicted flow simulation and decant rates for later years of mine development can significantly be improved by observation data from earlier years and subsequent updates of the groundwater model."

26.1.3 Measures That Will Be Put In Place to Remedy Any Residual or Cumulative Impact That May Result From Acid Mine Drainage

If AMD occurs in the future, the responsibility will be with the Kangra Coal (Pty) Ltd. T4 project to implement management measures. These include the following:

- Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWWMP;
- Areas that may have subsided or areas of depressions and/or sinkholes should be filled to create free draining surfaces. Where leachate is generated, it must be contained separately from water which is only slightly polluted through contact with the waste.
- Surface and groundwater quality and quality monitoring should be continued until a steady state is reached. If required, A pollution control dam could be used to intercept polluted seepage water stemming from the activities. An interception trench is an additional option to treat the contaminated discharge.
- Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine.
- Mining should remove all ore from the opencast and separate acid forming and non-acid forming material.
- The hydrogeological report and model should be updated regularly to ensure that the best preformance is envisaged.

27 WATER

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

The water uses listed in terms of Section 21(a), (c), (i) and (j) of the National Water Act, 36 of 1998, as amended ("NWA") will be applied for as triggered by the Kangra T4 coal mine project. Underground mining and all other listed activities in terms of NEMA and the regulations thereunder will not commence until the WUL is issued.

27.1.2 Has a water use licence been applied for?

An application for an Integrated Water Use Licence (IWULA) will be undertaken for the KangraT4 project. Underground mining will only commence one the WUL has been received from the DHSWS. The following water uses will need to be applied for in terms of Section 21 of the NWA:

(a) taking water from a borehole for potable and wash water use;

(c) Impeding or diverting the flow of water in a watercourse – for mining activities within 500m of wetlands;

(i) Altering the bed, banks, course or characteristics of a watercourse – for mining activities within 500 m of wetlands; and

(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of the people – dewatering of underground workings.

28 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

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

Table 138: Mitigation Measures to rehabilitate the environment

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Socio-Economic				
No-go option	Reduced period of development and upliftment of the surrounding communities and infrastructure.	N/A	N/A	N/A
No-Go Option	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	N/A	N/A	N/A
No-Go Option	**Positive:** No additional negative impacts on I&APs or surrounding land users	N/A	N/A	N/A
Environmental				
No-Go Option	**Positive:** No additional negative impacts on the environment	N/A	N/A	N/A
Hydrogeology				
Underground mining	Underground mining may result in spread of pollution	Institute water level and water quality monitoring programmes to confirm rate of water rise and water quality as the mine floods. Maintain an ability to access the underground workings until long term discharge and quality predictions have been confirmed. Service boreholes need to be plugged from the bottom where they intersect the workings and then grouted through to surface. It would be advantageous if the bord can be backfilled (e.g. with ash) to give further support to the roof to reduce the risk of bord failure which could destroy the plug and grouting thus allowing water to ingress into the workings.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DHSWS best practice guidelines Draft an Environmental Policy Groundwater Monitoring Pan	Continuous
Underground mining	Dewatering due to underground mining may lower water table			

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Closure of underground mine	Spread of pollution	Shafts should be sealed Should monitoring indicate the passive methods employed during the rehabilitation of the underground are ineffective and the decant water quality is unacceptable for release the following can be implemented. **Passive Method:** Should low volumes of water be encountered (< 5 ℓ/s) an interception trench can be designed as follows: The depth of the trench should be at least 4 mbgl (or 2 m below the groundwater level) to intercept polluted seepage that resulting from the opencast pit The design of the trench gradient must be such that the water is free-flowing without eroding the channel; The water from the trench must be captured, retained and managed within the mine water systems i.e. lined evaporation dams until the decant water quality reached equilibrium. A passive wetland treatment option could also be investigated. **Active Method:** Should high volumes of water be encountered (> 5 ℓ/s), Treatment strategies may include a greater or lesser degree of water treatment in order to render the water suitable for reuse. If there is still a residual water management problem, then the operation could evaluate and negotiate options with DWA for the discharge of such water to the water resource. Should the piezometric pressure be such that water in the underground mine is forced to surface and results in decant the following should be done: Monitoring of the water quality and volumes on frequency high enough to establish seasonal trends. Risk assessment on the effect of the water qualities on the most critical receptor must be done to establish if passive treatment such as a wetland or active treatment processes is required. All corridors between the current underground mine and the proposed T4 extension should be thoroughly sealed to prevent additional cumulative impacts. Such an action should effectively prevent any additional environmental impacts from the new T4 mine due to the depth of mining of up to 300 metres below surface.	GNR 704 Water Use Licence Groundwater monitoring program GNR 704 Water Use Licence Groundwater monitoring program	Continuous
Closure of underground mine	Decanting			

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Hydrology				
Construction of overhead powerlines, access roads and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	During design and construction of the access roads, storm water control measures (viz. flow retardation structures) should be provided to minimise the impact associated with erosion. Flow retardation structures will control run-off velocities (and subsequent erosion) by converting the flow pattern to sheet flow. During the construction phase, temporary stormwater control berms should be placed on the downstream perimeter of the ventilation shaft footprint, so as to minimise silt ingress into the receiving tributaries. Construction of the powerline, ventilation shafts and associated access / maintenance roads should take place during the winter months. The ventilation shafts' access roads should follow the alignment of existing tracks to the greatest extent possible. The footprint of the ventilations shafts should be kept as small as possible. During construction, laydown areas for construction equipment, vehicles etc. are to be demarcated and no access outside of the demarcated area should be allowed. All construction vehicles should be maintained regularly and checked for leaks. Drip trays should be placed under construction vehicles when parked overnight and all hazardous material should be stored in appropriately bunded areas, to prevent potential soil and surface water run-off contamination. The location of the actual ventilation adit should be located outside of the calculated 1:100-year floodline. The service road should be narrowed to one lane (approximately 4m) over water crossings. River crossings should be designed to reduced flow velocity and erosion. The use of gabions and reno mattresses should be considered.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		River crossings should be designed to allow for hydrological connectivity and avoidance of ponding and flow reduction in the streams and rivers. Appropriately sized culverts should be designed and installed. Ongoing rehabilitation of disturbed areas should be undertaken, including, shaping, revegetation and Alien Invasive Plant (AIP) removal. Appoint a specialist to assist in riverbank or wetland rehabilitation as necessary if the powerline pylons impacts on these sensitive areas. Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread within or beyond the footprint. A management plan and proper follow-up strategy for the prevention of the establishment and/or further spread of new populations of such species should be developed and enforced.		
Operation of overhead powerlines and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	All maintenance vehicles should be maintained regularly and checked for leaks. Regular inspection of maintenance and access roads should be scheduled to ensure that no erosion is taking place. All areas of erosion identified must be repaired. Regular inspection of road crossing structures should be scheduled to ensure structures are in good repair, functioning as intended and that there are no blockages. Ongoing rehabilitation of disturbed areas should be undertaken, including, shaping, revegetation and Alien Invasive Plant removal.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	
Operation of overhead powerlines and ventilation shafts	Surface water quantity - Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.		NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Removal of powerlines and ventilation shaft and any other infrastructure	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality.	Soils compacted by heavy machinery can be ripped to allow infiltration. Rehabilitation processes such as restoring the topography to a pre-activity state, and re-vegetation of disturbed areas will assist in returning natural surface water drainage patterns. Implement free draining rehabilitation.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	
Wetlands				
Construction of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during construction. Wetland fauna fatalities.	The number of wetland and stream / river crossings must be minimised as far as practically possible. Unnecessary watercourses crossings (i.e. proposed crossings that can be re-aligned) must be re-aligned and avoided. No pylons or towers must be established within any wetlands or riparian areas. A section of the powerline should be re-aligned to cross Unit W05a perpendicular to flow and avoid crossing Unit W07. Where wetland and stream / river crossings are required, every effort should be made to minimize the impacts by considering the following: • Crossing points should be aligned along areas or corridors of existing disturbance e.g. along existing road crossings. • The length of wetlands and rivers / streams crossed at each crossing must be minimised by adjusting alignments to coincide with narrower sections and ensuring that crossings cross perpendicular to flow. No new road watercourse crossings should be established as part of the development of the service roads. All service roads should follow the existing road network as far as practically possible.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous
Construction of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during construction.		NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	
Construction of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills		NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle	

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Construction of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance. Wetland avi-fauna fatalities.	The new watercourse crossings are required, the number of new wetland and stream / river crossings must be minimised as far as practically possible. Unnecessary watercourses crossings (i.e. proposed crossings that can be re-aligned) must be re-aligned and avoided. Except at planned watercourse crossings, where new service roads are aligned near wetlands and streams / rivers, a minimum buffer of 30m should be maintained between the wetland / riparian edge and the edge of the road as far as practically possible. Where new wetland and stream / river crossings are required, every effort should be made to minimize the impacts by considering the following: o For all crossing types and designs, flow through road crossings should not be unnecessarily concentrated (or impeded) and flow velocity should not be increased. In this regard, wetland and stream / river crossings should be via box / portal culverts established across the entire width of the wetland or riparian zone to avoid flow narrowing and concentration. Open bottom box culverts should be used and they should be sized to transport not only water, but the other materials that might be mobilized (i.e. debris). Pipe culverts should be avoided. Erosion protection and energy dissipation measures should be established at all road crossing outlets e.g. stilling basins and reno-mattresses. All culvert inlets and outlets and associated outlet erosion protection structures must not be raised above the wetland/riparian surface and/or stream/river bed and must be established to reflect the natural downstream slope of the wetland / riparian surface and/or stream / river bed.	DWS best practice guidelines Rehabilitation and closure plan	
Operation of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during repair and maintenance.			
Operation of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.			
Operation of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.		NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		Crossing points should be aligned along areas or corridors of existing disturbance e.g. along existing informal road crossings or cattle crossing routes. The length of wetlands and rivers / streams crossed at each crossing must be minimised by adjusting alignments to coincide with narrower sections and ensuring that crossings are straight and do not involve using long curves and are aligned at right angles to flow. If any road fill is utilised at wetland crossings, a porous layer should be established within the road fill at the appropriate elevation to ensure that wetland interflow and overland flow is able to pass through the road fill. For existing watercourse crossings, every effort should be made to minimize the impacts by considering the following: o Undersized or under-designed pipe culverts must be replaced with sufficiently sized box or pipe culverts. Erosion protection and energy dissipation measures should be established at all road crossing outlets e.g. stilling basins and reno-mattresses. Every effort must be made to minimise the upgraded footprint of the existing roads at watercourse crossings. The following road stormwater management measures are recommended: • Stormwater generated by the upgraded and new roads should be discharged at regular intervals and many small outlets should be favoured over few large. • Stormwater outlets must not be established within wetlands or riparian zones.		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		• As far as practically possible, stormwater conveyance should be via open drains rather than pipes and conveyance from the road drains to the outlets should via open drains with vegetated or rough surfaces that are armoured with erosion protection. • All outlets must be designed to dissipate the energy of outgoing flows to levels that present a low erosion risk. In this regard, suitably designed energy for gravel roads will need to be installed at appropriate locations. • All erosion protection measures must be established to reflect the natural slope of the surface and located at the natural ground-level. • Flight diverters should be established at the following locations: • Where the powerline occurs within 50m of Unit W01a. • Crossing of Unit W04 and a 50m buffer zone. • Crossing of Units W05a and W05b and a 50m buffer zone. • Crossing of Unit W07 and a 50m buffer zone. • Crossing of Unit W14a, W14b and W15 and a 50m buffer zone. Prior to the commencement of any construction activities, the following features must be staked out by a surveyor and demarcated using brightly coloured shade cloth: • Outer edge of the delineated wetland and riparian areas occurring within 100m of the proposed vent shafts footprints. • Outer edge of the delineated wetland and riparian areas occurring within 32m of the proposed powerlines and associated pylons / towers. • The outer edges of the entire construction corridor / right-of-way for the vent shafts and powerlines. At all watercourse crossings the construction corridor must be		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		as narrow as practically possible and should only include the proposed road footprint and a one-way running track. • Access to and from the project area should be either via existing roads or within the construction servitude. • Demarcation of all identified access, haulage and service roads. The alignment and routes for these roads need to be reviewed by the wetland ecologist. • All excavated soils and soil stockpiles must be stored / sited outside of the watercourses. • The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences. • Demarcations are to remain until construction and rehabilitation is complete. • All areas outside of this demarcated working servitude must be considered no-go areas for the entire construction phase. Any contractor found working within No-Go areas must be fined as per fining schedule/system setup for the project. • No equipment laydown or storage areas must be located within delineated wetland or riparian habitats. • No equipment laydown or storage areas must be located within delineated wetland and riparian areas. • All disturbed areas beyond the construction site that are intentionally or accidentally disturbed during the construction phase must be rehabilitated immediately to the satisfaction of the ECO. A detailed method statement for the construction activities within all watercourses must be compiled and appended to the construction (EMPr) prior to construction commencing. The final method statement must be reviewed by a wetland specialist prior to commencement and must include all measures provided in this section where relevant and applicable.		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed. Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows. Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately. If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence. All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas. After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area. The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. Drip trays should be utilised at all dispensing areas.		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		No refuelling, servicing or chemical storage should occur within 30m of any watercourse. No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site. Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose. Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal Temporary noise pollution due to construction works should be minimized by ensuring the proper maintenance of equipment and vehicles and tuning of engines and mufflers as well as employing low noise equipment where possible. Water trucks will be required to suppress dust by spraying water on affected areas producing dust. This will likely be required daily in the drier months or during dry periods. No lights must be established within the construction area near the watercourses and buffer zones.		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		The handling and/or killing of any animal species present is strictly prohibited and all staff/personnel must be notified of such incidents. Wetland fauna (e.g. snakes, frogs, small mammals) that are encountered during the construction phase must be relocated to other parts of the wetland under the guidance of the EO or ECO.		
Decommissioning powerline	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during decommissioning.	Refer to mitigation measures applicable during construction.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	During decommissioning
Decommissioning powerline	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.			
Construction of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during construction.	All vent shafts must be protected from the ingress and interception of surface runoff and subsurface interflow through the establishment of adequate berms and subsoil drains. The vent shaft walls should be sealed to minimise interflow and groundwater interception The duration of construction work within the watercourses must be minimised as far as practically possible through proper planning and phasing. Construction work within the watercourses should be limited to the dry winter season wherever possible. When working within watercourses, downstream silt traps / curtains should be installed to capture sediment eroded from the working area prior to construction activities commencing within the	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous
Construction of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during construction.			
Construction of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills.			

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Operation of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.	watercourses. These silt traps must be regularly monitored and maintained and replaced / repaired immediately as and when required. These measures regularly checked, maintained and repaired when required to ensure that they are effective. The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. Drip trays should be utilised at all dispensing areas. No refuelling, servicing or chemical storage should occur within 30m of any watercourse. No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site. Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose. Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous
Operation of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during repair and maintenance. Reduced water inputs to the wetlands fed by interflows due to interflow interception.			
Operation of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.			

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Decommissioning ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.	Refer to mitigation measures applicable during the construction of the ventilation shafts.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous
Decommissioning ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during decommissioning.			
Decommissioning ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.			
Operation of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence.	Best practice underground pillar safety factors must be applied to ensure that void collapse and subsidence risks are reduced. Total extraction should not occur. The design of the underground pillars will have to have a safety factor that will ensure no collapse of pillars or surface subsidence is anticipated. Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source in order that it can be pumped out of the mine	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Decommissioning of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence. Erosion and/or sedimentation of wetlands as a result of mine decant discharges once the water levels are reinstated.	before its quality can deteriorate through contact with sulphide minerals.		
Decommissioning of underground mining	Wetland pollution due to mine decant water once the water levels are reinstated.			
Noise				
Construction of overhead powerlines and ventilation shafts	Construction of overhead powerlines and ventilation shafts will result in noise due to the use of vehicles and machinery used for construction	-Recommended (not compulsory) – Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. When constructing the overhead powerlines within 200 m from receptors R8, R12, R14 and R18, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9 pm, e.g., concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence. – Corona discharge from overhead power lines can cause light/moderate buzzing noises that has the potential to be a noise nuisance with a potential tone within the 50 – 60 Hz range at up to 50 Should a receptor be within 200 m of the overhead power line, project engineers should consider discussing the potential for mitigation with an acoustical engineer/electrical engineer or project	ECA noise regulations SANS 10103 OHSA MHSA Blasting Regulations Vibration management plan Noise Management Plan	Continuous
Operation of powerline	Nuisance and health risks caused to close by receptors as identified, such as R8, R12 and R18			
Operation of ventilation shaft	Nuisance and health risks caused to close by receptors as identified, such as R6, R7, R8, R9, R14 and R15			

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		engineer (depending on the design of the overhead line. Engineers should assess the potential for corona discharge, if no potential, then no further mitigation for assessed receptor required). The developer must implement acoustical mitigation regarding ventilation stacks. The reason why these stacks are so important for further mitigation consideration is that: o Ventilation stacks are externally mounted (i.e., their exit port is open and not covered within a building). o Aerodynamic noises are usually constant and have a higher low frequency content to them. Low frequency has the potential to travel further and “over” barriers easier than higher frequencies (SANS10328:2008 recommends acoustical investigation of up to 2 km for low frequency noise sources). o High SPL low frequency noise sources have the potential to curve downwards back towards a receptor. Ventilation stacks pointing upwards can refract back to a receptor. An acoustical consultant/specialist or engineer can be consulted on mitigation. The following could be considered: o Silencers/sound attenuator, duct silencer, sound trap, muffler - Noise can be redirected or lowered by means of above-mentioned design implementation. o Direction (to be discussed with project engineers) NOTE this can be achieved with the duct silencer, mufflers stipulated above – The ventilation stacks could be directed away from receptors within 1 km (see constraints and mitigation map below). The following should be noted about the direction (in terms of acoustics) should it be selected as a mitigation option Vent Shaft 3 and 4 – Considered to be directed/re-directed (by any mentioned option) towards the southern direction. Vent Shaft 1 – Considered to be directed/re-directed (by any mentioned option) towards the south-eastwards or upwards direction. Vent Shaft 1, 3 and 4 If feasible the vent could be obscured (acoustical berm or shield) if pointing towards receptor R6, R7, R14		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		and R15 (Note this depends on engineering design and requires engineering inputs). The berm/acoustical barrier should consider the following: The berms should be solid (aggregate, brick etc. no foliage e.g. trees). The height should be a minimum of two (2) meters higher than top of the vent shaft. Recommended (not compulsory) – Should the project operations require alarms (e.g., when an operation ceases), an acoustical consultant/engineer should be consulted to ensure minimal alarm noise direction into the direction of receptors (north-west direction). Although these alarms are exempt from this acoustical assessment (see above point) these alarms (should they go off frequently) have a potential to cause a noise nuisance should it be measurable/audible at receptors. Should the layout change as assessed in the report, the report layout must be reviewed in terms of environmental acoustics. It is highly recommended that the Environmental Coordinator keep continuous communication with receptors regarding noises and potential loud noise events (including blasting or a potential situation whereby some noisy activity will commence near a receptor for some unforeseen circumstance). Prior knowledge of a noise event will be far more ideal than a receptor been unaware of a loud noise circumstance. A contact line should be made available to receptors, should a valid noise complaint arise, whereby receptors could lodge a complaint (and documented). Should a valid noise complaint be lodged, it is advised that the Environmental Co-ordinator contact an acoustical consultant with experience in noise monitoring to evaluate the complaint. The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. Although heavy vehicle reverse alarms are exempt from noise legalisation (GN R154) and needs to meet occupational health and safety standards, certain		

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		reverse alarms are less intrusive (less tonal more broadband character etc.). Recommended (not compulsory) - If the project proposes to extend or expand on local municipality routes, a noise assessment should be conducted (GN R154 legislation requirement). Expansion or extend refers to a municipal road that the project engineers require to add an extra lane or change the specifications of the road paving etc.		
Topography and Geology				
Underground mining	Subsidence of surface due to failure of pillars	Ensure the underground mining implements the correct mining methods and leaves sufficient pillars	Original topography and landform serve as a reference for rehabilitation	Continuous until closure certificate has been received
Terrestrial Ecology				
Construction of ventilation shafts and powerlines	The site has sections of habitat that has been transformed to an extent, specifically Ventilation shafts 3 & 4 footprint areas, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. From the site visit, the areas where the Ventilation shafts and powerline will occur is the areas that will be impacted directly. No/limited direct impacts on the larger Mining Right are expected and therefore the	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within other specialist reports and Environmental Management Programme (EMPr). To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. Continuous rehabilitation of the area should occur, immediate closure and rehabilitation. This will entail the spreading of topsoil, revegetation, and management of invasive species. Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment. This will be prudent in this development, since petroleum and other hydrocarbons associated with the trucks and	NEMBA TOPS Animal Protection Act, 1962 (Act 71 of 1962).	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	impacts are rather localised and possible to ensure it remains well-managed. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area	vehicle-based activities are likely to be spilled in the environment if not managed well.		
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of floral species of conservation concern. Three (3) species listed by POSA for the area are classified as species of conservation concern (SCC), and have a moderate likelihood of occurrence on the project footprint. None of these species were sighted during the field assessment on the relevant footprints, but confirmation should be repeated before the onset of development since construction may take many years to start. The same will be applicable for the pylon placement during construction of the powerline. Sensitive features should be avoided best possible.	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. All footprint areas should remain as small as possible. A survey for SCC species on the project footprint area should be undertaken by a suitably qualified specialist prior to the start of construction. If any SCC are encountered within the subject property in the future, the following should be ensured: ○ If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property. ○ 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. Human and vehicle movement should be restricted from taking place in sensitive habitats.		Continious
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of faunal species of conservation concern. The Blue crane calls heard during the field assessment could not be visually verified and therefore, although it is certain that it has been correctly identified, the conclusion can be made that although likely utilising the regional area, these birds are likely focussed on the	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Implement the approved EMP and adhere to all management features described in this report. Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora and/or fauna. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his		Continious

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	grassland patches and sections, and not specifically on the footprints itself (although may randomly occur). The area falls within an Important Birding Area, and hence other sensitive species may also occur in the area although not directly recorded during the field assessment. However, the same conclusion is likely to be made regarding the nature and extent of impacts to these species, as the mine is an underground mine with limited surface infrastructure.	employees, his Sub-Contractors or his Sub-Contractors' employees		
Construction of powerlines and ventilation shafts	The onset of activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The natural grassland areas and wetland/aquatic associated terrain will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area. Impacts may lead to the increase of invasive species or introduction of such from the outside areas and may change the vegetation structure and composition of this unit. These species may also compete with indigenous species and will degrade the veld condition by making it	The development areas should be well demarcated and contractors should not enter into adjacent areas. Access to certain development areas need to be planned wisely, avoiding aquatic terrain and other sensitive features. Unmanaged development is not ideal as it will increase the expected impact on the natural grassland vegetation type and will destroy the aquatic habitats and change the soil indefinitely. 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. Continuous rehabilitation of the area should occur, immediate closure of trenches and excavation areas and spreading of topsoil. Re-vegetation practices may be required to ensure success and seed mixes should match the surrounding vegetation structures.		Continious

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	unfeasible for other land-uses such as grazing and agriculture			
Construction of powerlines and ventilation shafts	Impacts on the water resources may occur. This may be due to pollutants entering the water resource, specifically petroleum related waste products, decant points, acid mine drainage (future and post closure), direct runoff from dirty footprints entering the surround water resources or could possibly also spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within the surface water and wetland specialist report. If possible, find an alternative placement for features where possible as to prevent placement within a wetland or wetland soils. The wetlands or associated buffer should be sufficient to protect ecological functioning of the area. Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater management systems, which should include oil traps. Continuous rehabilitation of the area should occur in accordance with the WUL, as well as monitoring as prescribed. Ensure proper stormwater management around the Ventilation shaft footprints and maintenance of this system. Stormwater management will prevent impacts reaching the natural environment.		Continious
Construction of powerlines and ventilation shafts	Faunal species could also be easily impacted by the powerline and extensive management measures have been prescribed to mitigate this based on electrocution risks for birds specifically.	Positions to fall outside the high sensitivity zones (100 m buffer of drainage lines) or license these positions in terms of Section 21 (c) and (i) in terms of the National Water Act, 1998 (Act 36 No. of 1998). These areas will then be subjected to the appropriate rehabilitation of riparian zones and ecological rehabilitation in terms of vegetation to ensure habitat stays favourable for species that may have specialised niches that depend on these aquatic systems. 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,		Continious

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
		his Sub-Contractors or his Sub-Contractors' employees or any other party associated with the drilling activities. Adhere to all management and mitigation measures as prescribed within the wetland specialist report (and other specialist reports) and Environmental Management Programme. Prevent impacts from reaching downstream water resources by ensuring no spillage and proper handling of infrastructure during removal. Continuous rehabilitation of the area should occur in accordance with the WUL, as well as monitoring as prescribed. Ensure proper stormwater management and that it remains functioning by regular inspection and maintenance.		
Removal of powerlines and ventilation shaft and any other infrastructure	Rehabilitation could be ineffective if measures are not appropriately complied to. 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.	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. Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase. 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. 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. • <u>If closure does occur:</u> ○ Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. ○ Adhere to all management and mitigation measures as prescribed within the wetland specialist report and Environmental Management Programme.		

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		○ Prevent impacts from reaching downstream water resources by ensuring no spillage and proper handling of infrastructure during removal. ○ Continuous rehabilitation of the area should occur in accordance with the WUL (specifically to the wetlands and pans), as well as monitoring as prescribed. Annual monitoring of the vegetation and habitat types should be instigated until it is sure that the areas have naturally regrown and vegetation is self-sustainable. If the regrowth is unsuccessful, it will be the applicant's responsibility to restore damaged and degraded habitat areas until it reached sustainability.		
Aquatic Ecology				
Site preparation and other construction impacts in proximity of water courses and wetland seeps	Loss of Biodiversity and Ecological function - Riparian zone impacts	Avoidance of unnecessary disturbance or destruction of natural habitat is an important mitigation tool for flora and thereby associated fauna. Avoid encroaching on natural areas directly adjacent to proposed activities in close proximity or within buffer areas. Rehabilitation must include planting of indigenous local species, preferably suitable riparian species if banks and beds are affected and as per approved rehabilitation plan for Section 21 (c) & (i) activities - focussing on species native to the river. Appoint a specialist to assist in riverbank or wetland rehabilitation as necessary if the powerline pylons impacts on these sensitive areas. All river (including non-perennial) crossings along the powerline will need to be authorised and remediated in accordance with approved WUL and Section 21(c) &(i) rehabilitation for beds and banks. A wetland assessment is recommended, as some of the non-perennial drainage lines are separated by dams/pan features, which may indicate seepage along and between and therefore the occurrence of wetlands, which was prevalent in the field during the assessment.	Hazardous Substances Act NWA MSDS OHSA MHSA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal	Continious

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		Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread within or beyond the footprint. A management plan and proper follow-up strategy for the prevention of the establishment and/or further spread of new populations of such species should be developed and enforced. To prevent the erosion of soil, management measures may include structures to protect areas and soil from areas susceptible to erosion. Water control structures should be constructed and well maintained to minimize erosion and to create a favourable habitat for the establishment of vegetation.		
Construction and operation of ventilation shafts and powerlines and underground mining	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning	Corridor movement associated with water resources should not be hampered by the development. No sections of the river should be cordoned off and avoidance of these sensitive areas is recommended. Unnecessary movement of workers need to be prevented at the site during all phases of the mining development. Continuous monitoring is important to ensure the baseline environmental condition is not impacted. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees; Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act. No fishing, hunting or trapping should be allowed by the employees or other parties on the Mining Right footprint and the land should be closely monitored regularly. No waste will be disposed of in or around the project area, which can attract rodents or other types of fauna; waste will be managed correctly.	Rehabilitation and closure plan DWS best practice Guidelines	Continious

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Construction and operation of ventilation shafts and powerlines and underground mining	Alteration of drainage patterns leading to decrease and changes in water quantity and availability in the Ecological Reserve	Define the runoff/flood characteristics of the study site and floodline analysis accordingly. Adherence to the Engineered Storm Water Management Plan as compiled by an accredited engineer is crucial.	Rehabilitation and closure plan DWS best practice Guidelines	Continuous
Construction and operation of ventilation shafts and powerlines and underground mining	Deterioration of water quality in the Klein-Vaal river due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring which will result in water quality impacts - Nutrient increases	Erosion protection and appropriate energy dissipation structures should be implemented where crossings are proposed, thereby stabilising and protecting the banks. Prevent any over abstraction of either ground or surface water (depending on where water will be obtained) as this will negatively impact water quality (surface water) and/or quantity (surface- and groundwater). Decreased Dissolved Oxygen will also result if nutrients increase and impacts reach water resources, leading to possible eutrophication and algae and a decline in PES, which will decrease the aquatic ecology integrity and thereby further affecting the streams. Monitor Water Quality and Aquatic Health (Biomonitoring) regularly - every month and Aquatic Health bi-annually (wet and dry season).	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Continuous
Construction and operation of ventilation shafts and powerlines	Sedimentation of water resources will result to nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Protect soil resource, beds and banks therefore, preventing erosion and increased sedimentation in the resource. This will prevent increased sedimentation and smothering of aquatic ecosystems. Implement appropriate Stormwater Management Plan, which will include erosion prevention measures and sediment trapping systems or measures.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Continuous
Construction and operation of ventilation shafts and powerlines	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).	There will be no discharges of dirty water from the construction site and mobile chemical toilets to be provided for workers during construction. Avoid contamination of soils and implement appropriate remedial measures if incidents of spillage occur.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle	Continuous

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and underground mining		Protect and prevent unnecessary impacts within the riparian and 32m zone (or otherwise delineated buffer as per surface water assessment) of the watercourse. Rehabilitate affected areas immediately to prevent sedimentation and protect against erosion.	DWS best practice guidelines.	
Construction and operation of ventilation shafts and powerlines and underground mining	Water Quantity impacts by diverting and reducing water available or reaching applicable areas to feed Ecological Reserves to sustain Aquatic diversity due to Impacts to Streamflow Regulation and possible diversions or impedances	Monitor amount of water abstracted carefully and keep a record of daily abstractions. Flow meters will be installed in the mine water circuit to enable refinement of the water balance. A water balance should be developed and updated on an annual basis based on water readings observed and monitored. Protect or license impacts to wetlands, to ensure proper management and prevention of unnecessary impacts. An annual report on the project water balance will be submitted to DHSWS. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall. Optimise water use by means of reuse and recycling. Implement divergences or impedances if these are applicable (crossings specifically) as per designs and formal management plans.	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Continuous
Heritage and Palaeontological				
Construction and operation of ventilation shafts	The identified heritage sites are considered to be outside of the boundary of the ventilation shafts and the impact of construction and operation will be low	**<u>Powerline option A</u>** Sites K65 (demolished structure) & K66 (dilapidated building) are of contemporary origin and therefore not of heritage significance. No further action is required. Sites K62, K63 & K64 consist of stone-walled enclosures dating to the historical / LIA period. Option A of the powerline runs between Site K62 & K63, while Site K64 is located further to the south. It is recommended that these sites be avoided by the proposed powerline. Site K61 and Cemetery K58 is located a significant distance to the north of the proposed powerline and should therefore not be at risk.	NEMA MPRDA NHRA SAHRA permitting requirements	Continuous
Construction and operation of powerline route A	The proposed powerline route A will impact on site K57, K59, K60 -K63, K68 and K71			Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Construction and operation of powerline route B	The proposed powerline route B will impact on site K50 and K51	It is recommended that these sites be avoided by the proposed powerline. Site K60, a stone-walled enclosure directly in the path of the proposed powerline, dates to the Historic Period / LIA, exceeds 60 years of age and is protected by the National Heritage Resources Act 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline. Cemeteries K59 & K68 are located in close proximity of the proposed powerline. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemeteries and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemeteries. Site K57 (settlement) falls directly in the path of the proposed powerline. It is recommended that this site be avoided by the proposed powerline as potential subsurface remains associated with a demolished structure at the centre of the settlement might be impacted during construction. The settlement is also associated with a cemetery, Site K71. It is recommended that a fenced-off conservation buffer of 30 m be established around the cemetery and that a qualified archaeologist compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemetery must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried in the concerned cemetery.		Continuous
Underground mining	Blasting impacts and subsidence may impact on heritage sites K01 - K06, K11- K13, K16 - K20, K23, K24 and K69			As needed

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		Site K53 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required. Should impact to sites K62, K63, K64, K60 and K61 be unavoidable, destruction permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stonewalled enclosures. Due to the high number of heritage sites, Option A is not advised, unless altered to avoid the specified heritage resources. This, however, will require a revision of the recommendations made for the specific heritage sites in the vicinity of the powerline. **Powerline option B** Site K50, consisting of several stone-walled enclosures directly in the path of the proposed powerline, exceeds 60 years of age and is protected by the National Heritage Resources Act 25 of 1999. It is therefore recommended that this site be avoided by the proposed powerline as per the indicated sensitive area. Site K51, a small stone-walled enclosure is located to the south of the proposed powerline and should therefore not be at risk of impact from the construction of the proposed powerline. Impact to Site K52, a potential grave (stone cairn), should be avoided during the construction of the proposed powerline. Should this not be possible, the potential grave may be inspected using Ground Penetrating Radar employed by a professional specialising in human remains. Site K54 was identified as a natural rock outcrop and is not of heritage significance. No further action is therefore required. Should impact to sites K50 and K51 be unavoidable, destructions permits may be applied for. However, it should be kept in mind that unmarked burial sites might be associated with these stone-walled enclosures. Due to fewer heritage sites, Option B is preferred. Should the route be altered to avoid the affected heritage sites, a revision of the recommendations must be made. Sites falling outside of the		

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		proposed surface development area, but within the proposed underground mining boundary. Sites K01 – K06, K11 – 13, K16 – 20, K22, K23, K44 and K69 consist of historical buildings or structures associated with surface infrastructure that fall within the area demarcated for underground mining. It is therefore recommended that the mine's ECO (Environmental Control Officer) quarterly, as well pre- and post-blasting, inspect these structures. Should any impact be observed, or if impact cannot be avoided, all buildings and structures associated with the demarcated areas must be adequately recorded by a qualified archaeologist and destruction permits be obtained from the relevant heritage authority. Sites K55, K56, K67 and K70 are cemeteries located within the boundary of the area demarcated for underground mining. These cemeteries may be impacted by the proposed underground mining. Therefore, it is recommended that the mine's ECO quarterly, as well as pre- and post-blasting, inspect these graves. Should any impact be observed, or if impact cannot be avoided, a qualified archaeologist should be contacted to provide the required input to ensure the safeguarding of the graves. Also, access to the cemeteries must not be refused. Sites K07, K08, K09, K10, K14, K15, K21, K24, K25, K27 – K43 and K45 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. The structures, however, no longer exist and no surface impact is expected. No further action is required. Sites K26, K46, K47, K48 and K49 are located on the demarcated underground mining area and was identified using historical aerial and topographical datasets. These sites, however, date to contemporary times and were subsequently demolished. No further action is required **General Recommendations** The above recommendations are based on the specific powerline route options and underground mining boundaries as indicated in this report. Should the proposed development expand to any area		

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		outside of the proposed surface or underground boundaries, a qualified archaeologist must revise the recommendations made in this report to ensure the safeguarding of heritage sites. Also, should the proposed surface impact areas be changed, a qualified archaeologist must conduct a pedestrian survey on the new areas and amend the report accordingly. As the following historical sites associated with surface infrastructure could not be visited due to access constraints, it is recommended that a qualified archaeologist inspect and verify these sites prior to mining: K02 – K04, K11, K19, K23 & K24. Access constraints caused by ongoing court cases, the language barrier and limited time also resulted in a lack of communication with the land owners. Since land owners and local farm workers are the most reliable and efficient source for locating burial sites, it is recommended that this information be gathered, mapped, inspected and the required recommendations be made to ensure the safeguarding of heritage sources. As archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).		
Blasting				
Construction of ventilation shaft 1 and 2	Blasting may result in ground vibrations, air blast and fly rock,	Control through management (third-party monitoring), blast design and communication. Cover blast.	Explosives Act MHSA OHSA	As needed

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Construction of ventilation shaft 3	Blasting may result in ground vibrations, air blast and fly rock and may impact on buildings, cultivated lands and a gravel road in the vicinity of this ventilation shaft site.	Control through management (third-party monitoring), blast design and communication. Cover blast.	MPRDA United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast	As needed
Agriculture and Land Capability				
Construction and operation of powerline and ventilation shafts	All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases	Limit vegetation clearance to only the areas where the surface infrastructure will be constructed. Avoid parking of vehicles and equipment outside of designated parking areas. Plan vegetation clearance activities for dry seasons (late autumn, winter and early spring). Design and implement a Stormwater Management System where run-off from surfaced areas are expected. Re-establish vegetation around the vent shafts and underneath the powerlines.	CARA	Continuous
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint; Materials must be delivered to a designated laydown area; Revise infrastructure layout to reduce or avoid the construction of new access roads to the powerline and vent shafts; and Limit trips to the vent shaft and powerline during the operational phase to only that required for maintenance.	Principles of CARA Rehabilitation and Closure Plan Ripping to 30cm where soil depth permits	As needed

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Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills; Any waste generated during construction, must be stored into designated containers and removed from the site by the construction teams. Any left-over construction materials must be removed from site.	Hazardous Substances Act NWA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal	Continious
Construction and operation of powerline and ventilation shafts	The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.	Vegetation clearance must be restricted to the vent shaft areas and within the power line servitude. Removal of obstacles to allow for access of construction vehicles must be kept to only where essential. Prior arrangements must be made with the landowners to ensure that livestock are moved to areas where they cannot be injured by vehicles traversing the area. No boundary fence must be opened without the landowners' permission. All left-over construction material must be removed from site once construction on a land portion is completed. No open fires made by the construction teams are allowable during the construction phase.	Principles of CARA Rehabilitation and Closure Plan	Continuous
Construction and operation of powerline and ventilation shafts	The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue	Vegetation clearance must be restricted to the vent shaft areas and within the power line servitude. Removal of obstacles to allow for access of construction vehicles must be kept to only where essential. Prior arrangements must be made with the landowners to ensure that livestock are moved to areas where they cannot be injured by vehicles traversing the area. No boundary fence must be opened without the landowners' permission. All left-over construction material must be removed from site once construction on a land portion is completed. No open fires made by the construction teams are allowable during the construction phase.	Principles of CARA Rehabilitation and Closure Plan	Continuous

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Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction	Refer to mitigation measures proposed for the construction phase under Agriculture and Land Capability.	Principles of CARA Rehabilitation and Closure Plan Ripping to 30cm where soil depth permits	As needed
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil pollution		Hazardous Substances Act NWA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal	Continuous
Construction and operation of ventilation shafts and powerline route	The construction and operation of the ventilation shaft and powerline route may result in loss of land capability		Principles of CARA Rehabilitation and Closure Plan	As needed
Socio- Economic				
Construction and operation of ventilation shafts and powerline route	Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally available or potentially available, all new labour requirements will be sourced from within 40 km of the site	Maximise the local content of the construction phase by (i) employing new recruits from the DPKISLM; and (ii) continue implementing the existing Procurement Policy but ensure that SMMEs and HDSAs from the DPKISLM are contracted and empowered wherever feasible. Include minimum thresholds for local employment, BEE procurement, SMME targets, local service providers, etc. in the Contractor Services Management Plan ("CSMP") for any contractors that might be used.	Social Labour Plan Labour Act Basic Conditions of Employment Act	Continuous

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Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses for construction is currently unknown and a standard environmental principle of 'low' is assigned	Once appointed, monitor the social performance of contractors and determine how contractors fair on each key performance Area ("KPA"). Continue with the existing Community Training Programmes that target SMMEs and local businesses and make it compulsory for larger suppliers to form partnerships with HDSAs and local SMMEs to provide mentorship and ensure skills transfer.		
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; etc. could have (limited) local economic spin-offs			
Construction and operation of ventilation shafts and powerline route and underground mining	No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.	The Community Liaison Officer ("CLO") and mine manager to communicate details of the construction phase with community leaders and Ward Councillors to ensure that no unrealistic job expectations are created.	Social Labour Plan Labour Act Basic Conditions of Employment Act	Continuous
Construction and operation of ventilation shafts and powerline route and underground mining	Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas: Dust on existing access roads and during the construction of new access roads on private properties, which	Awareness and communications: Appoint a Community Liaison Officer (CLO) for the duration of the construction phase. The person should be accustomed to local customs and speak the local languages. The mine to consult with surrounding communities/landowners whose private residences, crops and other infrastructure could be affected by dust, noise and other impacts that result from	Health and Safety Plan ESMS MHSA OHSA Code of Conduct	

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	impacts grazing and crops and settle on surface water; Degradation of gravel roads; Potential road safety issues (reckless drivers).	traffic movement, construction activities and basting (noise). Provide a schedule of the construction activities to landowners and relevant I&APs. Ensure that landowners are aware of procedures to raise complaints and attend to issues as a matter of priority. Erect signboards indicating accesses to the construction site. Display a contact number on the construction vehicles where motorists can report reckless driving. Consider circulating summaries of monitoring results (dust, ambient noise levels, etc.) to the local Councillor and landowners, especially those that raised complaints. Make use of the Environmental Monitoring Committee ("EMC") to distribute information. <u>Road safety and security measures</u>: Impose penalties for reckless drivers to enforce compliance to traffic rules. Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could lead to accidents. Repair and maintain access roads that have been damaged as a result of construction vehicles. Fence off the development footprint of the construction site prior to the commencement of site-clearing and other construction activities. Limit all activities to the development footprint of the proposed construction sites. Provide workers with identity tags and instate strict security measures at the access points to discourage unauthorised people entering the construction sites. Workers should not be allowed to remain in the construction area when they are off duty. Use existing Kangra Coal employees for construction related activities wherever possible.		
Construction and operation of ventilation shafts and powerline route and underground mining	An increase in crime is often associated with construction activities when an area is 'opened up' for workers and an increase in movement occurs.		Health and Safety Plan ESMS MHSA OHSA Code of Conduct	
Construction and operation of ventilation shafts and powerline route and underground mining	Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways: Construction related accidents due to structural safety of project infrastructure; Dust generation and air pollution causing respiratory diseases; High ambient noise levels caused by machinery and construction equipment, resulting in loss of hearing; Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and Possible increase in HIV/AIDS and other STDs due to prostitution activities and temporary sexual relationships with local women, unwanted pregnancies		Constitution of South Africa SLP Commitments	Continious

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	that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).	Make it compulsory for the main and sub-contractors to use local labour wherever possible and reflect minimum thresholds in the CSMP. Impacts related to blasting: Implement all mitigation and monitoring requirements of the Blast Specialist Report (September 2020), such as to cover blasts and monitor the farmstead/building near Vent Shaft 1 during vent shaft development and implement the required monitoring programme, photographic survey, etc. for all structures up to 1 000 m from the vent shaft areas. Inform landowners and communities of blasting schedules in advance. Intrusion impacts: Ensure that all construction machinery has the required silencers. Dust alleviation methods: Vehicles carrying dusty materials should be securely covered before leaving the site; water gravel and dirt roads regularly; temporarily cover earthworks if possible and minimize drop heights; monitor the dust fall out concentrations; etc.		
Operation of underground mining	The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers	To maximise the local content of the T4 Project, it is strongly advised to: Develop and implement a strategy of recruiting from the DPKISLM area when positions become available; Work with the DPKISLM LED Unit to identify and train local SMMEs and HDSAs that would be required during the course of the operational phase;	Social Labour Plan Commitments	Continious

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Operation of underground mining	**Positive:** Kangra Coal has prioritised sourcing capital goods, services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.	Supply a Value Chain Analysis and needs requirement to the DPKISLM so that they can assist in preparing the youth, women and entrepreneurs. Implement the Community Skills Development and Capacity Development Programme for the duration of the operational phase to increase the Mine's positive legacy once decommissioning takes place; Provide feedback to the communities and the DPKISLM when tenders have been awarded to ensure transparency throughout the process.	Social Labour Plan Labour Act Basic Conditions of Employment Act	Continious
Operation of underground mining	During the operational phase, the local economy could benefit in the following ways: A possible increase in municipal rates and taxes, resulting in higher levels of rateable income; Local communities would benefit economically through the SLP programmes and LED projects; New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine's procurement partners,		Social Labour Plan Labour Act Basic Conditions of Employment Act	
Operation of underground mining	Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include: Potential to alter the topography due to surfaces that collapse over time; Reduction of groundwater supply due to the pumping of underground water; Quality impacts on water resources and water that is not fit for human and	Implement all the mitigation and management measures as proposed in the various Specialist Reports and in the EIA compiled for this Project. Reduce the underground mining area to the smallest area possible. Place the vent shafts and power lines at localities where agricultural practices are the least influenced. It is recommended that negotiations take place with landowners that are impacted by the mine to decide on amicable solutions/options that would increment incomes/reduce impacts on livelihoods. This could include that:	Constitution of South Africa	

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	livestock consumption as well as irrigation purposes; and Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.	Affected farm portions be purchased by the mine and rented to the landowners for the duration of the operational phase, with the option of purchasing the land back once the mine has been closed; If land is not purchased, compensation be paid to landowners for annual losses incurred based on average profit per head of livestock, crop yields per hectare, loss of wool quality, and so forth. Ensure that all surrounding landowners are familiar with the procedures to lodge complaints and attend to the issues at hand expediently. Implement all efforts to maintain good relations with the land owners. Establish an EMC (consisting of landowners, mine representatives, Ward Councillor, etc.) for the duration of the operational phase that meet on a quarterly basis. Use this forum to: • Raise complaints/concerns; • Provide feedback and solutions on previous issues documented; • Provide monitoring results of water/dust fallout levels etc.; Provide historic and current data to the mine that relate crop yields, livestock illnesses that was not previously present, reduction in turnovers, cutbacks of farm workers, etc. This data would indicate any potential negative impacts on farming and livelihoods to encourage the mine to address these proactively.		
Operation of underground mining	More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers are employed on the farms that affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices, resulting in job losses.		Labour Act Basic Conditions of Employment Act SLP Commitments	Continuous
Operation of underground mining	A variety of factors could impact land values of affected farms and those in the surrounds: The quality and availability of water for domestic and farming purposes; Negative impacts on topography (surfaces that collapse with time due to underground mining); Loss of soil characteristics (erosion and compaction); Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock; Visual impacts; Criminal activities (theft, vandalism, etc.); Occurrence of informal settlements,		NEMAQA Dust regulations ECA noise regulations SANS 10103 OHSA MHSA	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	trespassing on private land, illegal grazing; Pre-requirements and restrictions set by the mining company in terms of new infrastructure developments on private properties; Fragmentation of agricultural land (subdivisions).			
Operation of underground mining	The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. The community projects will also continue.	Implement all mitigation and management measures proposed in previous sections of this report that would address transparency and communication with role-players. Resume existing road upgrade initiatives implemented for the existing Kangra Coal operations on national, provincial, district and/or local roads (if any). Inspect vehicles regularly to avoid oil spillages and un-roadworthy vehicles that could result in accidents. Impose penalties for reckless drivers. Display contact numbers on vehicles (especially those that travel on gravel roads in the local study area) so that landowners and community members can report reckless driving. Maintain internal access roads constructed for maintenance purposes and do dust suppression for the duration of the operations; upgrade stormwater management measures where required.	EMS policy.	

<table>
<tr><th>ACTIVITY AND PHASE</th><th>POTENTIAL IMPACT</th><th>MANAGEMENT AND MITIGATION MEASURES</th><th>STANDARAD TO BE ACHIEVED</th><th>TIME PERIOD FOR IMPLEMENTATION</th></tr>
<tr><td>Operation of underground mining</td><td>Impacts due to lack of communication with landowners and communities can results in disruptions for the Project, temporary mine closures and loss of income;
Financial implications for the mine, host communities and private landowners should legal resources be pursued.</td><td>Negotiate financial and land use options with landowners in advance as recommended in the previous sections of this report.
Ensure that all surrounding landowners are familiar with the procedures to lodge complaints and attend to the issues at hand expediently. Implement all efforts to maintain good relations with the land owners, be transparent and use the EMC and community forums to transfer information that would impact stakeholders.
To limit conflict and negative community mobilisation it is recommended that any future recruits be sourced from the DPKISLM/Ward 10 and SLP/LED commitments (training, bursaries, community projects, etc.) for T4 should target these locals.
It is imperative and in the mine’s best interest to take their environmental and social responsibilities serious and to maintain open communication channels with surrounding land owners and communities.</td><td>Labour Act
Basic Conditions of Employment Act
SLP Commitments</td><td>Continious</td></tr>
<tr><td>Operation of underground mining</td><td>Mining depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment.</td><td rowspan="3">Operational Health and Safety procedures and requirements of the Mining Right as well as the WUL to be implemented and monitored as prescribed by the guidelines of the MPRDA and the National Water Act 36 of 1998 (NWA).
Impose penalties for reckless drivers.
Display contact numbers on vehicles (and those that travel on gravel roads in the study area) so that landowners and community members can report reckless driving.
Fire breaks to prevent the spreading of veld fires where required.
Cover and maintain ventilation shafts in the appropriate manner.
Danger warning signboards in English and the local languages in the vicinity of the vent shafts and powerline infrastructure and at the access roads leading to the infrastructure</td><td>Labour Act
Basic Conditions of Employment Act
SLP Commitments</td><td rowspan="3">Continuous</td></tr>
<tr><td>Operation of underground mining</td><td>Increased traffic and impact on road infrastructure</td><td>National Road Traffic Act
OHSA
MHSA</td></tr>
<tr><td>Operation of underground mining</td><td>Impact on health and safety of workers and people living in the area</td><td>OHSA
MHSA
SLP Commitments
Grievance Mechanism</td></tr>
</table>

ACTIVITY AND PHASE	POTENTIAL IMPACT	MANAGEMENT AND MITIGATION MEASURES	STANDARAD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Closure of mining and dismantling of surface infrastructure	Increased traffic and impacts on road infrastructure		National Road Traffic Act OHSA MHSA	
Operation of underground mining	Increased threat in security		Health and Safety Plan ESMS MHSA OHSA Code of Conduct	
Operation of underground mining	Loss of work for labour force		Social Labour Plan Labour Act Basic Conditions of Employment Act	Continious

29 FINANCIAL PROVISION

29.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

Refer to comments made within Section 19.

29.1.1 Describe the Closure Objectives and the Extent to Which They Have Been Aligned To the Baseline Environment Described Under Regulation 22 (2) (D) As Described In 2.4 Herein

Refer to comments made within Section 19.

29.1.2 Confirm Specifically That the Environmental Objectives In Relation To Closure Have Been Consulted With Landowner and Interested and Affected Parties

Refer to comments made within Section 19.6.

29.1.3 Provide A Rehabilitation Plan That Describes And Shows The Scale And Aerial Extent Of The Main Mining Activities, Including The Anticipated Mining Area At The Time Of Closure

Refer to comments made within Section 19.7.

29.1.3.1 Explain Why It Can Be Confirmed That The Rehabilitation Plan Is Compatible With The Closure Objectives.

Please refer to comments made within Section 19.8.

29.2 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).

Annual financial provisioning reports will be updated and submitted to the DMRE. Kangra Coal (Pty) Ltd. will make the said amount available to the DMRE as required.

30 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 action
e) Mechanisms for monitoring compliance

Table 139: Mechanisms for monitoring (Including Time period, Functional requirements, Roles and responsibilities and Frequency)

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Socio-Economic							
No-go option	Reduced period of development and upliftment of the surrounding communities and infrastructure.	N/A	N/A	N/A	N/A	N/A	N/A
No-Go Option	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	N/A	N/A	N/A	N/A	N/A	N/A
No-Go Option	**Positive:** No additional negative impacts on I&APs or surrounding land users	N/A	N/A	N/A	N/A	N/A	N/A
Environmental							

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
No-Go Option	**Positive:** No additional negative impacts on the environment	N/A	N/A	N/A	N/A	N/A	N/A
Hydrogeology							
Underground mining	Underground mining may result in spread of pollution	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	-
Underground mining	Dewatering due to underground mining may lower water table	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	-
Closure of underground mine	Spread of pollution	GNR 704 Water Use Licence Groundwater monitoring program	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
			Quality Standards) for Environmental water resources and Water Quality as specified in WUL			and Quarterly for Groundwater quality and quantity - or as additionally specified in WML	
Closure of underground mine	Decanting	GNR 704 Water Use Licence Groundwater monitoring program	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity - or as additionally specified in WML	Continuous
Hydrology							
Construction of overhead powerlines, access roads and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	-

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Operation of overhead powerlines and ventilation shafts	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	-
Operation of overhead powerlines and ventilation shafts	Surface water quantity - Deterioration of road crossing structures and thereby causing erosion, damming or flow reduction in rivers and streams.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	-
Removal of powerlines and ventilation shaft and any other infrastructure	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	-

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
			as specified in WUL				
Wetlands							
Construction of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during construction. Wetland fauna fatalities.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout construction
Construction of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during construction.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout construction
Construction of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care	Water Quality as specified in WUL for process related water. GN 704: Capturing	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly	Continuously throughout construction

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
		NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	and containing dirty water			for Groundwater quality and quantity	
Construction of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance. Wetland avi-fauna fatalities.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout construction
Operation of powerlines and access roads	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during repair and maintenance.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout operation

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Operation of powerlines and access roads	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout operation
Operation of powerlines and access roads	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout operation
Decommissioning powerline	Erosion and/or sedimentation of wetlands due to catchment and/or wetland land clearing and landcover disturbance during decommissioning.	GNR 704 Water Use Licence Groundwater monitoring program	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
			as specified in WUL				
Decommissi oning powerline	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.	GNR 704 Water Use Licence Groundwater monitoring program	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity - ro as additionally specified in WML	Continuous
Construction of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during construction.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout construction
Construction of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during construction.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater	

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
		DWS best practice guidelines Rehabilitation and closure plan				quality and quantity	
Construction of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	
Operation of ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during repair and maintenance.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout operation

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Operation of ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during repair and maintenance. Reduced water inputs to the wetlands fed by interflows due to interflow interception.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout operation
Operation of ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance.	GNR 704 Water Use Licence Groundwater monitoring program NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity	Continuously throughout operation
Decommissioning ventilation shafts	Accidental direct impacts to wetland vegetation by heavy machinery during decommissioning.		NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan	Continuous	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Decommissioning ventilation shafts	Erosion and/or sedimentation of wetlands due to catchment land clearing and landcover disturbance during decommissioning.	GNR 704 Water Use Licence Groundwater monitoring program	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous
Decommissioning ventilation shafts	Pollution of wetlands due to the mishandling of hazardous substances and/or improper maintenance of machinery during decommissioning.	GNR 704 Water Use Licence Groundwater monitoring program	Water Quality: In line with the specific Integrated Unit of Analysis RQS (Resource Quality Standards) for Environmental water resources and Water Quality as specified in WUL	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous
Operation of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence.	GNR 704 Water Use Licence Groundwater monitoring program	Keeping the water table levels constant and not forming an unrecoverable drawdown cone, thereby impacting on water availability of other water users	Implement IWWMP Monitoring prescribed, water levels	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Decommissi oning of underground mining	Reduced water inputs to the wetlands fed by springs (weathered aquifer) due to weathered and fractured aquifer drawdown during the dewatering of the underground workings. Reduced water inputs to the wetlands fed by perched aquifers and springs (weathered aquifers) due to land subsidence. Erosion and/or sedimentation of wetlands as a result of mine decant discharges once the water levels are reinstated.	GNR 704 Water Use Licence Groundwater monitoring program	Keeping the water table levels constant and not forming an unrecoverable drawdown cone, thereby impacting on water availability of other water users	Implement IWWMP Monitoring prescribed, water levels	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous
Decommissi oning of underground mining	Wetland pollution due to mine decant water once the water levels are reinstated.	GNR 704 Water Use Licence Groundwater monitoring program Approved IWWMP Monitoring programme Spill procedure	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous
Noise							
Construction of overhead powerlines and ventilation shafts	Construction of overhead powerlines and ventilation shafts will result in noise due to the use of vehicles and machinery used for construction	Noise Management and Monitoring Programme	Health and Safety Standards. A Safe and Low Risk Environment. Noise Regulations ECA noise regulations SANS 10103 OHSA MHSA	Conduct noise monitoring and to include any other noise sources not previously assessed as part of current Noise management programme	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
			Blasting Regulations Vibration management plan Noise Management Plan				
Operation of powerline	Nuisance and health risks caused to close by receptors as identified, such as R8, R12 and R18	Noise Management and Monitoring Programme	Health and Safety Standards. A Safe and Low Risk Environment. Noise Regulations ECA noise regulations SANS 10103 OHSA MHSA Blasting Regulations Vibration management plan Noise Management Plan	Conduct noise monitoring and to include any other noise sources not previously assessed as part of current Noise management programme	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous
Operation of ventilation shaft	Nuisance and health risks caused to close by receptors as identified, such as R6, R7, R8, R9, R14 and R15	Noise Management and Monitoring Programme	Health and Safety Standards. A Safe and Low Risk Environment. Noise Regulations ECA noise regulations SANS 10103 OHSA MHSA Blasting Regulations	Conduct noise monitoring and to include any other noise sources not previously assessed as part of current Noise management programme	Environmental Manager, Contractor / specialist	Monthly for Surface water quality, Quarterly for Groundwater quality, including 2/3 years post closure monitoring	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
			Vibration management plan Noise Management Plan				
Topography and Geology							
Underground mining	Subsidence of surface due to failure of pillars		Original topography and landform serve as a reference for rehabilitation		Mine Manager		Continuous until closure certificate has been received
Terrestrial Ecology							
Construction of ventilation shafts and powerlines	The site has sections of habitat that has been transformed to an extent, specifically Ventilation shafts 3 & 4 footprint areas, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. From the site visit, the areas where the Ventilation shafts and powerline will occur is the areas that will be impacted directly. No/limited direct impacts on the larger Mining Right are expected and therefore the impacts are rather localised and possible to ensure it remains well-	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]	NEMBA TOPS Pre-mining conditions after Closure	Ecological Monitoring and Compliance	Environmental Manager	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
	managed. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area						
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of floral species of conservation concern. Three (3) species listed by POSA for the area are classified as species of conservation concern (SCC), and have a moderate likelihood of occurrence on the project footprint. None of these species were sighted during the field assessment on the relevant footprints, but confirmation should be repeated before the onset of development since construction may take many years to start. The same will be applicable for the pylon placement during construction of the powerline. Sensitive features should be avoided best possible.	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]	NEMBA TOPS Pre-mining conditions after Closure	Ecological Monitoring and Compliance	Environmental Manager	Annually	Continuous
Construction of ventilation shafts and powerlines	Development related activities may lead to the loss of faunal species of conservation concern. The Blue crane calls heard during the field assessment could not be visually verified and therefore, although it is certain that it has been correctly identified, the conclusion can be made that although likely utilising the regional area, these birds are likely focussed on the grassland patches and sections, and not specifically on the footprints itself (although may randomly occur). The	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]	NEMBA TOPS Pre-mining conditions after Closure	Ecological Monitoring and Compliance	Environmental Manager	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
	area falls within an Important Birding Area, and hence other sensitive species may also occur in the area although not directly recorded during the field assessment. However, the same conclusion is likely to be made regarding the nature and extent of impacts to these species, as the mine is an underground mine with limited surface infrastructure.						
Construction of powerlines and ventilation shafts	The onset of activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. The natural grassland areas and wetland/aquatic associated terrain will especially be negatively impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area. Impacts may lead to the increase of invasive species or introduction of such from the outside areas and may change the vegetation structure and composition of this unit. 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	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]	NEMBA TOPS Pre-mining conditions after Closure	Ecological Monitoring and Compliance	Environmental Manager	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction of powerlines and ventilation shafts	Impacts on the water resources may occur. This may be due to pollutants entering the water resource, specifically petroleum related waste products, decant points, acid mine drainage (future and post closure), direct runoff from dirty footprints entering the surround water resources or could possibly also spread from the road access points, during construction or during operational phase from sources such as the parking zones, or other vehicle related zones	GNR 704 Water Use Licence Groundwater monitoring program Approved IWWMP Monitoring programme Spill procedure	Water Quality as specified in WUL for process related water. GN 704: Capturing and containing dirty water	Implement IWWMP Monitoring prescribed	Environmental Manager Contractor / specialist	Monthly for Surface water quality, Bi-annually for Aquatic Ecology and Quarterly for Groundwater quality and quantity - Also adhere to WUL and specific agreements made in terms of the Offset strategy, which will include monitoring of the Offset and rehabilitated wetlands and areas.	Continuously throughout construction
Construction of powerlines and ventilation shafts	Faunal species could also be easily impacted by the powerline and extensive management measures have been prescribed to mitigate this based on electrocution risks for birds specifically.	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]	NEMBA TOPS Pre-mining conditions after Closure	Ecological Monitoring and Compliance	Environmental Manager	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Removal of powerlines and ventilation shaft and any other infrastructure	Rehabilitation could be ineffective if measures are not appropriately complied to. 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.	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended	Pre-mining conditions after Closure	Ecological Monitoring	Environmental Manager	As per operational phase until Closure certificate is issued or alternatively as revised by specialist	Continuous
Aquatic Ecology							
Site preparation and other construction impacts in proximity of water courses and wetland seeps	Loss of Biodiversity and Ecological function - Riparian zone impacts	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended	Hazardous Substances Act NWA MSDS OHSA MHSA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of ventilation shafts and powerlines and underground mining	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning	WUL Conditions. IWWMP requirements	Rehabilitation and closure plan DWS best practice Guidelines	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous
Construction and operation of ventilation shafts and powerlines and underground mining	Alteration of drainage patterns leading to decrease and changes in water quantity and availability in the Ecological Reserve	WUL Conditions. IWWMP requirements	Rehabilitation and closure plan DWS best practice Guidelines	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous
Construction and operation of ventilation shafts and powerlines and underground mining	Deterioration of water quality in the Klein-Vaal river due to contaminated soil and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring which will result in water quality impacts - Nutrient increases	WUL Conditions. IWWMP requirements	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of ventilation shafts and powerlines	Sedimentation of water resources will result to nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	WUL Conditions. IWWMP requirements	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous
Construction and operation of ventilation shafts and powerlines and underground mining	If river is negatively affected and may lead to a deterioration of the Present Ecological Status (PES).	WUL Conditions. IWWMP requirements	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous
Construction and operation of ventilation shafts and powerlines and underground mining	Water Quantity impacts by diverting and reducing water available or reaching applicable areas to feed Ecological Reserves to sustain Aquatic diversity due to Impacts to Streamflow Regulation and possible diversions or impedances	WUL Conditions. IWWMP requirements	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines.	Ecological Monitoring and Compliance	Environmental Manager	Biannually	Continuous
Heritage and Palaeontological							

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of ventilation shafts	The identified heritage sites are considered to be outside of the boundary of the ventilation shafts and the impact of construction and operation will be low	National Heritage Resources Act, 1999 (Act No. 25 of 1999)	NEMA MPRDA NHRA SAHRA permitting requirements	Record occurrences of sites and artefacts if found, contact a specialist immediately.	Environmental Manager	As per Section 38 permit, fencing of the graveyards, still providing access. If the graves will be conserved in situ, monitoring of compliance in terms of the 100m buffer needs to be undertaken throughout the lifespan of the project.	Continuous
Construction and operation of powerline route A	The proposed powerline route A will impact on site K57, K59, K60 -K63, K68 and K71			Record occurrences of sites and artefacts if found, contact a specialist immediately.	Environmental Manager	As per Section 38 permit, fencing of the graveyards, still providing access. If the graves will be conserved in situ, monitoring of compliance in terms of the 100m buffer needs to be undertaken throughout the lifespan of the project.	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of powerline route B	The proposed powerline route B will impact on site K50 and K51			Record occurrences of sites and artefacts if found, contact a specialist immediately.	Environmental Manager	As per Section 38 permit, fencing of the graveyards, still providing access. If the graves will be conserved in situ, monitoring of compliance in terms of the 100m buffer needs to be undertaken throughout the lifespan of the project.	Continuous
Underground mining	Blasting impacts and subsidence may impact on heritage sites K01 - K06, K11- K13, K16 - K20, K23, K24 and K69			Record occurrences of sites and artefacts if found, contact a specialist immediately.	Environmental Manager	As per Section 38 permit, fencing of the graveyards, still providing access. If the graves will be conserved in situ, monitoring of compliance in terms of the 100m buffer needs to be undertaken throughout the lifespan of the project.	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Blasting							
Construction of ventilation shaft 1 and 2	Blasting may result in ground vibrations, air blast and fly rock,	Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956). Vibration Management Plan	As per Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956). Explosives Act MHSA OHSA MPRDA United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast	Consult blast specialist as construction begins, blast in accordance with Blast Management Plan and specifications	Environmental Manager, Mine Manager	As needed	Continuous
Construction of ventilation shaft 3	Blasting may result in ground vibrations, air blast and fly rock and may impact on buildings, cultivated lands and a gravel road in the vicinity of this ventilation shaft site.	Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956). Vibration Management Plan	As per Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956). Explosives Act MHSA OHSA MPRDA United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and	Consult blast specialist as construction begins, blast in accordance with Blast Management Plan and specifications	Environmental Manager, Mine Manager	As needed	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
			recommendations on air blast				
Agriculture and Land Capability							
Construction and operation of powerline and ventilation shafts	All areas where vegetation is removed from the soil surface in preparation for the construction of the vent shafts as well as the electricity pylons, will result in exposed soil surfaces that will be prone to erosion. Areas where vehicles will traverse, will also be at risk of soil erosion. Both wind and water erosion are a risk and once the soil surface is exposed, the intensity of single rainstorm may result in soil particles being transported away. Exposed soil surfaces will remain at risk of soil erosion during the operational and decommissioning phases	CARA	Principles of CARA Rehabilitation and Closure Plan	Regular inspections around the constructed infrastructure to detect early signs of soil erosion developing. When signs of erosion is detected, the areas must be rehabilitated using a combination of geo-textiles and re-vegetation to prevent the eroded area(s) from expanding.	Environmental Control Officer / Environmental Manager	As needed	During the entire construction, operational and decommissioning phases
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil compaction. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	N/A	Pre-mining conditions after Closure	Monitoring of the condition of the surface areas and where activities are taking place - Visual inspection	Environmental Manager	Monthly, Visual	Areas which are concurrently rehabilitated

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of powerline and ventilation shafts	All areas where vehicles and equipment will traverse during the construction phase to deliver materials, prepare the terrain and construct the infrastructure be at risk of soil pollution. Similarly, maintenance vehicles that travel to the vent shafts and powerline, will increase the existing compaction.	CARA Hazardous Substances Act NWA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal	Pre-mining conditions after Closure	Set up service plan and record services of vehicles. Monitor areas for spills that needs to be cleaned. Ensure spills have been cleaned properly and disposed suitably	Environmental Control Officer / Environmental Manager	As needed	During the entire construction, operational and decommissioning phases
Construction and operation of powerline and ventilation shafts	The availability of grazing land for livestock farming will be reduced during the construction phase of the powerline and the vent shafts. While it is assumed that the vent shafts will remain fenced off, it is anticipated that vegetation will re-establish along the powerline corridor during the operational phase and animals can graze again around the pylons.	Mine Closure and Rehabilitation Plan	Principles of CARA Rehabilitation and Closure Plan	Monitoring of the condition of the newly included portions in the MR	Environmental Manager	Monthly	C During the entire construction, operational and decommissioning phases
Construction and operation of powerline and ventilation shafts	The availability of land suitable for crop production will be reduced during the construction phase of three short sections of the powerline and Vent shafts 1 and 3. In these areas, crop production will no longer be able to continue	Mine Closure and Rehabilitation Plan	Principles of CARA Rehabilitation and Closure Plan	Monitoring of the condition of the newly included portions in the MR	Environmental Manager	Monthly	During the entire construction, operational and decommissioning phases

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil compaction	N/A	Pre-mining conditions after Closure	Monitoring of the condition of the surface areas and where activities are taking place - Visual inspection	Environmental Manager	Monthly, Visual	Areas which are concurrently rehabilitated
Decommissioning of powerline and ventilation shafts	During the decommissioning phase, the movement of vehicles and equipment will again result in soil pollution	CARA Hazardous Substances Act NWA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal	Pre-mining conditions after Closure	Set up service plan and record services of vehicles. Monitor areas for spills that needs to be cleaned. Ensure spills have been cleaned properly and disposed suitably	Environmental Control Officer / Environmental Manager	As needed	During the entire construction, operational and decommissioning phases
Construction and operation of ventilation shafts and powerline route	The construction and operation of the ventilation shaft and powerline route may result in loss of land capability	Mine Closure and Rehabilitation Plan	Pre-mining conditions after Closure	Monitoring of the condition of the newly included portions in the MR	Environmental Manager	As per operational phase until Closure certificate is issued or alternatively as revised by specialist	Continuous
Socio- Economic							

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of ventilation shafts and powerline route	Apart from natural attrition of the workforce, no new recruitment will take place and the same staff currently employed by Kangra Coal will be used to establish the T4 Project. Where the skills are locally available or potentially available, all new labour requirements will be sourced from within 40 km of the site	N/A	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development.	Environmental Manager / Community Liaison Officer	Human Resources/ Procurement	Continuous	Environmental Manager / Community Liaison Officer
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** The value set for procurement of goods, services and consumables from HDSAs, SMMEs and other small businesses for construction is currently unknown and a standard environmental principle of 'low' is assigned	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	N/A	Supporting, utilising and building local economy	Keep records of service providers and where they are from	Human Resources/ Procurement	Annually
Construction and operation of ventilation shafts and powerline route and underground mining	**Positive:** An increase in spending power as a result of salaries and contracts with HDSAs/SMMEs (local merchants and grocery stores that benefit); a possible increase in informal traders; contractors that reside in B&B's and guesthouses; etc. could have (limited) local economic spin-offs	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	N/A	Supporting, utilising and building local economy	Keep records of service providers and where they are from	Human Resources/ Procurement	Annually

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of ventilation shafts and powerline route and underground mining	No new employment is envisaged and an influx of jobseekers is unlikely. However, communication with local communities to eliminate unrealistic expectations with regards to employment is required.	Community Engagement Plan	Social Labour Plan Labour Act Basic Conditions of Employment Act	Environmental Manager / Community Liaison Officer	Human Resources/ Procurement	Continuous	Environmental Manager / Community Liaison Officer
Construction and operation of ventilation shafts and powerline route and underground mining	Surface construction (vent shafts and powerline) holds the following traffic related impacts for the local/site specific study areas: Dust on existing access roads and during the construction of new access roads on private properties, which impacts grazing and crops and settle on surface water; Degradation of gravel roads; Potential road safety issues (reckless drivers).	Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Health and Safety Regulations. A safe and low risk environment	Monitor Emergency Preparedness	Environmental Manager, Mine Manager	Continuous	Continuous
Construction and operation of ventilation shafts and powerline route and underground mining	An increase in crime is often associated with construction activities when an area is 'opened up' for workers and an increase in movement occurs.	N/A	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development. Health and Safety Plan ESMS MHSA OHSA Code of Conduct	Complaints should be investigated (if any)	Environmental Manager	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Construction and operation of ventilation shafts and powerline route and underground mining	Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers that could manifesting in the following ways: Construction related accidents due to structural safety of project infrastructure; Dust generation and air pollution causing respiratory diseases; High ambient noise levels caused by machinery and construction equipment, resulting in loss of hearing; Dehydration, sunburn and related issues due to unsafe and insufficient drinking water and high temperatures during summer months; and Possible increase in HIV/AIDS and other STDs due to prostitution activities and temporary sexual relationships with local women, unwanted pregnancies that place further pressure on Basic Health Care Services (should contractors and/or workers from outside the local/regional study areas be used).	Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Health and Safety Regulations. A safe and low risk environment	Monitor Emergency Preparedness	Environmental Manager, Mine Manager	Continuous	Continuous
Operation of underground mining	The T4 Project MWP (2020) indicates that Kangra Coal has a workforce of 321 employees. A marginal impact on the local economy as a result of new employment is anticipated as: (i) the Project will make use of its existing workers	N/A	Increased Employment Opportunities in the Long term Social Labour PLan	Compliance with programme principles / vision	Human Resources	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Operation of underground mining	**Positive:** Kangra Coal has prioritised sourcing capital goods, services and consumables from HDSA empowered companies and already implements an enterprise development programme with the aim to find opportunities for HDSAs in the core of the business in line with the criteria and standards set by Mining Charter (2018). This practise will continue for the duration of the T4 Project operations.	Social Labour PLan	Social Labour Plan Labour Act Basic Conditions of Employment Act	Compliance with programme principles / vision	Human Resources	Annually	Continuous
Operation of underground mining	During the operational phase, the local economy could benefit in the following ways: A possible increase in municipal rates and taxes, resulting in higher levels of rateable income; Local communities would benefit economically through the SLP programmes and LED projects; New local suppliers and services established and possibly trained by the mine, thereby supporting employment of the mine's procurement partners,	Social Labour PLan	Social Labour Plan Labour Act Basic Conditions of Employment Act	Compliance with programme principles / vision	Human Resources	Annually	Continuous
Operation of underground mining	Possible long-term impacts of underground coal mining on natural resources and agricultural land uses could include: Potential to alter the topography due to surfaces that collapse over time; Reduction of groundwater supply due to the pumping of underground water; Quality impacts on water resources and water that is not fit for human and livestock consumption as well as	N/A	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development.	Complaints should be investigated (if any)	Environmental Manager	Annually	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
	irrigation purposes; and Water holding capacity of the soil could be impacted as water leaks out of soil profile beyond the root zone.						
Operation of underground mining	More than 300 permanent workers and fluctuating numbers of temporary/seasonal workers are employed on the farms that affected by the footprint of the MR area. Medium to long-term impacts on natural resources (water, soil, etc.) and intrusion impacts (pollution, escalation of crime, etc.) has the potential to influence agricultural practices, resulting in job losses.	N/A	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development.	Complaints should be investigated (if any)	Environmental Manager	Annually	Continuous
Operation of underground mining	A variety of factors could impact land values of affected farms and those in the surrounds: The quality and availability of water for domestic and farming purposes; Negative impacts on topography (surfaces that collapse with time due to underground mining); Loss of soil characteristics (erosion and compaction); Intrusion impacts, such as noise and dust, which could have an impact on crops and livestock; Visual impacts; Criminal activities (theft, vandalism, etc.); Occurrence of informal settlements, trespassing on private land, illegal grazing; Pre-requirements and restrictions set by the mining company in terms of new	Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Health and Safety Regulations. A safe and low risk environment NEMAQA Dust regulations ECA noise regulations SANS 10103 OHSA MHSA	Monitor Emergency Preparedness	Environmental Manager, Mine Manager	Continuous	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
	infrastructure developments on private properties; Fragmentation of agricultural land (subdivisions).						
Operation of underground mining	The aim of the various training programmes, as enforced through the Mining Charter (2018), is to produce a skilled, trained and diverse workforce to meet the demands of the modern industry; develop skills that enhance productivity of the workforce and improve the employment prospects of HDI's; and develop entrepreneurial skills that improve people's livelihoods and create mining-led local and regional economic diversification. The community projects will also continue.	Social Management Plan	MPRDA SLP Commitments	-	CLO SLP Manager Ward Councillor DPKISLM (LED Manager)	Identification of locally available skills and gaps. Recruitment targets included in Contractor Services Management Plan	When Mining Right is awarded Construction phase
Operation of underground mining	Impacts due to lack of communication with landowners and communities can results in disruptions for the Project, temporary mine closures and loss of income; Financial implications for the mine, host communities and private landowners should legal resources be pursued.	Community Engagement Plan	Labour Act Basic Conditions of Employment Act SLP Commitments	-	Responsibility: Mining company EMC to consist of CLO, Ward Councillor, representative of prominent community groups, landowners, national, provincial and local government.	Establishment of the EMC Annual / quarterly EMC feedback meetings and reports (monitoring purpose). Provide historic and current data to the mine that relate to crop yields, livestock illnesses, reduction in	Prior to construction Construction phase Operational phase

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
						turnovers, cutbacks of farm workers, etc	
Operation of underground mining	Mining depletes water supplies; pollutes the air, soil and water; destroys ecosystems and arable land. Runoff and spills from mines and waste ponds often contaminate drinking and irrigation water, violating the rights to life, health, water, food and a healthy environment.	NEMA EMPR Commitments Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Labour Act Basic Conditions of Employment Act SLP Commitments	As per groundwater monitoring plan, surface water monitoring plan, biomonitoring plan	Environmental Manager, Mine Manager	As per the requirements of the various plans	Continuous
Operation of underground mining	Increased traffic and impact on road infrastructure	Traffic Management Plan	As per Traffic Management Plan National Road Traffic Act OHSA MHSA	As per Traffic Management Plan	Environmental Manager, Mine Manager	As per Traffic Management Plan	Continuous
Operation of underground mining	Impact on health and safety of workers and people living in the area	Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Health and Safety Regulations. A safe and low risk environment OHSA MHSA	Monitor Emergency Preparedness	Environmental Manager, Mine Manager	Continuous	Continuous
Closure of mining and dismantling of surface infrastructure	Increased traffic and impacts on road infrastructure	Traffic Management Plan	As per Traffic Management Plan National Road Traffic Act OHSA MHSA	As per Traffic Management Plan	Environmental Manager, Mine Manager	As per Traffic Management Plan	Continuous

ACTIVITY AND PHASE	POTENTIAL IMPACT	COMPLIANCE WITH STANDARDS TO BE ACHIEVED	STANDARAD TO BE ACHIEVED	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBI LITIES	MONITORING AND REPORTING FREQUENCY	TIME PERIOD FOR IMPLEMENTATION IMPACT MANAGEMENT OPTIONS
Closure of underground mining	Increased threat in security	Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Health and Safety Regulations. A safe and low risk environment	Monitor Emergency Preparedness	Environmental Manager, Mine Manager	Continuous	Continuous
Closure of underground mining	Loss of work for labour force	Health and Safety Regulations as described in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) [as amended]	Health and Safety Regulations. A safe and low risk environment Social Labour Plan	Monitor Emergency Preparedness	Environmental Manager, Mine Manager	Continuous	Continuous

30.1 DETAILED MONITORING PROGRAMMES AS DESCRIBED FOR ACTIVITIES

30.1.1 Geology, Soil and Erosion Monitoring Programme

Soil monitoring will involve the inspection of soil which has been disturbed, compacted, contaminated or eroded. Soil monitoring will assist in determining where soils have not been sufficiently rehabilitated.

Where soils have been contaminated by the spillage of hydrocarbon, monitoring must take place on a weekly basis for at least four (4) weeks or until the soil is considered sufficiently rehabilitated. Soils samples should be taken and submitted to a laboratory to test for contaminant content if it is considered necessary.

- Soil monitoring should be undertaken:
- Areas which have been rehabilitated;
- After remediation soils which have been contaminated by spillages during the operational phase; and
- Closure and decommissioning phase.

All watercourses or riparian areas requiring re-vegetation should be monitored for signs of erosion. In addition, all of the following areas should also be monitored:

- All stormwater discharge points;
- All clean water diversion discharge points; and
- All roads and crossings.

Monitoring activities should consist of fixed-point photography, as well as a walk-through survey to observe for signs of erosion in the field. Monitoring should be done as specified and at the end of the rainy season. Any erosion damage observed should be repaired immediately.

30.1.2 Surface and Ground Water Monitoring Programme

30.1.2.1 Surface water monitoring

The objective of water quality monitoring is to obtain quantitative information on the physical, chemical, and biological characteristics of water via statistical sampling. The type of information sought depends on the objectives of the monitoring programme. Objectives and purposes range from detection of drinking water standard violations (non-compliance) to determination of the environmental state and analysis of temporal water quality trends. The specific goals these monitoring programs may have are listed below:

- Determine the fitness of water for various uses,
- Identify the causes of pollution (toxics, nutrients, sedimentation),
- Identify sources (point or diffuse) of pollution,
- Determine the overall effectiveness of any source directed measures,
- Identify long term resource quality trends,
- Define the state of a water resource,
- Allow for compliance monitoring, and
- Allow for the assessment of the effectiveness of changes in policy, regulation, and implementation of

IWRM.

With respect to the above-mentioned goals, the main monitoring objective for the project will be:

- Compliance monitoring as per the WUL and EMPr; and
- Impact monitoring in terms of the catchment RQO's.

The purpose of the surface water monitoring is to assess the impacts that the Kangra T4 coal mine and associated activities could have on the local water resources. Due to the scale, location and expected impacts from the proposed mining and related activities an upstream and downstream monitoring point in the C11C (Klein-Vaal River) catchment is proposed.

The following parameters should be analysed as part of the surface water quality monitoring:

- pH – Value at 25°C
- Electrical Conductivity in mS/m at 25°C
- Total Dissolved Solids at 180°C
- Nitrate (N)
- Nitrite (N)
- Dissolved Oxygen (O2)
- Aluminium (Al)
- Arsenic (As)
- Iron (Fe)
- Manganese (Mn)
- Sulphates (SO_4^{2-})
- Sodium (Na)•Calcium (Ca)

Table 140: Water quality monitoring points

Monitoring point	Description	Coordinates
T4/US	Monitoring point located upstream of the proposed project footprint. Tributary of Klein-Vaal River.	27° 6'21.19"S, 30°13'52.69"E
T4/DS	Monitoring point located downstream of the proposed T4 mining footprint. Klein-Vaal River.	27° 1'19.11"S, 30° 9'30.61"E

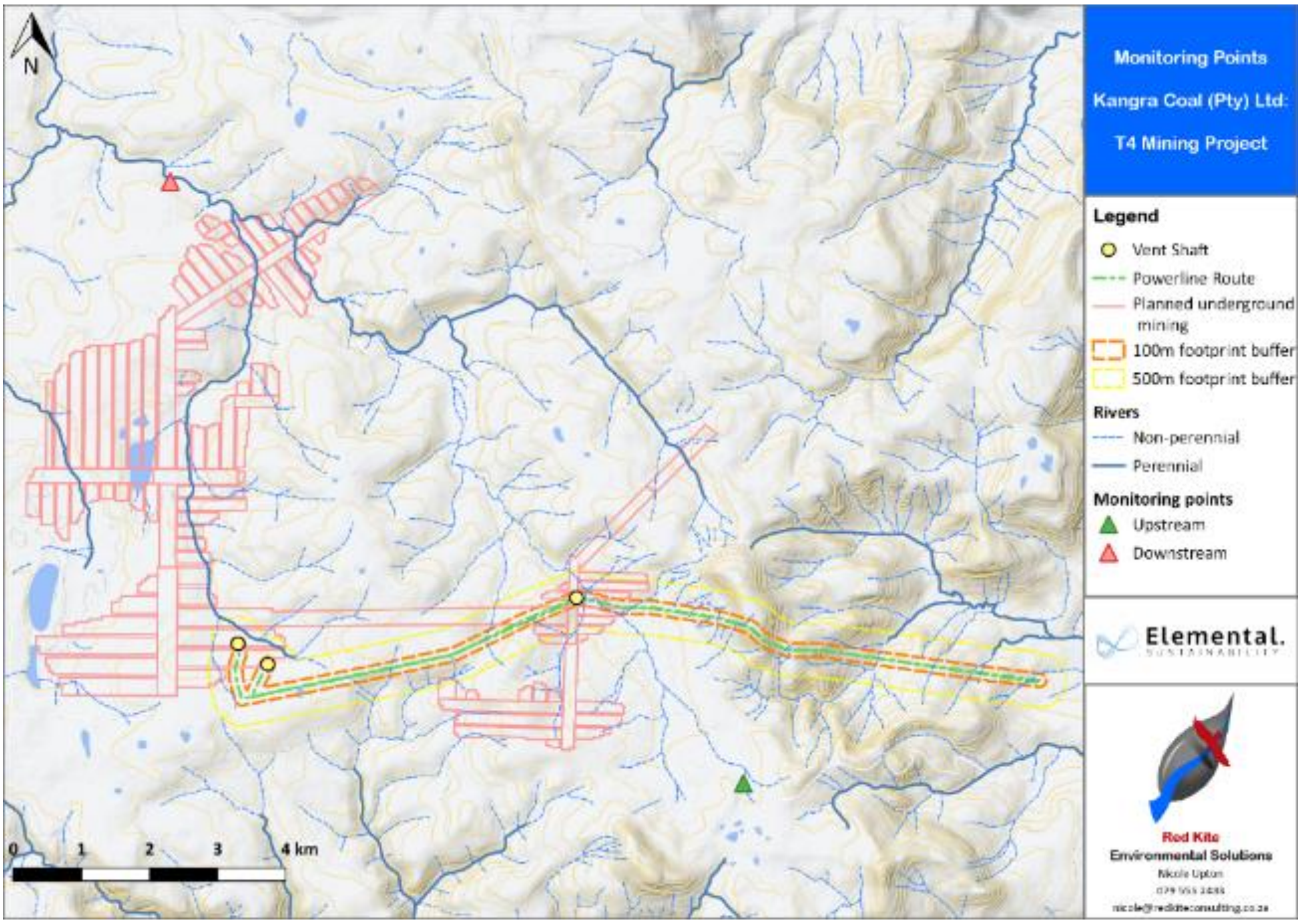

Figure 169: Proposed monitoring points

30.1.2.2 Groundwater Monitoring

30.1.2.2.1 *<u>Groundwater Monitoring Network</u>*

A groundwater monitoring system has to adhere to the criteria mentioned below. As a result, the system should be developed accordingly.

30.1.2.2.2 *<u>Source, plume, impact and background monitoring</u>*

A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped classification according to the following purposes:

- Source monitoring: Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry.
- Plume monitoring: Monitoring boreholes are placed in the primary groundwater plume's migration path to evaluate the migration rates and chemical changes along the pathway.
- Impact monitoring: Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern.

- Background monitoring: Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry.

30.1.2.2.3 System Response Monitoring Network

Groundwater levels: The response of water levels to abstraction is monitored. Static water levels are also used to determine the flow direction and hydraulic gradient within an aquifer. Where possible all of the borehole's water levels need to be recorded during each monitoring event.

30.1.2.2.4 Monitoring Frequency

In the operational phase and closure phase, quarterly monitoring of groundwater quality and groundwater levels is recommended. Quality monitoring should take place before after and during the wet season, i.e. during September and March. It is important to note that a groundwater monitoring network should also be dynamic. This means that the network should be extended over time to accommodate the migration of potential contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources.

30.1.2.2.5 Monitoring Parameters

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents). Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sampling positions. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH drops.

30.1.2.2.6 Abbreviated analysis (pollution indicators)

Physical Parameters:

- Groundwater levels

Chemical Parameters:

- Field measurements: o pH, EC
- Laboratory analyses: o Major anions and cations (Ca, Na, Cl, SO_4) o Other parameters (EC)

Full analysis

Physical Parameters:

- Groundwater levels

Chemical Parameters:

- Field measurements:

  - pH, EC
- Laboratory analyses:
  - Anions and cations (Ca, Mg, Na, K, NO_3, Cl, SO_4, F, Fe, Mn, Al, & Alkalinity)
  - Other parameters (pH, EC, TDS)
  - Petroleum hydrocarbon contaminants (where applicable, near workshops and petroleum handling facilities)
  - Sewage related contaminants (E. Coli, faecal coliforms) in borehole in proximity to septic tanks or sewage plants.

30.1.2.2.7 Monitoring Boreholes

DWAF (1998) states that “A monitoring hole must be such that the section of the groundwater most likely to be polluted first, is suitably penetrated to ensure the most realistic monitoring result.”[68]

Currently a monitoring network does exist for the Kangra Coal T4 section. It is further recommended that during operations this monitoring be continued, as well as groundwater quality and level monitoring after decommissioning of the site. In addition to this a hydrocensus should be done every 2 years surrounding the T4 project area.

However, a monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.

68 Department of Water Affairs and Forestry (DWAF). (1998). Minimum Requirements for the Water Monitoring at Waste Management Facilities. CTP Book Printers. Cape Town.

30.1.2.3 Wetland Monitoring

30.1.2.3.1 Construction Phase Monitoring

- Compliance monitoring will be the responsibility of a suitably qualified/trained ECO (Environmental Control Officer) with any additional supporting EO's (Environmental Officers) having the required competency skills and experience to ensure that monitoring is undertaken effectively and appropriately.
- A photographic record of the state of the watercourse prior to the commencement of clearing/construction must be kept for reference and rehabilitation monitoring purposes.
- The ECO must undertake bi-monthly compliance monitoring audits. Freshwater ecosystem aspects that must be monitored related to monitoring freshwater ecosystem impacts include:
    - The condition of the demarcation fence.
    - Evidence of any no-go area incursions.
    - The condition of the temporary runoff, erosion and sediment control measures and evidence of any failures.
    - Evidence of sedimentary deposits / plumes and elevated rates of sedimentation (i.e. vegetation smothering / burial).
    - Evidence of elevated river / stream turbidity levels.
    - Evidence of gully or bed/bank erosion.
    - Visual assessment of stormwater quality and instream water quality.
    - The condition of waste bins and the presence of litter within the working area.
    - Evidence of solid waste within the no-go areas.
    - Evidence of hazardous materials spills and soil contamination.
    - Presence of alien invasive and weedy vegetation within the working area.
    - Rehabilitation and re-vegetation methods and success.
    - Once the construction and rehabilitation has been completed, the ECO should conduct a close out site audit 1 month after the completion of rehabilitation.

30.1.2.3.2 Operational Phase Monitoring

- It is the applicant's responsibility to ensure the proper functioning of all vent shaft, powerline and service road infrastructure that is likely to require regular on-going maintenance.
- It is important that the location and extent of the wetlands and rivers in the vicinity of project activities be incorporated into all formal maintenance and repair plans for the project.
- The wetland areas occurring within the powerline servitude must not be burnt or cut.
- In terms of management, alien invasive plant control must be practiced on an on-going basis in line with the requirements of Section 2(2) and Section 3 (2) the National Environmental Management: Biodiversity Act (NEM:BA), which obligates the landowner/developer to control IAPs on their property.

It will be important that long-term monitoring of the potential freshwater ecosystem impacts be undertaken to proactively to identity any environmental issues and impacts that may arise as a result of the project. This should be one as part of the maintenance programme. The following key aspects should be monitored:

- Erosion in the wetland downslope of the vent shafts.
- Erosion and/or sedimentation in the wetland upstream and downstream of service road and powerline crossings.
- Presence of alien invasive plants.
- Powerline bird mortalities.

30.1.2.4 Ecological and Vegetation Establishment

30.1.2.4.1 *Vegetation re-establishment*

Areas re-vegetated following impacting activities, decommissioning activities or any activities leading to vegetation removal and disturbance should be monitored following seeding to ensure successful establishment of vegetation. The following broad guidelines should apply, though the site-specific details should be determined by a suitably qualified expert:

- Monthly monitoring for the first six (6) months, then annual monitoring during the growing season;
- Monitoring for the first six (6) months should focus on cover;
- 70% cover should be achieved after 3 months;
- Annual monitoring (representative sample of re-vegetated sites only) should be undertaken until the appointed independent specialist is satisfied that a sustainable vegetation cover has been established.

30.1.2.4.2 *Alien vegetation*

An ongoing alien vegetation removal programme should be implemented during all phases of the development.

30.1.3 Noise Monitoring Program

The Noise Monitoring Programme should include the following:

- Measurements should be conducted in terms of LAIeq equivalent values (impulse), with statistical and octave data logged (if uncertain about LAIeq or due to limitations). Metrological (wind) conditions should be logged. International (fast) measurements could be considered for comparison with the International Finance Corporation requirements (if required).
- Where feasible longer term (+24 hours) or unattended or 10-minute measurements should be attempted to represent a maximum capacity of evaluated scenario, and at/near receptors (or project footprint).
- (Recommended but not required) If feasible Engineering tests should be conducted during Environmental measurements to identify any noisy equipment requiring enclosures, or equipment where maintenance is required.
- The annual measurement report should be reviewed after the first 2 years.

- Reporting should be compiled and submitted to the relevant authorities. The ToR of the report should include SANS10103:2008 methodologies in it, with the Noise Control Regulations limits applied.
- Reports should be made available to receptors with the frequency and platform decided by the project team.

Frequency:

- Annual noise measurements to be conducted at receptors within 1 km of the vent shafts (receptors R14 – R15 (vent 3 and 4), R6 – R7 (vent 1)). Should a complaint regarding corona discharge from overhead power lines be reported, measurements at this receptor should be conducted.
- The Environmental measurements should be conducted at I&AP's i.e., farmsteads, receptors, communities.
- Monitoring at the project footprint boundary needs to be conducted. Although no receptors are at the boundary, the noise spill-over extent into neighbouring properties must be assessed.
- The measurements should be conducted prior to any phase to ensure baseline findings. Measurements should further be conducted during all phases including construction, operational and closure phases.

Target Criterion:

- The methodology as proposed by SANS10103:2008 should be used. Compliance with the Noise Control Regulations should be met (no increase of +7 dBA from identified Rating).
- The boundary of the property/farm portion/mining rights area should not be exceeded by 61 dBA 24 hour or similar (controlled zone).

30.1.4 Blasting Monitoring Programme

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

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

Most of the above aspects do not require specific locations of monitoring. Ground vibration and air blast monitoring requires identified locations for monitoring. Monitoring of ground vibration and air blast is done to ensure that the generated levels of ground vibration and air blast comply with recommendations. Proposed positions were selected to indicate the nearest points of interest at which levels of ground vibration and air blast should be within the accepted norms and standards as proposed in this report. The monitoring of ground vibration will also qualify the expected ground vibration and air blast levels and assist in mitigating these aspects properly. This will also contribute to proper relationships with the neighbours.

Four monitoring positions were identified for the vent shaft areas as a minimum that will be required. Some of these points may be applicable to more than one installation. Monitoring positions for Vent Shaft 1 are indicated in Figure 170 and Table 141 lists the positions with coordinates. Monitoring positions for Vent shaft 3 are indicated in Figure 171 and Table 142 lists the positions with coordinates. Monitoring positions for Vent shaft 4 are indicated in Figure 172 and Table 143 lists the positions with coordinates. These points will need to be re-defined after the first blasts done and the monitoring programme defined.

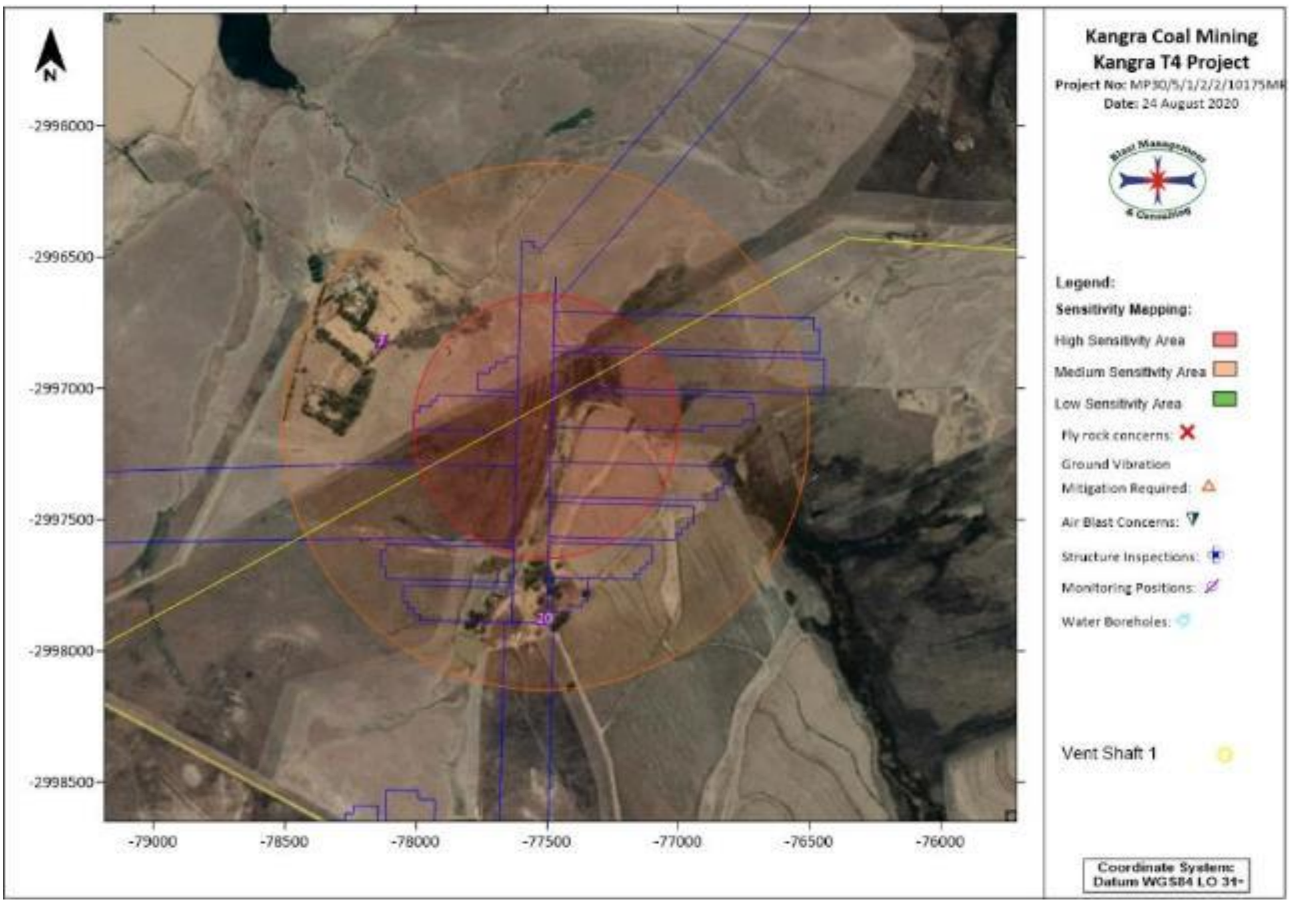

Figure 170: Monitoring Positions suggested for Vent Shaft 1

Table 141: List of possible monitoring positions for Vent Shaft 1

Tag	Description	Y	X
7	Farmstead	78131.16	2996819
20	Farmhouse	77506.38	2997874

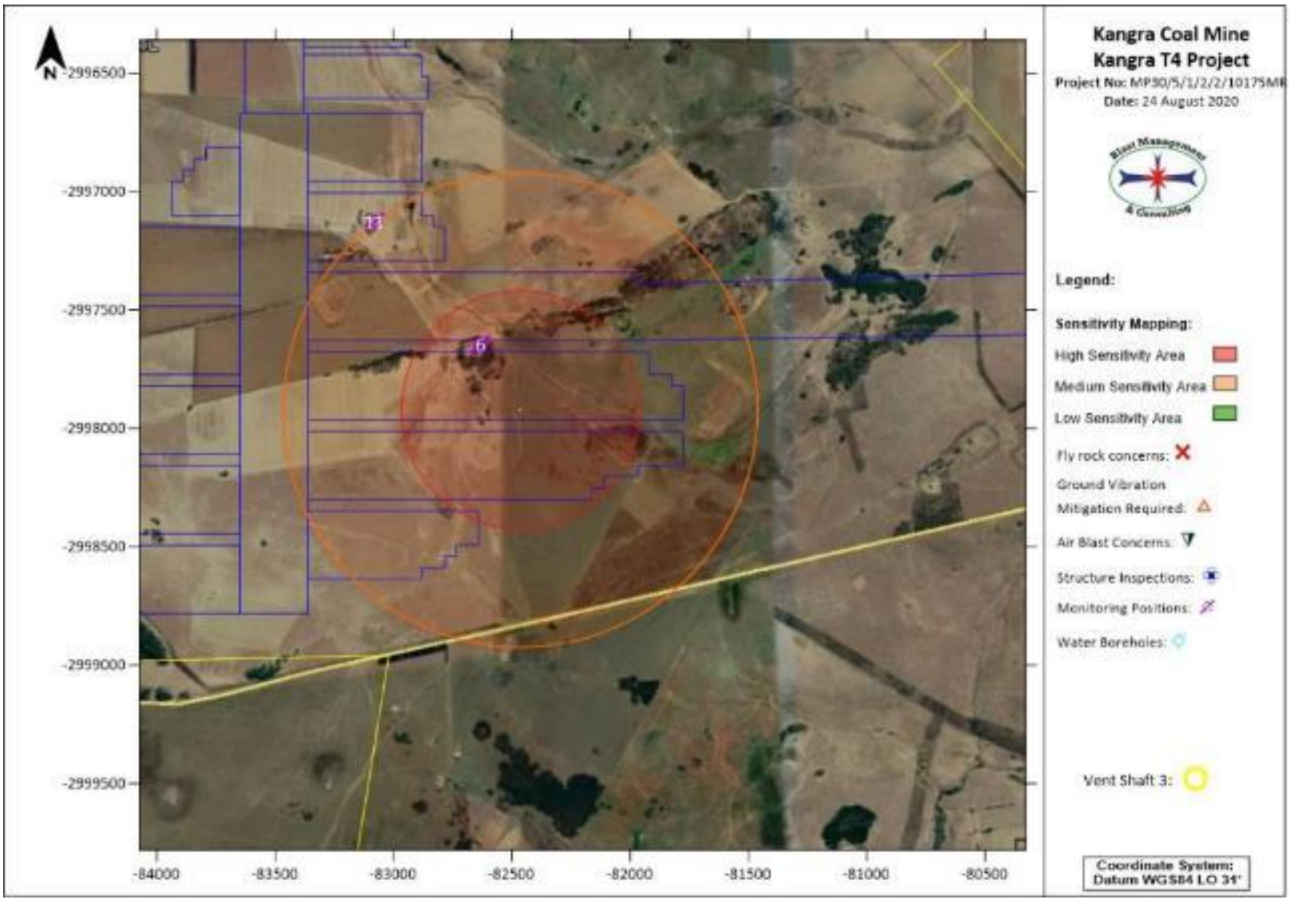

Figure 171: Monitoring Positions suggested for Vent Shaft 3

Table 142: List of possible monitoring positions for Vent Shaft 3

Tag	Description	Y	X
6	Building	82630.43	2997649
11	Farmstead	83078.57	2997129

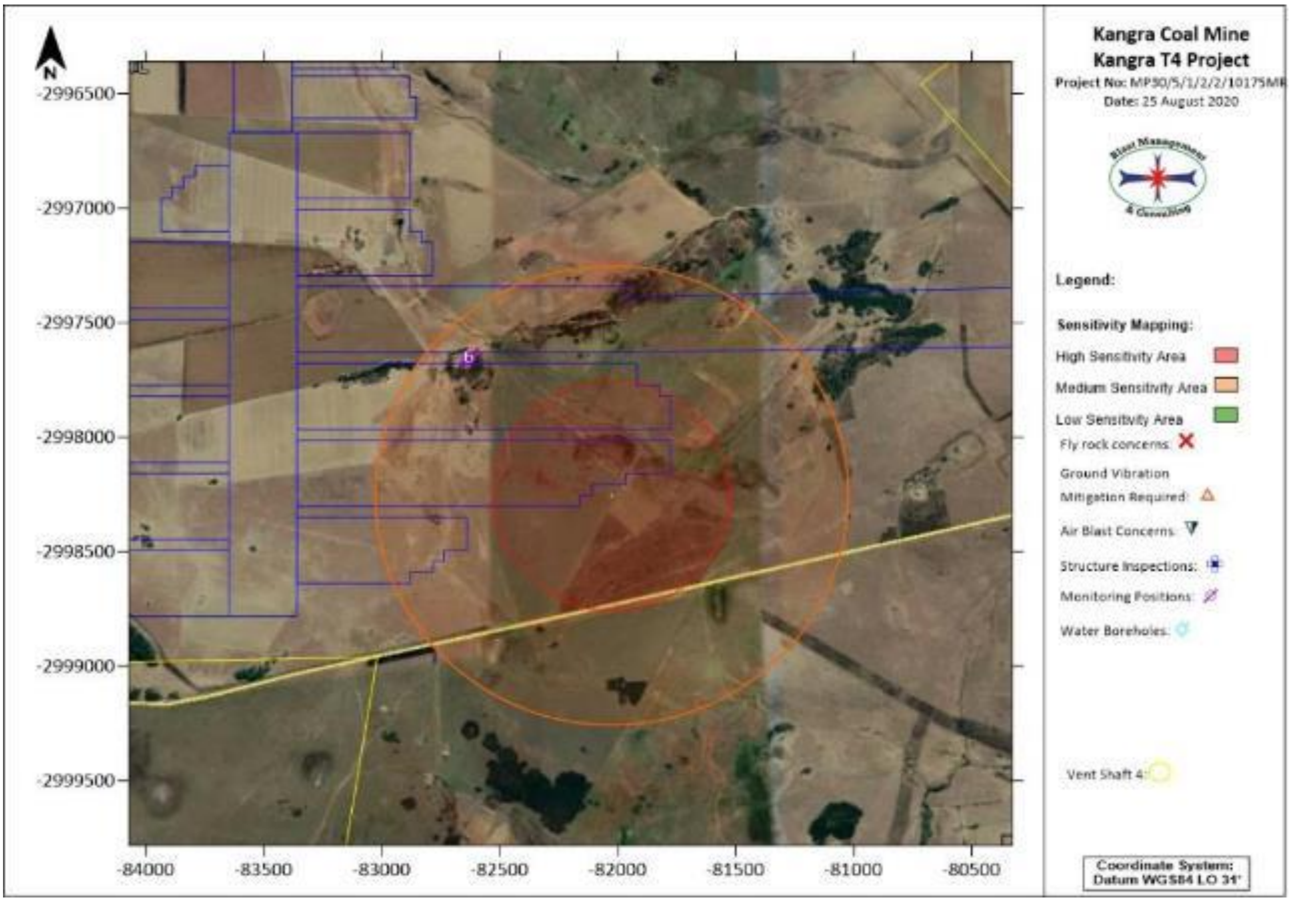

Figure 172: Monitoring Positions suggested for Vent Shaft 4

Table 143: List of possible monitoring positions for Vent Shaft 4

Tag	Description	Y	X
6	Building	82630.43	2997649

30.1.4.1 Recommendations

The following recommendations are proposed.

30.1.4.1.1 Regulatory requirements for Vent Shaft 1, 3 and 4: MHSA 500 m

Regulatory requirements indicate specific requirements for all non-mining structures and installations within 500 m from the mining operation. The mine will have to apply for the necessary authorisations as prescribed in the various acts. Table 144 shows list of these installations. Figure 173 below shows the 500 m boundary around the Vent Shaft 1. The location of non-mining installations is clearly observed.

Table 144: List of possible installations within the regulatory 500 m for Vent Shaft 1

Tag	Description	Classification	Y	X
1	River	11	77384.24	2996980

2	River	11	77514	2996821
3	River	11	77668.56	2996686
6	Cultivated Fields	7	77277.24	2997252
18	Cultivated Fields	7	77130.05	2997480

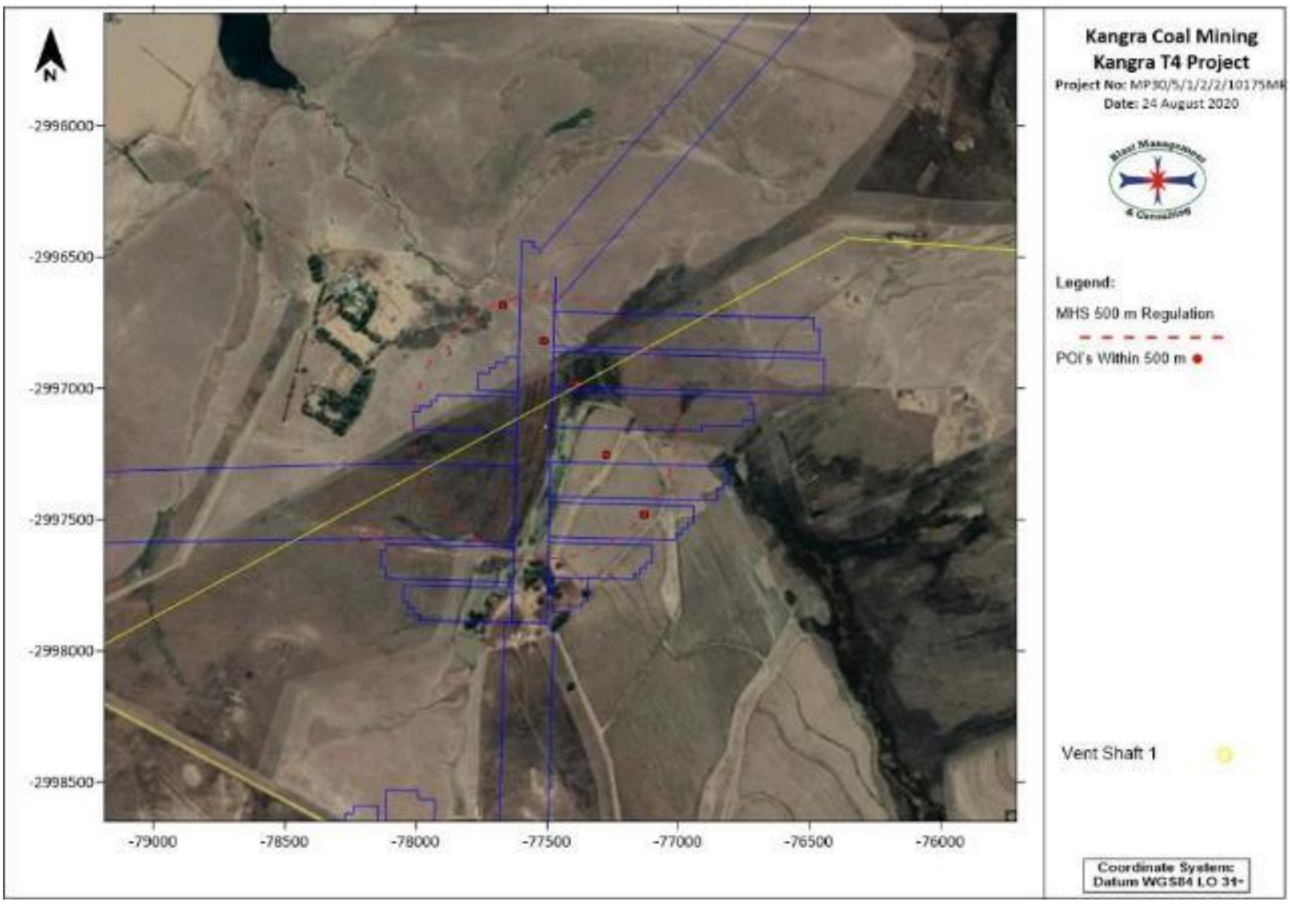

Figure 173: Regulatory 500 m range for Vent Shaft 1

Regulatory requirements indicate specific requirements for all non-mining structures and installations within 500 m from the mining operation. The mine will have to apply for the necessary authorisations as prescribed in the various acts. Figure 173 shows list of these installations. Figure 174 below shows the 500 m boundary around the Vent Shaft 3. The location of non-mining installations is clearly observed.

Table 145: List of possible installations within the regulatory 500 m for Vent Shaft 3

Tag	Description	Classification	Y	X
1	Ruins	4	82141.1	2997611.626
3	River	11	81967.9	2997954.163
4	River	11	82267	2997837.693
5	Dam/Dam wall	11	82766.7	2997715.793

Tag	Description	Classification	Y	X
6	Building	2	82630.4	2997648.791
7	Building	2	82674.6	2997665.602
8	Cultivated Fields	7	82638.6	2997453.492

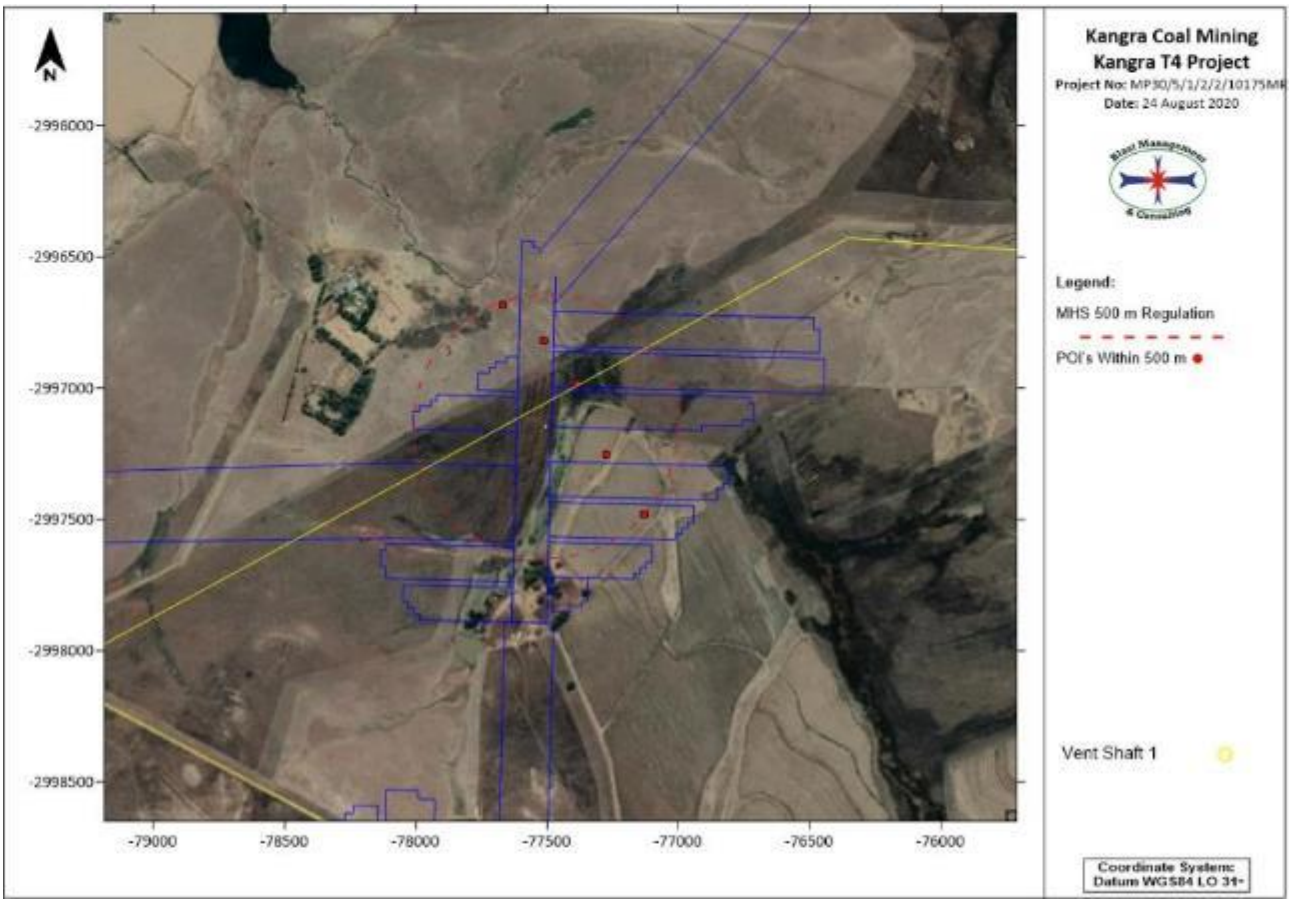

Figure 174: Regulatory 500 m range for Vent Shaft 3

Regulatory requirements indicate specific requirements for all non-mining structures and installations within 500 m from the mining operation. The mine will have to apply for the necessary authorisations as prescribed in the various acts. Table 146 shows list of these installations. Figure 175 below shows the 500 m boundary around the Vent Shaft 4. The location of non-mining installations is clearly observed.

Table 146: List of possible installations within the regulatory 500 m for Vent Shaft 3

Tag	Description	Classification	Y	X
3	River	11	81967.9	2997954.163
4	River	11	82267	2997837.693
27	Gravel Road	14	81919.8	2998719.217

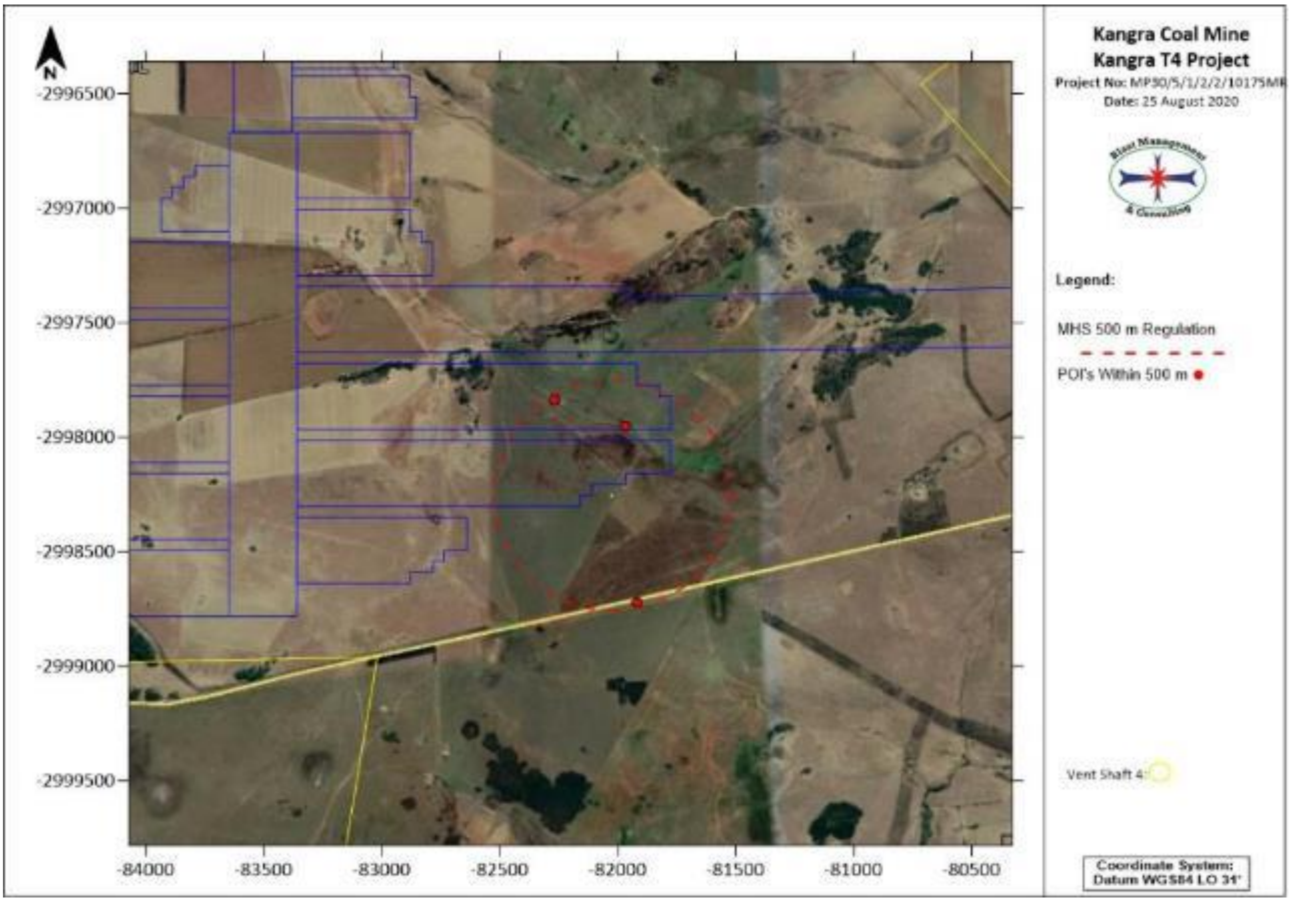

Figure 175: Regulatory 500 m range for Vent Shaft 4

30.1.4.1.2 Regulatory requirements for Vent Shafts 1, 3 and 4: MHSA 100 m

Regulatory requirements indicate specific requirements for all non-mining structures and installations within 100 m from the mining operation. The mine will have to apply for the necessary authorisations as prescribed in the various acts. There are no installations. within the 100 m boundary around the Vent Shaft 1, 3 and 4 areas.

30.1.4.1.3 Blast Designs

Blast designs can be reviewed prior to first blast planned done. Consideration must be given to structures surrounding the blast intended. This may require changed drilling diameters, blasting patterns, charging configurations or initiation system. A detail design cannot be done at this stage by the author as much more information is required than currently available.

30.1.4.1.4 Safe Blasting Distance and Evacuation

The calculated minimum safe distance is 492 m. This is the estimated area that must be cleared at least around a blast before firing. It is recommended that at least 500 m be used as a safe distance from any blast. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance.

30.1.4.1.5 Road Closure

When blasting at Vent Shaft 4 then the gravel road is in the vicinity of the project area needs to be considered. The gravel road is 474 m away from Vent Shaft 4 and should be closed. Stop and Go will be required when blasting is done within 500 m from this gravel roads. Road closure will be required with inspection for after blast fly rock. And There may also be smaller roads that are used by the local communities that may not be clearly indicated on maps and should also be considered for closures when blasting is done. During blasting care must be taken to ensure all people and animals cleared to outside the unsafe area as determined by the blaster.

30.1.4.1.6 Stemming length

The current proposed stemming lengths at least must be maintained to ensure some form of fly rock control. Specific designs where distance between point of concern and blast is known should be considered with this. It may be required to increase stemming lengths for additional control.

30.1.4.1.7 Photographic Inspections for Vent Shaft 1, 3 and 4

The option of photographic survey of all structures up to 1000 m from the vent shaft areas is recommended. The mine will be operating for a significant number of years. This will give advantage on any negotiations with regards to complaints from neighbours. This process can however only succeed if done in conjunction with a proper monitoring program. At 1000 m at vibration level of 0.3 mm/s is expected for the maximum charge used. This level of ground vibration is already too low/acceptable and people in structures could experience ground vibration negatively. Figure 176 shows the structures within the 1000 m area for the Vent Shaft 1 to be considered. Table 147 shows list of structures identified for inspection.

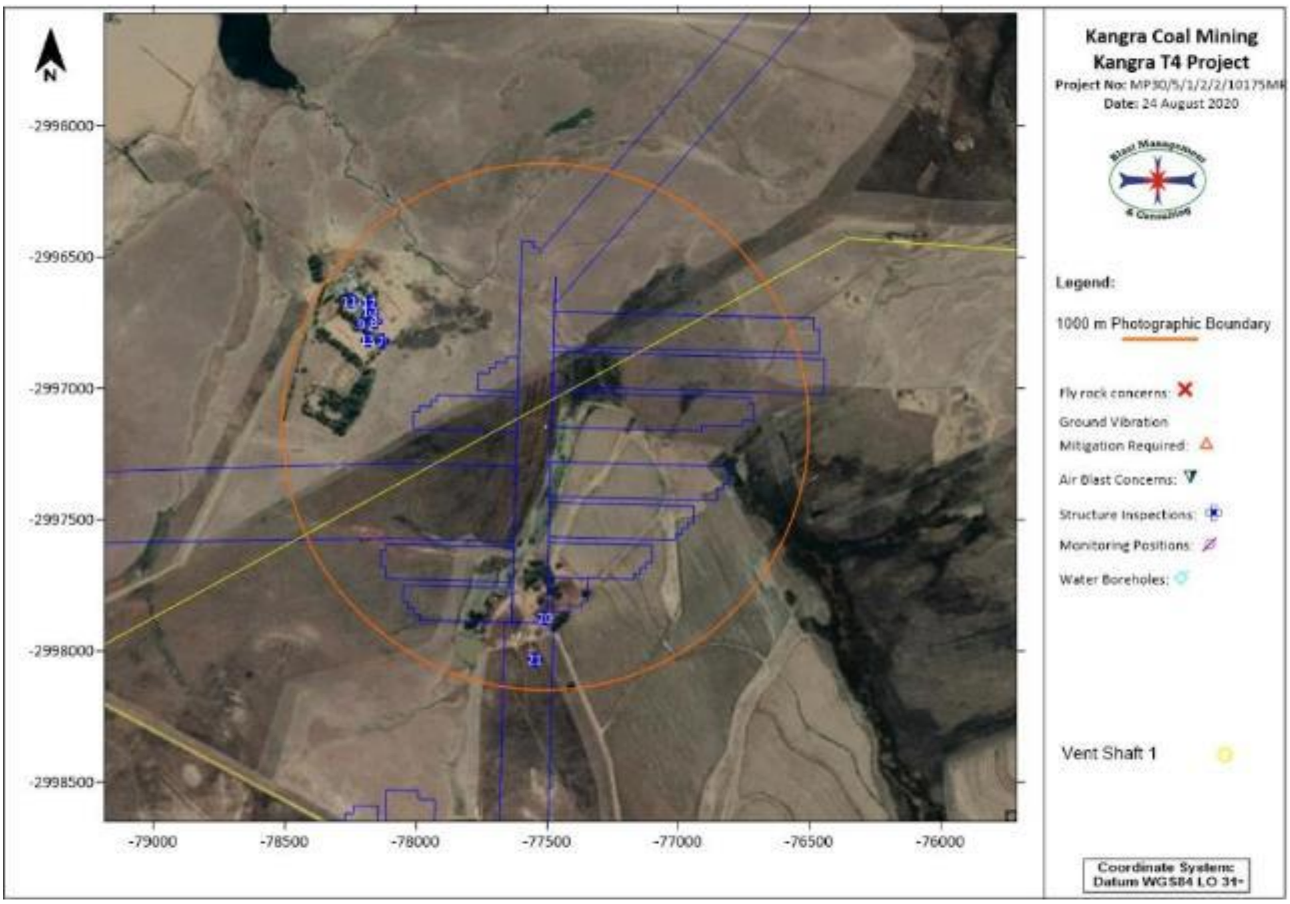

Figure 176: Structures within 1000 m area around the Vent Shaft 1 area

Table 147: List of structures identified for inspections

Tag	Description	Y	X
7	Farmstead	78131.16	2996819
8	Farm Buildings/Structures	78157.06	2996745
9	Farm Buildings/Structures	78204.78	2996755
10	Farm Buildings/Structures	78175.79	2996708
11	Farm Buildings/Structures	78250.21	2996668
12	Farm Buildings/Structures	78176.87	2996673

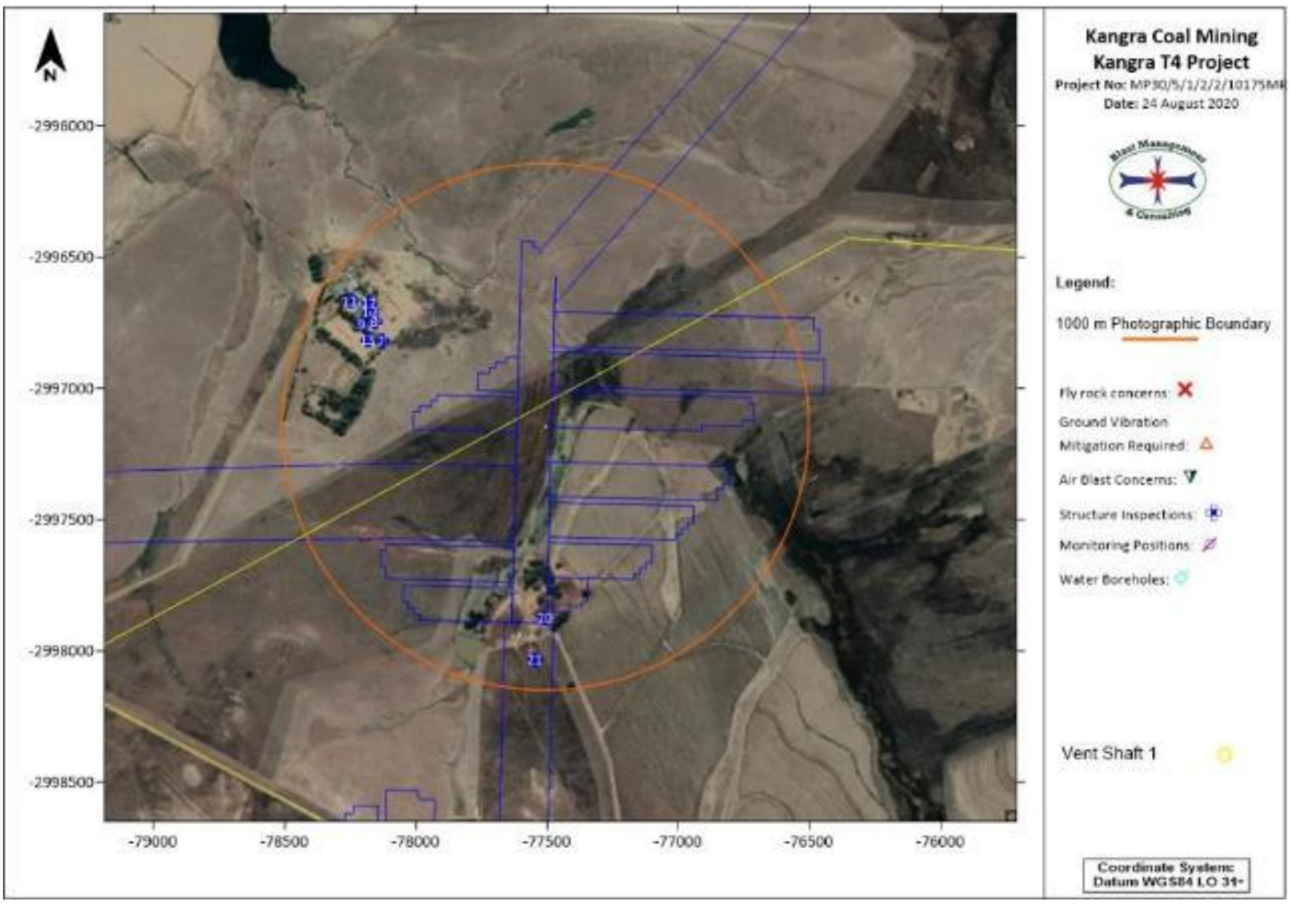

Figure 177: Structures within 1000 m area around the Vent Shaft 3 area

Table 148: List of structures identified for inspections

Tag	Description	Y	X
1	Ruins	82141.12	2997612
3	River	81967.92	2997954
4	River	82267.04	2997838
5	Dam/Damwall	82766.68	2997716
6	Building	82630.43	2997649
7	Building	82674.58	2997666
8	Cultivated Fields	82638.59	2997453

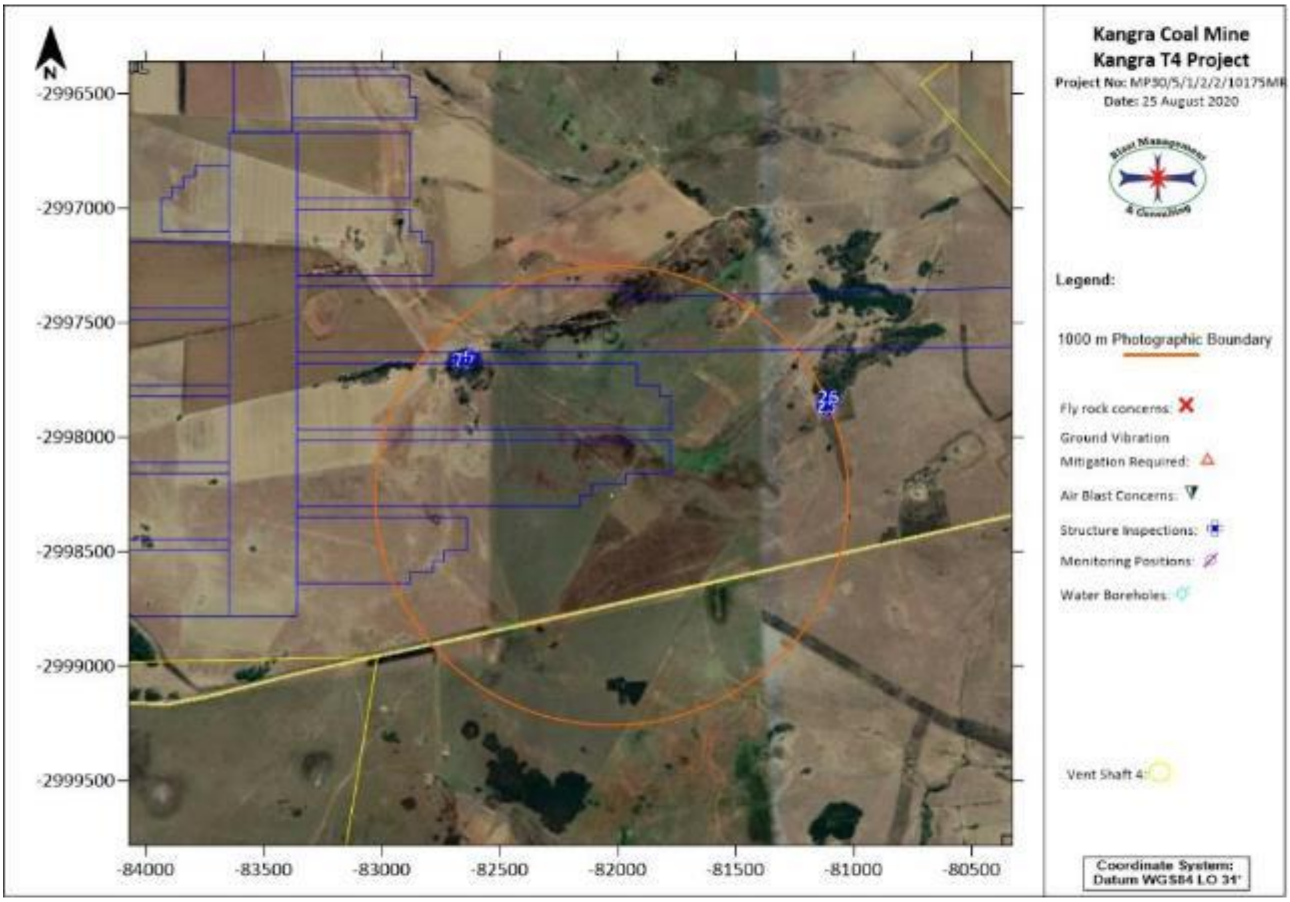

Figure 178: Structures within 1000 m area around the Vent Shaft 4 area

Table 149: List of structures identified for inspections

Tag	Description	Y	X
6	Building	82630.43	2997649
7	Building	82674.58	2997666
24	Informal Housing	81109.03	2997842
25	Informal Housing	81111.79	2997865
26	Informal Housing	81106.15	2997828

30.1.4.1.8 Recommended Ground Vibration and Air Blast Levels

The ground vibration and air blast levels limits recommended for blasting operations in this area are provided in Table 150.

Table 150: Recommended ground vibration air blast limits

Structure Description	Ground Vibration Limit (mm/s)	Air Blast Limit (dBL)
National Roads/Tar Roads:	150	N/A
Electrical Lines:	75	N/A
Railway:	150	N/A
Transformers	25	N/A
Water Wells	50	N/A
Telecoms Tower	50	134
General Houses of proper construction	USBM Criteria or 25 mm/s	Shall not exceed 134dB at point of concern but 120 dB preferred
Houses of lesser proper construction	12.5	
Rural building – Mud houses	6	

30.1.4.1.9 Blasting Times

A further consideration of blasting times is when weather conditions could influence the effects yielded by blasting operations. It is recommended not to blast too early in the morning when it is still cool or when there is a possibility of an atmospheric inversion or too late in the afternoon in winter. Do not blast in fog or in the dark. Refrain from blasting when wind is blowing strongly in the direction of an outside receptor. Do not blast with low overcast clouds. These ‘do nots’ stem from the influence that weather has on air blast. The energy of air blast cannot be increased but it is distributed differently and therefore is difficult to mitigate.

It is recommended that a standard blasting time be adhered to and blasting notice boards setup at various routes around the project area that will inform the community of blasting dates and times.

30.1.4.1.10 Third Party Monitoring

Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. This will bring about unbiased evaluation of levels and influence from an independent group. Monitoring could be done using permanent installed stations. Audit functions may also be conducted to assist the mine in maintaining a high level of performance with regards to blast results and the effects related to blasting operations.

30.1.4.1.11 Video monitoring of each blast

Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions.

30.1.4.1.12 Relocation

There are no specific public houses and installations identified outside of the areas that will require re-location.

30.1.5 Aquatic Biodiversity Monitoring

Aquatics biodiversity monitoring is recommended to tbeimplemented as indicated in Table 151.

Table 151: Aquatic biodiversity monitoring

Location	Aspect	Parameters	Frequency
Upstream in watercourse	Aquatic Health – Biomonitoring	As per Water Quality measured to determine baseline quality – refer to Surface water assessment report (Red Kite Environmental Solutions (Pty) Ltd, 2020)	Bi-annually
	Surface water quality and quantity		Monthly
Downstream in watercourse	Surface water quality and quantity		Monthly
	Aquatic Health – Biomonitoring		Bi-annually
Water balance	Daily abstraction values	Bi-annual updating of formal water balance based on seasonal trends, usage (flow meter data).	Daily recording, monthly statistics and bi-annual water balance update to determine trends on a seasonal basis
Footprints within buffer zones which includes crossings or other within 100m (rivers) or 500m (wetlands)	Monitor regularly (status quo)	Monitor for impacts within sensitive zones	Monthly

30.1.6 Biodiversity Monitoring

A monitoring framework should be instigated and managed by their responsible body and the following system may enforce good practice:

- Implement an “Observe and report” approach which will enable employees to report any disturbance of flora/fauna or degradation that they encounter.
- Alien invasive awareness, eradication and control programme on an annual basis.

30.1.7 Heritage Monitoring Program, including Paleontological Features

If the graves will be conserved *in situ*, monitoring of compliance in terms of the 100m buffer needs to be undertaken throughout the lifespan of the project. No other specific heritage monitoring program was described. However, should any heritage remains be discovered during any phase of the development, a specialist should be consulted.

If a Section 38 permit is obtained, all features described as conditions should be adhered to and compliance monitored. Refer to Table 152 for the monitoring requirements for heritage and paleontological features.

Table 152: Monitoring requirements for heritage features and paleontological features

Site Type	Impact	Application Phase	Action	Frequency	Responsible Person
Heritage building, structure and cemeteries intersecting the area demarcated for underground mining	Potential damage should subsidence and vibration occur	Operational	Monitoring of buildings, structures and cemetries	Quarterly, as well as pre- and -post blasting (if applicable)	ECO
Demolished heritage site intrersecting the area demarcated for underground mining.	None known	Operational	None required	N/A	N/A
Heritage site in close proximity to proposed powerline	Potential damage to cemeteries, stone-walled enclosure and a settlement	Planning and Construction	Avoid sensitive areas	Once - planning	ECO / Person responsible for powerline route selection
All surface impacts	Potential damage to subsurface culturally significant material	Construction	Monitor subsurface material	Duration of construction	ECO

30.1.8 Air/Dust Monitoring Program

It is highly recommended that a dust monitoring campaign be conducted prior to the commencement of the proposed mining operations and the construction of the ventilation shafts. This then should continue for the life of mine in order to establish historical repository of data needed to fully understand/address fugitive and airborne dust emissions from the construction, operation and closure activities. Managing dust fallout effectively will result in the reduction of respiratory diseases that are as a result of air pollution, reduced risk of damage to property, improved visibility, and fewer disturbances to existing flora and fauna habitats.

30.1.8.1 Gravimetrical Dust Fallout – (Milligram/Square Meter/Day) Or (mg/m^2/Day) (Monthly 8 Samples)

Site layout for sampling points must be carried out according to the eight main compass directions; the site layout and equipment placement must be done in accordance with the ASTM standard, D 1739 – 2010, thereafter relevant sampling reference numbers will be allocated to the receptors accordingly. At each gravimetric dust fallout gauge/receptor point there is a stand built according to specification containing the dust sample collection bucket. Samples will be collected after a 1 month running period (+-30 day's exposure). After sample collection, the samples are taken to a SANAS accredited laboratory as required. A visual site investigation is done where after correlations are drawn and findings are identified and reported on.

Dust buckets of a standard size and shape are prepared and set up at locations related to the eight main compass points on the borders of the property so that dust can settle in them for periods of 30+/-2 days. The dust buckets are then sealed and replaced with new empty ones and send away to the SANAS accredited laboratory for analysis. The masses of the water-soluble and –insoluble components of the material collected are then determined and results are reported as mg/m^2/day. This methodology is described according to South African National Standards 1929:2004 and the American Society for Testing and Materials (ASTM) Designation: D 1739-98 (2010). The results for this method of testing are obtained by gravimetrical weighing. The apparatus required include open top buckets/containers not less than 150 mm in diameter with a height not less than twice its diameter. The buckets must be placed on a stand at a height of 2+/-0.2 m above the ground.

30.1.8.2 Particulate Matter PM10 (Monthly 8 Samples)

As reported previously, no current monitoring campaign exists within the Kangra Coal T4 project area. The client should establish a fine particulate monitoring programme, which should include one particulate instrument to monitor PM10 and preferably PM2.5 from the mine operation. Handheld sampling instruments not only allows for sampling in the 8 main wind directions, but also on-site sampling down-wind of potential dust sources to quantify and determine impacts that need to be managed. It is advised to conduct this sampling on a monthly basis but also when the need arise during periods of elevated dust concentrations being emanated from the site.

New technology to perform cost effective real-time dust and particulate matter is currently becoming a cost-effective option. This type of technology can record real-time wind speed and direction together with particulate concentrations. It can thus be used more effectively for management purposes. Actionable intelligence is generated on dust and particulate matter emissions, which in turn can then be used to determine the origin of the particulate emissions. In a scenario where mining operations are situated in such close proximity to each other and residential areas, this type of technology can become instrumental in decision making on the management of dust for a mining operation.

30.1.9 Waste Monitoring

The following wastes needs to be monitored for the project:

- The types and volumes of waste deposited; and
- The volume of water removed and disposed of.

30.1.10 Rehabilitation Monitoring

The purpose of a monitoring, maintenance and aftercare programme is to ensure that the rehabilitation and closure objectives are met and that the rehabilitation process is followed. The frequency of monitoring must be adequate to identify potential gaps in the effectiveness of the mine closure strategy. A monitoring programme must be implemented during the operational and closure phases of the mine. The following identified aspects required continuous monitoring during the operation and closure phases:

- Alignment of the final landform design with that of the actual topography and landscape;
- Placing of the correct topsoil depth in order to encourage successful rehabilitation of vegetation communities;
- Erosion status of the mine site;
- Surface drainage and surface water quality;
- Groundwater quality;
- Successful re-vegetation and basal cover proportions;
- Rehabilitation effectiveness;
- Fauna and flora re-colonisation; and
- Control of invasive vegetation species.

31 ENVIRONMENTAL MONITORING AND AUDITING

The Department of Environmental Affairs (now Department of Environmental Affairs, Forestry and Fisheries) defines environmental auditing as *"a process whereby an organisation's environmental performance is tested against its environmental policies and objectives"* Monitoring and auditing is an essential environmental management tool which is used to assess, evaluate and manage environmental and sustainability issues:

In order to ensure that the objectives of sustainable development and integrated environmental management are met and in order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the operations.

Monitoring and management actions associated with the project are contained in Section 31 of this report as well as in the various specialist reports associated with this project. This section provides a summary of the critical monitoring aspects per specific environmental field.

31.1 GENERAL MONITORING AND MANAGEMENT

The appointment of a suitably qualified on-site Environmental Control Officer (ECO) is essential to the successful implementation and management of this project, although this role can be fulfilled by the SHE Representative. The ECO will be responsible for the implementation of the EMP, applicable environmental legislation and any stipulations/conditions set by the relevant competent authorities (including but not limited to the DMRE and DHSWS). The ECO will conduct formal monthly site inspections and conduct an internal annual audit during the phases of the development.

An external Environmental Auditor should also be appointed to conduct annual audits for the duration of the project. The auditor should monitor the success and effective implementation of the environmental management measures stipulated by applicable legislation, the EIA/EMP, and any conditions set by the competent authorities. Following each site visit, the auditor should submit a report to the DMRE documenting the success/failure of the implementation of the management measures at the operations.

31.1.1 Specific Monitoring Requirements

Monitoring of the development (both on site and where appropriate in the surrounding environments) should be considered a high priority and should be conducted in accordance with the relevant specialist recommendations as summarized below:

31.1.2 Monitoring Protocol

It is essential that during the implementation and operational phase of the development that the monitoring of certain elements are carried out to ensure compliance with regulatory bodies. A monitoring protocol will be required. The monitoring only includes those activities identified in the EMP and excludes any monitoring that should take place according to the water use license. Compliance in terms of the WUL is essential.

31.1.3 Monitoring Requirements and Record Keeping

To ensure that the procedures outlined throughout the EMP are implemented effectively, it will be necessary to monitor the implementation of the EMP and evaluate the success of achieving the objectives listed in the EMP. To ensure that all personnel on site are aware of their obligation to protect the environment, induction training will also include environmental awareness.

The audit procedure will include a Compliance audit, conducted by the ECO. Where the objectives of the EMP are not being met the reasons will be determined and remedial action or variation to the tasks will be recommended. Major residual effects shall be documented in a Non-Conformance Report, during the remaining phases of the project. Follow-up audits will be conducted as per the audit protocol in the EMP.

31.1.3.1 Implementation Phase

The following monitoring needs to be conducted:

- The onset of monitoring (and those recorded within the Baseline assessment) will provide enough baseline data for comparison against future monitoring of the activities if re-opening occurs, especially since no significant change in monitoring is prescribed.
- All monitoring should commence at full scale as soon as opening is envisaged to ensure recent data for comparison against the operational phase.

31.1.3.2 Operational Phase

The following monitoring must be conducted: Please refer to Section 30 and also Table 138 regarding mitigation outcomes and

Table 139 for mechanisms for monitoring. Adherance to all conditions and monitoring frameworks as prescribed by the mine WUL.

31.1.3.3 Audit Protocol

It is essential that during the current and future phases of the development, the monitoring and auditing of certain elements are carried out to ensure compliance with regulatory bodies. An Audit Protocol for all phases will be required. The auditing only includes those activities identified in the EIA/EMP and excludes any auditing that should take place according to the water use license or any other legislative authorization process if and when they will be authorized.

31.1.3.3.1 <u>Construction, Operational and Decommisioning Phase</u>

The following audits must be completed:

- EMP compliance (Continuously): to be checked by an on-site ECO, SHE representative or Environmental manager (EM).
- External environmental compliance audits (EIA/EMP annually during operations).

31.1.3.4 Environmental Incidents

An environmental incident is defined as any unplanned event that results in actual or potential damage to the environment, whether of a serious or non-serious nature. An incident may involve non-conformance with environmental legal requirements, the requirements of the EMP, or contravention of written or verbal orders given by the ECO or relevant authority.

All details regarding Environmental Incidents and procedures have been described within Section 24.3.2 above and should be handled accordingly.

31.1.3.5 Penalties and Fines for Non-Compliance or Misconduct

This EMP forms part of the contract agreement between the Client and the Principal contractor. As such, non-compliance with conditions of the EMP will amount to a breach of contract. Penalties will be issued directly to the contractor by the applicant in the event of non-compliance to the EMP specifications. The issuing of a penalty will be preceded by a verbal warning by the applicant, as well as strict instruction in at least one monthly ECO report to rectify the situation. The ECO and applicant will communicate with regards to realistic timeframes for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMP.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the contractor if such actions were in contravention of the specifications of the EMP will be borne by the contractor himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMP cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts may be adjusted depending on the seriousness of the infringement:

- Category One: Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent landowners, existing communities, tourists or persons passing through the area.
- Category Two: Acts of non-compliance that cause minor environmental impact or localized disturbance.
- Category Three: Acts of non-compliance that affect significant environmental impact extending beyond point source.
- Category Four: Acts of non-compliance that result in major environmental impact affecting large areas, site character, protected species or conservation areas.

31.1.4 Environmental Awareness Plan

Environmental awareness training is important for two primary reasons:

a) The workforce must understand how they can play a role in achieving the objectives specified in the EMP; and

b) The workforce must understand their obligations in terms of the implementation of the EMP and adherence to environmental-legislative requirements.

The environmental awareness plan is aimed at ensuring that employees, contractors, subcontractors and other relevant parties are aware of and able to meet their environmental commitments. This plan is to be updated on a yearly basis during the phases of the project in light of operational changes, learning experiences and identified training needs.

All full-time staff and contractors are required to attend an induction session when they start, which should include environmental aspects. It is, therefore, recommended that the ECO/Environmental Manager be involved in induction training. As the induction and entry will be located on the existing premises, the induction sessions may be modified/adapted based on the audience attending the specific session, but it should ensure that all employees gain a suitable understanding of:

- Environmental requirements of the project, and how these will be implemented and monitored;
- Including each employee's responsibilities with respect to environmental issues;
- Contents and commitments of the EMP, including no-go areas, employee conduct, pollution prevention (prohibitions against littering, unauthorized fires, loud music, entry to adjacent properties, road conduct etc.);
- Environmentally sensitive areas on and around the development sites, including why these are deemed important and how these are to be managed. Employees will also be made aware of protected species found on the existing and surrounding site and how these are to be conserved, as well as alien invasive species potentially found on the site and how these should be managed; and
- Incident identification, remediation and reporting requirements: what constitutes an environmental incident (spillages, fire, etc.) and how to react when such an incident occurs.

Environmental training will not be restricted to induction training sessions alone, but will be conducted on an on-going basis throughout the lifecycle of the project as and when required. Records are to be kept of the type of training given (matters discussed and by whom), date on which training was given and the attendees of each training session.

Kangra Coal currently has a general environmental awareness programme in place at the adjacent mining areas, as well as job specific environmental awareness training. Both of the environmental awareness programmes will be applicable to the Kangra T4 coal mine project.

The purpose of the general environmental awareness programme is to promote ongoing environmental awareness amongst the workforce. It will focus on addressing environmental issues which have been identified as problematic through environmental audits, complaints received, or environmental monitoring undertaken. This awareness campaign can form part of daily/ weekly toolbox talks and must cover all applicable topics related to environmental management.

The purpose of the job specific environmental awareness training is to ensure that Employees within the specific management units are equipped to implement the actions committed to in the EMPr. All members of the workforce are to be subject to job specific environmental training. This training is undertaken by the managers of each of the management units. Supervisors will be trained to assist with the implementation and training of the work force.

31.1.4.1 Environmental Risk Identification

The environmental risks associated with each management area are to be identified by the manager and supervisors together with the technical services manager. The risks are to be documented and actions to reduce these risks should be developed. The actions are to ensure overall compliance with the commitments of the EMPr.

31.1.4.2 Training

All members of the workforce (mining, plant workers, administration etc.) are to be subject to job specific training. This may include but not be limited to:

- Preventing pollution;
- Spill prevention and clean-up procedures;
- The location and purpose of material safety data sheets (MSDSs)
- Managing waste;
- No-go areas;
- Incident reporting.

The aspects to be covered however are dependent on the findings of the individual risk assessments. This is to be undertaken for each management area initially. Thereafter all new members of the workforce are to undergo environmental training as part of the training required to do their particular job.

31.1.4.3 Social Management Plan

Following are the management and monitoring measures for the Social Management Plan component of the Project:[69] [70]

The objectives of the HDSA / Gender/ Skilld Development plan are to:

- Include previously disadvantaged individuals and groups in the employment, SMME, skills development and community projects.
- Identification of real community-based needs for community projects and income generating projects.
- Locals in the DPKISLM and in the site specific study area are the primary recipients of economic advantages of the Project, training programmes, etc.
- Contribute to the ‘Skills Development Plan’.

The activities and outputs for this plan are provided in Table 153.

[69] This section only deals with social issues. Environmental related management and monitoring measures as proposed in the SEIA report are included in the EMPr.

[70] A ‘Skills Development Plan’ and ‘Procurement Policy’ are addressed in the SLP and compiled and finalised by the Kangra Coal in accordance with the New Mining Charter.

Table 153: Activities and outputs

ACTIVITIES	TIMEFRAME	RESPONSIBLE / PARTIES INVOLVED	OUTPUT
• Conduct needs assessment / skills / youth / gender analysis in local communities (DPKISLM). • Obtain the DPKISLM database of SMME's and identify gaps (training, etc.). • Implement training and other strategies to equip SMME's. • Feedback when tenders are awarded to promote transparency. • Compile strategies to address employment equity of HDSA's (women, youth, disabled). • Provide annual feedback for SLP purposes.	• When Mining Right is awarded • Construction phase • Operational phase (monitoring)	• CLO • SLP Manager • Ward Councillor • DPKISLM (LED Manager) • Community groups (Ward committees, Youth, Women, etc.)	• Identification of locally available skills and gaps. • Recruitment targets included in Contractor Services Management Plan (CSMP). Penalties where contracts are breached. • Prepared and trained SMME's that are ready to tender. • Compilation of a 'Gender Equity Policy'. • Equity strategies included in the 'Skills Development Plan'. • Identification of SLP infrastructure and income-generation community projects and training programmes focused on locals.

31.1.4.4 Awareness / Community Engagement Plan

The objectives of the community engagement plan are:

- Promotion of transparency and implementation of public participation for the duration of the Project.
- Eliminate conflict and address potential conflict in a pro-active manner.
- To establish a structure (EMC) that can be accessed by stakeholders for communication and engagement purposes.
- Address potential negative impacts on farming and livelihoods proactively.

The activities and outputs of the awareness / community engagement plan are provided in Table 154.

Table 154: Activities and outputs

ACTIVITIES	TIMEFRAME	RESPONSIBLE / PARTIES INVOLVED	OUTPUT
• Appointment of a Community Liaison Officer (CLO). • Establishment of an Environmental Management Committee (EMC) and its objectives. • Compile protocol for stakeholders to raise complaints and make the procedures publicly available. • Attend to matters expediently.	• Prior to construction • Construction phase • Operational phase	• Responsibility: Mining company • EMC to consist of CLO, Ward Councillor, representative of prominent community groups, landowners, national, provincial and local government.	• Establishment of the EMC • Annual / quarterly EMC feedback meetings and reports (monitoring purpose). • Provide historic and current data to the mine that relate to crop yields, livestock illnesses, reduction in turnovers, cutbacks of farm workers, etc.

31.1.4.4.1 *Complaints /Grievance Register*

A complaints/grievance register must be kept at the office of the community liaison or environmental manager. The complaints form must also be electronically available and the environmental manager's contact details provided should a complaint submission be required or if minor problems are raised that can be easily rectified. The complaints register must provide the means for any environmentally related complaint to be registered. A registered complaint needs to be investigated and resolved though formal complaints system where the complainant can enquire on the status of the complaint. Complaints should be investigated with one month of being lodged or communication on reasons for extension be submitted to the complainant. Should complaints not be resolved to the satisfaction of the complainant it need to be escalated to the Department of Mineral Resources and Energy for mediation.

31.1.4.5 Responsible Persons

Compliance with the emergency response plan and ensuring individual safety will be responsibility of all employees and contractors on the mine. Record keeping, investigation and management of emergencies will be the responsibility of the following persons:

- Mine Manager;
- Environmental Management Representative- this includes the Safety, Health and Environmental (SHE) managers and officers;
- Mining Engineer; and

- Site Manager(s).

31.1.4.6 Defining an Environmental Response Plan

Environmental emergencies occur over the short term and require an immediate response. A mine, as part of its management tools, especially if it is ISO 9000 and ISO 14001 compliant, should have an Environmental Emergency Response Plan. The plan should be disseminated to all employees and contractors and in the event of an emergency, it should be consulted.

This Environmental Emergency Response Plan should be used together with the Emergency Preparedness Plan placed on the mine where it will be easily viewed. The Emergency Response Plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers.

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

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

The checklist includes:

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

31.1.4.7 Process for Identifying Environmental Emergency Procedures

The process that will be used to identify emergency situations at the mining operations will be conducted in terms of the Aspects Registers and may include the following emergencies:

- Safety risks and subsidence;
- Dam Overflow;
- Dam Breach (on-site);
- Residue Stockpile Failures and Risks;
- Berm Breach/Drain Overflow;

- Hydrocarbon Spill (diesel, oil, grease, etc.); and
- Veld Fires.

The necessary actions required, as well as the responsible person for ensuring that the actions are followed through and the reporting requirements are adhered to, to ensure effective and efficient response to each of the environmental emergency situations listed above are set out in this procedure.

31.1.4.8 Most likely Potential Environmental Emergencies

The following define the most likely potential environmental emergencies:

- Accidents;
- Fires;
- A major hydrocarbon spill or leak;
- A major spill or leak of process water;
- Flooding;
- Subsidence; and
- Explosions.

31.1.4.9 Accidents

In the case of a medical accident or problem, refer to the Emergency Preparedness Plan.

31.1.5 Indicate the Frequency of the Submission of the Performance Assessment Report

Yearly performance assessment reports are recommended. Refer to details on Auditing procedures (Section 31.1.3.3).

31.1.6 Manner In Which Risks Will Be Dealt With In Order To Avoid Pollution Or The Degradation of The Environment

Refer to Table 138 for the recommended mitigation measures to limit environmental impacts. A suitable risk matix may be used to evaluate operational risks during any stage of the development. Ensure compilation and compliance with all Standard Operational Procedures (SOPs) and that they be updated annually/bi-annually to ensure validity.

Also create a system or platform for I&APs to submit any grievances to the mine and communication with internal and external stakeholder i.e an Environmental and Social Management System (ESMS) system.

32 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

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

The Immediate Closure Provision as calculated will be updated yearly as part of the annual liability assessment required by the MPRDA and GNR 1147 in terms of the NEMA, once operations commence. The Final Rehabilitation plan will need to be formalised as soon as Closure planning commences.

33 UNDERTAKINGS (*will be signed for final submission*)

The EAP, ……………..Elemental Sustainability (Pty) Ltd …………, herewith confirms

a) The correctness of the information provided in the reports;

b) The inclusion of comments and inputs from stakeholders and I&APs;

c) The inclusion of inputs and recommendations from the specialist reports where relevant; and

d) The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;

Signed at..on this............................ day...

Signature of applicant ....

Designation..

COMMITMENT/UNDERTAKING BY THE APPLICANT

I, ………………………………………………………, the undersigned and duly authorised thereto by the Kangra Coal (Pty) Ltd: Kangra T4 Coal Mine undertake to adhere to the requirements and to the conditions as set out in the EMPR submitted to the Director: Mineral Development and approved on.........................

....

Signed at..on this............................ day...

Signature of applicant ....

Designation..

-END-

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35 APPENDICES

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