DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

THE PROPOSED WELGEDACHT BALLOON SIDING, GAUTENG PROVINCE

VARIOUS PORTIONS OF THE FARM GEIGERLE 238 IR AND VARIOUS PORTIONS OF THE FARM PALMIETKUILEN 241 IR

DMRE REF: GP 30/5/1/2/2/ 10047 MR

Date: 12 August 2022

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	Draft Environmental Impact Assessment Report for the proposed Welgedacht Balloon Siding		
Client	Canyon Resources (Pty) Ltd		
Responsible Person	Contact Person: Mr. Tshiyamo Rankali Contact nr.: +27 11 783 7996 Email: t.rankali@canyoncoal.com		
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DOCUMENT REVIEWED BY

Responsible person	Date	Position
SR van de Giessen	29 July 2022	Senior Environmental Assessment Practitioner
Signature		
Responsible person	**Date**	**Position**
Du Toit Wilken	3 August 2022	Senior Project Manager and Specialist
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 PROPOSED WELGEDACHT BALLOON SIDING, GAUTENG PROVINCE

VARIOUS PORTIONS OF THE FARM GEIGERLE 238 IR AND VARIOUS PORTIONS OF THE FARM PALMIETKUILEN 241 IR

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	Canyon Resources (Pty) Ltd
Project	Welgedacht Balloon Siding
Contact person	Mr. Tshiyamo Rankali
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File Reference Numbers	GP 30/5/1/2/2/ 10047 MR

IMPORTANT NOTICE

Please note: Althought the proposed Welgedacht Balloon Siding is not a mining right project, it falls withiin the mining right of the Palmietkuilen Colliery and the EnvironmentalAssessmnt Pracitioner and Applicant were advised to submit the EIAr and EMPr on the DMRE templates.

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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LIST OF 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

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

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 (*Pr.Sci.Nat* and EAPASA)
Tel No.:	083 388 4633
Fax No.:	None
Email address:	sonja@elemental-s.co.za
Name of the Reviewer	Du Toit Wilken (*Pr.Sci.Nat*)
Tel No.:	084 588 2322 / 083 388 4633
Fax No.:	None
Email address:	dutoit@elemental-s.co.za

1.2 EXPERTISE OF THE EAP

1. 2.1 THE QUALIFICATIONS OF THE EAP (WITH EVIDENCE)

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

In terms of Regulation 13 of the 2014 EIA Regulations (Government Notice R. 982) as amended by GNR326 (2021), an independent Environmental Assessment Practitioner (EAP), must be appointed by the applicant to manage the application. Elemental Sustainability (Pty) Ltd. has been appointed by the Applicant as the EAP and is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations and Section 1 of the NEMA. This includes, inter alia, the requirement that Elemental Sustainability is:

- Objective and independent;
- Has expertise in conducting EIA's;
- Complies with the NEMA, the Regulations and all other applicable legislation;
- Takes into account all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessments and relevant application processes) are attached as Appendix 1 & 2 to this report.

Table 2: Expertise of the EAP

Name of the Practitioner:	Sonja van de Giessen (*Pr.Sci.Nat* and EAPASA)
Qualifications:	University of North West, MSc Environmental management – 2018 University of South Africa, BSc Hons Environmental Science – 2010
Professional affiliation(s):	Natural Professional Scientist (*Pr. Sci.Nat.* Number: 400084/18) Environmental Assessment Practitioner South Africa (EAPASA Number: 2019/1496)
Expertise of the EAP:	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.
Experience	Approximately 10 years of experience.

1.1.1.1 Specialist Studies

Specialist consultants are recommended to provide discipline specific input during the EIA phase and the following specialist disciplines have been undertaken:

- Ecological Assessment and Alien Invasive Management Plan.
- Heritage and Archaeological Assessment.
- Hydrogeological Assessment.
- Traffic Assessment.
- Hydrological Assessment (including water balance and aquatic assessment, if applicable).
- Hydropedological Assessment.
- Noise Assessment.
- Air Quality Assessment, including a Climate Change Assessment.
- Visual Impact Assessment.
- Palaeontological Assessment.
- Soils, Land Use and Capability and Agricultural Impact Study.
- Storm Water Management Plan (including Geotechnical Assessment, floodlines and topography).
- Traffic Impact Assessment.
- Wetland Delineation Study; and
- Engineering Designs.

2 DESCRIPTION OF THE PROPERTY

2.1 SITE LOCATION

The proposed Welgedacht Balloon Siding is situated in the Gauteng Province, about 9 km northeast of the Springs Municipality, 2 km southeast of the Welgedacht Community and 1.3 km northwest of Aston Lake in the Lesedi Local Municipality. The project comprises of a railway line from the main Transnet line on Portions 10, 30, 32, 45, 51, 55, and 57 of the farm Geigerle 238 IR; and Portions 2, 9, 19 and 20 of the farm Palmietkuilen 241 IR within the Gauteng Province. The main siding will be located on Portion 19 of the farm Palmietkuilen 241IR. A conveyor belt is proposed and will run from the main siding over Portions 2 and 19 of the farm Palmietkuilen 241IR. Table 3 below provides a description of the project properties.

Table 3: Property description

Name:	Welgedacht Balloon Siding	
Application area (Ha)	±32ha for the main siding and ±80 ha approximately with railway line and conveyor belt	
Magisterial district:	Lesedi Local Municipality Sedibeng District Municipality	
Distance and direction from nearest town	9km north-east of Springs Municipality, 2 km southeast of the Welgedacht Community and 1.3 km northwest of Aston Lake in the Lesedi Local Municipality	
21-digit Surveyor General Code for each farm portion	Portion 10 of Geigerle 238IR	T0IR00000000023800010
	Portion 30 of Geigerle 238IR	T0IR00000000023800030
	Portion 32 of Geigerle 238IR	T0IR00000000023800032
	Portion 45 of Geigerle 238IR	T0IR00000000023800045
	Portion 51 of Geigerle 238IR	T0IR00000000023800051
	Portion 55 of Geigerle 238IR	T0IR00000000023800055
	Portion 57 of Geigerle 238IR	T0IR00000000023800057
	Portion 2 of Palmietkuilen 241IR	T0IR00000000024100002
	Portion 9 of Palmietkuilen 241IR	T0IR00000000024100009
	Portion 19 of Palmietkuilen 241IR	T0IR00000000024100019
	Portion 20 of Palmietkuilen 241IR	T0IR00000000024100020

1.3 Locality map (show nearest town, scale not smaller than 1:250 000)

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

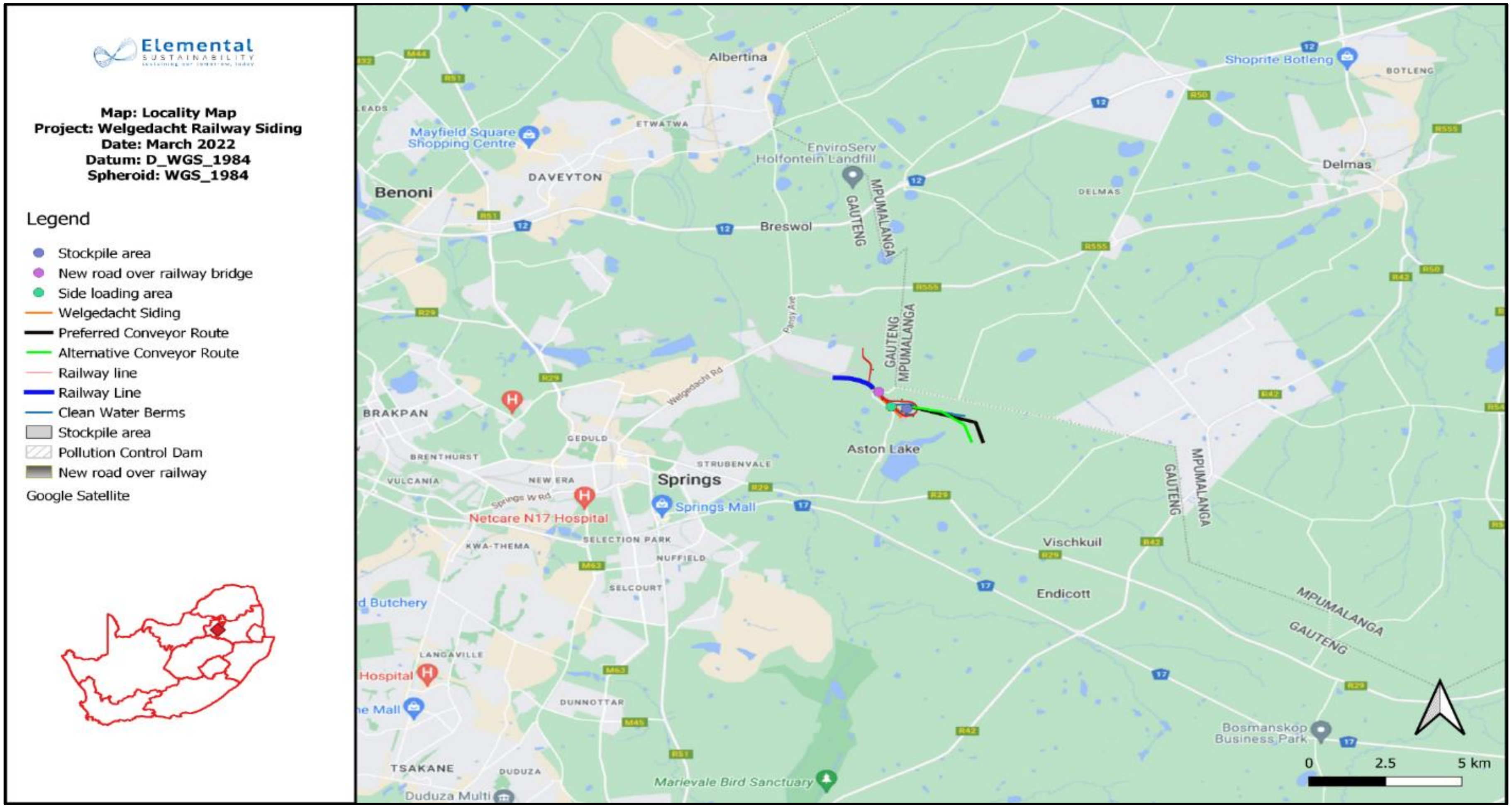


Figure 1: Locality of the Welgedacht Balloon Siding

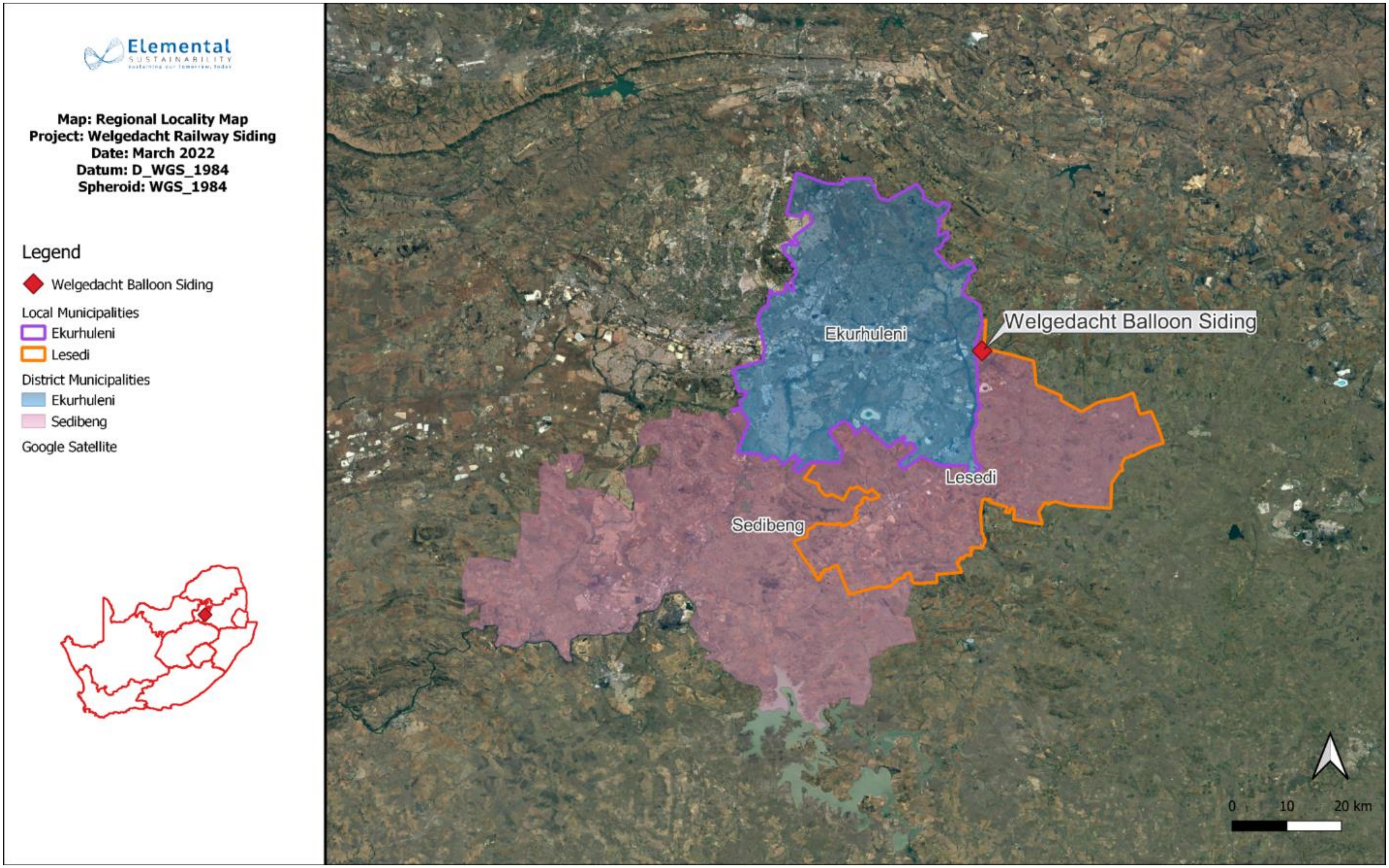


Figure 2: Regional locality for the proposed Welgedacht Balloon Siding

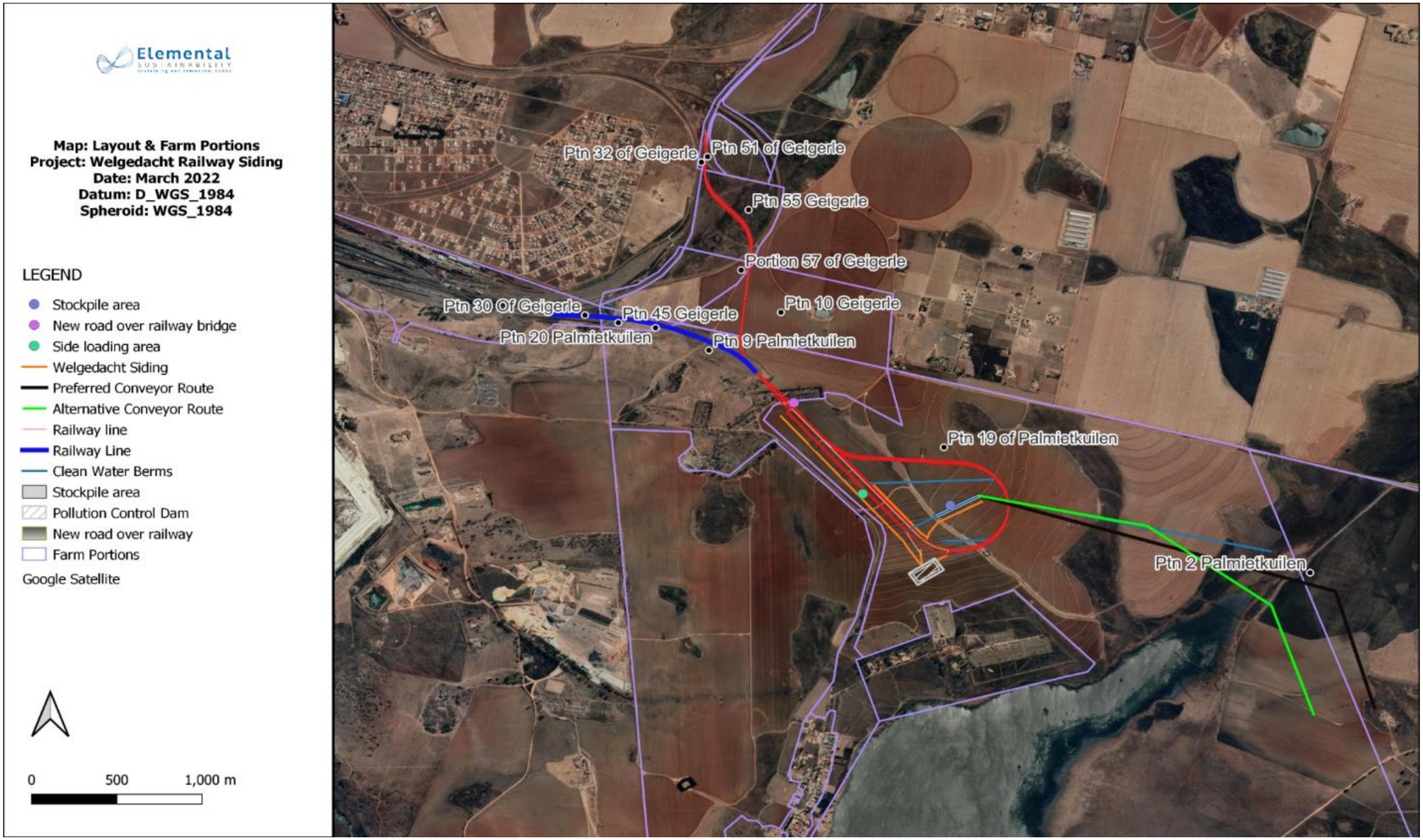


Figure 3: Farm portions for the proposed Welgedacht Balloon Siding Project

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.

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.

The listed activities are provided in Table 4. Refer to

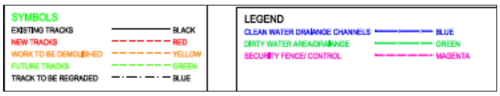


Figure **4.**

Table 4: Listed and specified activities

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
(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)***
Powerlines	The siding will make use of the existing Eskom substation.	NA	GNR983 as amended (LN 1) Activity 2	-
Storm water infrastructure will trigger this activity.	The combined length of the stormwater management infrastructure is over 1000m	X	GNR983 as amended (LN 1) Activity 9	X
A PCD will be constructed.	Proposed PCD 13 200m^3	N/A	GNR983 as amened (LN 1) Activity 13	X
Fuel storage.	No fuel will be stored on site	N/A	GNR983 as amended (LN 1) Activity 14	X
The powerline and the conveyor cross watercourses and the combined capacity of soil to be removed for the	More than 10m^3 of soil will be	X	GNR983 as amended (LN 1) Activity 19	X

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
supporting infrastructure will be more than 10m^3	removed from watercourses			
Service roads.	Service roads will be established	X	GNR983 as amended (LN 1) Activity 24	-
The access and service roads trigger this activity.	The access and service roads will be wider than 8m	X	GNR983 as amended (LN 1) Activity 27	-
Balloon siding and related infrastructure (railway, conveyor, access road, service roads, bridge, PCD, powerlines).	142 ha of agricultural land will be impacted on.	X	GNR983 as amended (LN 1) Activity 28	-
Balloon siding and related infrastructure (railway, conveyor, access road, service roads, bridge, PCD, powerlines).	Sections of the project fall within protected Soweto Highveld Grassland and Eastern Highveld Grassland as Vulnerable and in the “National List of Ecosystems that are Threatened and need of protection.” the project area is located within a nationally threatened ecosystem, namely, the Blesbokspruit Highveld Grassland (GP1) which is currently listed as Critically Endangered in terms of Section 52 of NEMBA	X	GNR983 as amended (LN 1) Activity 30	-
Access road	The existing road in the project area will be extended by more than 1 km.	X	GNR983 as amended (LN 1) Activity 56	-
Fuel storage.	No fuel will be stored on site	N/A	GNR 325 (LN2) Activity 4	X
Pollution Control Dam and Dust Suppression	PCD will be 13200m^3	X	GNR 984 as amended (LN2) Activity 6	X
Conveyor belt.	2.4km long	X	GNR 984 as amended (LN2) Activity 7	-

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
Powerlines need to be erected for the project.	11 KVA	Not applicable as the the powerline will be 11KVA	GNR 984 as amended (LN2) Activity 9	-
The railway line will trigger this activity.	±8.5km	X	GNR 984 as amended (LN2) Activity 12	-
Balloon siding and related infrastructure (railway, conveyor, access road, service roads, bridge, PCD, powerlines).	± 40 ha	Although the balloon siding is more than 20 ha in size, the proposed siding is located on agriclutural land and therefore this activity is not triggered.	GNR 984 as amended (LN2) Activity 15	-
Access road	Access road will be lengthened by more than 1 km.	X	GNR 984 as amended (LN3) Activity 4	-
Balloon Siding and related infrastructure (railway, conveyor, access road, service roads, bridge, PCD, powerlines)	More than 300m^2 of vegetation will be cleared.	X	GNR 985 as amended (LN3) Activity 12	-
The fuel tanks may trigger this activity.	No fuel tanks will be erected on site, therefore, this activitiy will not be applicable.	NA	GNR 985 as amended (LN3) Activity 10	NA
Balloon Siding and related infrastructure (railway, conveyor, access road, service roads, bridge, PCD, powerlines) 120ha.	More than 10m^2 of development will occur within the watercourses	X	GNR 985 as amended (LN3) Activity 14	X
Access road	Access road will be lengthened by more than 1km.	X	GNR 985 as amended (LN3) Activity 18	-
National Environmental Management Waste Act				
PCD	13200 m^3	X	GNR 921 Activity A1	X
PCD	13200 m^3	X	GNR 921 Activity A12	X
PCD	13200 m^3	X	GNR 921 Activity B1	X
Coal Stockpile	32 000 tons	X	GNR 921 Activity B 7	X
The construction of a PCD and the coal stockpile	PCD = 13200 m^3	X	GNR 921 Activity B10	X
Coal Stockpile	32 000 tons	X	GNR 921 Activity B11	X

Table 5: Description of the EIA Regulations Listed Activities

Legislation	Listed activities	Applicability of the activity	Competent Authority
NEMA			
GNR983 as amended (LN 1) Activity 2	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where— (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.	The existing Eskom substation will be used for electricity, therefore, this activity is not applicable	Gauteng DMRE
GNR983 as amended (LN 1) Activity 9	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	X	
GNR983 as amened (LN 1) Activity 13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	The proposed PCD will be 13200m^3, therefore this activity is not applicable	
GNR983 as amended (LN 1) Activity 14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	No fuel tank will beerected on sie, therefore, this activity is not applicable.	
GNR983 as amended (LN 1) Activity 19	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— i) will occur behind a development setback; ii) is for maintenance purposes undertaken in accordance with a maintenance management plan; or iii) falls within the ambit of activity 21 in this Notice, in which case that activity applies; iv) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or v) 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	X	

GNR983 as amended (LN 1) Activity 24	The development of a road— (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road— (a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; (b) roads where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.	X	Gauteng DMRE
GNR983 as amended (LN 1) Activity 27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	X	
GNR983 as amended (LN 1) Activity 28	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.	X	
GNR983 as amended (LN 1) Activity 30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	X	
GNR983 as amended (LN 1) Activity 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	X	
GNR 325 (LN2) Activity 4	The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	No fuel tanks will be rected on site, therefore, this activity is not applicable.	
GNR 984 as amended (LN2) Activity 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence 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 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;	X	Gauteng DMRE

	(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day		
GNR 984 as amended (LN2) Activity 7	The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods— (i) in gas form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 700 tons per day; (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or (iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons per day.	X	
GNR 984 as amended (LN2) Activity 9	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.	Not applicable as the the powerline will be 11KVA	
GNR 984 as amended (LN2) Activity 12	The development of railway lines, stations or shunting yards excluding — (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in a mining area; or (iii) additional railway lines within the railway line reserve.	X	
GNR 984 as amended (LN2) Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The balloon siding is located on agricultural land and only the linear activities fall on areas with indigenous vegegtation, therefore, this activity is not applicable.	
GNR 984 as amended (LN3) Activity 4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. **c. Gauteng** i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas;	X	

	iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas; viii. Important Bird and Biodiversity Area (IBA); ix. Sites or areas identified in terms of an international convention; x. Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the NEMPAA; xi. Sites designated as nature reserves in terms of municipal Spatial Development Frameworks; or xii. Sites zoned for conservation use or public open space or equivalent zoning.		
GNR 985 as amended (LN3) Activity 12	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. **c. Gauteng** i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	X	
GNR 985 as amended (LN3) Activity 10	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. ***c*) Gauteng** (i) A protected area identified in terms of NEMPAA, excluding conservancies; (ii) National Protected Area Expansion Strategy Focus Areas; (iii) Gauteng Protected Area Expansion Priority Areas; (iv) Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; (v) Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004);	No fuel tanks will be erected on site, therefore, this activity is not applicable.	

	(vi) Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; (vii) Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas; (viii) Sites or areas identified in terms of an international convention; (ix) Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the NEMPAA; (x) Sites designated as nature reserves in terms of municipal Spatial Development Frameworks; (xi) Sites zoned for conservation use or public open space or equivalent zoning; or (xii) Important Bird and Biodiversity Areas (IBA).		
GNR 985 as amended (LN3) Activity 14	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs (*a*) within a watercourse; (*b*) in front of a development setback; or (*c*) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. **c. Gauteng** i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas; iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites or areas identified in terms of an international convention; viii. Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the NEMPAA; ix. Sites designated as nature reserves in terms of municipal Spatial Development Frameworks; or x. Sites zoned for conservation use or public open space or equivalent zoning.	X	Gauteng DMRE
GNR 985 as amended	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. **c. Gauteng**	X	Gauteng DMRE

(LN3) Activity 18	i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas; iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas; viii. Sites or areas identified in terms of an international convention; ix. Important Bird and Biodiversity Area (IBA);		
NEMWA			
GNR 921 Activity A1	The storage of general waste in lagoons.	X	DMRE Gauteng
GNR 921 Activity A12	The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).	X	
GNR 921 Activity B1	The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.	X	
GNR 921 Activity B 7	The disposal of any quantity of hazardous waste to land.	X	
GNR 921 Activity B10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	X	
GNR 921 Activity B11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	X	

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)

3.2.1 BACKGROUND

The proposed Welgedacht Balloon Siding is located 9km north-east of Springs Municipality, 2 km southeast of the Welgedacht Community and 1.3 km northwest of Aston Lake, in the Gauteng Province. Access to the project area can be reached by the D1255. The siding will be used for transportation of coal from the Proposed Palmietkuilen Colliery and possibly other mines when operational. The layout for the siding is provided in Figure 4 below. A larger layout is attached as Appendix 3.

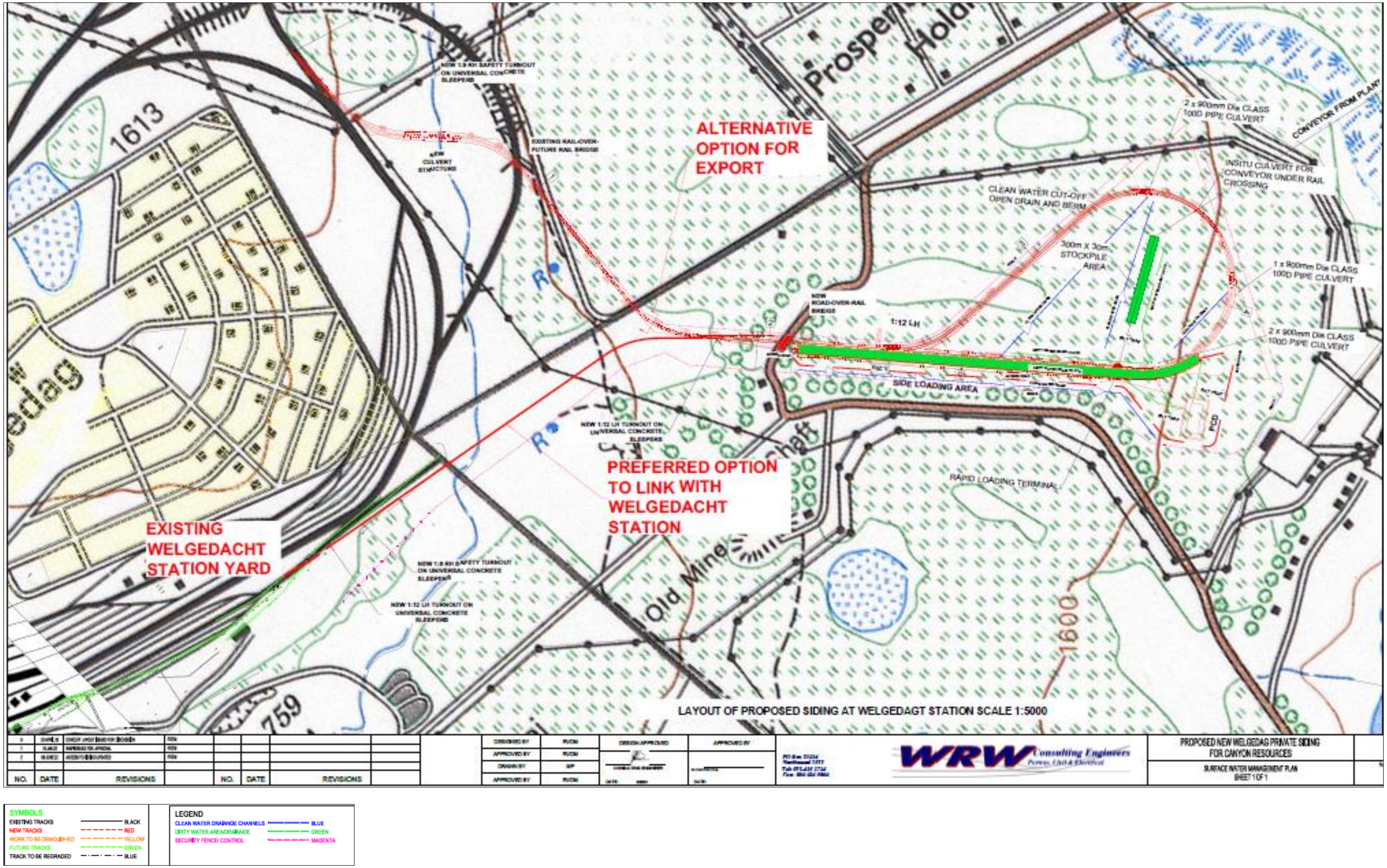


Figure 4: Proposed layout plan for the Welgedacht Balloon Siding

3.2.2 THE WELGEDACHT BALLOON SIDING INFRASTRUCTURE

The following components of the railway design were taken into consideration:

- Length of the railway;
- Railway layout for the unloading facility;
- Frequency of trains;
- Formation design;
- Track design;
- Signalling design;
- Electrical design; and
- Communication design.

3.2.3.1 ROUTE LENGTH

The length of the proposed rail line will range between 5 and 6 km.

3.2.3.2 RAIL LAYOUT FOR UNLOADING FACILITY

The rail yard will be designed for 104 wagon trains, hauled by six locomotives. The layout will include loading options by means of Front-End Loaders at first and later by means of a Rapid Loading Terminal. Two loops will be provided on each side of the loading point to allow a set of 104 loaded wagons to be placed, and a set of 104 loaded wagons loaded in a previous operation to be removed. Provision has been made for a spur line to allow for defective wagons to be staged temporarily.

3.2.3.3 FREQUENCY OF TRAINS

It is envisioned that at least one train will enter the siding and one train will exit the siding on a daily basis. There will be a total of three trains every two days.

3.2.3.4 FORMATION DESIGN

The formation design approach for this project will be based on the following engineering principles:

- To optimise the use of in-situ materials;
- To ensure proper horizontal and vertical alignment;
- To ensure drainage designs conforming to the required standards with special attention given to cross drainage;
- To provide an appropriate formation structure for a 25-year design life; and
- To ensure that the proposed design of the formation is economical and cost effective in terms of construction and subsequent maintenance.

3.2.3.5 TRACK DESIGN

The track design will allow for an axle load of 26 ton, which will be to class N1 Main Line standard. The minimum radius of curves on the line will be 300 m. This is to ensure that the new proposed railway line's track design is in accordance with the existing track design of the Transnet Freight Rail (TFR) line from which it takes off. Refer to Figure 5 for a typical cross section of a track design.

Figure 5: Typical cross section of track design

3.2.3.6 SIGNALLING DESIGN

The signalling design will be done to interface with the existing TFR signalling system and enable TFR to operate the take-off turnout as a part of the centralised train control system. The rail connection may require some associated changes to the existing control panels. Some changes to the existing home signals may also be required with the associated cabling that accompanies the moving of signals.

3.2.3.7 ELECTRICAL DESIGNS

The electrical substation and overhead traction design will be done to the latest prevailing standards. The OHTE system voltage will be 3.3 kV DC. The OHTE system will be fed from the Welgedacht sub-station (Figure 6). The OHTE system voltage will be 3.3 kV DC.

Figure 6: Example of an OHTE system

3.2.3.8 COMMUNICATIONS DESIGN

The communication design will be done to interface with the communication system of TFR within the Welgedacht Station. Remote control of substations and communication between trains and the centralised traffic control centre.

3.2.3.9 GEOMETRIC DESIGN STANDARDS

The line will be designed for 26 ton per axle loads at a maximum gradient of 1% (1:100) and will be in accordance with the following design documents:

- SANS 3000-1 Standards; and
- Standard Guidelines for the construction of rail lines.

3.2.3.10 BRIDGES

In the event that the railway crosses a stream or road, the following structures may be required to be constructed:

- Culverts: Crossing streams or providing for storm water runoff;
- Road over rail bridges: Crossing under roads;
- Rail over road bridges: Crossing over roads;
- Rail over stream bridges: Crossing streams.

3.2.4 THE CONVEYOR BELT

It is proposed that an overland conveyor belt and associated service road be established between the plant at the proposed Palmietkuilen Mining Project to the proposed Welgedacht Balloon Siding. The conveyor will transfer coal product from the plant to the siding. The conveyor belt will be constructed on the approved alignment following a site walk down, and the construction will entail the fabrication, installation modifications and commissioning of 3.5 km overland conveyor. The activities associated with the construction of the conveyor belt includes the following:

- Civil works;
- Mechanical works;
- Electrical works:
- Transfer stations and
- Service road.

3.2.4.1 CIVIL WORKS

This civil works covers the ground works and service roads along the conveyor route as per the design drawing. Ground works and concrete plinths for the conveyor support (outside wetlands area):

- Excavation needs to be undertaken every 4m for the conveyor support structure on all areas outside the indicated wetlands areas as indicated on the conveyor route drawing with the following specifications:

- 2m long x 400mm wide x 400mm deep G5 material to be inserted into the hole and compacted
- 1.2m x 300mm x 250mm concrete plinths to be installed on the levelled G5 base; and
- Steel conveyor gantry structure to be installed on the concrete plinths.

Ground works and piles for the conveyor support (inside wetlands area):

- Pile holes to be drilled every 6m for the conveyor support structure in the wetlands areas, as indicated on the conveyor route drawing with the following specifications:
  - 2 x Diameter 300mm holes to be drilled 3m to 4m deep in the existing soil every 6m inside the wetlands area;
  - 2 x Diameter 300mm concrete piles to be installed in the holes and levelled to 300mm protrusion above ground level; and
  - Steel conveyor gantry structure to be installed on the concrete piles.

3.2.4.2 MECHANICAL WORKS

The mechanical conveyor structure will fit on top of the concrete plinths and piles as per the design drawings. The conveyor steel transfer structures will be built on the conveyor route.

3.2.4.3 ELECTRICAL WORKS

A 11kV feeder line will run alongside the conveyor belt.

3.2.4.4 TRANSFER STATION

Currently, one transfer point will be constructed for the proposed conveyor belt. Refer to Figure 7 for the conveyor transfer station.

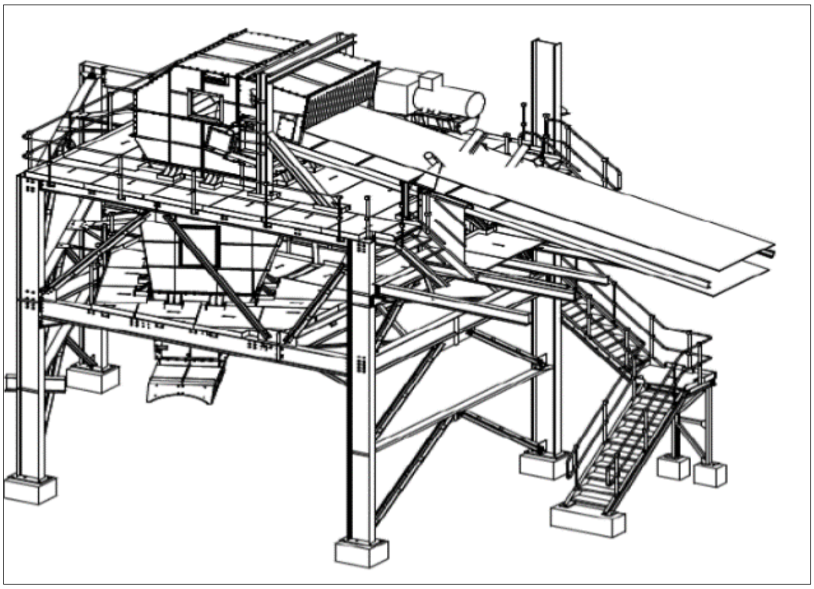


Figure 7: Conveyor Transfer Station

3.2.4.5 *SERVICE ROAD*

A single lane service road (2.5m wide) will be graded next to the majority distance of the conveyor. No material will be excavated for the road. The road will go up to the furthest possible point, from the east and from the west as to not protrude the wetland.

3.2.5 GENERAL AND HAZARDOUS WASTE

General and hazardous waste will be generated during the construction and operational phases. The types of waste may include:

- hazardous industrial waste (such as packaging for hazardous materials, used oils and lubricants,
- used liquid fuels, hydrocarbon contaminated soils) and
- general industrial waste (such as scrap metal, building rubble and demolition waste).

Any hydrocarbon contaminated soils will be removed and dealt with as hazardous waste. These wastes will be handled, sorted and temporarily stored on site in a waste/salvage yard. Where waste can be re-used or recycled this shall be undertaken, or alternatively the waste will be removed by approved waste handling companies for recycling, re-use or final disposal at permitted waste disposal facilities.

3.2.6 SEWAGE

Portable toilets will be used at the siding, a licensed sewerage removal company will be appointed for handling and maintenance of the toilets.

3.2.7 ACCESS ROAD AND FENCING

Access to the project area can be reached via the D1255. There will also be a proposed access road within the railway servitude. The access road will run parallel to the railway line. It is envisioned that the access road and railway servitude will be fenced off for safety and security reasons. A service road will run alongside the conveyor route. The service road will, however, not cross the wetland area as indicated in Figure 3.

3.2.8 SECURITY AND ACCESS CONTROL

The siding will implement access control.

3.2.9 WATER AND SERVICES

Run-off water from the contaminated area (stockpile and workshops) will be directed towards the pollution control dam (PCD) on site. The water collected in the PCD will be used for dust suppression. Potable water will be obtained from the municipality. The information regarding the dam volume and storm water berms will be included in the EIAR and the Integrated Water and Waste Management Plan for the water use licence application.

3.2.9.1 POLLUTION CONTROL DAM

The PCD is designed to have a freeboard of 0.800m and a full-service level (FSL) of 2,55m. The FSL allows for the operational storage depth of 1,890m and a 1:50 year event storage depth of 0,66m. In the sizing of the PCD allowance is made for 1,3/m^2/day average water usage for the year for dust suppression on the 63 000m2 coal loading platform and stockpile area.

The PCD has side slopes of 1:3 and the design allows for lining with a 2mm thick high-density polyethylene (HDPE) liner with properly compacted soil underneath as per geotechnical report. This liner could be replaced with high density gunite later. All inlets and outlets will be concrete lined. A concrete lined silt trap will be provided upstream of the PCD to reduce sediment flow into the PCD. Refer to Appendix 5 for the Stormwater Management Plan.

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 7 details the relevant environmental authorisations, which are applicable to the project.

Table 7: 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 project 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:*	The proposed project requires an application for an environmental authorisation for various activities, including activities in Listing Notice 2. An integrated NEMA and NEM:WA application has been launched with the DMRE (This application).

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
Listing Notice 1, 2 & 3 have been triggered as well as GN633 for several waste activities requiring a Waste License as well.	
EIA Regulations, 2017 (Government Notices 982 - 984), as amended 2021 *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] 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.
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 proposed stockpile 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. An integrated NEMA and NEM:WA 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.*	The proposed siding will have to apply for a Water Use License for the following Section 21 water uses: - Section 21(c): Impeding or diverting the flow of water in a watercourse - Section 21(g): Disposing of water in a manner which may detrimentally impact on a water resource - Section 21(i): Altering the bed, banks, course or characteristics of a watercourse
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 proposed siding and related activities on the wetland 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)	

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
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 and a Paleontolgical Assessment has been undertaken for the project (refer to Appendix 14 and Appendix 16)and the documents will be distributed to SAHRA for comments during the onset of the PPP Phase.
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. An Air Quality and Climate Change Assessment (Appendix 19) and Noise Impact Assessment (Appendix 18) has been undertaken during the onset of the project and the details will be provided within the EIA Phase of the project.
List of Activities which Result in Atmospheric Emissions, published in terms of NEM:AQA in Government Notice 893 of 2013 (as amended)	The proposed activities will not trigger any of the activities.
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 and GNR 827 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 siding will be required to report in the prescribed format.
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.
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*	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 application for removing and clearance of vegetation has been applied for within this application and no other vegetation

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
Financial accountability • *Section 43* *Biodiversity management plans.*	clearance will be permitted other than that approved in terms of the EA when/if the Competent Authority makes its decision.
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. An Alien Invasive Management Plan has been compiled and is included in Appendix 12B)
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 require management measures to be implemented to strive to maintain the status quo environment, especially through the guidelines provided by the Regional Conservation Committee.
Draft National Biodiversity Offset Policy, 2017	Not applicable to this project.
Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • *Section 2* *Declaration of grouped hazardous substances;* • *Section 4* *Licensing;* • *Section 16* *Liability of employer or principle* • *Section 9 (1)* *Storage and handling of hazardous chemical substances* • *Section 18* *Offences*	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 encountered.
Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995) • *Section 4*	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.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
Duties of persons who may be exposed to hazardous chemical substances • *Section 9A (1)* *Penalties*	
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 siding will produce general and hazardous waste which needs to be managed and disposed of according to best practices such as recycling, safe storage, etc. A Waste License is required for the siding for the establishment of Waste/ Residue Stockpiles. An integrated NEMA and NEM:WA application has been launched with the DMRE.
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 these 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. No general waste will be processed on the siding area, in terms of these norms and standards.
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.
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. On the 5 June 2020, the Department of Forestry, Fisheries and Environment (DFFE) issued Directions GN650 in terms of the Disaster Management Act (Act 57 of 2002). As per the Directions, a Public Participation Plan is required for all public participation to be conducted in terms of the NEMA, which ensures that 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

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
	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. These Directives have been applied to the public participation process.
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 related activity must take measures to manage water in an effective manner as prescribed by the regulations. A storm water management plan will be implemented on site to protect the water resources (refer to Appendix 5). A water use license application and GNr 704 exemption application will be made
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 and will be utilised by the noise specialist to determine the impact and mitigation measures.
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 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.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
	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]	Registration of servitudes and deed titles.
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 • 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 has been 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;

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
	• 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 has been taken into account in the assessment and mitigation of impacts during the EIA phase.
New Growth Path (2010)	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 has been taken into account in the assessment and mitigation of impacts during the EIA phase.
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 project.
SANS 3000- standards Railway safety management (All standards published in 2016 and 2017)	These standards are applicable to ensure the systemic engineering and operational safety standards in terms of electrical distribution and overhead traction systems; track and

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
	associated civil infrastructure and installations; level crossings; train authorization and control, and telecommunication; operational principles for safe movement on rail; and interface and interface management, and interoperability requirements are met.
Gauteng Spatial Development framework, January 2011.	Gauteng Spatial Development Framework aims to accommodate growth and sustainability by providing a clear future provincial spatial structure that is robust, flexible, compact and complex. The development frameworks have informed project planning and the need and desirability of the project, and has been taken into account in the assessment and mitigation of impacts during the EIA phase
Lesedi Municipality IDP (2020-2021)	The Municipality is looking at consolidating existing sectors and exploring new sectors of growth and in this way building local economies to create more employment and sustainable livelihoods. The development frameworks have informed project planning and the need and desirability of the project and has been 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.	

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).

The main benefits of the proposed Welgedacht Balloon Siding 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;
- It will contribute to the economic welfare of the surrounding community by creating working opportunities;
- It will contribute to the upliftment of living standards and the health and safety of the local community; and
- Effective transportation of coal.

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's (2017) Guideline on Need and Desirability, in order 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 8.

Table 8: 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.).	The following specialist studies have been conducted in support of this application: • Ecological Assessment including Alien Plant Management Plan; • Heritage and Archaeological Assessment; • Hydrogeological Assessment; • Hydrological Assessment (including water balance and aquatic assessment, if applicable); • Hydropedological Assessment; • Noise Assessment; • Air Quality Assessment including Climate Change Assessment; • Visual Impact Assessment; • Palaeontological Assessment; • Soils, Land Use and Capability and Agricultural Impact Study; • Storm Water Management Plan (including Geotechnical Assessment, floodlines and topography); • Traffic Impact Assessment; and • Wetland Delineation and Risk Assessment. The conclusions of these studies, and the identified impacts and mitigation measures stemming there from have beene included in this EIAR and EMPR. The need of the project in terms of the Sedibeng District Municipality SDF have also been considered in the EIAR and EMPR.
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?	Refer to baseline ecological information in Sections 10.7 and 10.9 and the impact assessment and mitigation measures in Sections 14 and 15 of this report. These sections will be further expanded in the EIA and EMPR, with the addition of specialist input.
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	Refer to baseline ecological information Sections 10.7 and 10.9, and the impact assessment and mitigation measures in Section 14 and □3)15 15 of this report.

	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?	
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 Sidings lifetime, 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 loading and transportation of coal, which may lead to hydrocarbon spills. Regulations for soil clean-up and management will been prescribed in the EMPr.
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 Heritage Impact Assessment has been undertaken for the proposed project. Refer to Section 10.12 of this EIAR and the impact assessment and mitigation measures in Sections Section 14 and Section 15
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 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?	The operation will be used for the transportation of a known resource (coal resource – limited resource) within the vicinity of the project area. 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?	Water will be bought from the local municipality for domestic use. Water requirements have been described in thie EIAr and all water uses will be licensed in terms of the National Water Act. Stormwater will be captured in the PCD infrastructure and re-used and will be used as dust suppression around the dirty footprint areas within the area. This will alleviate the requirement for clean make-up water to be sourced from groundwater. No discharges into the environment will be applied.
1.8	How were a risk-averse and cautious approach applied in terms of ecological	The current knowledge gaps include:

	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?	• Refer to Section 13 of this EIAR. • Refer to Section 14 and Section15 of this EIAr. • The mitigation measures associated with the impacts are provided in Section 15. • Refer to Section 14 and Section15 of this EIAr.
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?	Refer to the impact assessment and mitigation measures in Section 14 and Section.15 of this EIAr.
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.)?	Refer to the impact assessment and mitigation measures Section 14 and Section 15 of this EIAr.
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 in Section 14 and Section 15 of this EIAr.
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?	Refer to Section 7, details of the alternatives considered.
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?	Refer to Section 14 and Section 15 of this EIAr.
"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? 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	The economic baseline revealed that the Lesedi Local Municipality (LLM) is a relatively small economy and makes a minor contribution towards the economies of the Sedibeng DM and Gauteng Province, although the economy has shown above average growth in the past few years mainly due to the growing tertiary industries. In addition, the primary sector has a negligible impact on employment and GDP in the local economy of Lesedi. Lastly, the municipality is dominated by low income earners. The planned Siding project should assist in improving the economic environment. Providing employment to the local labour will have a positive impact on the employment creation, skills development, household earnings and local economy activity.

	landscapes, etc.), and 2.1.4 Municipal Economic Development Strategy ("LED Strategy").	The Siding will connect with the main Transnet Railway Line, which is utilised to transport coal in South Africa, with various coal mines in the vicinity of the proposed Siding which will be able to make use of the Siding to transport the coal product.
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? 2.2.2. Implementation on Social labor Plan (SLP)	Also refer to the comments made above. The proposed project will benefit society and the surrounding communities both directly and indirectly by providing jobs at the proposed operation and through the transportation of coal reserves. 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 recorded, to ensure local economic development (as recommended in the EMPR). Section 14 and Section 15 of this EIAr.
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. Refer to the proposed public participation process in Section 8**Error! Reference source not found.** of this EIAR.
2.4	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?	Refer to the impact assessment and mitigation measures in Section 14 and Section 15 of this EIAr.
2.5	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 under-utilised 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, 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,	Alternatives have been assessed during the process and the best suited alternative will be described within this application and depicted in the EIA Phase. Refer to Section 7**Error! Reference source not found.**, of this report.

	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?	Specialist studies have been undertaken for this project. Refer to Section 10. All gap knowledges have been identified and included – refer to Section13. Section 14 and Section15 of this EIAr includes the impacts assessment. The mitigation measures associated with the impacts have been determined – Section 15.
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 the impact assessment the mitigation measures Section 14 and Section 15.
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.)?	A section of the area where the project is proposed to be located is currently utilised for agriculture and grazing. A Soil and Agricultural Assessment study has been undertaken and included in this EIA report. Refer to Section 10.10. Also refer to the impact assessment and mitigation measures in Section 14 and Section 15 of this report.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to the impact assessment and mitigation measures in Section 14 and Section 15 of this report.
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 14 and Section 15 of this EIAR. The siding will be in line with the regulatory requirements to ensure that the mitigation measures proposed can be carried out.

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?	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 14 and Section 15 of this report.
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?	Refer to the impact assessment and mitigation measures in Sections 0 and 3)15 of EIAr.
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 will be promoted?	Refer to Section 8 of this EIAr, describing the public participation process to be undertaken for the proposed project.
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 Section **Error! Reference source not found.** of this EIAr, describing the public participation process 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 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?	The Applicant will need to draft an Environmental Policy and a Health and Safety Policy, which will regulate activities in the project area. All workers and contractors will need to abide to the policies and framework as specified.
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	A Soil, Land Capability and Agricultural Impact Assessment has been undertaken as part of the EIA process. Refer to Section 10.10 and Section 14 and Section 15 of this EIAr.

	100 jobs, but impact on 1000 agricultural jobs, etc.).	
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: • Environmental Authorisation (this application); • WUL (Department of Water and Sanitation –DWS – To be initiated). • All legislation that 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 Section 8**Error! Reference source not found.** of this EIAr, describing the public participation process to be implemented for the proposed project, as well Section 21 (the impact on any national estate), in the EIAr.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the impact assessment and mitigation measures in Section 14 and Section15 of this EIAr.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	This is addressed in Section 18 and Section 19 of this EIAr.
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 being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to Section 7 (description of the process followed to reach the proposed preferred site), of the EIAR.
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 Section 14 and Section 15 of of this EIAr.

6 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The proposed Palmietkuilen Colliery, which will be serviced by the proposed Welgedacht Balloon Siding, has a Life of Mine of 53 years, therefore, the environmental authorisation is required for at least 53 years. The siding may also be utilised by other mines.

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.

A project alternative is defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004). In an EIA process, project alternatives serve to determine the most effective way of meeting the objectives of that project. This is generally done through either enhancing the benefits of an activity and/or mitigating the negative impacts and risks of an activity.

According to the Department of Environmental Affairs (DEA) Criteria for Determining Alternatives in EIA Guideline (2004), there are various types or categories of alternatives, including:

- Location alternative – alternative project sites in the same geographic area;
- Process/design alternative – alternative process/design/equipment;
- Activity alternative – consideration of different means to achieve the same project objective;
- Routing alternative – consideration of different routes for linear infrastructure;
- Site layout alternative – consideration of the different options to place project infrastructure; and
- No-go alternative – the proposed project/activity does not proceed, implying that the current situation or status quo remains.

i) Details of all alternatives considered

The identification of alternatives is a key aspect of the success of the 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 have to 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/layout/design 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.

The alternatives are described, and the advantages and disadvantages are presented in this section. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process (DEAT; 2004). Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

7.1 TRANSPORTATION OF COAL

Coal from the proposed Palmietkuilen Colliery to the proposed Welgedacht Balloon Siding can either be transported via road and/ or conveyor belt. The transportation of coal product from site to the rail siding will be undertaken by a conveyor belt. The alternative is to use trucks to transport coal product to the siding. The preferred alternative is to use the conveyor belt. The benefit of utilising the siding will, *inter alia*, reduce the number of coal trucks on the roads in the surrounding area.

7.2 CONVEYOR BELT ROUTING ALTERNATIVES

Routing alternatives were considered for the conveyor belt and are indicated below in Figure 8. The specialist studies undertaken during the EIAr phase determined that the impacts from both the preferred route (Alternative 1) and the Alternative conveyor belt route were similar. The heritage specialist did indicate that the the eastern end of the preferred conveyor route route intersects Site BA09, an area that used be associated with buildings since at least 1953. The buildings formed part of a piggery, but were demolished in later years and are no longer associated with surface remains. Since subsurface culturally significant material might be located at Site BA09, the demarcated area is considered to be potentially sensitive. Care should therefore be exercised during the construction phase and should cultural material be discovered; a qualified archaeologist must be contacted. BA09 does, however, have field rating of 4C and a low significance as per SAHRA. The Preferred Conveyor Route (Alternative 1) will, therefore, be implemented.

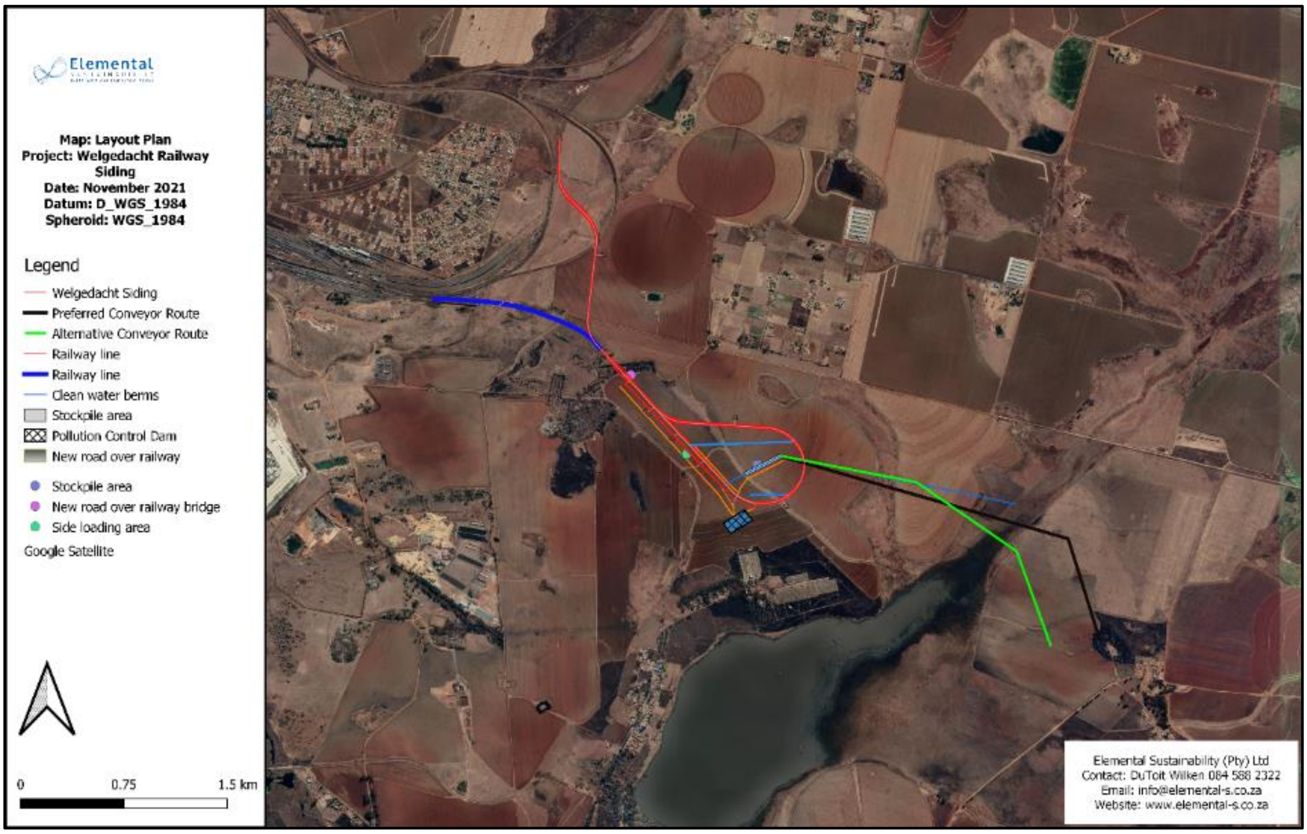


Figure 8: Conveyor Route – Alternatives

7.3 NO GO OPTION

The no-go option refers to the alternative of the proposed project not going ahead at all. This alternative will avoid potentially positive and negative impacts on the environment and the status quo of the area would remain, which is the conditions of the current baseline environment without any deviations or expansions.

The implications of the no-go option have been evaluated as part of the EIA, focusing on comparing potential impacts from the proposed project with the status quo. This section describes the pros and cons of various alternatives described above. The findings are presented here in Table 6.

Table 6: Summary of advantages and disadvantages of alternative coal transportation

Environmental consideration	Transportation of coal via existing road network	Transportation of coal via conveyor belts
Impacts on sensitive habitat	No new roads will have to constructed for the hauling of coal outside the boundary of the proposed site. No virgin land will have to be transformed.	This alternative traverse the Blesbokspruit and wetlands on the western side of the project site. Transporting coal through these areas poses a risk to the wetlands and the Blesbokspruit. The risk has been quantified in this report
Rehabilitation	No rehabilitation required	The footprint of the conveyor belt will require rehabilitation
Air emissions	Dust and exhaust emissions from the transportation of coal on hauling trucks	Dust generation due from the transportation of coal on trucks. No exhaust emissions.
Noise generation	Medium noise impacts associated with hauling trucks	Minimum noise generation
Financial considerations	High cost for fuel consumption of hauling trucks	Very high initial costs to establish infrastructure
Visual impact	Moderate visual impact	High visual impact
Traffic	High traffic load may cause disruption	No additional traffic

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 that must be followed as per the requirements of the NEMA EIA Regulations and the regulations thereunder as well as the NWA.

8.1 PUBLIC PARTICIPATION

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered and a record of all comments and responses is included in the reports submitted to the Authorities. The process ensures that all stakeholders are provided an opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

8.2 LEGAL FRAMEWORK

The PPP for the proposed project has been undertaken in accordance with the requirements of the NEMA EIA Regulations (2014), as amended in 2021, as well as the NWA and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

On the 5 June 2020, the DFFE issued Directions GN650 in terms of the Disaster Management Act (Act 57 of 2002). As per the Directions, a Public Participation Plan was required for all public participation to be conducted in terms of the NEMA, which ensures that 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 non-exhaustive 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.

A copy of the Public Participation Plan is included in Appendix 5 of this report. It is also noted that subsequently in 2022, the directives for PP have been cancelled by the Minister.

The public participation process that has been undertaken for the Welgedacht Balloon Siding is discussed in the sections below.

8.2.1 SECTION 39: ACTIVITY ON LAND OWNED BY PERSON OTHER THAN THE PROPONENT - SUBREGULATION 1 AND 2(A), (B) AND (C)

(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.

(2) Subregulation (1) does not apply in respect of -

a) linear activities; and

[Para. (a) amended by GN 517 of 11 June 2021.]

(b) . . . . . .

[Para. (b) amended by GN 326 of 7 April 2017 and deleted by GN 517 of 11 June 2021.]

(c) strategic integrated projects as contemplated in the Infrastructure Development Act, 2014.

As the application is for an environmental authorisation in terms of NEMA, the proponent is required to obtain written consent of the landowner or person in control of the land to undertake the activity. Written consent has been obtained from the landowner and has been included in the EA form submitted to the DMRE.

8.2.2 SECTION 41: PUBLIC PARTICIPATION PROCESS

8.2.2.1 SECTION 41, SUBREGULATION 2 (A) – SITE NOTICES

1) *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.*

Ten site notices were erected during the scoping phase within and surrounding the proposed Welgedacht Balloon Siding project area. The site notices were placed in conspicuous areas that are accessible to the public at the boundary. The site notices included a short background of 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 9 below indicates the locations at which the site notices were placed for theproposed Welgedacht Balloon Siding project. Also refer to Appendix 6.

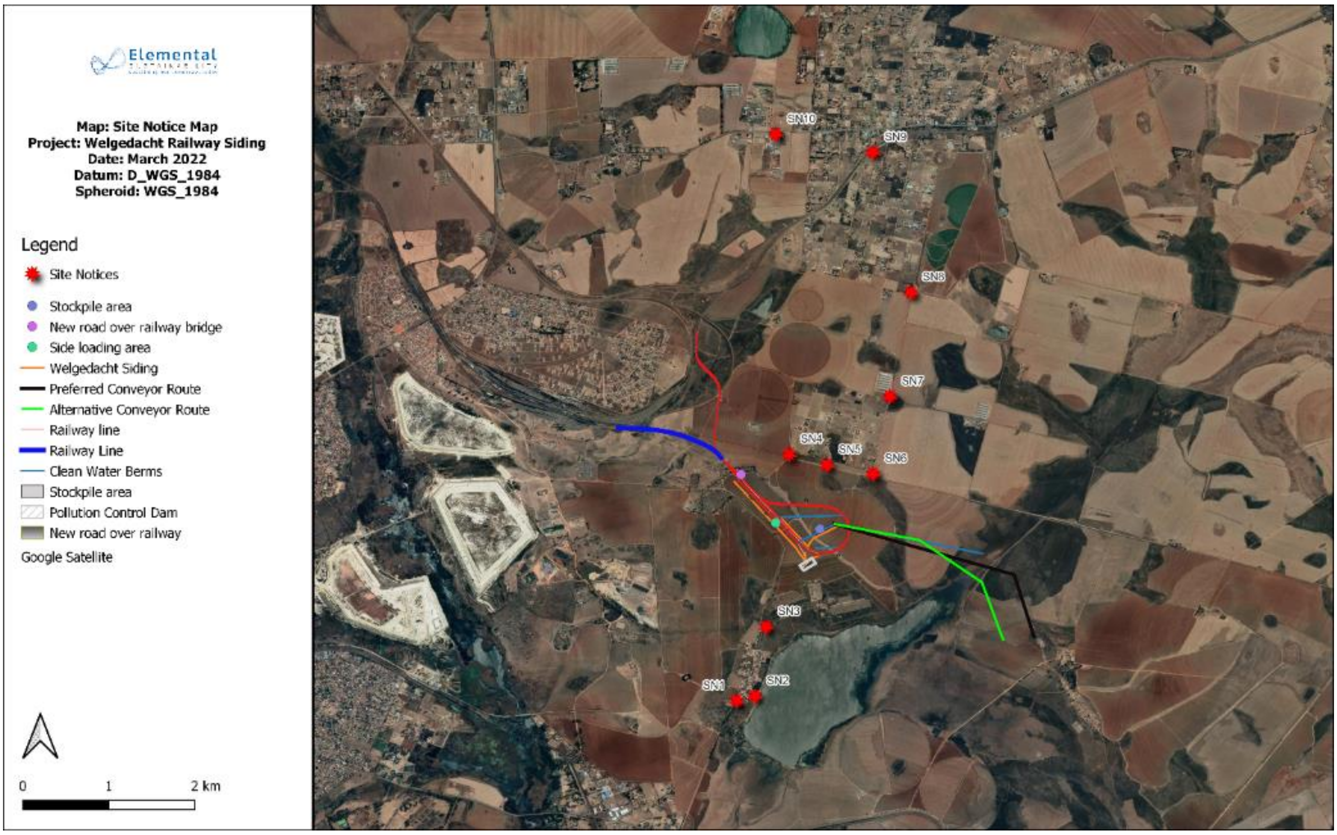


Figure 9: Location of site notices

8.2.2.2 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;*
[Subpara.(i) amended by GN 326 of 7 April 2017.]

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;*
[Subpara.(ii) amended by GN 326 of 7 April 2017.]

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;*
[Subpara.(iii) amended by GN 326 of 7 April 2017.]

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;*

Written notices were provided to all identified landowners in and directly adjacent to the project area. Written notices were also be sent to the municipality that has jurisdiction in the area and all organs of state as pre-identified and that register for the project (Appendix 6) This includes the following:

- South Africa Heritage Resource Agency (SAHRA);
- Department of Roads and Transport;
- Department: Agriculture, Rural Development, Land and Environmental Affairs;
- Department of Agriculture Forestry and Fisheries.
- Department of Mineral Resources and Energy (DMRE); and
- Department of Water and Sanitation (DWS).
- Department of Forestry, Fisheries and Environment;
- Agriculture, Land Reform and Rural Development;
- Department of Economic Development and Tourism;
- Gauteng Department of Public Works, Roads and Transport;
- Department of Social Development – Provincial;
- South African National Roads Agency (SANRAL);
- Provincial Heritage Authority;
- Eskom;
- Transnet;
- Lesedi Local Municipality;
- Sedibeng District Municipality; and
- Ward Councillor/s.

A Background Information Document (BID), in English, was distributed in and around proposed Welgedacht Balloon Siding project area. The BID was distributed electronically to all I&APs that have provided an email address. The BID was also translated to isiZulu and was distributed within the Welgedacht community. Copies of the BIDS are available in Appendix 6.

8.2.2.3 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 project is restricted to the Springs area, an advertisement has been placed in the local newspaper (The Springs Advertiser) containing the following information:

- Project name;
- Applicant name;
- Project location;
- Nature of the activity;
- Relevant EAP contact person for the project;
- Availability of the Scoping Report for review; and
- Contact details for the relevant EAP where I&APs can send comments/concerns.

A copy of the advert that was placed for the scoping phase is attached in an Appendix 6 of this report.

8.2.2.4 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 Section 8.2.2.2 and Section 8.2.2.3 above, both the site notice and the adverts included all information as per the requirements of Section 41, subregulation 3.

The EAP's contact number, postal address and email address have been stated on the site notice and adverts. Comments/concerns and queries have been encouraged to be submitted in either of the following manners:

1. Electronically (email);
2. Telephonically; and/or
3. Written letters.

8.2.2.5 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

[Para. (*a*) amended by GN 326 of 7 April 2017.]

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

Site notices erected around the boundary of the proposed Welgedacht Balloon Siding were at least 60cm by 42 cm. The proposed format was Arial and the font size was 14. A locality map was included on the site notice. Refer to Appendix 6 a copy of the site notice. The locality map of where the site notices have been placed has been included in Appendix 6.

8.2.2.6 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.

      [Para. (*b*) amended by GN 326 of 7 April 2017 and substituted by GN 517 of 11 June 2021.]

Subregulation 5 is not applicable to the Welgedacht Balloon Siding, 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, have been made available to potential I&APs. The Scoping Report was made available for a 30-day public review period from **12 November 2021 to 13 December 2021**.

A hard copy of the Draft Scoping Report was made available at the Bakerton Library in Springs and an electronic copy was made available on Dropbox. All registered Interested and Affected Parties were sent an electronic link with the Public Participation notification.

The Environmental Impact Assessment Report with the Environmental Management Programme Report will also be made available for public review and comment for a period of 30 days.

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.*

As this is an integrated application, namely an environmental authorisation and waste licence application in terms of the NEMA, and a water use licence application in terms of the NWA, it is proposed to combine the public participation process with all notification documentation and other public participation opportunities referring to all three authorisation/permit or licence.

8.2.3 SECTION 42: REGISTER OF INTERESTED AND AFFECTED PARTIES

8.2.3.1 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 7 in the Environmental Impact Assessment Report.

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

8.2.4.1 INTERESTED AND AFFECTED PARTIES AND COMMENTING AUTHORITIES

43) 1). A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.
2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.
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.

8.2.4.2 DECISION MAKING AUTHORITIES

The decision-making authorities includes the:

- Department of Mineral Resources and Energy (DMRE) for the EA in terms of NEMA; and
- Department of Water and Sanitation (DWS) for the water use licence.

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 7) to the the Environmental Impact Assessment Report.

8.2.4.3 ENVIRONMENTAL AUTHORISATION

- 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 project.
- Scoping Phase:

  1) During the Scoping phase the I&APs have had the opportunity to comment on the Scoping Report, which was made available for public review for 30 days. Registered I&APs were notified of the availability of the Scoping Report. The report was made available electronically via a downloadable link and a hard copy of the report was made available in the Bakerton Library in Springs from 12 November 2021 to 13 December 2021. The Draft Scoping Report was made available for a 30 day review and comment period, from All necessary measures were put in place to ensure that the COVID-19 protocols are adhered to when reviewing the document. Should you require a CD copy of the report, please contact ELEMENTAL. Upon request, Zoom, Microsoft teams and skype meetings will be arranged and communicated with registered I&APs, together with a hand sanitiser);

  2) Hard copies of the Scoping Report were submitted departments as listed in 8.2.2.2.
- 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 from 12 August to 12 September 2022. 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 at the bakerton Public Library in Springs
  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.

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

8.2.5.1 PUBLIC MEETINGS AND OPEN DAYS

Due to the restrictions, as a result of COVID-19 at the time of the scoping phase, Zoom meetings, Microsoft Team Meetings, Skype, and/or phone calls with landowners and I&AP's were encouraged. Open hours were held at the Riverside Country Estate, 163 Haasbroek Road, Grootvaly, Springs from 08h00 to 12h00 and at the Welgedacht Primary School, 4 Ave, Welgedacht, Springs from 13h00 to 17h00 on 07 December 2021. The purpose of the meeting for the Scoping Phase, was to introduce the project and to get the potential I&APs to register, as well as raise any concerns or issues that the I&APS may have with regards to the proposed Welgedacht Balloon Siding Project. Notes of the Zoom, Microsoft Team, Skype, and/or phone calls for the Scoping phase have been included in the Appendix 6.

During the EIA phase, the purpose of the public meeting/s 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. Information regarding the public meeting/s will be emailed to all I&APs and the concerns and issues raised will be included in the Final EIAr to be submitted to the DMRE.

8.2.6 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 and scoping phase):

- Concerns that the project may impact the condition of the roads;
- The impact of the proposed project on air quality in the area;
- The impact of the project on the quantity and quality of groundwater;
- Increased crime in the area;
- The impact of the project on surface water and the wetlands;
- Negative impacts on agriculture;
- Conflicts of interest within the Gold One prospecting right and the proposed project; and
- Sense of place will change.

*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 to date.*

The Draft Environmental Impact Assessment and Environmental Management Reports have been compiled. The document will be distributed for Public Review from the 12 August to 12 September 2022 (this document). The comments and response reports will be updated and included in the Final EIAr to be submitted to the Department in Appendix 7.

8.2.7 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 7), 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).

8.2.8 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.

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. Refer to the discussion of alternatives in Section 7.

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 the specialist reports undertaken for the proposed Welgedacht Balloon Siding Project.

10.1 GRADIENT AND LANDSCAPE CONTEXT

Surface elevations at the project site range between 1580 and 1610 m above mean sea level (mamsl), with the general slope direction being from northwest to southeast at the southern sector of the site and southeast to northwest on the northern sector of the site. A large part of the study site consists of cultivated lands and grazing areas. Railway lines, farm roads and powerlines also transect the area. Natural wetlands are also located in parts of the project area.

10.2 GEOLOGY

The project site falls within the Springs-Vischkuil Coalfield (Digby Wells, 2017) and is underlain by sandstone, shale and coal beds of the Vryheid formation (Ecca Group; Karoo Supergroup), which are in turn underlain by the Dwyka formation diamictite which has been mapped at the northern extent of the Site and ~2.5 km west and south of the Site. Dolomite and chert of the Malmani subgroup are located at the northern Site extent and ~3 km west and south of the Site with quaternary alluvial deposits located ~1 km east and ~2 km south of the Site. The Vryheid formation is comprised predominantly of sandstone and shale, with subordinate coal beds, with a maximum thickness of ~500 m in the deeper parts of the Karoo basin and ~80-170 m in the Witbank Coalfield and marginal areas (GPT, 2018).

The Site is underlain predominantly by shale, sandstone and coal of the Vryheid formation based on the 1:250’000 geological map series 2628 East Rand. Digby Wells (2017) installed several hydrogeological boreholes at the nearby Palmietkuilen Site south of the Site, where the following was noted:

- The weathered zone extends to a depth of ~10-12 m and is comprised of shallow gravel (<5 m depth) and clay (3-12 m depth),
- Mudstone, quartzite and shale were intersected up to 50-70 m depths and are expected in the central

region of the Site,

- Tillite was intersected at depths between 35 and 60 m, which is expected at the western extent of the Site, and
- Dolerite was intersected locally at depths in excess of 80 m.

Figure 10 is a geological map indicating the project area.

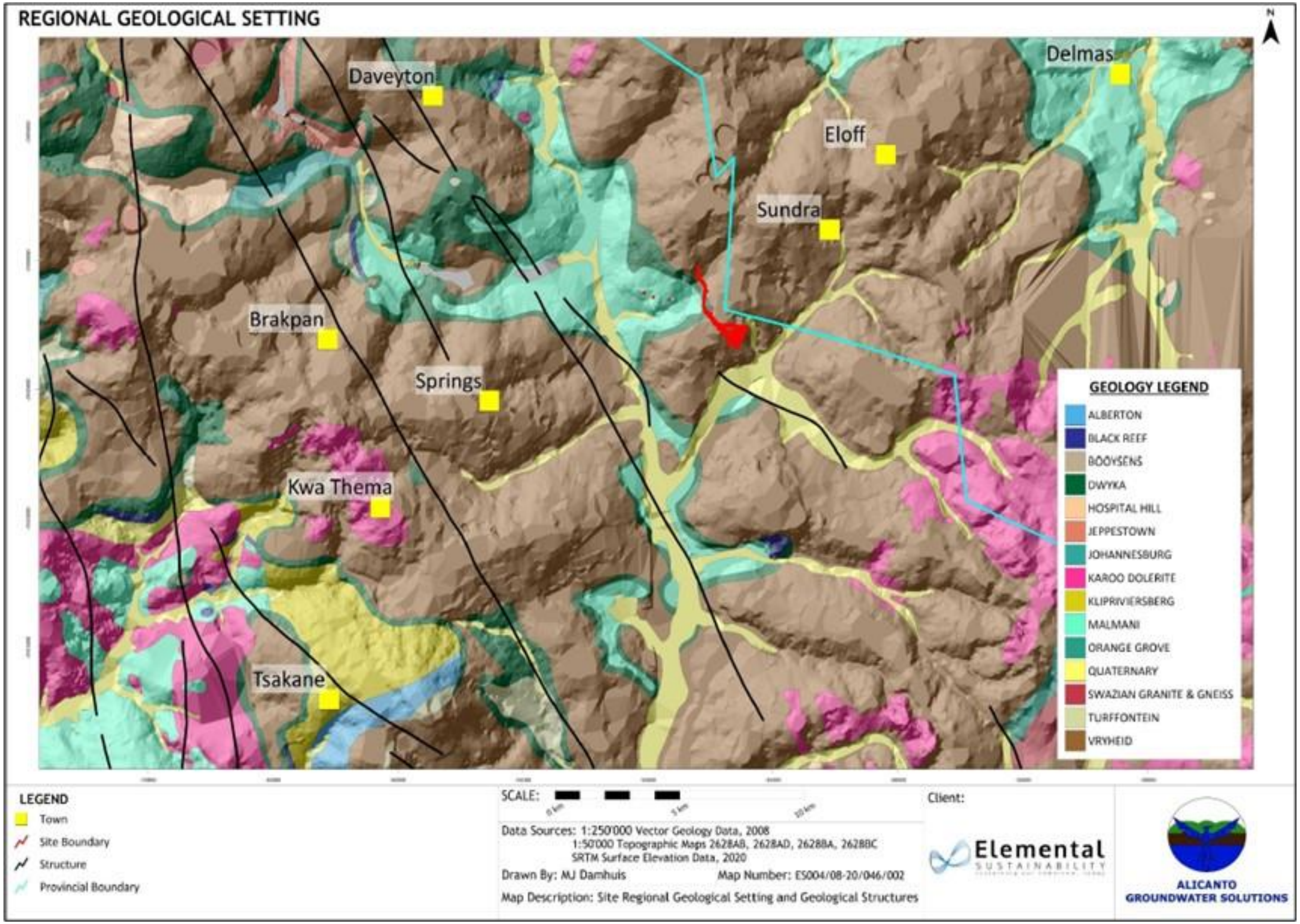


Figure 10: Geological Map indicating the proposed Welgedacht Balloon Siding

10.3 CLIMATE

10.3.1 TEMPERATURE

The temperatures are highest on average in October to February where temperatures rise above 30°C. The coldest months in the year are in June and July (>5°C) where the number of frost days are the highest. In the summer months' maximum average daily temperatures are predicted to be 23°C to 26°C on average, with a maximum of 32°C possible during hot days, dropping to a predicted 9°C to 13°C on average at night, and 4°C minimum on cold nights. During winter months the average day time temperature are predicted in the 18°C to 21°C range, while cold winter night-time temperatures are predicted to drop to -3°C.

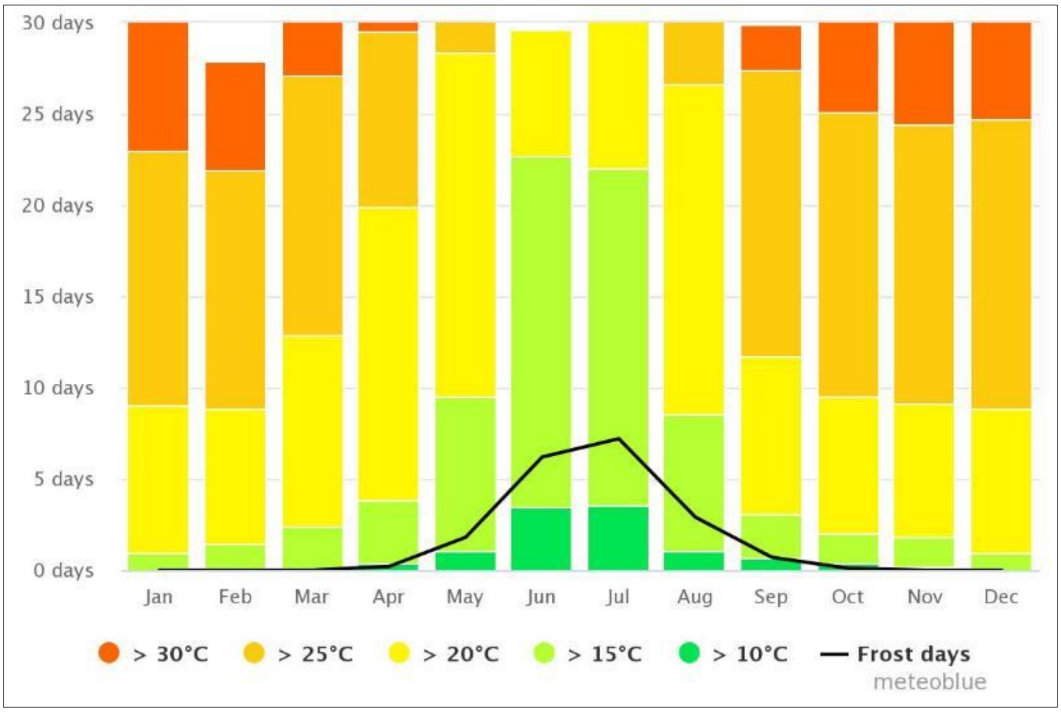


Figure 11: Mean monthly temperatures in Springs, Gauteng

10.3.2 MEAN MONTHLY PRECIPITATION

The site is situated in the summer rainfall region of South Africa, with the majority of rainfall between September and March. Rainfall data was obtained from satellite datasets for 30 years, which indicated a mean annual precipitation (MAP) of 699 mm and evaporation data presented by GPT (2018) showed a mean annual evaporation (MAE) of 1697.3 mm. Figure 12 shows the monthly distributions of rainfall and evaporation at the Site.

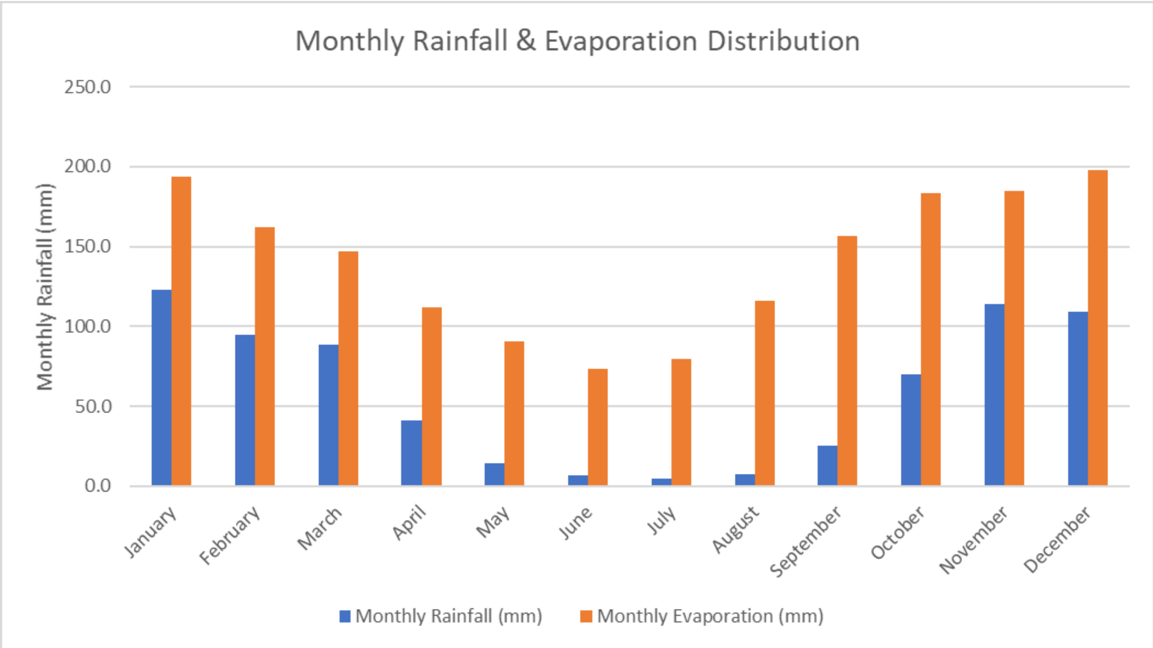


Figure 12: Monthly precipitation and evaporation distribution for the study area

10.3.3 WIND SPEED AND DIRECTION

The predominant wind direction in the proposed region is north to northwest and less frequent winds occur from the east and northeast and southwest. The maximum average wind speed is 7 m/s (classified as a “gust”) during October. This is due to the changing of the seasons (winter to spring) and wind speeds tend to increase from August Refer to Figure 13.

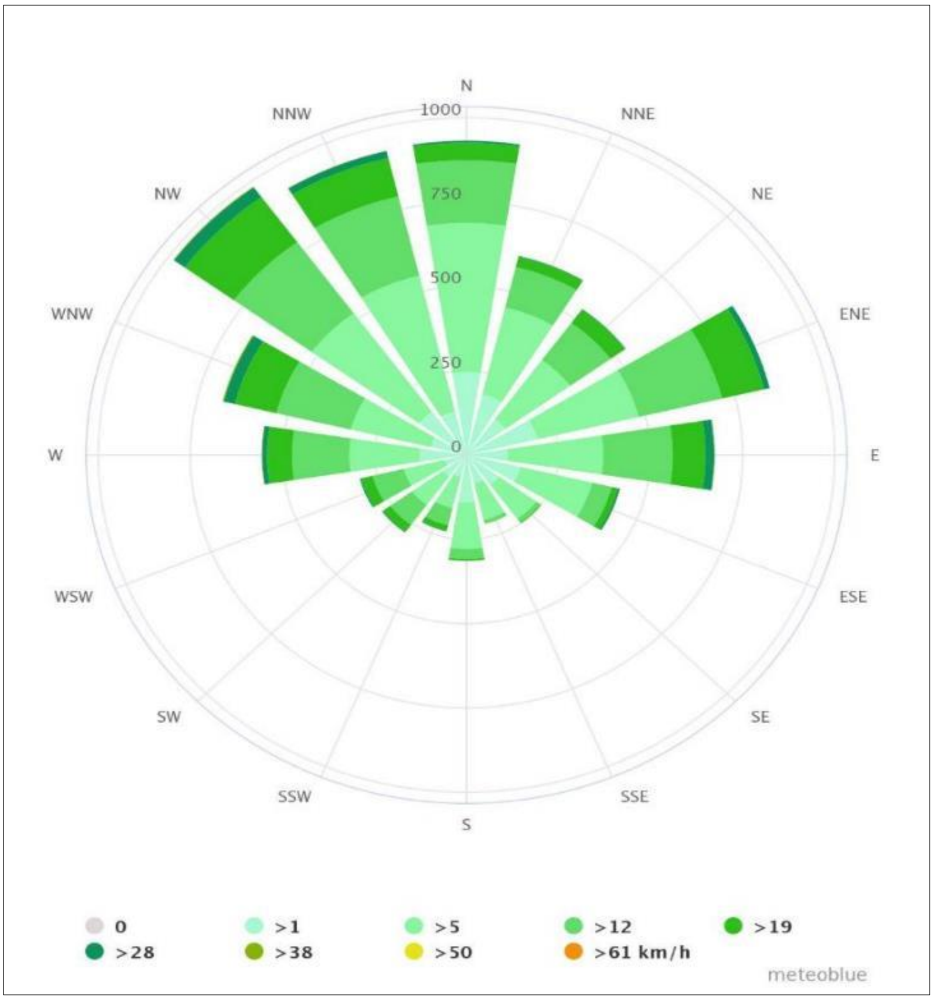


Figure 13: Windrose indicating wind speeds and directions in the Springs area

10.4 GROUNDWATER (HYDROGEOLOGY)

Alicanto Groundwater Solutions (Pty) Ltd. (AGS) undertook the groundwater study at the proposed Welgedacht Balloon Coal Siding. A desktop assessment, as well as a site visit was undertaken for the proposed project. The methodology utilised for the hydrogeological assessment is included in the specialist report. A copy of the report is included in Appendix 8.

10.4.1 HYDROGEOLOGY

According to the 1:500'000 Hydrogeological Map Series 2526: Johannesburg (Barnard, 1999) the proposed project site is underlain by intergranular and fractured aquifers with an average borehole yield of 0.1-0.5 l/s. Barnard (1999) mapped a high yielding karst aquifer unit ~2 km west and at the northern rail extent of the Site with an average borehole yield in excess of 5 l/s.

Borehole data was obtained from the National Groundwater Archive (NGA) database (DWS, 2020) within a 10-km radius of the Site. The average borehole depth was ~48 m, ranging between <5 m and ~200 m, with the average water strike depth being ~37 m, ranging between <2 m and ~165 m. The majority of the boreholes were drilled to depths of 30-45 m, with two water strike zones identified at 10-20 m and 30-45 m depths as shown in Figure 14. Water strike frequencies decreased dramatically at depths greater than 80 m. Most blow yields recorded in the NGA (DWS, 2020) were below 0.1 l/s (27%), with more than 50% of the total blow yields being less than 0.5 l/s. The average recorded blow yield was 1.2 l/s, ranging between <0.1 l/s and 1.3 l/s, up to localised maximum values of 1.5-5 l/s. Figure 15 shows the blow yield distribution for the regional area.

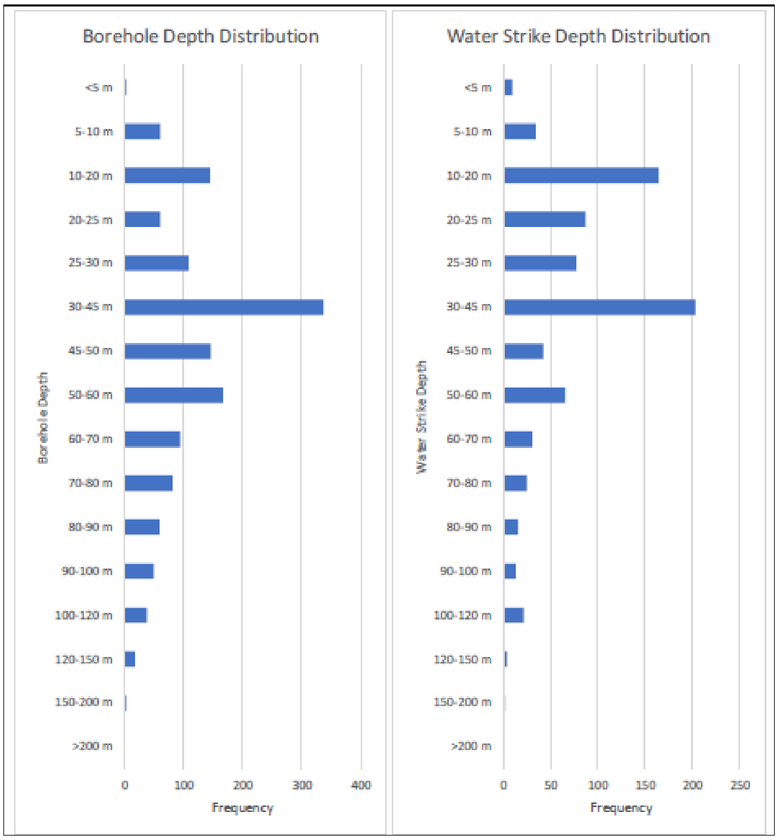


Figure 14: Regional Borehole and Water Strike Depth Distributions (DWS, 2020)

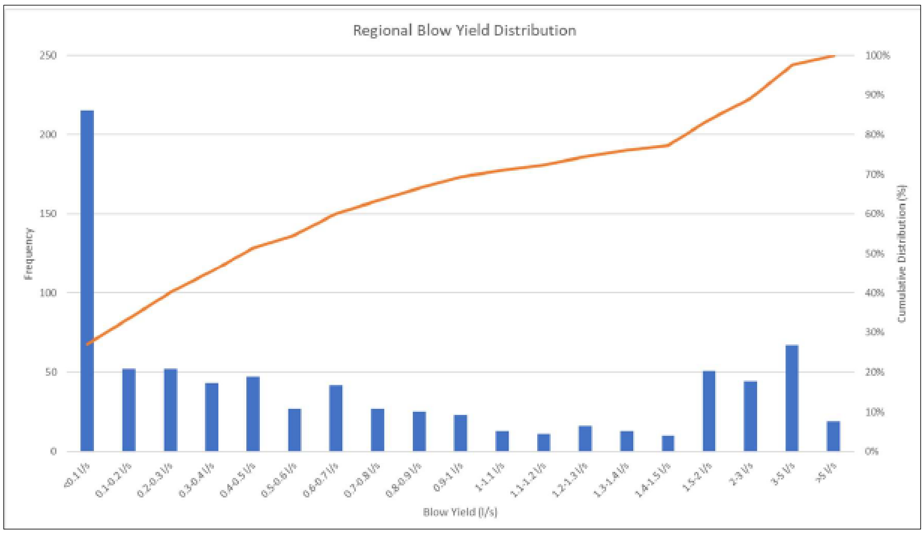


Figure 15: Regional Blow Yield Distribution

According to Hodgson & Krantz (1998) three distinct hydrogeological units are present within the Karoo coalfields, namely:

- An upper, weathered hydrogeological unit;
- A fractured, Ecca sediments hydrogeological unit; and
- A deeper, fractured basement hydrogeological unit.

The upper, weathered hydrogeological unit is typically found between 5 and 12 m depths, with the dominant recharge mechanism being infiltration of rainwater (1-5% of MAP) (AGS, 2019). Groundwater movement in the upper, weathered hydrogeological unit is controlled by the less permeable shale found at depth, as well as outcropping intrusions, paleo-topographic highs or streams/rivers where topography cuts through the water table (AGS, 2019).

The fractured Ecca hydrogeological unit is found at depths ranging between 20 and 45 m with the frequency of successful water strike intersection decreasing with depth. The matrix of the Ecca geology is well-cemented, thus lowering groundwater potential in the matrix and leading to almost all economic water strikes being associated with secondary geological features such as faults, fracture zones and intrusive contact zones. The basement hydrogeological unit is generally regarded as insignificant due to its low yielding nature, great depth (>100 m) and limited recharge potential due to the overlying Dwyka tillite units.

Within the Site region there is a fourth hydrogeological unit to be considered, namely the karst unit situated ~2 km west and at the northern rail extent of the Site. According to the 1:500’000 hydrogeological map series 2526 Johannesburg (Barnard, 1999) the average borehole yield of the karst system west of the ste is over 5 l/s. Figure 19 shows the Site regional hydrogeological setting.

10.4.1.1 UNSATURATED ZONE

Limited information was available regarding the unsaturated zone at the Site and a detailed investigation of the unsaturated zone was outside of the project scope of work. The unsaturated zone typically behaves as a buffer zone for water infiltrating to the aquifers of a region, as well as a storage zone for water in some instances. The nature of the unsaturated zone is important when determining aquifer vulnerability at a Site.

Based on the available water levels for the Site area, the unsaturated zone is between 2 and 12-15 m in thickness and found up to ~20 m below ground level in areas of high weathering.

10.4.1.2 AQUIFER PARAMETERS

Based on literature (Grobbelaar et al., 2004; Hodgson & Krantz, 1998) the Ecca Group geology generally forms poor aquifers, with most water strikes being intersected at bedding contact zones and at secondary features such as faults or intrusions. Transmissivity values obtained from aquifer testing conducted in the region (AGS, 2019) varied between 0.007 and 2.5 m2/day, with an average of ~1 m2/day. The low values (i.e. 0.007 m2/day) were likely to be representative of competent Dwyka Group and values for the fractured Karoo hydrogeological unit are likely to be between 0.1 and 1.5 m2/day up to 2.5 m2/day or higher at zones that are highly fractured or contact zones with more competent geology.

Storage values for the Site are expected to range between 0.001 and 0.1, with specific storage values in the range of 0.00000001 and 0.00001.

Recharge values were calculated using the Chloride Mass Balance method and taken from literature values. The regional recharge for the Site was expected to vary between 1 and 4% of MAP.

10.4.1.3 GROUNDWATER LEVELS

Regional water levels obtained from the NGA (DWS, 2020) ranged between X and Y m, with an average water level of ~12 m below ground level (m bgl). During the 2020 hydrocensus a total of twenty-two (22) boreholes were identified, with most of the boreholes being inaccessible due to pumping equipment, blockage or denial of access. Digby Wells (2017) identified thirty-two (32) boreholes within the Site area, with water levels ranging between 1 and 75 m bgl, with an average of ~17 m bgl.

Regional groundwater levels showed a strong correlation with surface elevations (89%) while hydrocensus results showed less of a correlation (~51%). However, it was suspected that poorly correlated water levels recorded during the hydrocensus investigations were likely to be due to abstraction at the boreholes and once the values were removed from the dataset a correlation of ~91% was achieved. The correlation with surface elevation suggests that groundwater flow at the project site takes place under semi-confined conditions and groundwater flow is likely to mimic surface topography. Regional groundwater level contours were generated using Bayesian interpolation techniques (refer to Figure 16).

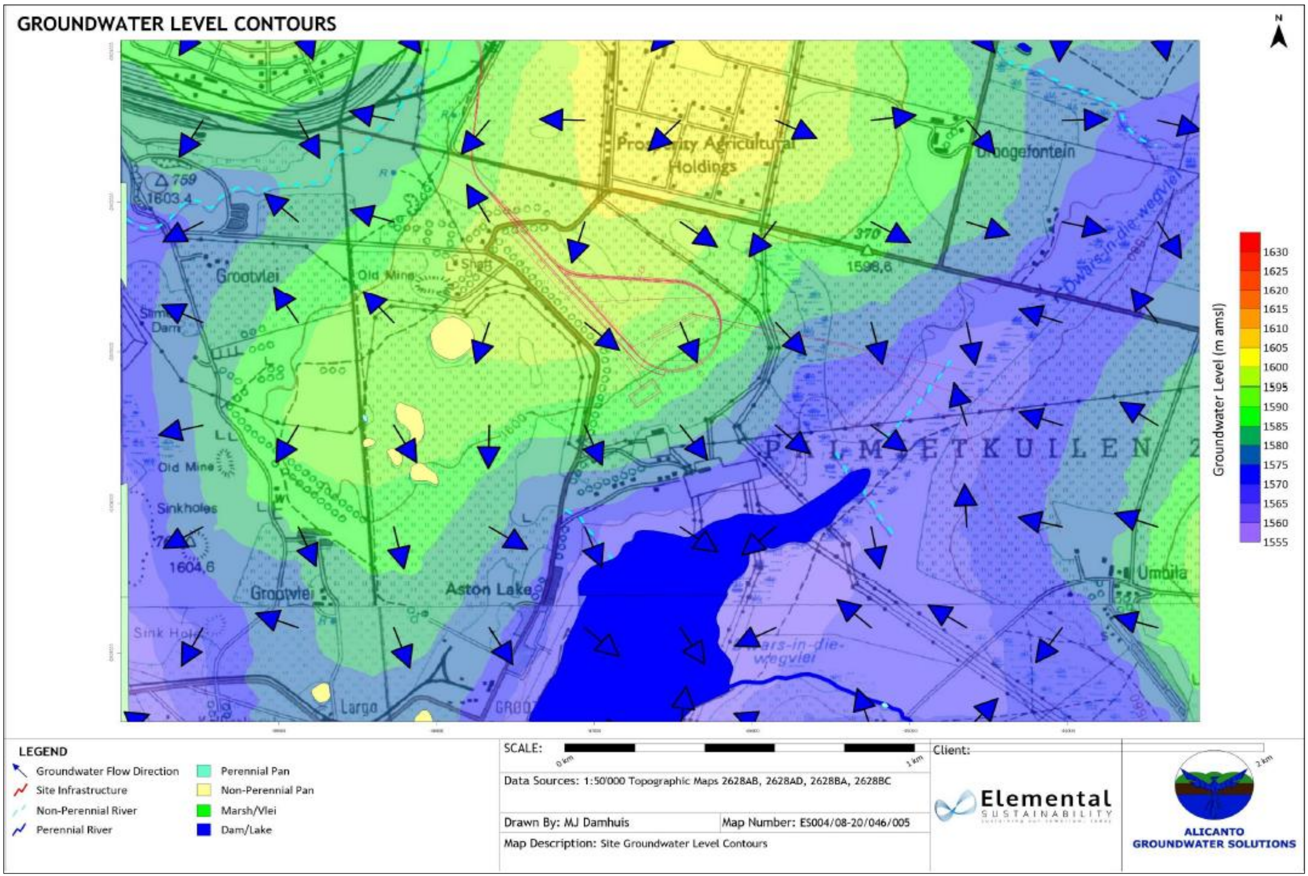


Figure 16: Regional Groundwater Level Contours

10.4.2 HYDROCENSUS

A hydrocensus was undertaken by Digby Wells in 2017. Refer to Figure 17. Alicanto undertook another hydrocensus in 2020 (Figure 18). Figure 19 shows the location of the 2017 and 2020 hydrocensus in terms of the proposed Welgedacht Balloon Siding project.

X-Coordinate (LO29, WGS84)	Y-Coordinate (LO29, WGS84)	BH ID	Water Level (m bgl)	Use
-43019.56	-2906022	BH3	1	Monitoring
-43419.93	-2902810	BH6	2.5	Monitoring
-43624.31	-2904428	Scbh1	5.12	Domestic used
-51411.48	-2900601	SLBH1	6.98	Not used
-41556.93	-2904200	BH5A	7.88	Monitoring
-44071.92	-2907355	SCHBH1	8.15	Drinking water
-44159.75	-2907377	SCHBH2	9.14	Drinking water
-48826.37	-2906873	PL53BH	12.33	Domestic used
-48562.95	-2906263	PL47BH	13.04	Not used
-48664.21	-2906695	PLBH1	13.7	Not used
-48364.74	-2906373	PL74BH2	15.25	Not used
-44204.04	-2904353	BH4	16.27	Monitoring
-46860.60	-2901880	PL42BH1	20.45	Domestic used
-46206.92	-2901922	PL57BH1	51.86	Not used
-45829.84	-2901456	PL50BH1	73.51	Drinking water
-46167.50	-2901767	PL55BH	Blocked	Not used
-48590.42	-2906396	PL74BH	Blocked	Not used
-43707.07	-2904772	SCBH2	Blocked	Not used
-43698.42	-2904672	SCBH3	Blocked	Not used
-43574.56	-2905259	SCBH4	Blocked	Not used
-49391.14	-2902322	JbBH1	Dry	Not used
-45903.47	-2901544	PL50BH2	Dry	Not used
-47378.45	-2904552	ALBH1	Equipped	Domestic used
-48950.53	-2906530	ELCOBH1	Equipped	Domestic used
-42588.52	-2908292	PL18BH1	Equipped	Domestic used
-42493.45	-2908347	PL18BH2	Equipped	Domestic used
-45870.75	-2901755	PL56BH	Equipped	Drinking water
-48321.99	-2906317	PL69BH	Equipped	Domestic used
-46314.77	-2901103	PL7BH	Equipped	Domestic used
-48243.34	-2906782	PLBH2	Equipped	Domestic used
-42175.38	-2903892	SCBH5	Equipped	Domestic used
-48230.36	-2907048	WNBH1	Equipped	Drinking water

Figure 17: Digby Wells Hydrocensus Summary (2017)

X-Coordinate (LO29, WGS 84)	Y-Coordinate (LO29, WGS 84)	BH ID	Borehole Depth (m)	Collar Height (m)	Static Water Level (m bc)	Static Water Level (m bgl)	Owner		Comments
-48664.2	-2906695	PLBH1	-	-	-	-	-	-	Borehole Destroyed (according to Owner)
-48610.4	-2906642	DDBH01	-	0	Not Accessible		James van Heerden	082 926 7806	Not in Use
-48511.6	-2906744	BKBH01	-	-	Not Accessible		Ryrie Ronny		Not in Use
-48478.3	-2906802	BKBH02	-	-	Not Accessible		Ryrie Ronny		Not in Use
-48243.3	-2906782	PLBH2	-	-	Not Accessible				Borehole visible from street
-48327.4	-2906711	WSBH01	18	-	Not Accessible		Graham Winn	082 555 1840 winstead@mweb.co.za	Domestic & Horse Watering; Sampled at Tap
-48947.4	-2906525	ECBH01	48	-	Not Accessible		Giovanni Da Brigo	082 365 3892	Domestic Use for multiple properties
-48250.2	-2906210	PLBH01	54		Not Accessible		Doep Duplooy	082 800 8400	Domestic Use
-48292.9	-2906111	PLBH02	-		Not Accessible		Doep Duplooy	082 800 8400	Domestic Use
-48378.8	-2906364	TRBH01			Not Accessible				Domestic Use
-44157.6	-2907382	SCHBH1		0.3	24.04	23.74	Bongane Primary School		Domestic Use and Irrigation
-44063.3	-2907355	SCHBH2			Not Accessible		Bongane Primary School		Domestic Use and Irrigation
-43624.3	-2904428	SCBH01	Destroyed				Schoeman Boerdery - Andries	079 873 6673	Rocks in Borehole
-43707.1	-2904772	SCBH02	Destroyed				Schoeman Boerdery - Andries	079 873 6673	Rocks in Borehole
-43698.4	-2904672	SCBH03	Destroyed				Schoeman Boerdery - Andries	079 873 6673	Rocks in Borehole
-43574.6	-2905259	SCBH04	Destroyed				Schoeman Boerdery - Andries	079 873 6673	Rocks in Borehole
-42175.4	-2903892	SCBH05			Not Accessible		Schoeman Boerdery - Andries	079 873 6673	Domestic Use, Sampled at Tap
-45870.7	-2901755	PL56BH			Not Accessible				
-45899.9	-2901572	PL50BH1	~200	0.2	>80 m		Richard Wilson	071 993 5300	Not in Use
-45877.1	-2901559	PL50BH2	~150	0.3	49.17	48.87		ravenmetalworx@gmail.com	Not in Use
-45788.1	-2901378	PL50BH3	~150		Not Accessible - Bees				Domestic Use, Sampled at Tap
-49065.8	-2906296	Borehole on property used for domestic supply. AGS denied access or information regarding the borehole.							

Figure 18: October 2020 Hydrocensus Results

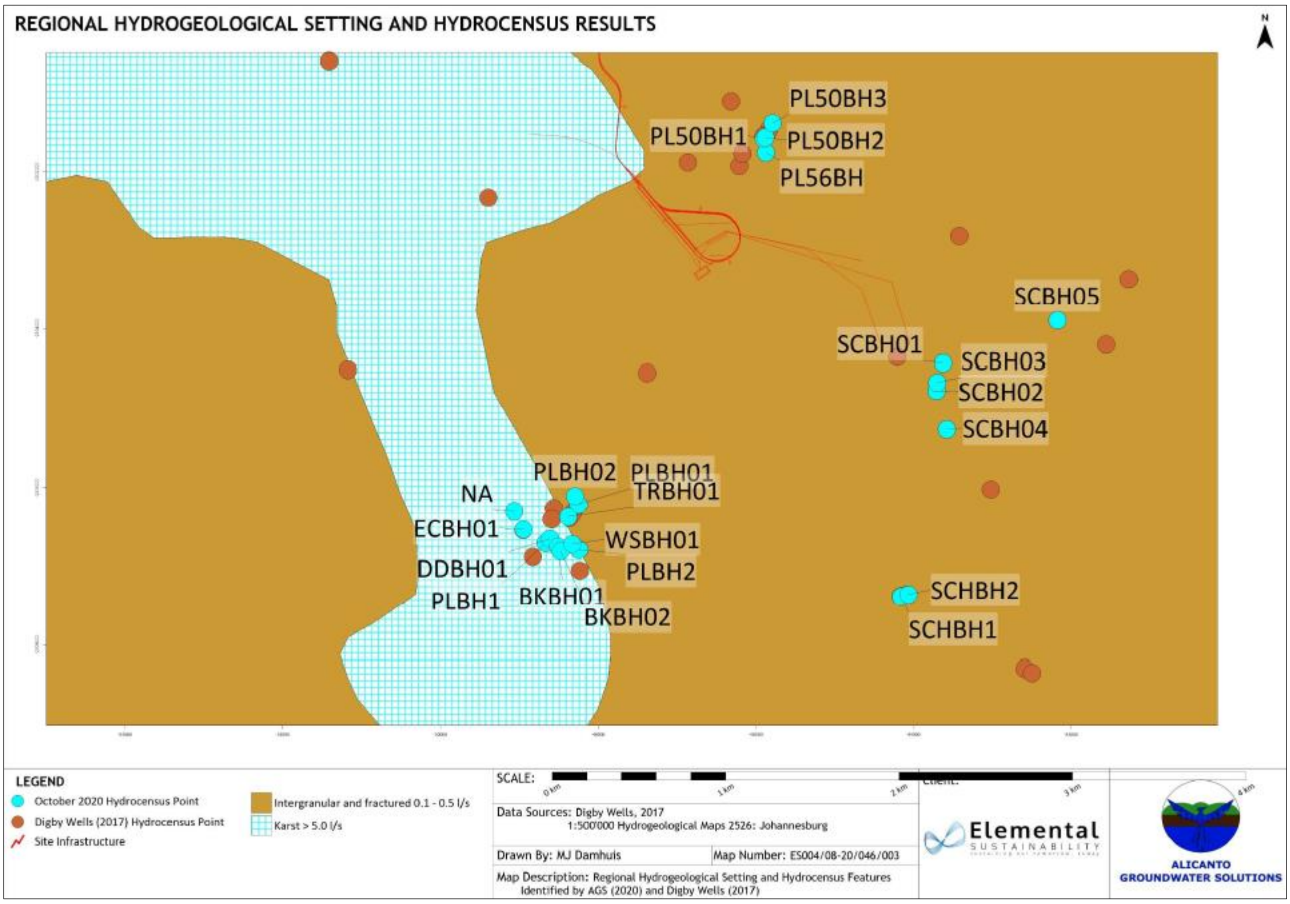


Figure 19: Hydrocensus 2017 and 2020

10.4.2.1 GROUNDWATER QUALITY

During the October 2020 hydrocensus investigation a total of three (3) groundwater samples were collected from boreholes within the site locality and submitted to SANAS-accredited Aquatico Laboratories for analysis. The water quality results were compared with the SANS 241:2015 limits for drinking water quality and the following observations made:

- The groundwater quality was generally good, and most parameters were compliant with the SANS 241:2015 limits;
- Turbidity exceeded the operational limit at borehole PL50BH3;
- Nitrate as N exceeded the acute health limit at borehole PL50BH3, which may be caused by nearby agricultural activities;
- EC values at borehole WS BH01 were equal to the aesthetic limit; and
- E.Coli at borehole WS BH01 slightly exceeded the acute health limit.

Boreholes PL50BH3 and SCBH05 were sampled by Digby Wells in 2017 and Alicanto during the October 2020 hydrocensus investigations, therefore, allowing for the results to be compared. In general, the results did not change significantly, except for iron, manganese, ammonia and fluoride which all decreased to below detection limit. Refer to **Table 19** below for the results.

Table 7: Digby Wells (2017) Hydrocensus Groundwater Quality Results

Parameter	SANS 241:2015 Limits				Sample ID									
	Aesthetic	Operational	Chronic health	Acute heath	SCHBH1	SCBH05	SCCBH1	ALBH01	VLBH2	WNBH1	PL18BH2	PL42BH	PL50BH	SCBH01
Total Dissolved Solids	1200	NS	NS	NS	245	207	345	282	380	1446	104	273	338	236
Nitrate (NO3) as N (mg/l)	NS	NS	NS	11	5.68	2.09	11.8	2.41	4.82	21.8	1.07	10.4	1.06	24.3
Chloride as Cl (mg/l)	NS	NS	300	NS	10.8	18.8	23.1	22.2	40.5	327	9.49	12.2	30.4	22.3
Total Alkalinity (mgCaCO3/l)	NS	NS	NS	NS	180	138	196	171	225	227	73.8	185	228	29.7
Sulphate as SO4 (mg/l)	250	NS	NS	500	9.37	13.4	28.5	40.3	38.9	425	4.25	3.3	32	21.3
Calcium as Ca (mg/l)	NS	NS	NS	NS	46.1	31.4	64.3	47.6	59.8	195	21.7	52.1	31.7	24.9
Magnesium as Mg (mg/l)	NS	NS	NS	NS	21.7	14.7	24.7	22.4	25	102	6.75	24.5	19.2	16.9
Sodium as Na (mg/l)	200	NS	NS	NS	15.7	22.6	24.7	25.6	54.9	153	9.15	11.4	75.8	18.5
Potassium as K (mg/l)	NS	NS	NS	NS	5.83	12.5	7.63	8.03	1.99	9.5	2.47	9.81	4.24	6.53
Iron as Fe (mg/l)	0.3	NS	2	NS	0	0.02	0	0	0	0	0	0	0	0
Manganese as Mn (mg/l)	0.1	NS	0.4	NS	0	0	0	0	0	0	0	0	0	0
Electrical Conductivity (mS/m)	170	NS	NS	NS	33.7	27.2	46.2	39.2	51.9	213	15.7	38.8	47.2	29.6
pH	NS	5-9.7	NS	NS	8.67	8.37	8.73	8.73	8.67	8.46	8.46	8.69	8.78	8.12
Aluminium as Al (mg/l)	NS	0.3	NS	NS	0	0	0	0	0	0	0	0	0	0
Ammonia as N (mg/l)	6.6	NS	NS	NS	0.15	0.07	0.12	0.19	0.26	0.19	0.29	0.1	0.21	0.13
Fluoride as F (mg/l)	NS	NS	1.5	NS	BDL	0.27	BDL	BDL	0.33	0.52	BDL	BDL	0.35	BDL

BDL - Below Detection Limit

NS - No Standard Defined

Yellow indicates exceedance of SANS 241:2015 Aesthetic Limit

Orange indicates exceedance of SANS 241:2015 Operational Limit

Purple indicates exceedance of SANS 241:2015 Chronic Health Limit

Red indicates exceedance of SANS 241:2015 Acute Health Limit

Table 18: October 2020 Hydrocensus Groundwater Quality Results

Parameter	SANS 241:2015 Limits				Sample ID		
	Aesthetic	Operational	Chronic health	Acute heath	PL5OBH3	WS BH01	SCBH05
pH	NS	5-9.7	NS	NS	7.79	7.46	7.04
Turbidity (NTU)	5	1	NS	NS	3.97	0.492	0.369
Electrical Conductivity (mS/m)	170	NS	NS	NS	52.4	170	31.4
Total Dissolved Solids (mg/l)	1200	NS	NS	NS	380	978	245
Total Alkalinity (mg CaCO3/l)	NS	NS	NS	NS	206	255	131
Total Hardness (mg CaCO3/l)	NS	NS	NS	NS	151	651	117
Bicarbonate Alkalinity (mg CaCO3/l)	NS	NS	NS	NS	205	254	131
Chloride as Cl (mg/l)	300	NS	NS	NS	24.4	250	11.8
Sulphate as SO4 (mg/l)	250	NS	NS	500	24.6	192	7.82
Nitrate (NO3) as N (mg/l)	NS	NS	NS	11	15.7	0.543	1.31
Nitrite (NO2) as N (mg/l)	NS	NS	NS	0.9	BDL	BDL	BDL
Ammonium (NH4) as N (mg/l)	NS	NS	NS	NS	0.009	0.008	0.012
Ammonia (NH3) as N (mg/l)	NS	NS	1.5	NS	BDL	BDL	BDL
Fluoride as F (mg/l)	NS	NS	1.5	NS	BDL	BDL	BDL
Calcium as Ca (mg/l)	NS	NS	NS	NS	30.4	140	27.1
Magnesium as Mg (mg/l)	NS	NS	NS	NS	18.1	72.9	12
Sodium as Na (mg/l)	200	NS	NS	NS	62.9	105	16.5
Potassium as K (mg/l)	NS	NS	NS	NS	4.02	6.68	9.06
Iron as Fe (mg/l)	0.3	NS	2	NS	BDL	BDL	BDL
Manganese as Mn (mg/l)	0.1	NS	0.4	NS	BDL	BDL	BDL
E.Coli (CFU/100 ml)	NS	NS	NS	BDL	BDL	2	BDL
Total Coliforms (CFU/100 ml)	NS	10	NS	NS	BDL	2	8

BDL - Below Detection Limit

NS - No Standard Defined

Yellow indicates exceedance of SANS 241:2015 Aesthetic Limit

Orange indicates exceedance of SANS 241:2015 Operational Limit

Purple indicates exceedance of SANS 241:2015 Chronic Health Limit

Red indicates exceedance of SANS 241:2015 Acute Health Limit

Table 8: Comparison of Selected Groundwater Quality Results (Digby Wells (2017) versus October (2020)

Parameter	PL50BH		SCBH05	
	2018	2020	2018	2020
Total Dissolved Solids	338	380	207	245
Nitrate (NO3) as N (mg/l)	1.06	15.7	2.09	1.31
Chloride as Cl (mg/l)	30.4	24.4	18.8	11.8
Total Alkalinity (mgCaCO3/l)	228	206	138	131
Sulphate as SO4 (mg/l)	32	24.6	13.4	7.82
Calcium as Ca (mg/l)	31.7	30.4	31.4	27.1
Magnesium as Mg (mg/l)	19.2	18.1	14.7	12
Sodium as Na (mg/l)	75.8	62.9	22.6	16.5
Potassium as K (mg/l)	4.24	4.02	12.5	9.06
Iron as Fe (mg/l)	0	BDL	0.02	BDL
Manganese as Mn (mg/l)	0	BDL	0	BDL
Electrical Conductivity (mS/m)	47.2	52.4	27.2	31.4
pH	8.78	7.79	8.37	7.04
Ammonia as N (mg/l)	0.21	BDL	0.07	BDL
Fluoride as F (mg/l)	0.35	BDL	0.27	BDL

10.4.3 HYDROGEOLOGICAL CONCEPTUAL MODEL

According to Hodgson & Krantz (1998) three distinct hydrogeological units are present within the Karoo coalfields, namely:

- An upper, weathered hydrogeological unit;
- A fractured, Ecca sediments hydrogeological unit; and
- A deeper, fractured basement hydrogeological unit.

The upper, weathered hydrogeological unit is typically found between 5 and 12 m depths, with the dominant recharge mechanism being infiltration of rainwater (1-5% of MAP) (AGS, 2019). Groundwater movement in the upper, weathered hydrogeological unit is controlled by the less permeable shale found at depth, as well as outcropping intrusions, paleo-topographic highs or streams/rivers where topography cuts through the water table.

The fractured Ecca hydrogeological unit is found at depths ranging between 20 and 45 m with the frequency of successful water strike intersection decreasing with depth. The matrix of the Ecca geology is well-cemented, thus lowering groundwater potential in the matrix and leading to almost all economic water strikes being associated with secondary geological features such as faults, fracture zones and intrusive contact zones. Digby Wells (2017) determined the average hydraulic conductivity and transmissivity for the fractured Ecca unit to be ~0.04 m/day and 2.44 m^2/day, respectively, based on slug testing conducted on boreholes installed at the nearby Palmietkuilen site. The dominant recharge mechanism for the fractured rock unit would be from rainfall and release of groundwater from the upper weathered unit, with recharge values expected to vary between 1 and 4% of MAP.

The basement hydrogeological unit is generally regarded as insignificant (AGS, 2019) due to its low yielding nature, great depth (>100 m) and limited recharge potential due to the overlying Dwyka tillite units. According to GPT (2018) water quality of the basement aquifer is poor due to fluoride associated with the granitic rocks. Aquifer testing at basement rock units showed transmissivity values to be ~0.01 m2/day up to 0.2 m^2/day.

The karst hydrogeological unit situated west and at the northern Site extent is not expected to interact with the proposed Site activities and was thus noted, but not analysed in great detail for this project. According to the 1:500 000 hydrogeological map series 2526 Johannesburg (Barnard,1999) and data obtained from the NGA (DWS, 2020) the average borehole yield of the karst system west of the Site is over 5 l/s. Figure 20 shows the conceptual hydrogeological section for the proposed Welgedacht Balloon Siding project area.

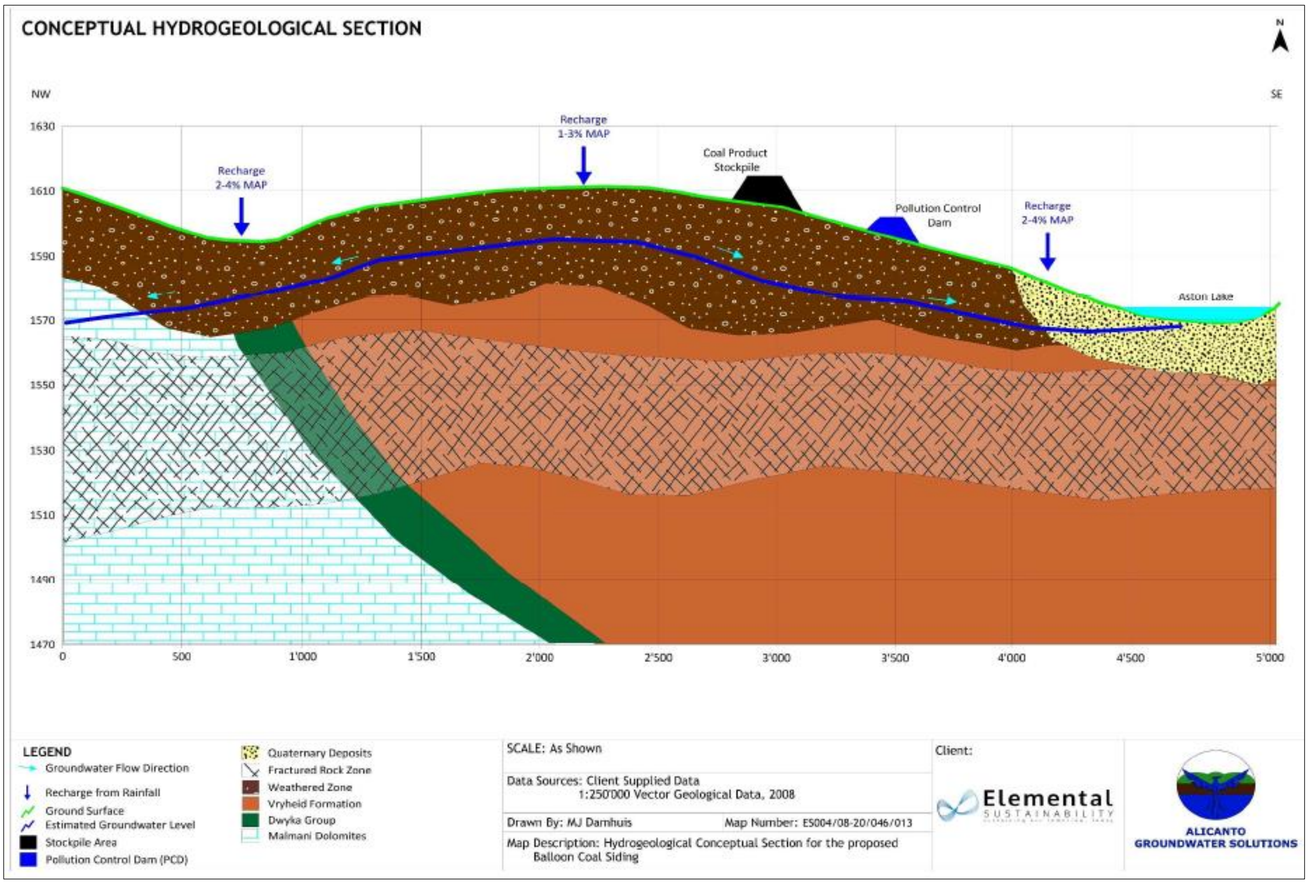


Figure 20: Conceptual Hydrogeological Model

10.4.5 AQUIFER CHARACTERISATION

10.4.5.1 AQUIFER VULNERABILITY ASSESSMENT

The Site aquifer vulnerability was determined using the DRASTI method where aquifer vulnerability is based on a number of factors, namely:

- Depth to Groundwater (D) – providing an indication of the distance and time contaminants would need to travel through the unsaturated zone to the groundwater table;
- Recharge (R) – which aids in the mobilisation of surface contaminants to the groundwater table;
- Aquifer Material (A) – the nature of the geological units which are water-bearing (e.g. fractured, porous etc.);
- Soil (S) – soil type(s) present at the Site, which may influence the travel time and concentration of contaminants reaching the groundwater table;
- Topography (T) – which provides an indication of the amount of runoff versus infiltration of surface contaminants; and
- Impact of the vadose zone (I) – the material found in the unsaturated zone which may slow the infiltration of contaminants.

An aquifer vulnerability map was constructed for the Site (Figure 21), with the Site aquifers being of a low vulnerability and high vulnerability zones noted at the Blesbokspruit area west of the Site and the area to the south of the Site near to Aston Lake was noted to be medium to high vulnerability.

10.5.5.2 AQUIFER CLASSIFICATION

Based on the results of the hydrocensus results the Site aquifer is a 'Major Aquifer System', due to the majority of the local population engaged during the hydrocensus investigation being dependent on groundwater. Aquifer system management and second variable classifications ratings were assigned according to the criteria listed in Table 9 and groundwater quality management classification system ratings as per Table 10 in order to determine the groundwater quality management (GQM) index.

The GQM index was calculated using the equation below, with the calculated level of protection being 4 (i.e. medium level of protection according to Table 11).

Equation 1: GQM Index

$GQM\ Index = Aquifer\ System\ Management \times Aquifer\ Vulnerability = 4 \times 1 = 4$

Table 9: Aquifer System Management and Second Variable Classification Ratings

Aquifer System Management Classification		
Class	**Points**	**Site Points**
Sole Source Aquifer System	6	4
Major Aquifer System	4	
Minor Aquifer System	2	
Non-Aquifer System	0	
Special Aquifer System	0-6	
Second Variable Classification (weathering/fracturing)		
Class	**Points**	**Site Points**
High	3	2
Medium	2	
Low	1	

Table 10: Groundwater Quality Management Classification System Ratings

Aquifer System Management Classification		
Class	**Points**	**Site Points**
Sole Source Aquifer System	6	4
Major Aquifer System	4	
Minor Aquifer System	2	
Non-Aquifer System	0	
Special Aquifer System	0-6	

Aquifer Vulnerability Classfication		
Class	**Points**	**Site Points**
High	3	1
Medium	2	
Low	1	

Table 11: GQM Index for the Site

GQM Index	Level of Protection	Site GQM Index
<1	Limited	4
1-3	Low Level	
3-6	Medium Level	
6-10	High Level	
>10	Strictly Non-Degradation	

10.5.5.3 GROUNDWATER RECHARGE

The groundwater recharge at the Site was determined to vary between 1.5 and 7.1% of MAP, as summarised in Table 12, with the representative recharge to groundwater being determined as 3%.

Table 12: Recharge Calculations

Method	Mm/a	%MAP	Certainty (Very High = 5; Low = 1)
Chloride	33	4%	4
Soil Map	47.7	7.1%	3
Geology Map	33.7	5.0%	3
Vegter Map	32	4.7%	3
Acryu Map	10	1.5%	2
Harvest Potential Map	25	3.7%	3

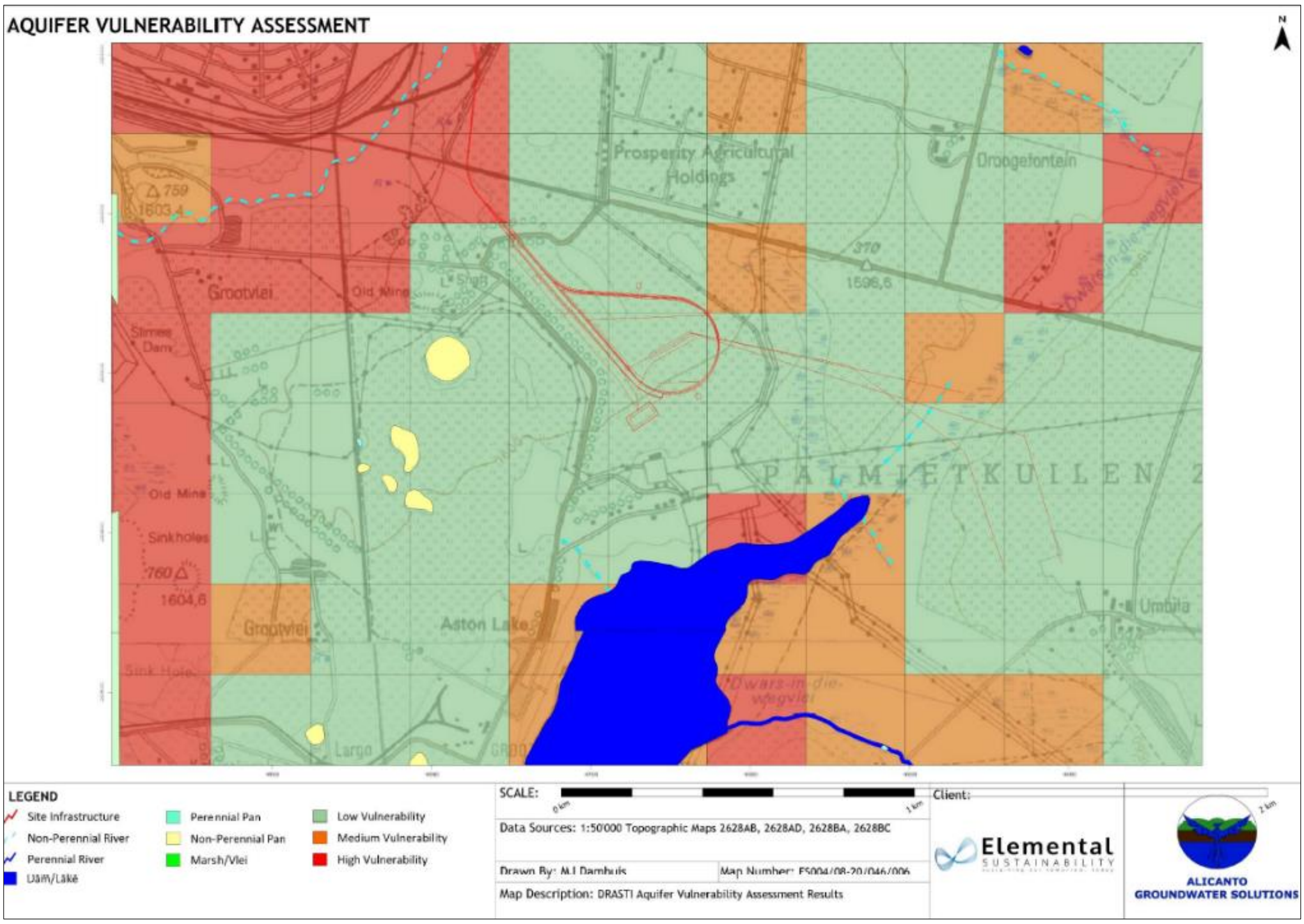


Figure 21: Aquifer Vulnerability

10.4.6 NUMERICAL MODELLING

A numerical groundwater flow and contaminant transport model was constructed for the Site using Processing MODFLOW for Windows (PMWIN), which is a pre- and post-processing program for MODFLOW. MODFLOW is a widely used finite difference modelling code developed by the USGS and will be suitable for modelling the site and site conditions.

The objective of the numerical model was to simulate the potential impacts of the proposed railway siding on the receiving groundwater environment (if any). The methodology for the numerical modelling was adapted from the "Standard guide for application of a groundwater flow model to a site-specific problem" (ASTM, 2010) where the processes often overlap which allows for modelling to be an iterative process aimed at meeting the project objectives.

The following processes, in sequential order, were included within the numerical modelling task:

- Model Construction;
- Model Calibration;
- Sensitivity Analysis;
- Model Verification; and
- Predictive Modelling.

The numerical model and modelling results are discussed in Section 14.5.1.

10.5 HYDROPEDOLOGY

A wetland flow driver assessment study was conducted by Geo Pollution Technologies (Pty) Ltd. A site visit was undertaken on 25 and 26 March 2022. A copy of the report is included in Appendix 9.

10.5.1 Identification of Dominant Hillslopes

Based on observations during the site assessment, soils vary in the catena on the proposed Welgedacht Balloon Siding development, thus affecting the soil water regime through the soil profile. There are variances in the soil types between the pan wetland complex and the seeps and valley bottom wetland complexes.

The identified hillslopes seeps within the proposed development are comprised of Kroonstad/Longlands soil forms. Kroonstad is Orthic A over E-horizon underlined by a G-horizon. Whereas Longlands is Orthic A over E-horizon underlined by soft plinthic B-horizon that are characterised by inherently poor internal drainage due to the underlying G-horizon and soft plinthite layer encountered at relatively shallow depth, thus creating interflow occurring in the E-horizon. The E-horizon has sand and silt, having lost most of its minerals and clay as water moves through the soil.

The valley bottoms are characterised by Rensburg/Arcadia soil forms, which comprises of a Vertic topsoil underlined by a well-defined G-Horizon/unspecified material (high clay content), resulting in impeded drainage within the soil profile. During the site assessment, the channelled valley bottom was dry with large cracks on the surface (Vertic topsoil). These soils consist of 2:1 montmorillonite clay which have shrink-swell properties, hence deep cracks on the surface during dry conditions.

10.5.2 SURFACE RUNOFF

Drainage from the siding is expected towards the Aston lakes in the southeast at an average slope of 1 to 2% as shown in Figure 22 and Figure 23 below. A GoldSim daily time step catchment model was used to simulate the daily runoff for the wetland catchment. Overbank flows would occur as a result of short duration intense flow events. An SCS dimensionless hydrograph was used to calculate the typical relationship between average storm flow and peak storm flow. The calculations showed that for larger storms (>2-year recurrence interval), the average daily flow is 26% of the peak flow.

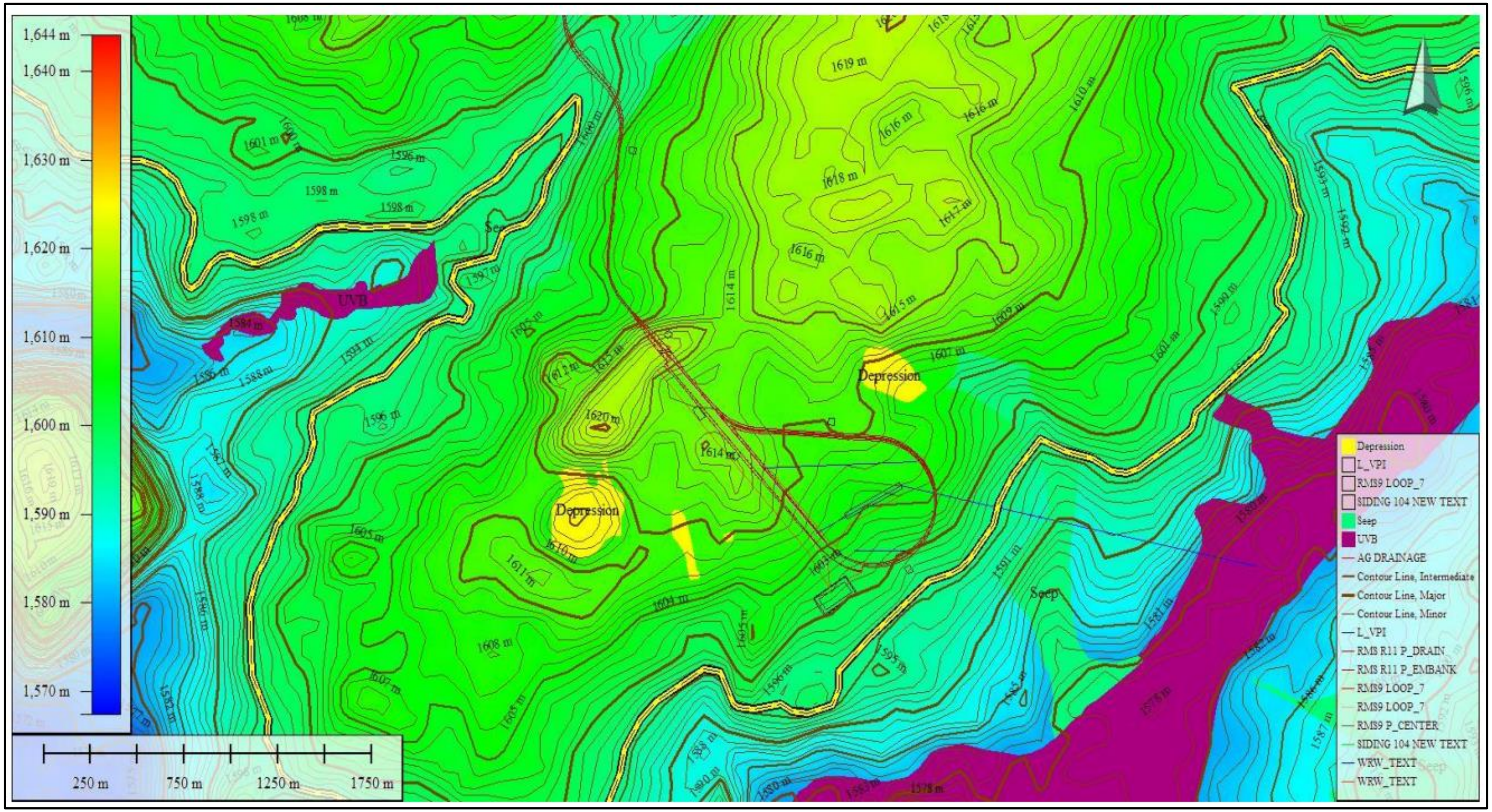


Figure 22: Site drainage and topography

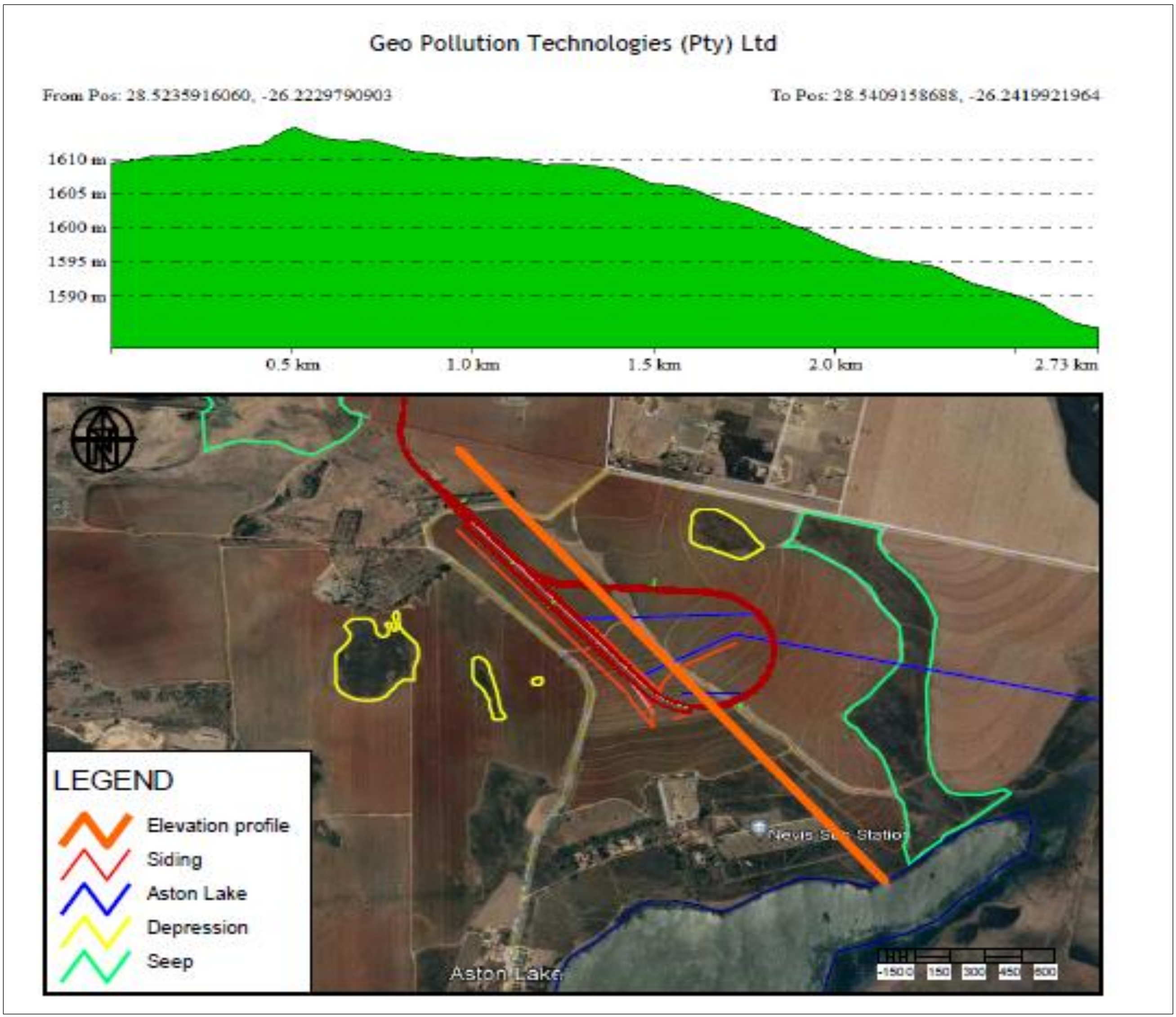


Figure 23: Elevation Profile

10.5.3 CONCEPTULIZE HILLSLOPE HYDROPEDOLOGICAL RESPONSES

Auger holes were drilled to delineate the soils. Bucket augers were done at selected points within the site boundary. No groundwater was encountered during the auger hole drillings. However, the risk for an elevated groundwater condition is considered to be high during high rainfall seasons. The subsurface soil profile comprises sandy to gravelly fill, alluvial, colluvial, residual material and weathered sandstone rock. In Figure 24an attempt to delineate the soils hydro-pedologically was made. Based on the site visit and available information the siding is situated on recharge soils or in other words no impacts on the wetlands in terms of flow is foreseen as depicted in Table 13.

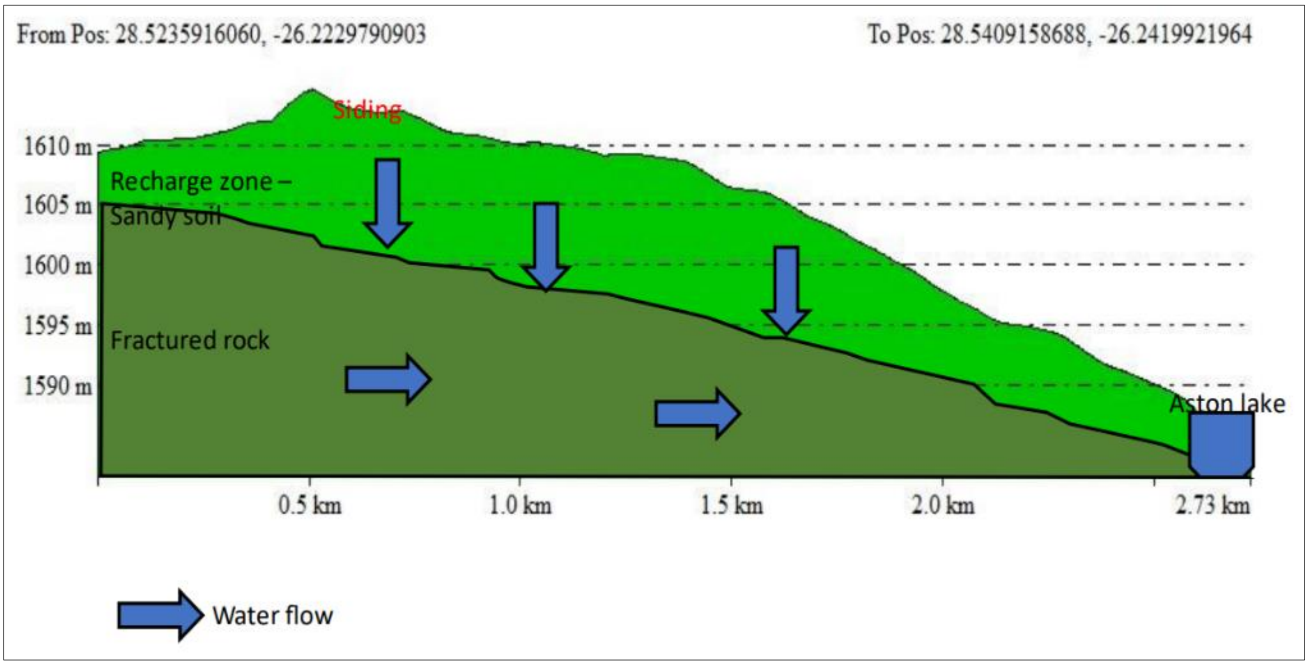


Figure 24: Conceptual understanding of current flow below the siding towards Aston Lake

Table 13: Soil Description

Area	**Number of Auger Holes**	**Depth of Refusal (m)**	**Soil Description**			**Groundwater intersected**	**Hydropedological Description**	
Within wetlands	5	0.5 – 1.5 m	Sandy-clay soil	Arcadia Katspruit and Wesleigh	High expansible clay	No - Wet clays	Responsive soils	These soils respond quickly to rain events and are responsible for overland flow generation during typical rain events.
Outside wetland	5	0.5 to 1.5	Sandy soil	Hutton and Clovelly	Well drained	No	Recharge soils	In these soils, vertical flow into, through and out of the profile into the underlying bedrock is the dominant flow direction.

10.5.4 QUANTIFICATION OF HYDRAULIC PROPERTIES AND FLOWRATES

Quantification of hydraulic properties was done through the following:

1. In situ field infiltration tests;
2. Sieve analysis;

10.5.4.1 IN SITU INFILTRATION TESTS

In situ infiltration tests (falling head permeability test) to estimate the rate at which runoff will infiltrate, or pass through the soil profile were done as follows:

Step 1: Test hole with the following dimensions Depth 50 cm, Diameter 10 cm

Step 2: Determine soil texture through a ribbon test

Step 3: Fill the hole with water and measure time to drain the hole completely

Step 4: Calculate the infiltration rate using the following formula

$$k = \frac{2.3A}{F(t_2 - t_1)} \log \frac{h_1}{h_2}$$

A summary of the falling permeabilities is shown Figure 25. The following observations can be made regarding the permeabilities:

- AH1, AH4, AH5, AH9 and AH6 have permeabilities typical of sandy loam or recharge soils1.
- AH2, AH3 and AH8 to AH10-7 have permeabilities typical of clay and can be regarded as responsive soils.

Point Name	Coordinate		Soil texture	Infiltration rate
	X	Y	Description	cm/s
AH1	28.534857	-26.230647	Silty clay loam	7.75E-07
AH2	28.534802	-26.228183	Clay loam	8.33E-09
AH3	28.536168	-26.228991	Clay loam	6.15E-09
AH4	28.538434	-26.231376	Silty clay loam	8.16E-07
AH5	-26.232202	28.539626	Silty clay loam	7.23E-07
AH6	-26.23427	28.536808	Silty clay loam	6.75E-07
AH7	-26.236491	28.540078	Clay loam	1.09E-08
AH8	-26.236647	28.542742	Clay loam	1.11E-08
AH9	-26.232637	28.54359	Clay loam	7.20E-09
AH10	-26.228923	28.541074	Clay loam	1.09E-08

Figure 25: Auger hole positions and infiltration rates

10.3.5 QUANTIFICATION OF HYDROPEDOLOGICAL FLUXES

The siding could impact on the flow drivers of the wetland systems through interception systems such as drainage systems, berms, increased/decreased recharge and water quality changes. The following is observed from available data:

- As the siding is situated on recharge soils and no dewatering is expected there is limited risk of wetland flow driver impacting on the depressions west and northeast of the siding or seep wetland to the east.

10.3.5.1 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. Based on the SANBI Biodiveristy Series 22, the following to water systems is present on the proposed area:

- **Depressional pans** – Small (deflationary) depressions which are circular or oval in shape; usually found on the crest positions in the landscape. The topographic catchment area can usually be well-defined (i.e., a small catchment area following the surrounding watershed). Although often apparently endorheic (inward draining), many pans are "leaky" in the sense that they are hydrologically connected to adjacent valley bottoms through subsurface diffuse flow paths.
- **Seepage wetlands** – Seepage wetlands are the most common type of wetland (in number), but probably also the most overlooked. These wetlands can be located on the mid- and footslopes of hillsides; either as isolated systems or connected to downslope valley bottom wetlands. They may also occur fringing depressional pans. Seepages occur where springs are decanting into the soil profile near the surface, causing hydric conditions to develop; or where through flow in the soil profile is forced close to the surface due to impervious layers (such as plinthite layers; or where large outcrops of impervious rock force subsurface water to the surface).

10.3.5.2 ASSUMPTIONS

Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment. Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment.

The wetland's catchment determines the relative extent of different hydrological response types in the catchment and within specific hillslopes contained within the catchment. The impact on flow drivers of the wetland catchment is detailed below and is based on the following assumptions (*status quo*). A water balance2 on the wetland catchment is represented by:

- Rainfall 100% of flow input
- Evapotranspiration is 50 – 70% of rainfall (outflow)

- Runoff is 10% (outflow)3
- Groundwater recharge is 5% (outflow)
- 20 -30 % 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 Grootfontein mining area, based on the site visit historic activity 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, however it was deemed necessary to indicate the impact on the existing seepage wetland.

10.5.6 CURRENT FLOW DRIVERS

As mentioned earlier the siding is situated on recharge soils thus there are no wetland flow drivers that could be impacted on with the exception of run-off which could increase through hard surfacing transporting contaminated water to seep wetland and eventually Aston lake. Nonetheless current flow drivers of the seep wetland in the south east are shown in percentages in Figure 26 below. Note that the depressional pan is upgradient of the proposed and thus are unaffected by the development.

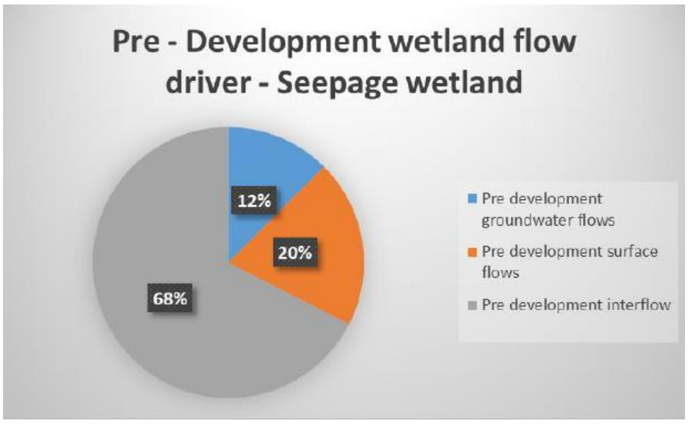


Figure 26: Wetland flow driver percent

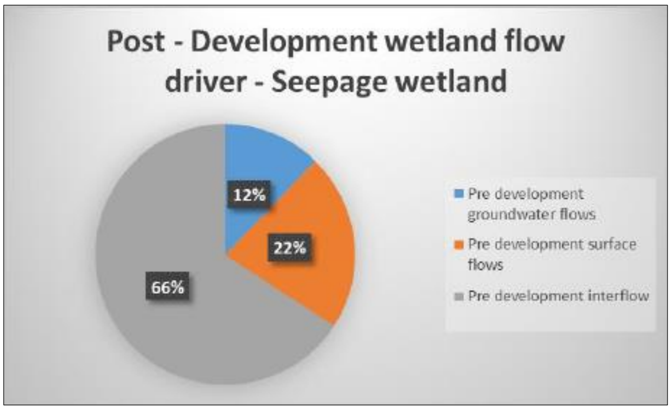


Figure 27: Wetland flow driver percentages pre and post development

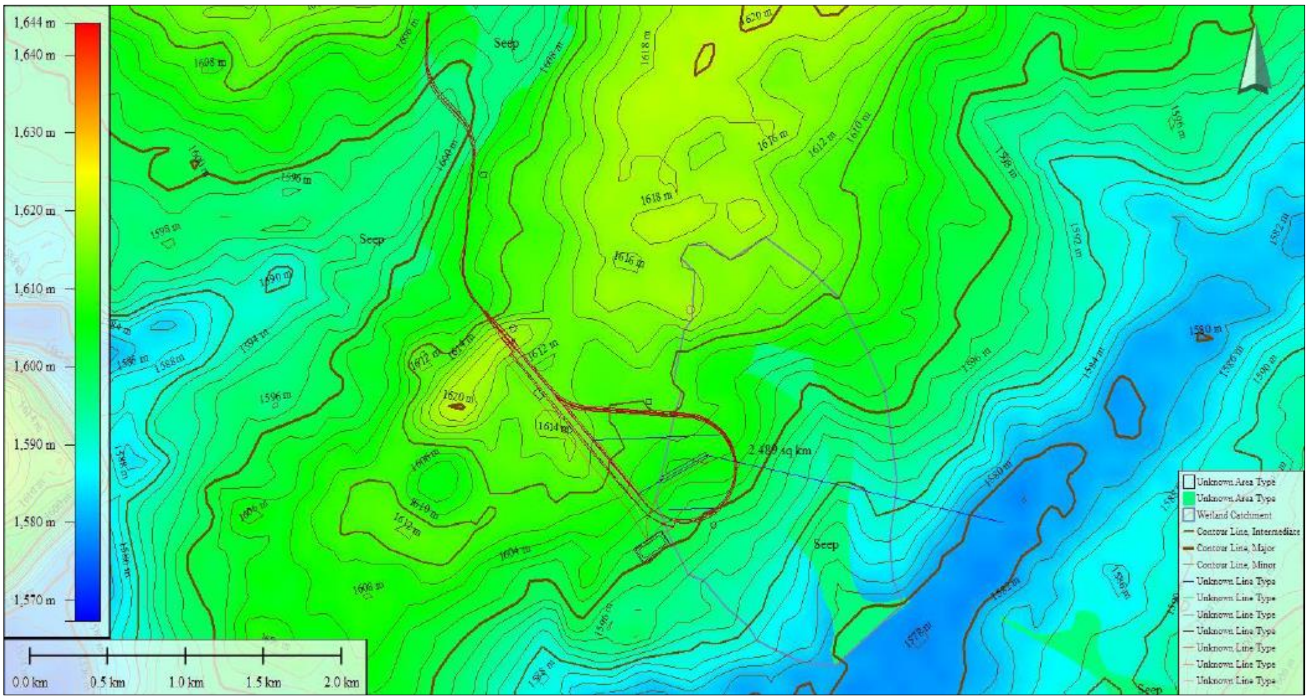


Figure 28: Seep wetland southeast of the proposed Welgedacht Balloon Siding

10.5.7 SUMMARY AND RECOMMENDATIONS

During the driiling of the auger holes no groundwater was encountered. However, the risk for an elevated groundwater condition is considered to be high during high rainfall seasons. The ground conditions identified within the site are inferred based on actual field test positions and are likely to variate. The subsurface soil profile comprises sandy loam outside the wetland areas to clay soil within the depressions and seep wetlands. As the siding is situated on recharge soils and no dewatering is expected there is limited risk of wetland flow driver impacting on the depressions west and northeast of the siding or seep wetland to the east. The water flow and quality in the seepage wetland system should be measured on a quarterly basis for the following variables: Flow (m^3/day) if any before the siding and after establishment, pH (pH units), TDS (mg/l), SO_4 (mg/l) and full metals by ICP-OES (mg/l). There should be diversion of clean surface water from upgradient of the siding catchment to the seep wetland in the south-east. Culverts must be installed where the railway crosses the wetland areas.

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 10 for a copy of the report.

10.6.1 METHODOLOGY

The study includes a desktop study which provided the majority of the baseline surface water, climate and water quality data for comparison. Supplementary, a site survey to sample and assess the condition of the watercourses and the associated riparian vegetation was conducted on site. This allows for the application of rating criteria to assess the impacts of the proposed project on the surface water system. Water samples were obtained upstream and downstream of the proposed project area during the site visit and submitted to a SANAS Accredited Laboratory. The results are provided in this Surface Water Assessment and all water samples are compared to the Resource Water Quality Objectives (RWQO) for the catchment and are noted as the water quality baseline for future sample comparison.

10.4.2 Water Quality

During the field survey upstream and downstream water samples were taken and analysed by a SANAS accredited laboratory. Samples are taken to provide baseline for water quality in order to assist in determining whether any future impacts to the water quality are as a result of the proposed project. The tables below provide details regarding the sampling points and the associated Resource Water Quality Objectives (RWQO) as stipulated in the Proposed Reserve Determination of Water Resources for the Vaal Catchment (DWS, December 2018), as well as the National Target Water Quality Range (TWQR) as stipulated in the South African Water Quality Guidelines, Vol. 7: Aquatic Ecosystems (Second Edition, 1996).

10.6.2 CATCHMENTS

The Welgedacht Balloom Siding falls within the Vaal Water Management Area (WMA), the Upper Vaal Sub-WMA. Major rivers in the Vaal WMA include the Wilge, Liebenbergsvlei, Mooi, Renoster, Vals, Sand, Vet, Harts, Molopo and Vaal. The catchment is 81 856 ha in size. The Upper Vaal Water Management Area (Sub-WMA) includes the following major rivers: the Wilge River, Liebenbergsvlei River, Mooi River and Vaal River, and covers the following Dams:

- Boskop Dam – Mooi River
- Grootdraai Dam – Vaal River
- Klerkskraal Dam – Mooi River
- Klipdrift Dam – Loop Spruit
- Potchefstroom Dam – Mooi River
- Saulspoort Dam – Liebenbergsvlei
- Sterkfontein Dam – Nuwejaar Spruit
- Vaal Dam – Vaal River

Tertiary drainage regions of the Upper Vaal include C11 to C13, C21 to C23, and C81 to C83. The project falls across two quaternary catchments (C21D and C21E). The proposed project site falls within the following tertiary, and quaternary catchments:

- C21 – Tertiary:
  - C21D – Quaternary, northern source of the Blesbokspruit and tributaries.
  - C21E – Quaternary, mid-section of the Blesbokspruit and tributaries

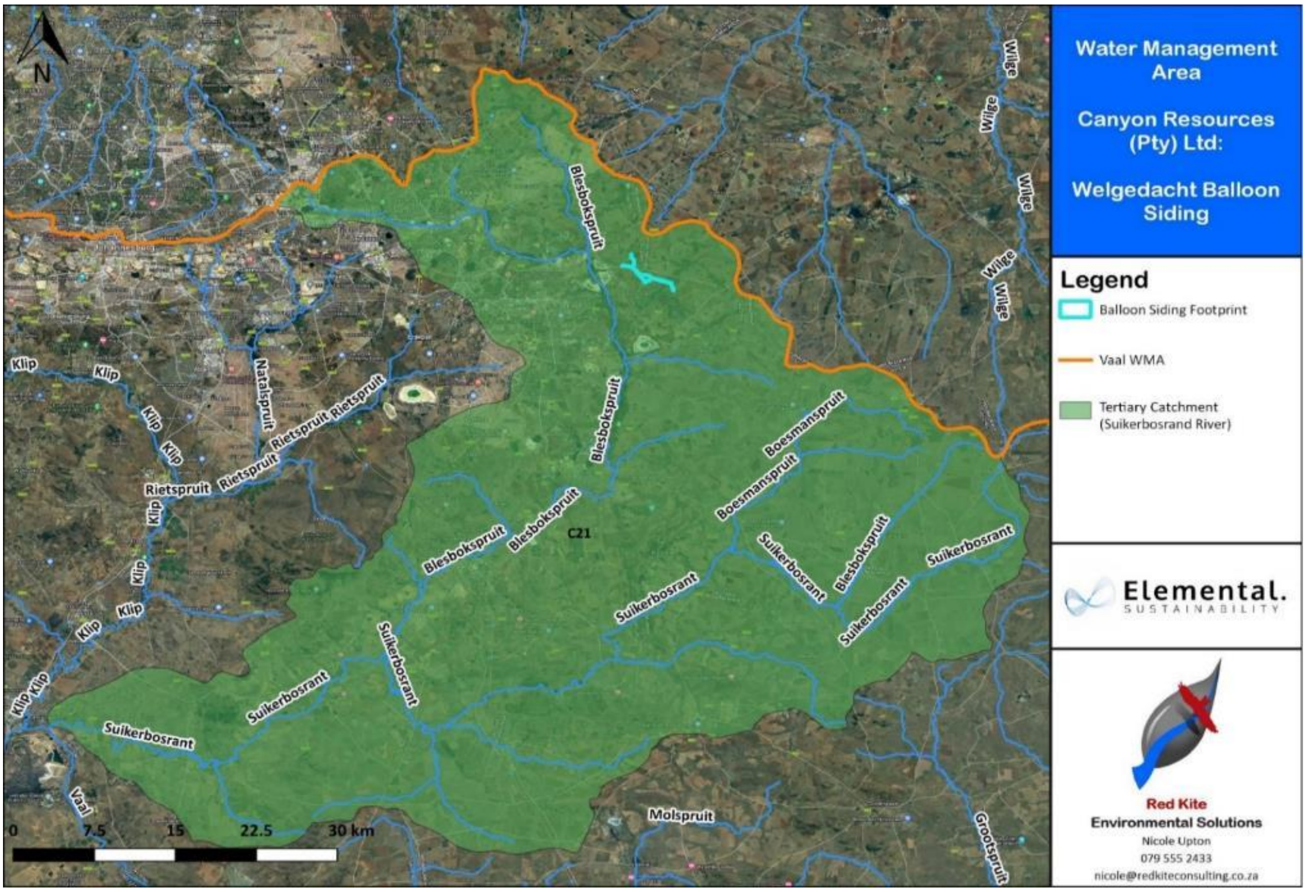


Figure 29: WMA and Tertiary Catchment

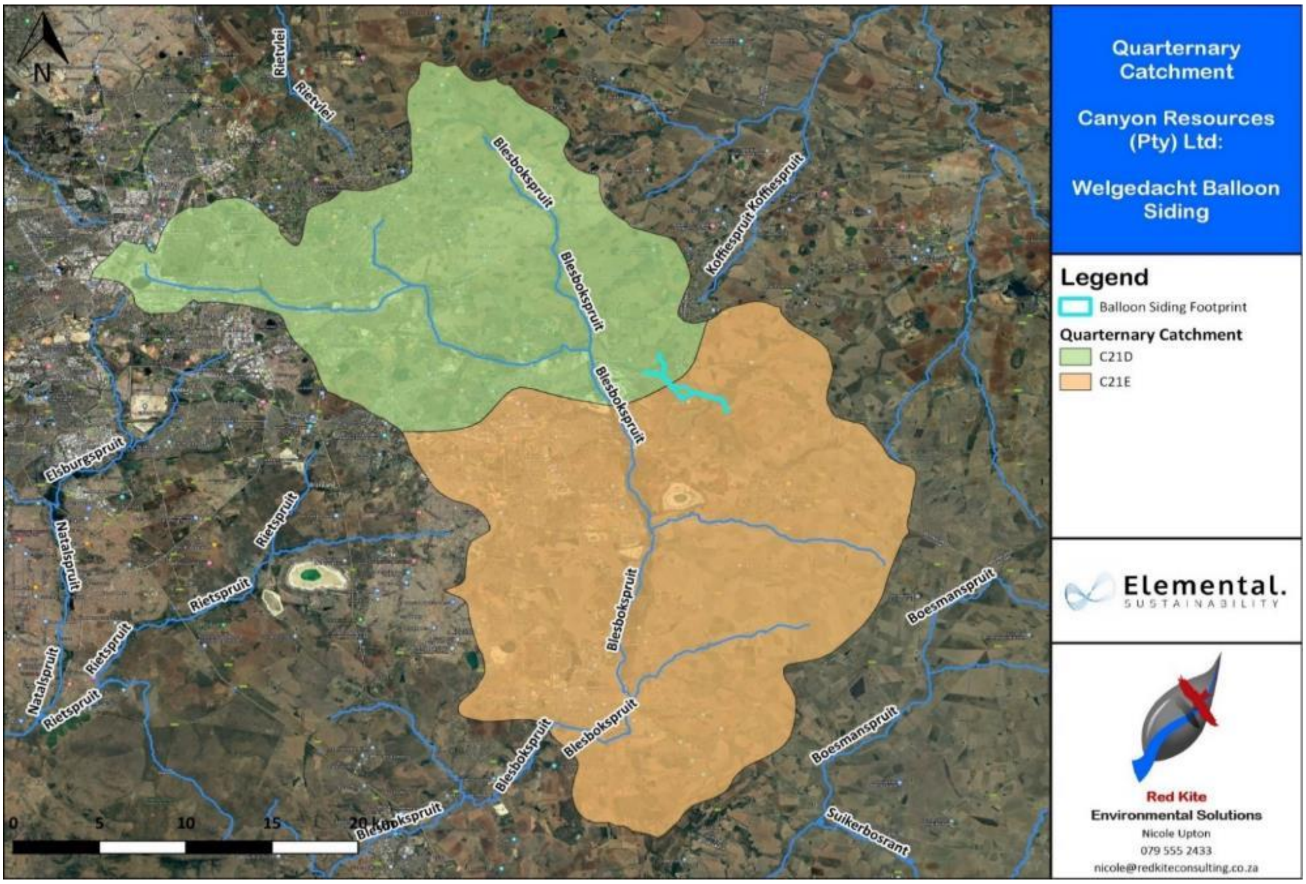


Figure 30: Quaternary Catchment

10.6.3 DRAINAGE SYSTEMS

The project footprint falls across two unnamed tributaries of the Blesbokspruit. The unnamed tributary crossing the north-western section of the project area drains to the south-west into the Blesbokspruit and is located in the C21D quaternary catchment. The unnamed tributary crossing the south-eastern section of the project area also drains to the south-west into the Blesbokspruit and is located in the C21E quaternary catchment.

The south-eastern tributary flows into the Aston Lake and is associated with a wetland zone. The north-western tributary is undefined and no channel was identified. A dam is located immediately upstream in this tributary which has limited water flow downstream of the dam. This tributary is associated with diffuse water flow, and is better described as a wetland, rather than a river or stream (refer to photograph below).

The Blesbokspruit continues south through Nigel before altering direction to the south-west. The Blesbokspruit converges with the Suikerbosrand River south-west of Heidelberg. The Suikerbosrand River continues west where it converges with the Vaal River at Three Rivers.

The watercourses draining the proposed project area are non-perennial have been significantly altered through the surrounding activities. Many smaller farm dams surround the project area, with Aston Lake to the south of the project area. Standing water is prominent within the non-perennial rivers during the wet season.

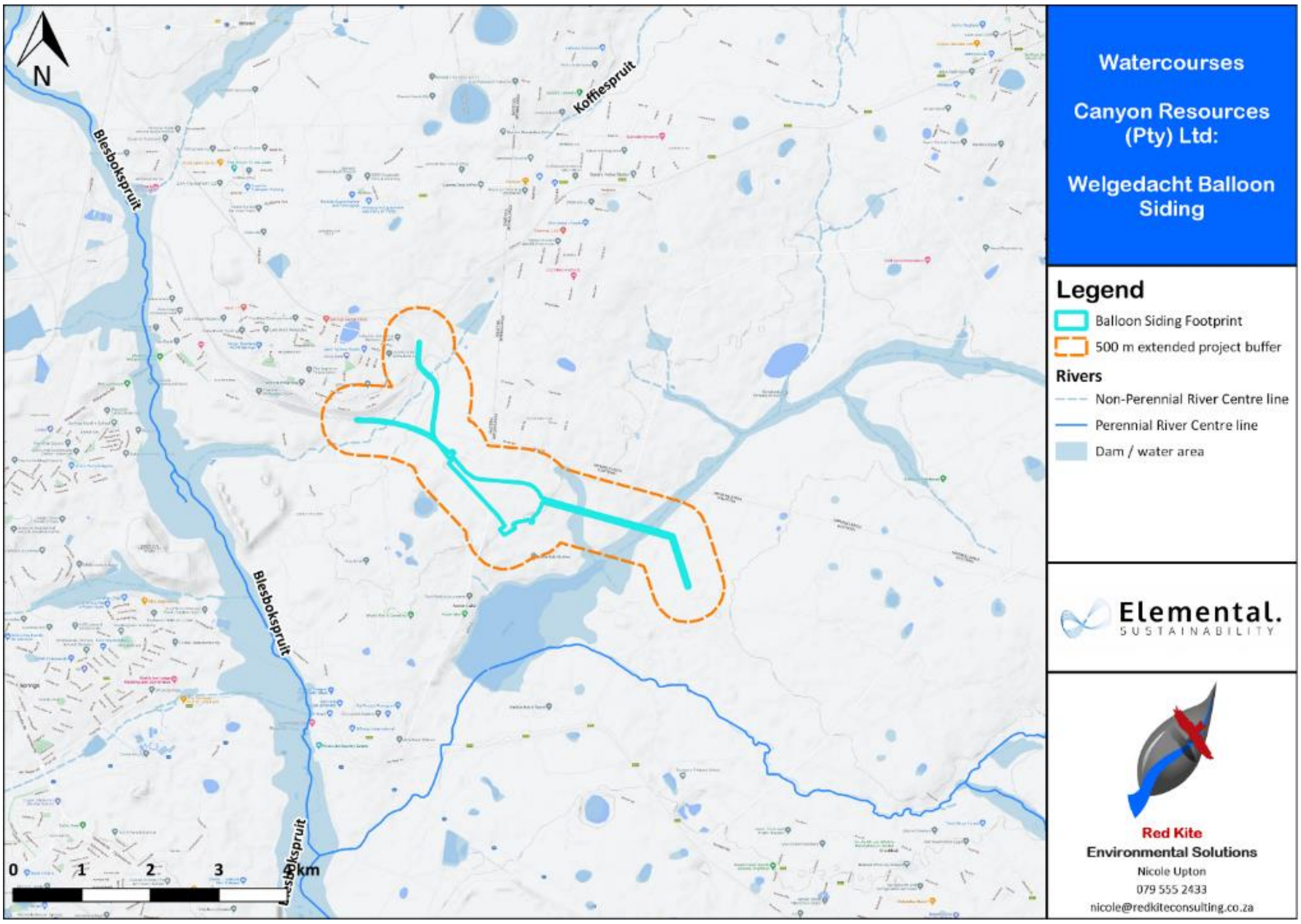


Figure 31: Surrounding watercourses

10.6.4 MEAN ANNUAL RUNOFF

The South African National Water Act adopted in 1998, is implemented by means of the National Water Resource Strategy. The NWRS provides the framework for the management of the water resources. Some of the protective measures are designated Resource Directed Measures such as the establishment of the Reserve. The NWA establishes the ‘Reserve’ consisting of an unallocated portion of water that is not subject to competition with other water uses. It refers to both the quality and quantity of water and is made up from two distinct parts, namely the basic human needs reserve and the Ecological Reserve.

The Ecological Water Requirement Site 11 (EWR 11) is used for reserve, importance, and quality determination. This site falls in the upper section of the C21F quaternary catchment, downstream in the Blesbokspruit and the C21D and C21E quaternary catchments. The data below was sourced from the Proposed Reserve Determination of Water Resources for the Vaal Catchment (DWS, December 2018).

The EWR 11 site’s MAR equates to 100.69 million m3/a, with 18.145 allocated to the total reserve, including 18.14% for the Ecological Reserve and 0.005% for the Basic Human Needs Reserve as indicated in the table below.

Table 14: Mean Annual Run-off and Reserves for the EWR site and relevant Quaternary Catchments:

EWR & Catchment	Ecological Reserve (%NMAR)	BHN Reserve (%NMAR)	Total Reserve (%NMAR)	NMAR (MCM)
EWR11 – C21F	18.14	0.005	18.145	100.69

10.6.5 PRESENT ECOLOGICAL STATUS

Studies undertaken by the Department of Water and Sanitation assessed all quaternary catchments as part of the Resource Directed Measures for Protection of Water Resources.The Ecological Importance and Sensitivity (EIS), Present Ecological State (PES) and Target Ecological Category (TEC) were defined, and it serves as a useful guideline in determining the importance and sensitivity of the aquatic ecosystems. The results for the proposed Welgedacht Balloon Siding site are provided below.

Table 15: PES, EIS and REC for the relevant Quaternary Catchments:

EWR	Catchment/s	Resource	EIS	PES	TEC
11	C21D, C21E, C21F	Blesbokspruit	Low	D	D

Table 16: Classification of River Health Assessment Classes:

Class	Description
A	Unmodified, natural
B	Largely natural, with few modifications
C	Moderately modified
D	Largely modified
E	Extensively modified
F	Critically modified

10.6.6 RESOURCE CLASS

On 22 April 2016, the Minister of Water and Sanitation, published the Classes and Resource Quality Objectives of water resources for catchments of the Upper Vaal WMA, as GN No. 424 in Government Gazette No. 39943. This notice provides a summary of the water resource classes and ecological categories for Integrated Units of Analyses (IUAs).

IUAs are classified in terms of their extent of permissible utilisation and protection as either Class I: indicating high environmental protection and minimal utilisation; or Class II: indicating moderate protection and moderate utilisation; and Class III: indicating sustainable minimal protection and high utilisation. The table below indicates the Resource Class set for the relevant Quaternary Catchments, within which the project area is situated.

Table 17: Water Resource Class and Ecological Category for the relevant Quaternary Catchments (DWS, 2016)

IUA	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchments	Major River Name	Tributary
Klip River (Gauteng) (UI)	III	EWR 11	C21F (downstream of C21D and C21E)	Suikerbosrand	Blesbokspruit

10.6.7 CURRENT SURFACE WATER USERS

The Orange/Vaal River system can be regarded as the most important river system in South Africa, due to its size and strategic central location, and because it sustains about half the economic production and a large proportion of the population of the country.

The Upper Vaal WMA is the most developed, industrialised, and populous of the Orange/Vaal WMAs from a water resource management perspective. It is a pivotal WMA in the country. Large quantities of water are transferred into the WMA from the Usutu to Mhlatuze and the Thukela WMAs as well as from the Senqu (Orange) River in Lesotho.

Focussing more on the region surrounding the project area, i.e. the Suikerbosrand River Tertiary Catchment, the primary surface water users and impacts are mining, agricultural, industrial and domestic.

The area surrounding the project consists of:

- Mainly agricultural land with a number of farm dams.
- Coal mining operation in close proximity to the north and west.
- Residential, including small holding to the north and south-east, as well as urban developments concentrated to the west (Springs).
- Industrial areas are mainly concentrated around Springs to the west and south-west of the project area.
- Wetlands and riparian areas, including Aston Lake.
- Eskom powerlines and substations, railway lines and associated infrastructure.

10.6.8 SURFACE WATER QUALITY

During the field survey upstream and downstream water samples were taken and analysed by a SANAS accredited laboratory. Samples are taken to provide baseline for water quality in order to assist in determining whether any future impacts to the water quality are as a result of the proposed project. The tables below provide details regarding the sampling points and the associated Resource Water Quality Objectives (RWQO) as stipulated in the Proposed Reserve Determination of Water Resources for the Vaal Catchment (DWS, December 2018), as well as the National Target Water Quality Range (TWQR) as stipulated in the South African Water Quality Guidelines, Vol. 7: Aquatic Ecosystems (Second Edition, 1996).

Table 18: Water Quality Sample Information

Sample Name	Coordinates	Location Description
WBS US	26°13'55.08"S, 28°33'30.10"E	Bridge north-east of project area upstream of Aston Lake
WBS DS	26°16'10.59"S, 28°31'23.45"E	Bridge south of project area and Aston Lake

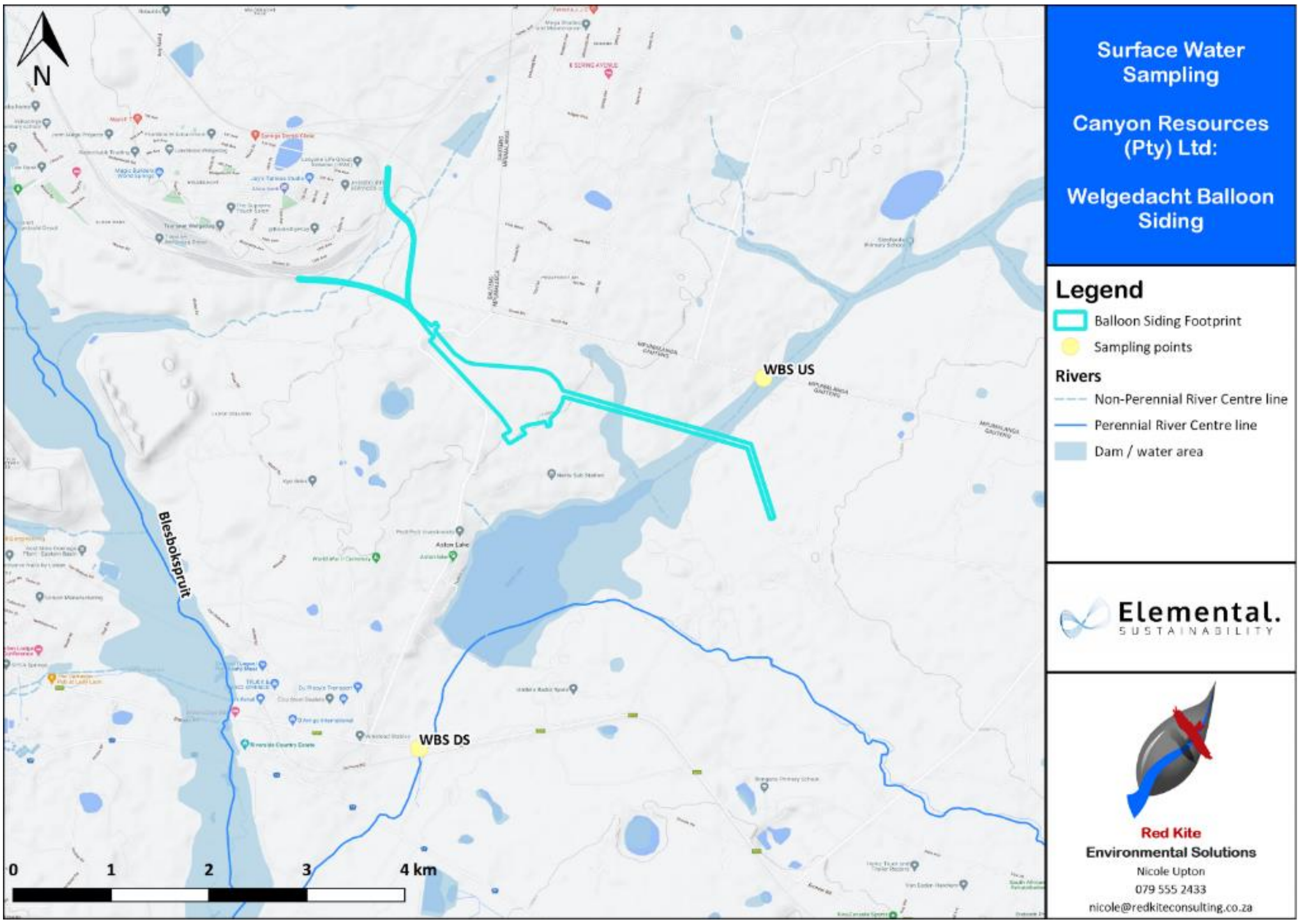


Figure 32: Surface Water Sampling Locations

The EWR 11 RWQO and national TWQR compared with the samples are detailed in the table below. All levels recorded fall within acceptable levels apart from Manganese and Aluminium. For the baseline data, additional variables were tested not included in the RWQO for EWR 11 and national TWQR.

Although the pH of the sampled water was found to be acceptable, elevated concentrations of Aluminium and Manganese could be indicative of water quality impacts from upstream coal mining activities.

Table 19: Baseline sample compared to the RWQO for EWR 11 and the TWQR

Variable	Measurement	RWQO	TWQR	WBS US	WBS DS
				111859	111860
pH	@ 25 ºC	6.5 - 8.0	< 5% var.	7.2	7.6
Conductivity	mS/m	<85	N/A	31.5	44.6
TDS	@ 180°C	N/A	< 15% var.	230	384
Nitrate	N mg/l	N/A	N/A	<0.1	<0.1

Variable	Measurement	RWQO	TWQR	WBS US	WBS DS
				111859	111860
Nitrite	N mg/l	N/A	N/A	<0.05	<0.05
Dissolved Oxygen	O2 mg/l	>6	N/A	6.1	6.0
E. coli	/100ml	N/A	N/A	190	1
Aluminium	Al mg/l	N/A	0.01	0.292	0.181
Arsenic	As mg/l	N/A	0.01	<0.001	0.002
Iron	Fe mg/l	N/A	< 10% var	2.32	4.24
Manganese	Mn mg/l	N/A	0.18	1.47	1.69

10.6.9 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 100 m) of the proposed project, 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 proposed project surface infrastructure (refer to sensitivity map, below).

As most of the streams and rivers related to the proposed project are associated with wetland zones, the buffer zones used for delineated wetland zones were obtained from the Wetland Assessment undertaken for the project. Refer to the Wetland Assessment compiled for the proposed project for details relating to the delineation of the wetlands and the determined buffer zones.

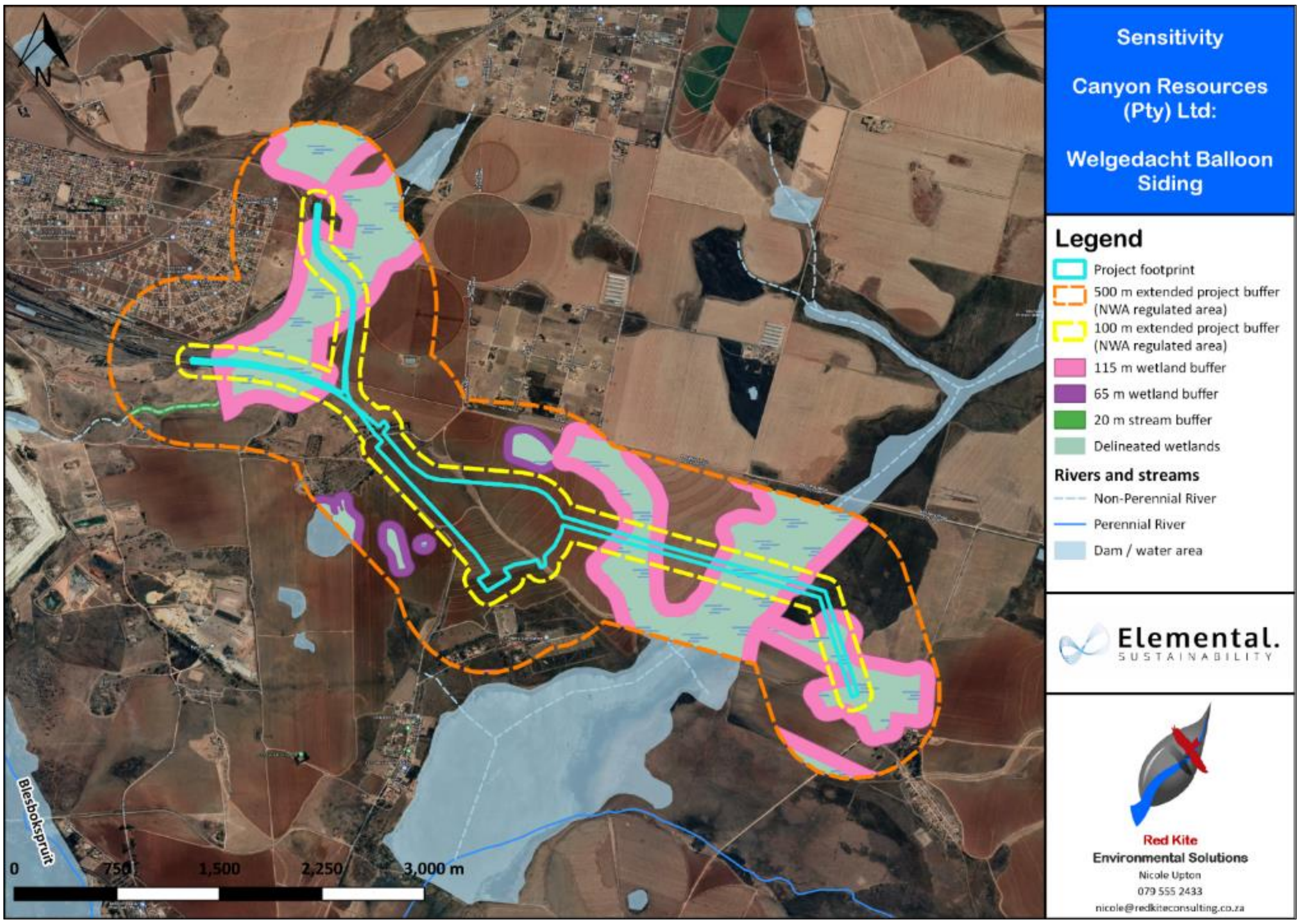


Figure 33: Surface water features sensitivity map within 500 m of the project footprint

10.7 AQUATIC ECOLOGY

The Aquatic Ecology Baseline and Impact Assessment was compiled by Enviridi Environmental Consultants (Pty) Ltd. and is attached to this report as Appendix 11. This subsection provides only an overview of the full report available. Refer to this report for any additional detail.

The site was visited during the beginning of the wet season, although no significant rainfall had yet been received for the region. The main river was found to be holding very little water with stagnant sections and therefore, tributaries alongside the river system were investigated and data gathered from two points which could be sampled to provide an indication of the aquatic health of the area.

The below table provide the detail of the proposed sampling/assessment points used for the Aquatic Ecology Assessment.

Table 20: Aquatic Ecology Assessment sample location information:

Sample Point	Coordinates	Location Description
US	26°13'54.90"S, 28°33'30.09"E	North-Eastern Upstream Point
DS	26°16'9.68"S, 28°31'26.71"E	South-Western Downstream Point

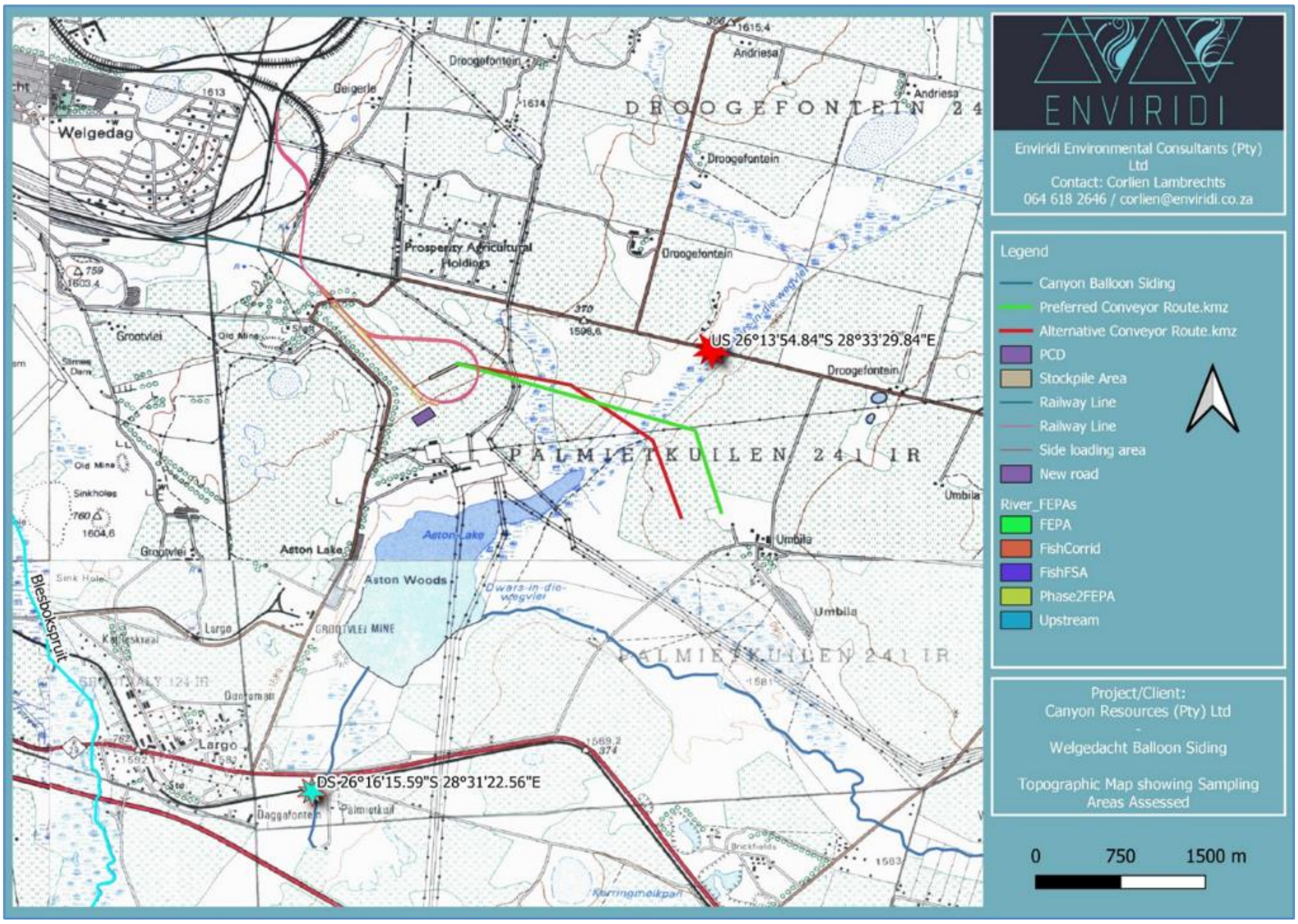


Figure 34: Sites surveyed during site assessment and to be included in the monitoring framework

10.7.1 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 Blesbokspruit River and associated tributaries.

Table 21: 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
US & DS Point - C21E-01356 - Blesbokspruit						
C21E-01356	Class E – Serious Modification	Moderate	Moderate	14.15	2	C
The Sub Quaternary Reach (SQR) associated with the monitoring points fall within the Blesbokspruit (SQR) itself and is labelled C21E-01356. The reach is characterized by the following: • The Reach spans an area of 14.15 km; • The Present Ecological State (PES) has been rated Seriously Modified (Class E); • The Ecological Importance of the reach has been rated High; 9 species of fish are expected in the reach; • The Ecological sensitivity is rated Moderate with very high invertebrate responses to changes in physico-chemical parameters;						

- The reach does not fall into a FEPA– Refer Figure 14;
- Large instream modifications have been recorded in the reach;
- Historic anthropogenic impacts recorded in the reach include:
  - Mining Impacts, Rural Influent, Instream dams, Industries, Towns, Effluent and Eutrophic
  - Ramsar Wetland in Reach

Fish species recorded within this reach:
- *Labeobarbus aeneus* (Smallmouth yellowfish) – Least Concern;
- *Barbus Anoplus Weber* (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.

Table 22: National Biodiversity Assessment (2018) Data for the SQR

Field Name	Description	Data Applicable for Blesbokspruit (NBA 2018)	
Representative Points Sampled		**US Point C21D040000**	**DS Point C21E030000**
Order	River order	2	2
Mainstem	Mainstem = 1 is a quaternary mainstem; the rest of the 1:500,000 rivers are tributaries that are nested within quaternary catchments	0	1
Flow	Flow variability	Permanent	Permanent
River Type	River type used by NFEPA which comprises the level 1 ecoregion number followed by the flow	Permanent P_F	Permanent P_E
PES 1999	Present ecological state 1999 with desktop modification	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.	Z = Tributary condition modelled as not intact, according to natural land cover	Class D: Largely Modified
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
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
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	Class F - PES as per NBA 2018 Assessment	Class E - PES as per NBA 2018 Assessment

Field Name	Description	Data Applicable for Blesbokspruit (NBA 2018)	
Representative Points Sampled		**US Point C21D040000**	**DS Point C21E030000**
	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.		
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)
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

10.7.2 FRESHWATER ECOSYSTEM PRIORITY AREAS

The National Freshwater Ecosystem Priority Areas (NFEPA) project is a multi-partner project between the Council for Scientific and Industrial Research (CSIR), the Water Research Commission, the South African National Biodiversity Institute, the Department of Forestry, Fisheries and the Environment, 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 DFFE and DWS 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 not intercept with any Freshwater Ecosystem Priority Areas (FEPA) areas.

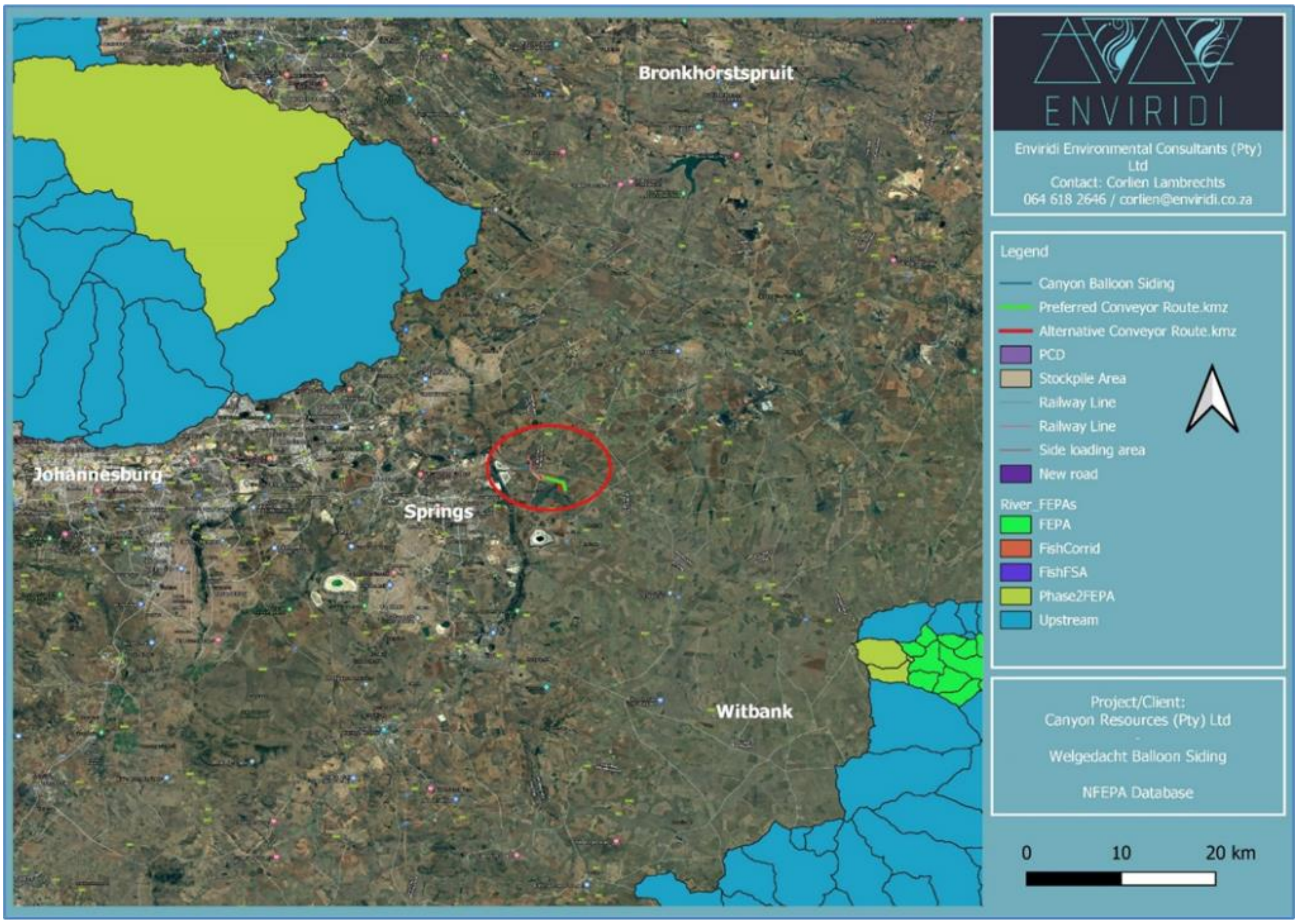


Figure 35: River Freshwater Ecosystem Priority Areas

10.7.3 IHAS AND SASS 5 RESULTS

The below provide the relevant assessment results for the sample points to be used for baseline data and identify potential impacts.

Table 23: Integrated Habitat Assessment Survey (IHAS) Results

SURVEY	OCTOBER 2020 – HIGH FLOW		
Sites Assessed	**Score**	**Suitability**	**Flow**
US	N/A – no flow to be sampled	Not suitable (currently Inadequate)	Only wetland seepage present during assessment
DS	N/A – no flow to be sampled	Not suitable (currently Inadequate)	Only wetland seepage present during assessment

Table 24: South African Scoring System Version 5 (SASS 5) Results

Sampling Point	SASS Score	No of Taxa	ASPT	SASS 5 Results
US	N/A	N/A	N/A	N/A
DS	N/A	N/A	N/A	N/A

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).

No SASS5 was implemented since the waterbodies found were stagnant and not connected with wetland characteristics prevalent, therefore not suitable for the correct implementation of SASS as it will not provide comparable results.

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

- All US and DS points were found to be seepage systems with wetland systems and not suitable for SASS at the time of the assessment. These points could be feasible for SASS at a later stage during the end of the High flow season when more water is present in the water resources
- QHI and VEGRAI Indices were calculated for conditions encountered and both awarded a PES of Class D for the specific stretch of river assessed, which compares to the 2018 DWS PES of Class C and Class E (different stretches of the Blesbokspruit).
- The REC recommended for this assessment is therefore Class C.

10.8 WETLANDS

A wetland impact assessment was undertaken by Elemental Sustainability (Pty) Ltd. Refer to Appendix 12. A site visit was undertaken on the 29th of March 2021 to assess the present ecological status of the area and to determine the impacts of the proposed Welgedacht Balloon Siding on the surrounding wetland environment. A baseline desktop assessment was undertaken of all available data. Google Earth images were studied in order to determine the position of possible wetlands in the study area. All possible wetlands were subsequently surveyed in order to determine the delineation thereof. The method described by the Department of Water Affairs and Forestry (DWAF, 2005) was followed in the delineation of the wetlands and riparian zones in the study area.

The following methodologies were utilised:

- Delineation of wetlands;
- Classification and characterisation of the wetlands;
- Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) description of wetlands;
- Buffer zone recommendations; and
- Impact Assessment.

10.8.1 LAND USE AND ECOLOGICAL STATE

The study site and its surrounding area has been severely transformed over the years. The dominant land use in the area is crop cultivation and other farming related activities, which has significantly alterted the natural state of the wetlands occurring on the study site. Naturally occurring grassland vegetation has been either transformed to crop fields or severely impacted by cattle grazing and trampling. Eskom powerlines and a substation is also present in the vicinity.

Severe alien invasive species establishment has ensued due to the anthropogenic disturbances and further spread is evident, especially along dirt roads in the surrounding area. Water quality of the wetlands have been impacted on by nutrient loading, especially phosphates and nitrates, and sedimentation from the surrounding agricultural activities, exposed soil surfaces and dirt roads which traverse the wetlands. This has impacted on the wetlands` hydrological and geomorphological functioning. All these disturbances have negatively impacted on the wetlands` ability to maintain biodiversity and affected the ecological integrity of the wetlands.

Two major Valley-bottom systems occur in the surrounding area, one (1) Channelled and one (1) Unchannelled, with extensive hillslope seeps draining towards die systems. The Unchannelled system has been dammed and is referred to as Aston Lake. However, these wetlands are linked to a greater stream network of the Blesbokspruit RAMSAR Wetland. They are ecologically significant and provides services such as catchment recharge, streamflow regulation, water quality improvement and flood attenuation.

10.8.2 WETLAND CLASSIFICATION AND SYSTEM CHARACTERISATION

Multiple wetland systems occur within the 500 m DWS Regulated Area (assessment area) and surrounds. Within the assessment area, the wetlands total approximately 221.69 ha in size. Six (6) Wetland Units (WU) were identified, with some of the smaller wetlands grouped into one (1) unit and assessed as a whole (Table 25 and Figure 37). The potential impacts of activities such as mining, crop production, erosion, road networks, dams and clearing of natural vegetation within the greater catchment were taken into consideration during the assessment.

Table 25: Classification of the Wetland Units within the 500 m DWS Regulated Area

Wetland Unit (WU)	Size within 500 m Regulated Area (ha)	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) Unit
WU1	64.66 ha	Valley Floor	Unchannelled Valley-bottom (UVB) with Aston Lake
WU2	57.67 ha	Slope	Seeps connected to the Unchannelled Valley Bottom (UVB)
WU3	7.35 ha	Dammed	Depressions
WU4	80.73 ha	Slope	Seeps in the north-western section
WU5	8.66 ha	Valley Floor	Unchannelled Valley-bottom (UVB) in the north-western section
WU6	2.62 ha	Valley Floor	Channelled Valley-bottom (CVB) in the south-eastern section
Total	**221.69**		

10.8.2.1 WETLAND UNIT DESCRIPTION AND DELINEATION

All Wetland Units were delineated on a desktop level with the use of digital satellite imagery and topographical maps. Portions of the features were verified during the field survey according to the guidelines advocated by DWA (2005, 2008).

During the assessment, the following indicators were used to ascertain the boundaries of the wetlands:

- Terrain units were used as the primary indicator, along with aerial imagery that indicated wetland boundaries which were formed by the surrounding land uses.
- Vegetation, although transformed, was considered informative.
- Soil form was considered; and the presence of mottles (soils with variegated colour patterns) was used as an indicator for wetlands in some instances, mainly Depressions. In some areas the mottling of soils did not provide an accurate delineation of boundaries, and as such the above-mentioned characteristics were used in conjunction to determine boundaries.

Figure 36 indicates the various wetland units of the larger area outside of the 500m DWS Regulated area. Figure 37 indicates the various wetland units that were delineated within the 500 m DWS Regulated Area (assessment area) and surrounds.

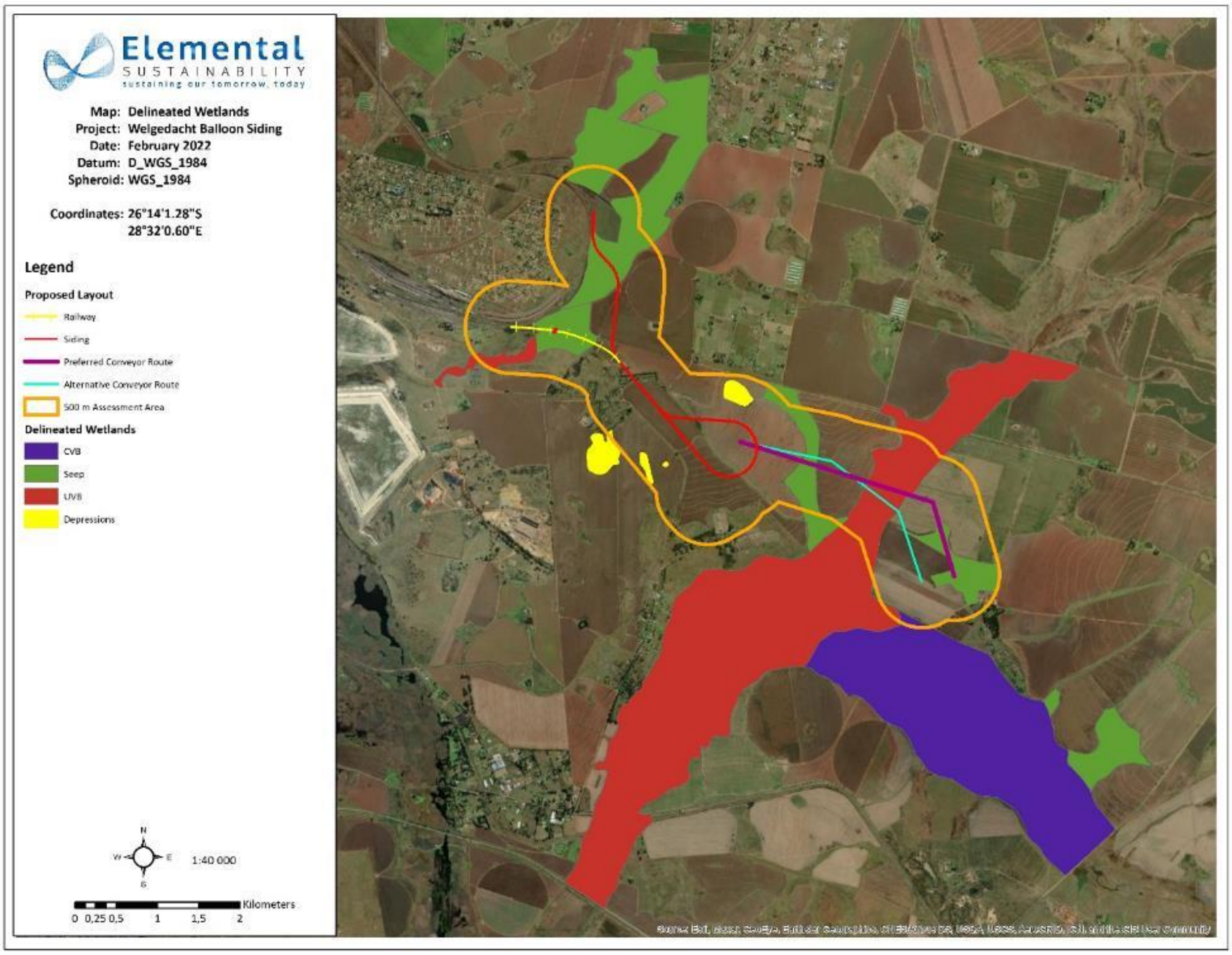


Figure 36: Delineated wetlands of the larger area outside of the 500 m DWS Regulated Area

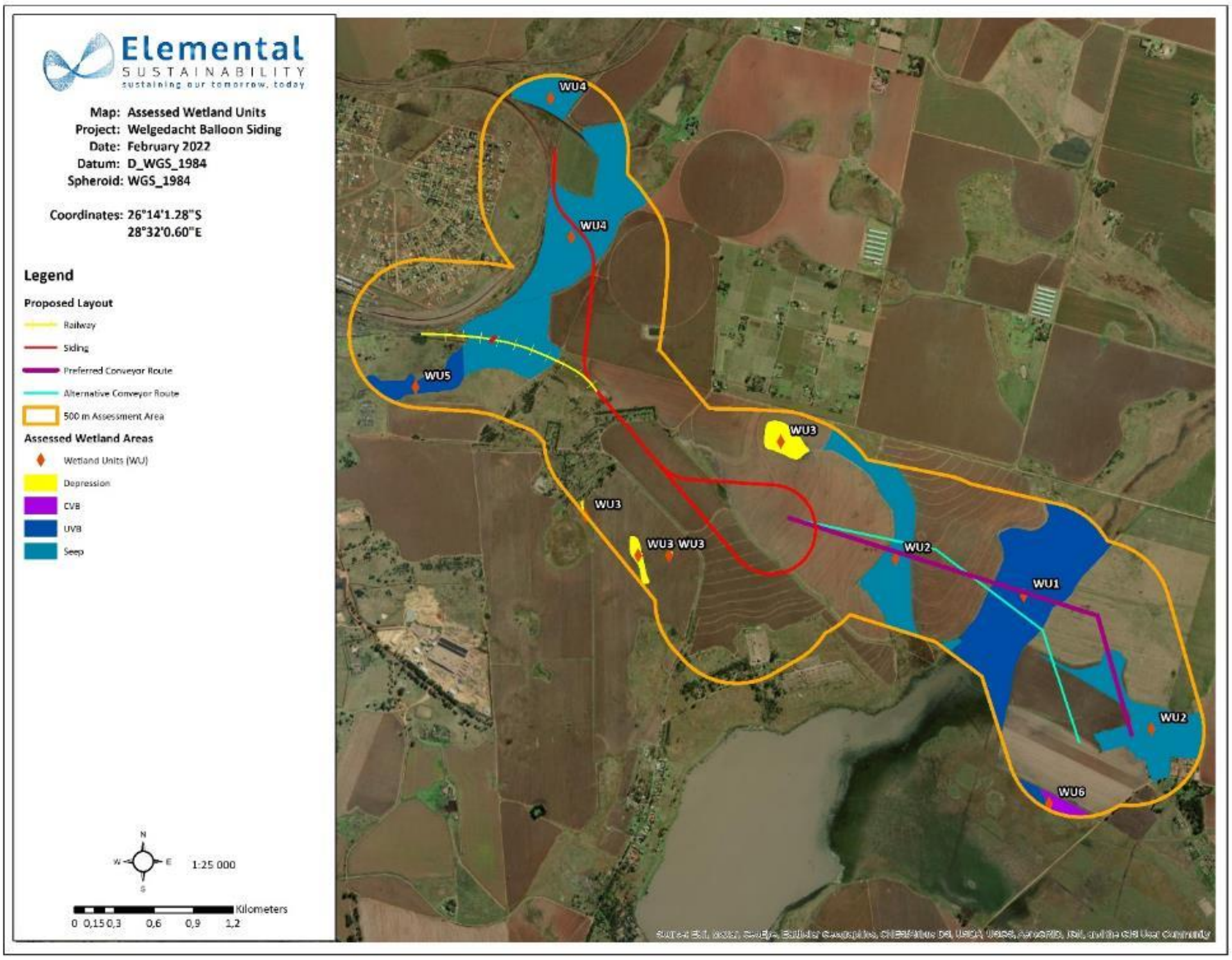


Figure 37: Assessed wetland units within the 500 m DWS Regulated Area

10.8.2.2.1 WETLAND UNIT 1

Table 26 provides a description of the various features of Wetland Unit 1.

Table 26: Description of Wetland Unit 1

Feature	**Assessment**
Wetland Type	Unchannelled Valley-bottom Wetland
Current Impacts and Downstream Features	The wetland receives its water mainly from lateral runoff and input from Seeps as several roads upstream traverse the system and limits the channel inflow from upstream wetland systems. Various alien and invasive species were identified within and surrounding the wetland, especially along roads and crop fields. The surrounding areas are dominated by agricultural activities. Clear signs of sediment deposition and erosion was visible downstream of the roads traversing the site. The UVB is dammed downstream and forms Aston Lake, a large instream dam. The Eskom substation and powerlines is situated just north of Aston Lake. Cattle trampling was observed in some areas.
Other Input Sources	Catchment Recharge from Seeps
Vegetation Characteristics	Vegetation is dominated by a mix of grasses and sedges. Reed beds were visible in areas of sediment deposition. *Typha capensis* (Bullrush) were present

	in permanent wet zones. Large stands of alien invasive vegetation occurred along the wetland, especially next to roads. Other species that were observed included *Imperata cylindrica* (ow), *Sporobolus pyramidalis* (fw), *S Sporobolus africanus* (fw) and *Setaria sphacelata* var. *sphacelata* (fw), *Cyperus digitatus* (ow)
Aquatic Fauna	Several avifauna (bird) species occur in around the wetland. The wetland area also forms part of the Blesbokspruit Important Bird Area (IBA). Several fish species were introduced into Aston Lake for recreational purposes.
Depth Characteristics	Very deep in the dam areas, with shallow flow upstream and downstream of the dams. Pooling observed upstream of roads traversing the wetland.
Soil Forms	Soils with mottling present and higher organic carbon content Arcadia soil form

10.8.2.2.2 WETLAND UNIT 2

Refer to Table 27 for the various features of wetland unit 2.

Table 27: Description of Wetland Unit 2

Feature	Assessment
Wetland Type	Seeps connected to the larger UVB System
Current Impacts and Downstream Features	The wetland receives its water mainly from lateral runoff. Various alien and invasive species were identified within and surrounding the wetland, especially along roads and crop fields. The wetlands are basically delineated by the surrounding crop fields. Clear signs of sediment deposition and erosion was visible downstream of the roads traversing the site. Cattle trampling was observed in some areas.
Other Input Sources	None.
Vegetation Characteristics	Vegetation is dominated by a mix of grasses and sedges in the seasonal and temporary zones. *Imperata cylindrica* (Cottonwool Grass) (ow) was most prominent in Seep wetlands.
Aquatic Fauna	Several avifauna (bird) species occur around the wetland; however, the area is too disturbed to provide sufficient nesting for species.
Depth Characteristics	Shallow where surface water is visible, however, this is mostly visible after rainfall events.
Soil Forms	Bleached E-horizon wetland soils Kroonstad form

10.8.2.2.3 Wetland Unit 3

A description of wetland unit 3 is included in Table 28.

Table 28: Description of Wetland Unit 3

Feature	Assessment
Wetland Type	Depression Wetlands
Current Impacts	Encroachment from surrounding agricultural activities. Mainly fed by stormwater

	run-off. Highly impacted on by crop cultivation.
Other Input Sources	None.
Downstream Features	N/A
Vegetation Characteristics	Mostly terrestrial species present.
Aquatic Fauna	None.
Depth Characteristics	N/A

10.8.2.2.4 Wetland Unit 4

Table 29 provides a description of wetland unit 4.

Table 29: Description of Wetland Unit 4

Feature	**Assessment**
Wetland Type	Seeps in the north-western section
Current Impacts and Downstream Features	The wetland areas are highly degraded. Various alien and invasive species were identified within and surrounding the wetland. Railways and roads are prominent in the area.
Other Input Sources	None.
Vegetation Characteristics	The occurrence of *Imperata cylindrica* indicate that wetland conditions are present.
Aquatic Fauna	The area is too degraded to provide habitat for faunal species.
Depth Characteristics	No water visible.
Soil Forms	Bleached E-horizon wetland soils Kroonstad form

10.8.2.2.5 Wetland Unit 5

Refer to Table 30 for a description of the features of wetland unit 5.

Table 30: Description of Wetland Unit 5

Feature	**Assessment**
Wetland Type	Unchannelled Valley-bottom (UVB) in the north-western section
Current Impacts and Downstream Features	The wetland is severely degraded. It drains towards the Blesbokspruit in the north.
Other Input Sources	Flow from Seeps
Vegetation Characteristics	Dominated by *I. cylindrica* (ow), *S. pyramidalis* (fw), *S. africanus* (fw) and *Setaria sphacelata* var. *sphacelata* (fw), *Cyperus digitatus* (ow)
Aquatic Fauna	The area is too degraded to provide habitat for faunal species.
Depth Characteristics	Some shallow pooling present in places.

Soil Forms	Westleigh soil form in the temporary/seasonal zone Permanent zone was found to show two wetland soil types including the Katspruit and Rensburg soil form.

10.8.2.2.6 Wetland Unit 6

Table 31 provides a description of the features of wetland unit 6.

Table 31: Description of Wetland Unit 6

Feature	**Assessment**
Wetland Type	Channelled Valley-bottom (CVB) in the south-eastern section
Current Impacts and Downstream Features	Similar to that of the WU1. The wetland receives its water mainly from lateral runoff and input from Seeps. The surrounding areas are dominated by agricultural activities. The CVB also flow towards Aston Lake where it is dammed, therefore forming part of the wider wetland system.
Other Input Sources	None
Vegetation Characteristics	Vegetation is dominated by a mix of grasses and sedges. Reed beds were visible in areas of sediment deposition. *Typha capensis* (Bullrush) were present in permanent wet zones. Large stands of alien invasive vegetation occurred along the wetland, especially next to roads. Other species that were observed included *I. cylindrica* (ow), *S. pyramidalis* (fw), *S. africanus* (fw) and *Setaria sphacelata* var. *sphacelata* (fw), *Cyperus digitatus* (ow)
Aquatic Fauna	Several avifauna (bird) species occur in around the wetland. The
Depth Characteristics	Very deep in the dam areas, with shallow flow upstream and downstream of the dams.
Soil Forms	Soils with mottling present and higher organic carbon content Arcadia soil form

10.8.3 BUFFER ZONE DETERMINATION

Calculated buffer zones were based on industry worst case scenarios and were calculated as follows (Macfarlane *et al.* 2014) (Figure 38):

- WU1: 115 m
- WU2: 115 m
- WU3: 65 m
- WU4: 115 m
- WU5: 115 m
- WU6: 115 m

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. Although several roads and power lines traverse the wetlands, already impacting on their ecological integrity, the aim is to minimise and mitigate the impact of the proposed Welgedacht Balloon Siding and its associated infrastructure on the identified wetlands. For some of the proposed infrastructure, i.e. the conveyor and railway line in the north western section, the buffer zone will not be implemented. However, it is imperative that the service road and any other vegetation clearing, excavations, infilling and/or deposition activities remain outside of the calculated buffer zones.

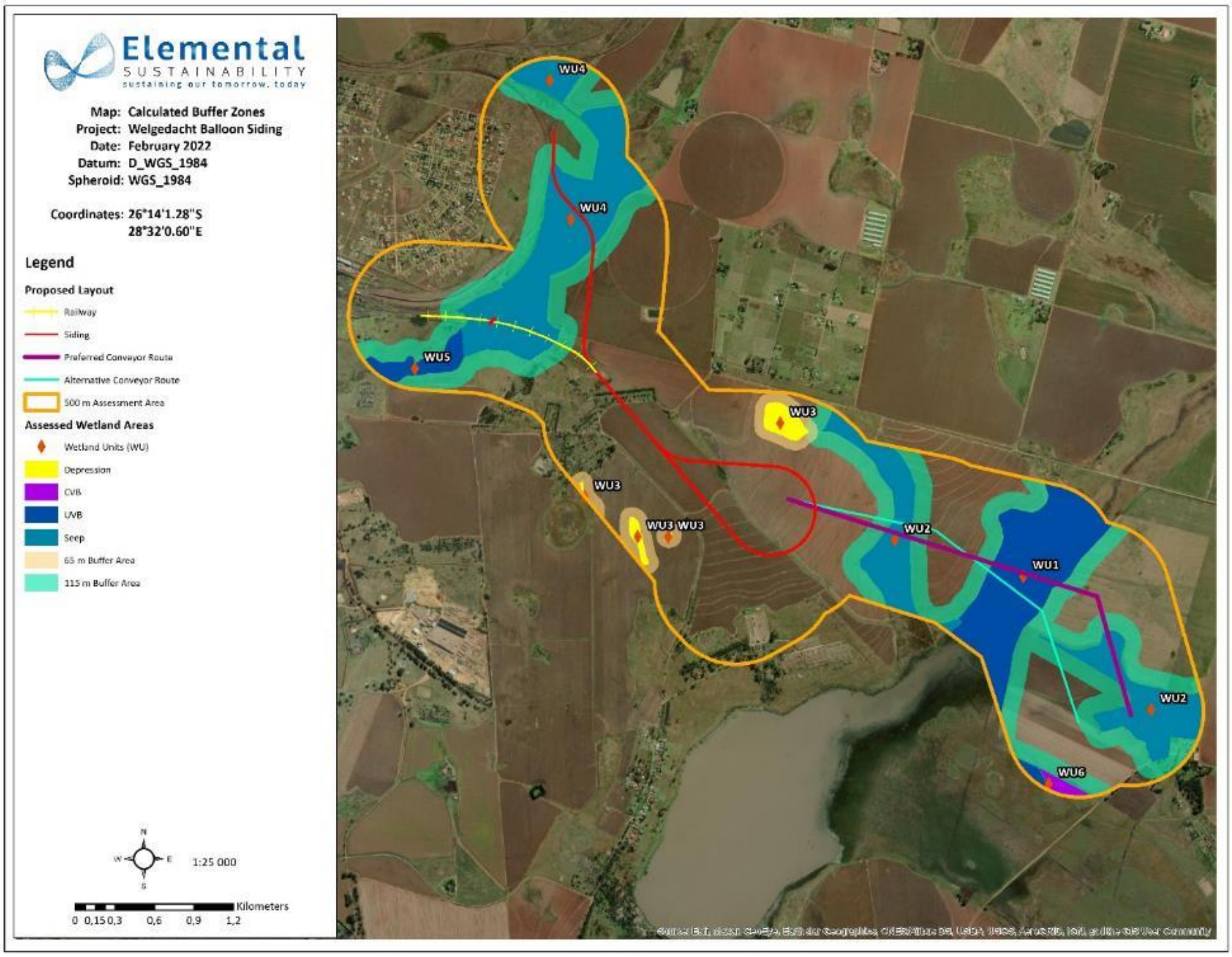


Figure 38: Scientifically calculated buffer zones for the identified wetland units

10.8.4 WETLAND INTEGRITY AND FUNCTIONAL ASSESSMENT

10.8.4.1 WET-HEALTH ASSESSMENT

Three modules, namely hydrology, geomorphology and vegetation, were assessed as a single unit for the HGM Units and subsequently an area weighted score was obtained for the HGM Units. The potential impacts of activities such as agriculture, altered hydrological functions and clearing of natural vegetation within the greater catchment were taken into consideration during the assessment. The overall PES Category for the Wus are provided in **Table 32** overleaf.

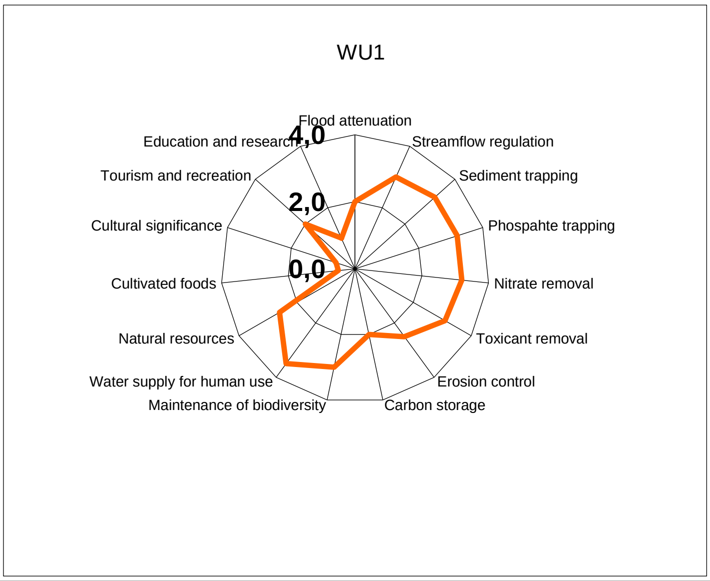
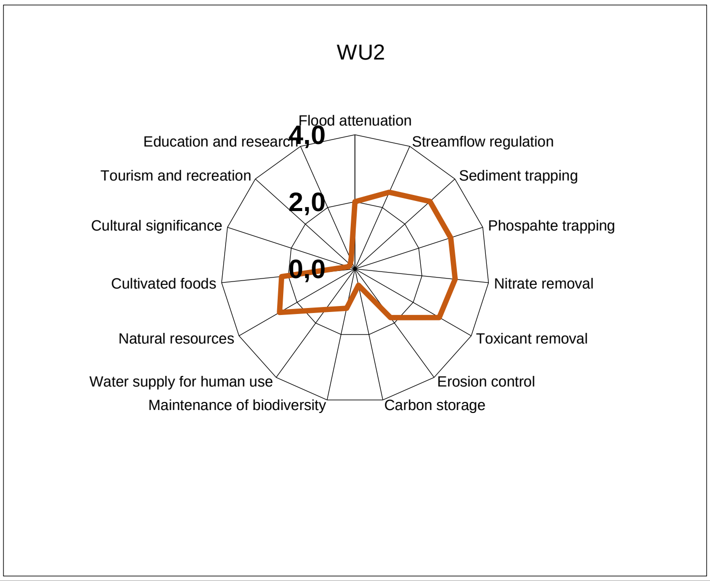
Table 32: Summary of results of the WET-Health assessments conducted for the WUs

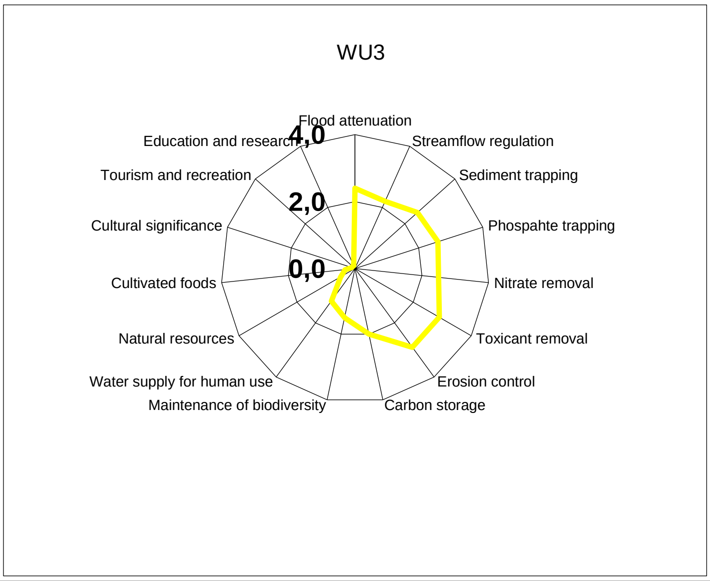
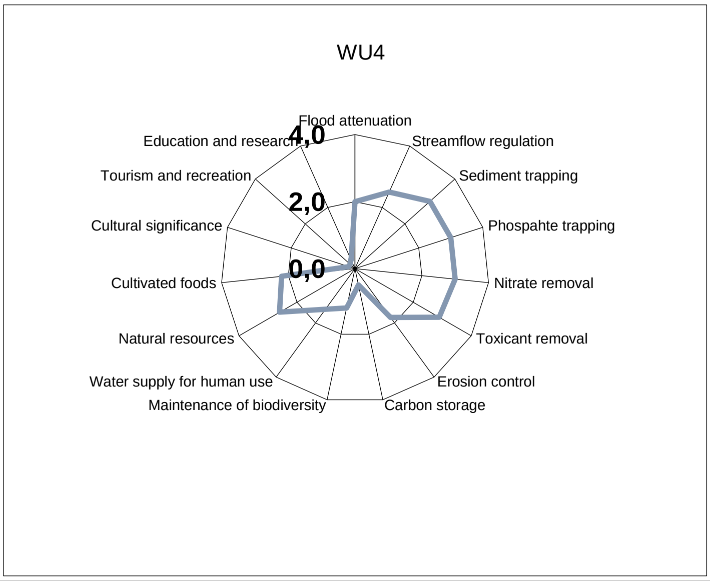
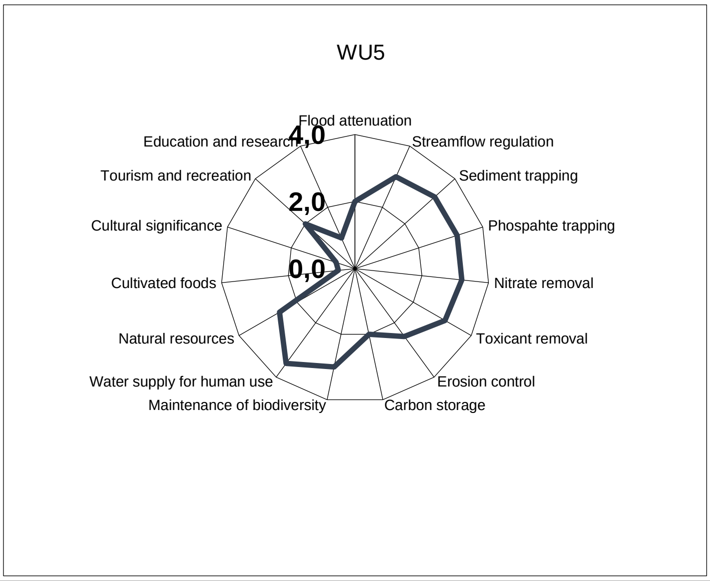
Wetland Unit (WU)	Hydrogeomorphic (HGM) Unit	PES & Wet-Health Score	Description	Change Score
WU1	Unchannelled Valley-bottom with Aston Lake	D- Largely Modified	A large change in ecosystem processes and loss of natural habitat and biota has occurred.	→ Remain Stable
WU2	Seeps connected to the Unchannelled Valley Bottom	D – Largely Modified	A large change in ecosystem processes and loss of natural habitat and biota has occurred.	→ Remain Stable
WU3	Depressions	D – Largely Modified	A large change in ecosystem processes and loss of natural habitat and biota has occurred.	→ Remain Stable
WU4	Seeps in the north-western section	E – Seriously Modified	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	→ Remain Stable
WU5	Unchannelled Valley Bottom	D – Largely Modified	A large change in ecosystem processes and loss of natural habitat and biota has occurred.	→ Remain Stable
WU6	Channelled Valley-bottom in the north-western section	E – Seriously Modified	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	→ Remain Stable

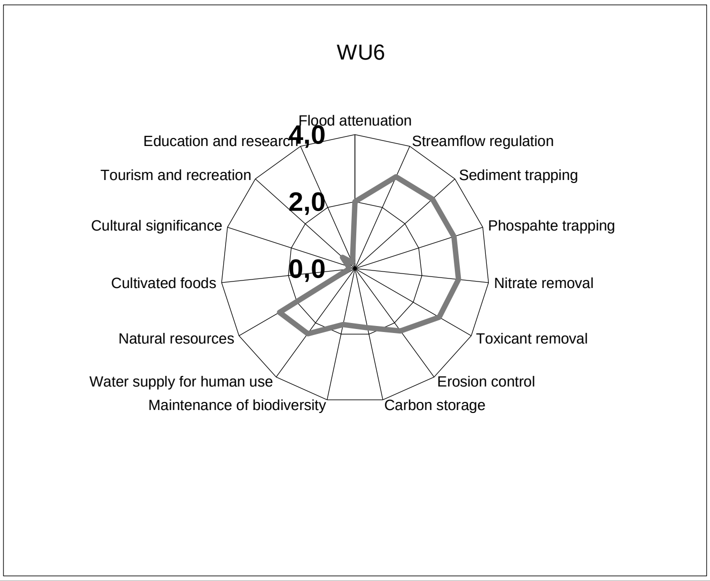
10.4.4.2 ECOSYSTEM SERVICES

Physical and hydrological features allow hydro-geomorphic units to perform specific ecosystems services. A Wet-EcoService evaluation was done for the hydro-geomorphic types found on site to determine these services as described in the methodology. The degree of disturbance and modification of wetlands results in a decrease in the ability to which they can perform these ecosystem services. The findings of the Wet-Ecoservice evaluation conducted is provided in **Table 33** below.

Table 33: Results of the Ecosystem Services provided by all WUs on site

Wetland Unit	WET-EcoServices Assessment
WU1	
WU2	

WU3	 WU3 Flood attenuation Streamflow regulation Sediment trapping Phospahte trapping Nitrate removal Toxicant removal Erosion control Carbon storage Maintenance of biodiversity Water supply for human use Natural resources Cultivated foods Cultural significance Tourism and recreation Education and research 4,0 2,0 0,0
WU4	 WU4 Flood attenuation Streamflow regulation Sediment trapping Phospahte trapping Nitrate removal Toxicant removal Erosion control Carbon storage Maintenance of biodiversity Water supply for human use Natural resources Cultivated foods Cultural significance Tourism and recreation Education and research 4,0 2,0 0,0
WU5	 WU5 Flood attenuation Streamflow regulation Sediment trapping Phospahte trapping Nitrate removal Toxicant removal Erosion control Carbon storage Maintenance of biodiversity Water supply for human use Natural resources Cultivated foods Cultural significance Tourism and recreation Education and research 4,0 2,0 0,0

WU6	

10.4.4.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The EIS assessment was applied to all wetland features within the study area in order to ascertain the levels of sensitive and ecological importance of the features, as well as to assist in informing a suitable REC for each. The results of these assessments are summarised in Table 34 below.

Table 34: EIS scores obtained for the wetland assessed (DWAF, 1999)

Wetland Unit	Wetland Importance and Sensitivity	Score	Importance	REC
WU1 UVB	**Ecological Importance & Sensitivity**	**2.2**	**High**	**C/D Improve**
	Hydro-Functional Importance	2.1	High	
	Direct Human Benefits	1.3	Moderate	
WU2 Seep	Ecological Importance & Sensitivity	1.0	Low	**D Maintain**
	Hydro-Functional Importance	**1.9**	**Moderate**	
	Direct Human Benefits	0.8	Low	
WU3 Depressions	Ecological Importance & Sensitivity	0.6	Low	**D Maintain**
	Hydro-Functional Importance	**0.9**	**Low**	
	Direct Human Benefits	0.5	Low	
WU4 Seep	Ecological Importance & Sensitivity	1.0	Low	**D Improve**
	Hydro-Functional Importance	**1.9**	**Moderate**	
	Direct Human Benefits	0.8	Low	
WU5 UVB	**Ecological Importance & Sensitivity**	**2.2**	**High**	**C/D Improve**
	Hydro-Functional Importance	2.1	High	
	Direct Human Benefits	1.3	Moderate	
WU6 CVB	Ecological Importance & Sensitivity	1.8	Moderate	**D Improve**
	Hydro-Functional Importance	**2.0**	**Moderate**	
	Direct Human Benefits	1.1	Moderate	

10.8.5 SUMMARY OF RESULTS

The results recorded for the wetlands potentially affected by the proposed Welgedacht Balloon Siding and its associated infrastructure are summarised in Table 35 below.

Table 35: Summary of the results.

Classification	Scientific Buffer	PES	EIS	REC
WU1 - Unchannelled Valley-bottom (UVB)	115 m	D	High	C/D Improve
WU2 - Seeps	115 m	D	Moderate	D Maintain
WU3 - Depressions	65 m	D	Low	D Maintain
WU4 - Seeps	115 m	E	Moderate	D Improve
WU5 - Unchannelled Valley-bottom (UVB)	115 m	D	High	C/D Improve
WU6 - Channelled Valley-bottom (UVB)	115 m	E	Moderate	D Improve

10.9 ECOLOGICAL ASSESSMENT

Enviridi Environmental Consultants (Pty) Ltd. undertook an ecological impact assessment for the proposed Welgedacht Balloon Siding. A copy of the report is included in Appendix 12.

A desktop assessment was conducted to establish whether any potentially sensitive species/receptors might occur on site. A field investigation was undertaken on the 18th of November 2020 to supplement and confirm several findings from the desktop study. 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.

10.9.1 FAUNA ASSESSMENT

The development falls over the 2628BA Quarter Degree Squares (QDS) feature (Figure 39), which has been included within this report. Information on plant species recorded for the 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 the Ecological Impact Assessment Report included as Appendix 12 of this EIAR.

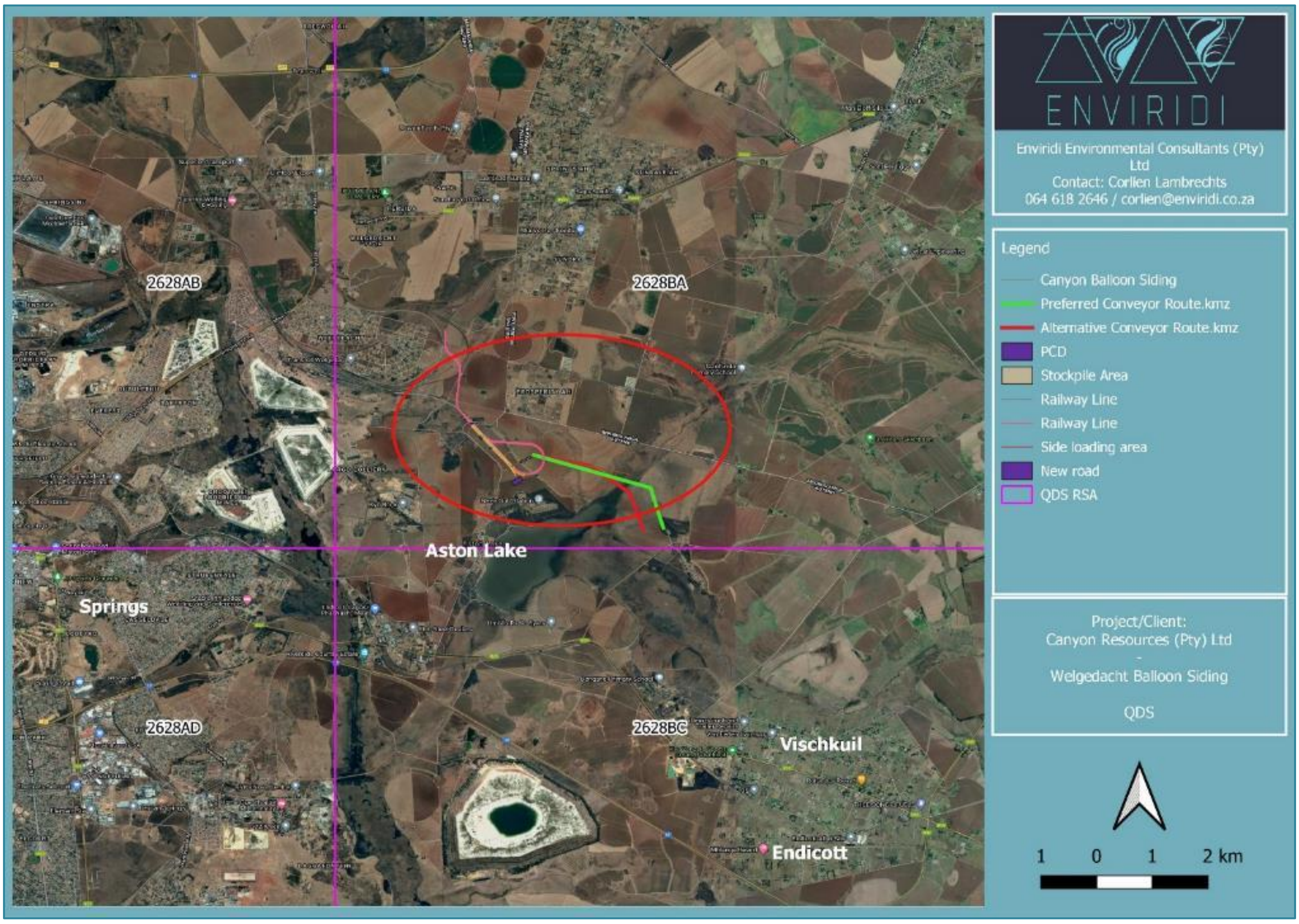


Figure 39: Quarter Degree Squares (QDS) – 2628BA

10.9.2 BIOME

According to the National Vegetation Map (SANBI 2006 – 2018) the project area is located across two biomes, i.e. the Savanna and Grassland biomes. The majority of the project area is situated within the Grassland Biome, with prominent wetland areas designated as Savanna Biome.

10.9.3 BROAD VEGETATION DESCRIPTION (VEGETATION MAP, 2018)

Sections of area on which the proposed Welgedacht Balloon Siding falls occur within the Threatened Ecosystem; Blesbokspruit Highveld Grassland (GP1), which has a Critically Endangered status (NBA 2011). Other areas also fall within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA 2011).

Three vegetation types, according to the National Vegetation Map (SANBI, 2006 – 2018), occur in the project area, namely Soweto Highveld Grassland (Gm8), Andesite Mountain Bushveld (SVcb11) and Eastern Highveld Grassland (Gm12). The majority of the project footprint is located in the Soweto Highveld Grassland, with only the conveyor situated over the Andesite Mountain Bushveld and Eastern Highveld Grassland.

The NBA 2011 does not correspond with the latest NBA 2018 in all aspects, which does not show the Blesbokspruit Highveld Grassland (Skowno, Raimondo, Poole, Fizzotti, & Slingsby, 2019), but falls in line with the 2018 Vegetation Map, showing the following statuses:

- Soweto Highveld Grassland – Vulnerable (The Siding footprint falls specifically within this section);
- Andesite Mountain Bushveld – Least Concern (LC);
- Eastern Highveld Grassland – Vulnerable (VU).

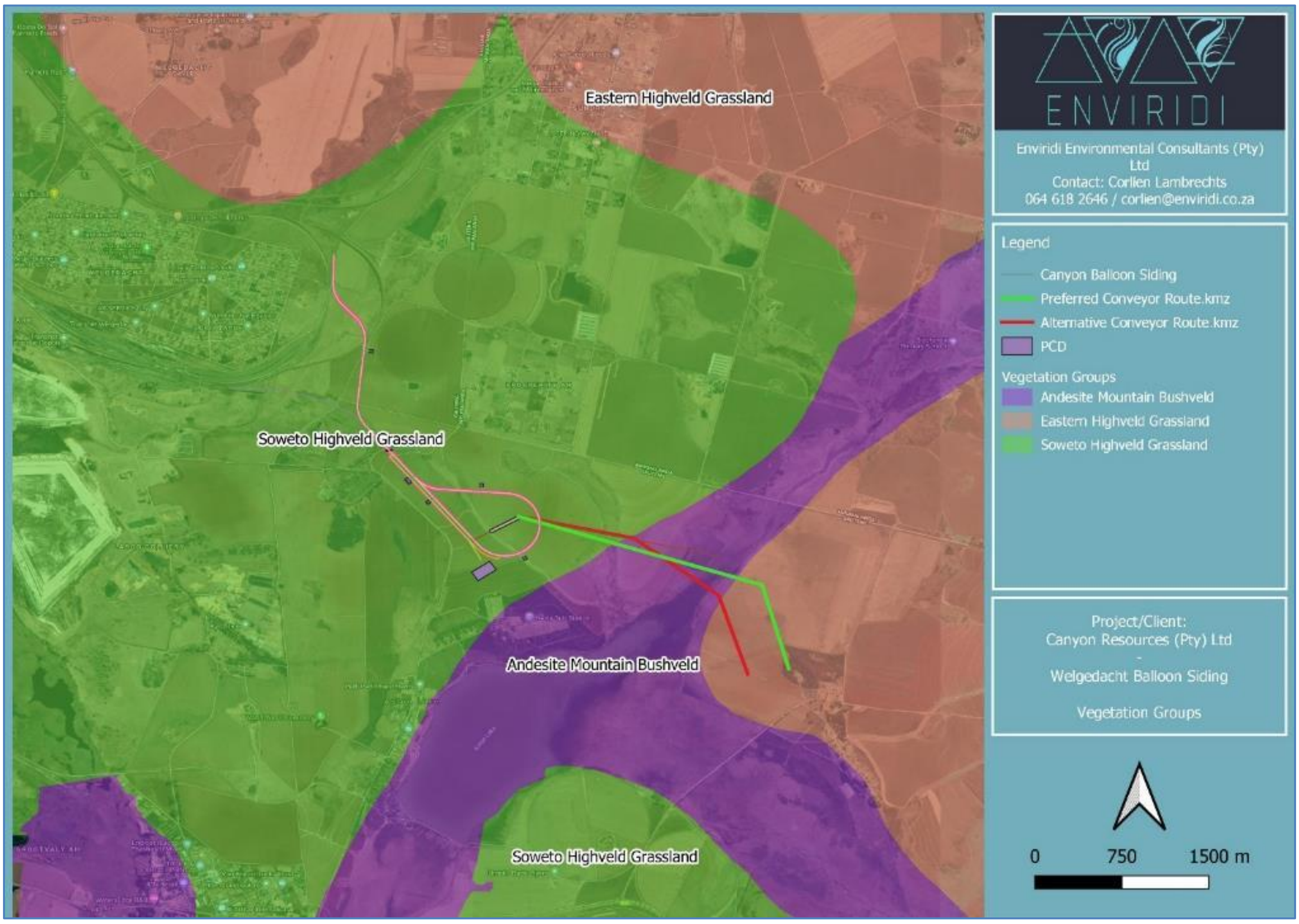


Figure 40: Vegetation Group for the Welgedacht Balloon Siding Project

10.9.3.1 SOWETO HIGHVELD GRASSLAND (GM8)

Soweto Highveld Grassland is found in the Mpumalanga, Gauteng, and to a very small extent also in neighbouring Free State and North-West, Provinces. The Soweto Highveld Grassland is characterised by gently to moderately undulating landscapes on the Highveld plateau, supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

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

- **Graminoids:** *Andropogon appendiculatus* (d), *Brachiaria serrata* (d), *Cymbopogon pospischilii* (d), *Cynodon dactylon* (d), *Elionurus muticus* (d), *Eragrostis capensis* (d), *E. chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. planiculmis* (d), *E. racemosa* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Setaria nigrirostris* (d), *S. sphacelata* (d), *Themeda triandra* (d), *Tristachya leucothrix* (d), *Andropogon schirensis*, *Aristida adscensionis*, *A. bipartita*, *A. congesta*, *A. junciformis* subsp. *galpinii*, *Cymbopogon caesius*, *Digitaria diagonalis*, *Diheteropogon amplectens*, *Eragrostis micrantha*, *E. superba*, *Harpochloa falx*, *Microchloa caffra*, *Paspalum dilatatum*.
- **Herbs:** *Hermannia depressa* (d), *Acalypha angustata*, *Berkheya setifera*, *Dicoma anomala*, *Euryops gilfillanii, Geigeria aspera* var. *aspera*, *Graderia subintegra*, *Haplocarpha scaposa*, *Helichrysum miconiifolium*, *H. nudifolium* var. *nudifolium*, *H. rugulosum*, *Hibiscus pusillus*, *Justicia anagalloides*, *Lippia scaberrima*, *Rhynchosia effusa*, *Schistostephium crataegifolium*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata, Haemanthus humilis* subsp. *hirsutus*, *H. montanus, Rhynchosia totta*.
- **Shrubs:** *Anthospermum hispidulum*, *A. rigidum* subsp. *pumilum*, *Berkheya annectens*, *Felicia muricata*, *Ziziphus zeyheriana*.

10.9.3.2 ANDESITE MOUNTAIN BUSHVELD (SVCB11)

Andesite Mountain Bushveld is found in the Gauteng, North-West, Mpumalanga and Free State Provinces. The vegetation type is characterised by dense, medium-tall thorny bushveld with a well-developed grass layer on hill slopes and some valleys with undulating landscape.

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

- **Trees:** *Senegalia caffra* (d), *Vachellia karroo* (d), *Celtis africana*, *Protea caffra*, *Zanthoxylum capense*, *Ziziphus mucronata*.
- **Shrubs:** *Asparagus laricinus* (d), *Euclea crispa* subsp. *crispa* (d), *Rhus pyroides* var. *pyroides* (d), *Diospyros lycioides* subsp. *lycioides*, *Gymnosporia polyacantha*, *Lippia javanica*, *Rhamnus prinoides, Asparagus suaveolens* (d), *Searsia rigida* var. *margaretae*, *Teucrium trifidum, Isoglossa grantii, Rhoicissus tridentata*.
- **Graminoids:** *Eragrostis curvula* (d), *Hyparrhenia hirta* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Cymbopogon pospischilii*, *Digitaria eriantha* subsp. *eriantha*, *Elionurus muticus*, *Eragrostis racemosa*, *E. superba*, *Panicum maximum*.
- **Herbs:** *Commelina africana*, *Vernonia galpinii*, *V. oligocephala, Aloe greatheadii* var. *davyana*.

10.9.3.3 EASTERN HIGHVELD GRASSLAND (GM12)

The Eastern Highveld Grassland vegetation type is located in the Mpumalanga and Gauteng Provinces. The vegetation type is distributed on lightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour

grasses and some woody species (*Senegalia caffra*, *Celtis africana*, *Diospyros lycioides* subsp. *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*).
A list of expected common and dominant species in undisturbed vegetation includes the following (those with a "d" are considered to be dominant) (Mucina and Rutherford, 2006):

- **Graminoids:** *Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (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 ceresiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewsia biflora*, *Ctenium concinnum*, *Diheteropogon amplectens*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *Rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*.
- **Herbs:** *Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens*, *H. caespititium*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata, Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia, ecklonis*.
- **Shrubs:** *Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*.

10.9.3.4 VEGETATION CONSERVATION STATUS

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under NEMBA (Section 3.1.1), lists national vegetation types that are afforded protection on the basis of rates of transformation. The Andesite Mountain Bushveld is classified as Least Concern, and the Soweto Highveld Grassland and Eastern Highveld Grassland as Vulnerable and in the “National List of Ecosystems that are Threatened and need of protection”, which is also reflected by the 2018 National Biodiversity Assessment.

Additionally, the project area is located within a nationally threatened ecosystem, namely, the Blesbokspruit Highveld Grassland (GP1) which is currently listed as Critically Endangered in terms of Section 52 of NEMBA. The ecosystem is delineated by the Blesbokspruit and its tributaries together with associated wetlands.

The Blesbokspruit Highveld Grassland ecosystem is listed under criterion F, indicating that the area is prioritized for meeting explicit biodiversity targets as defined in the systematic biodiversity plan and is considered to be highly irreplaceable and highly threatened. In addition to this, the ecosystem provides suitable habitat for 26 known species of special concern (threatened and/or endemic plant and animal species).
The key biodiversity features include:

- Red or Orange Listed plant species such as *Delosperma leendertziae* and *Khadia beswickii*;

- Red or Orange Listed mammals such as *Lutra maculicollis* (Spotted-necked Otter) and *Hyaena brunnea* (Brown Hyena);
- Red or Orange Listed bird species including *Tyto capensis* (African Grass Owl), *Phoeniconaias minor* (Greater Flamingo), *Phoeniconaias minor* (Lesser Flamingo), *Circus ranivorus* (African Marsh-Harrier), *Sagittarius serpentarius* (Secretary Bird), *Mycteria ibis* (Yellow-billed Stork), *Hydroprogne caspia* (Caspian Tern), *Mirafra cheniana* (Melodious Lark), *Falco naumanni* (Lesser Kestrel), *Eupodotis senegalensis* (White-bellied Korhaan) and *Crex crex* (Corncrake);
- Red or Orange Listed priority invertebrates including *Chrysoritis aureus* (Heidelberg Copper Butterfly) and *Pterinochilus murinus* (Golden Starburst Baboon Spider); and
- Seven vegetation types including Andesite Mountain Bushveld, Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands, Gold Reef Mountain Bushveld, Rand Highveld Grassland, Soweto Highveld Grassland and Tsakane Clay Grassland.

Within the National Threatened Ecosystems (2011 & 2018), the area generally has a status of Vulnerable and is known to be Poorly Protected (refer to Figure 41).

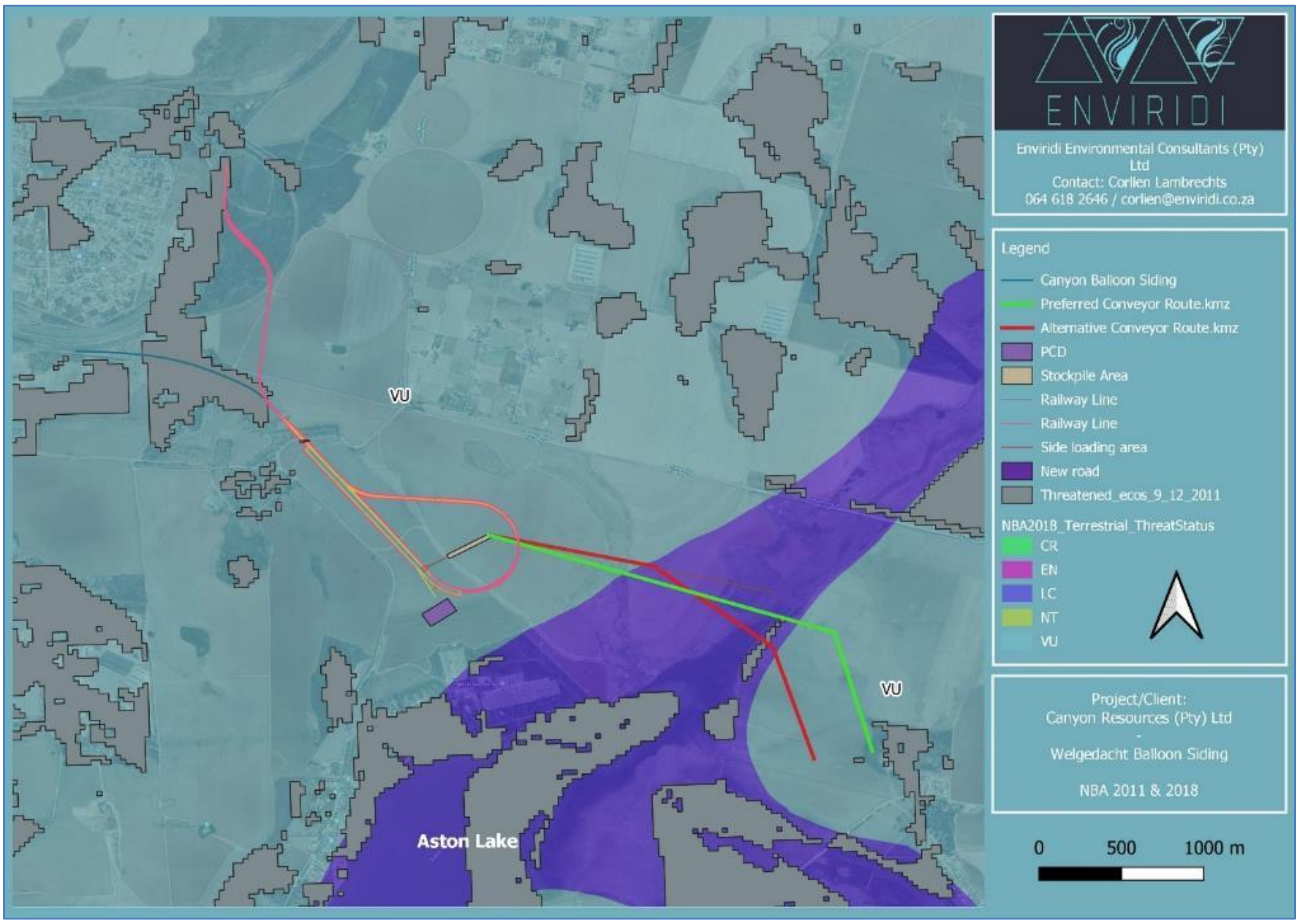


Figure 41: Welgedacht Balloon Siding Development showing Threatened Ecosystems 2011 – 2018

10.9.3.5 RAMSAR SITE

Blesbokspruit: 02/10/86; Gauteng; 1,858 ha; 26°17'S 028°30'E. Added to the Montreux Record, 6 May 1996. Bird Sanctuary, Nature Reserve. One of the few permanent water bodies in the Transvaal region. Formed during the 1930 construction of road and pipeline embankments for the mining industry. Seasonally important for several species of locally migrant waterbirds and various notable mammals. Mining activities take place upstream. The site was placed on the Montreux Record in May 1996 in response to contamination by large quantities of polluted water discharged from adjacent mines. Ramsar site no. 343. Most recent RIS information: 1995.[1]

Blesbokspruit is the only Ramsar wetland in the Gauteng province. It is situated 4 km outside of Nigel, the Highveld town at an altitude of 1,585 m. The Ramsar site area is over 2,000 hectares and extends all along the Blesbokspruit (a small river and one of the Vaal River's larger tributaries), from the Grootvaly Wetland Reserve in the north to the Marievale Bird Sanctuary in the south. The wetland was formed during the 1930 construction of road and pipeline embankments for the mining industry of the area. It was declared as a wetland of international importance on 2 October 1986.

Water levels in the Blesbokspruit are artificially maintained by the inflow of mining, industrial and municipal effluents that are contained by embankments. The average annual rainfall is between 600 and 700 mm and temperatures vary from -10 °C in winter to 35 °C in summer.

The biggest attraction at this Ramsar wetland from a tourism point of view is the Marievale Bird Sanctuary. The Marievale Nature Reserve, which is protected in terms of the NEMPAA, is situated 4 km south-west of the project footprint. No other areas protected in terms of the NEMPAA are situated within 10 km of the project footprint.

Marievale Bird Sanctuary, approximately 1,000 ha in extent, was also declared an Important Bird Area by Birdlife South Africa (IBA SA021). Over 230 bird species have been recorded here, including many national rarities. The sanctuary, managed by the Gauteng Department of Agriculture, Conservation and Environment, consists of large expanses of marsh with extensive reedbeds interspersed with open patches of water and mudflats during drier periods. There are areas of natural grassland and farmland surrounding the wetlands.
It is stated that although the bird species count is not as large as many other wetlands, the bird variety is considered good. Waterbirds such as Red-knobbed Coots, Goliath Herons, Grey Herons, Black-headed Herons, Squacco Herons, Black Herons, Purple Herons, Common Moorhens, Yellow-billed Ducks, Hottentot Teals, Red-billed Teals, Maccoa Ducks, Black Crakes, Kingfishers, Reed Cormorants, African Darters, Whiskered Terns are known to occur.[2]

[1] https://rsis.ramsar.org/ris/343
[2] http://www.saramsar.com/2015/04/blesbokspruit.html

In the surrounding grasslands right next to the wetlands Amor Falcons, Pin-tailed Whydahs, Long-tailed Widowbirds, Orange-breasted Waxbills, Southern Red Bishops, African Snipes, Swainsons's Spurfowl, Cape Batis and more have been historically observed. The Blesbokspruit RAMSAR site is located approximately 2.6 km west of the project footprint. No NPAES areas are situated within 10 km of the project footprint.

10.9.4 SITE SURVEY RESULTS

10.9.4.1 FLORAL ASSESSMENT RESULTS

As indicated a site survey was undertaken on the project area on the 18th of November 2020. The surface topography of the project area is flat with the project footprint situated at 1600 mamsl. The footprint of the proposed project is approximately 83 ha in extent.

The majority of the proposed project footprint (and extended 200 m project buffer) is located on land transformed for crop cultivation, with smaller, fragmented sections of impacted grassland and wetland also occurring on the project footprint and 200 m extended project buffer.

Land uses, on and adjacent to the project area, currently consist of cropland, wetland and riparian zones, impacted grassland, residential areas, Eskom powerlines and substations, railway lines and associated infrastructure and livestock grazing.

Vegetation units were identified according to plant species composition, previous land use and topography. The state of the vegetation of the proposed project area varies from being natural to completely degraded. The following broad classification of Vegetation Units (VU) were found to occur on the proposed project footprint and 200 m extended project area:

1. Impacted grassland (VU1);
2. Riparian vegetation (VU2); and
3. Transformed land (VU3).

The vegetation units, as identified during site visit, databases and aerial imagery are indicated in the figure below.

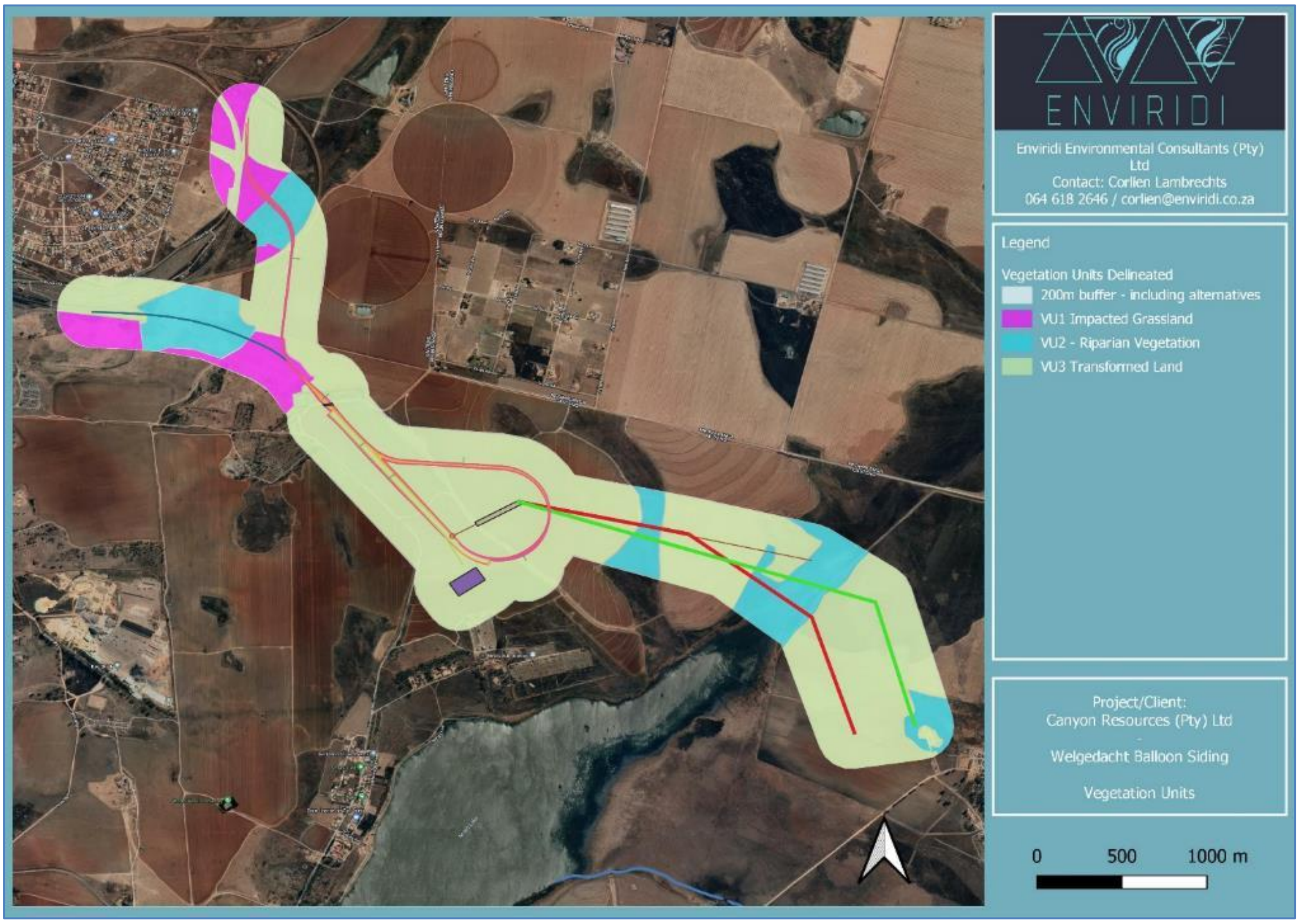


Figure 42: Vegetation units for project footprint and 200 m extended project area

10.9.4.1.1 Vegetation Unit 1 (VU1)

This vegetation unit occurs on flat terrain and covers 40.6 ha of the project footprint and 200 m extended project buffer. The vegetation of VU1 is indigenous grassland has been moderately to heavily impacted by surrounding land-uses and is highly fragmented by adjacent transformed vegetation and infrastructure. VU1 is considered to be heavily to moderately disturbed and the plant species composition of this VU is no longer representative of the Soweto Highveld Grassland vegetation type.

Fourty-four (44) plant species were identified in VU1, of which 15 were grass species. The VU is dominated by grass species, with few trees and shrubs. The dominant grass species include: *Eragrostis chloromelas* (Curly leaf), *Eragrostis curvula* (Weeping love grass), *Agrostis lachnantha* (Bent grass) and *Themeda triandra* (Red Grass).

Ten exotic species were identified to occur in low densities within VU1, especially along road verges, of these nine species, three are classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Argemone ochroleuca* (White-flowered Mexican poppy), *Eucalyptus* sp. and *Verbena bonariensis* (Purple top). *Eucalyptus* trees were found in moderate densities toward the north-western section of the project footprint. As expected, exotic species density and diversity was found to be higher along road and railway verges, the edges of crop fields and in proximity to residential areas.

VU1 consists of indigenous grassland, is located in areas categorised in the GCP as CBA and ESA and is located within ecosystems categorised as Vulnerable (Soweto Highveld Grassland) and Critically Endangered (Blesbokspruit Highveld Grassland) in terms of the NEMBA. However, due to the vegetation being very fragmented, moderately to highly impacted by current land-use and surrounding activities and that the vegetation composition is no longer representative of the Soweto Highveld Grassland, VU1 has been rated as having Moderate sensitivity.

10.9.4.1.2 Vegetation Unit 2 (VU2)

VU3 is characterised by riparian vegetation associated with Ashton Lake and wetlands. 68.8 ha of the project footprint and 200 m extended project buffer is located in VU2. The riparian vegetation is moderately disturbed by human movement, surrounding crop cultivation, residential areas, railways, roads and livestock grazing. The VU was found to be highly fragmented by adjacent transformed vegetation and infrastructure. Vegetative cover in VU2 was found to be good with moderate species diversity.

Twenty-nine (29) flora species were identified in VU2, most of which are obligate and facultative wetland species. Dominant species include: *Cyperus* spp., *Schoenoplectus* spp., *Typha capensis* (Bulrush), *Paspalum dilatatum* (Dallis grass), *Agrostis lachnantha* (Bent grass), *Bromus catharticus* (Rescue grass), and *Eleocharis dregeana* (Finger sedge). *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 and is provincially protected in terms of the TNCO.

Six exotic species were identified to occur in low densities within VU2, especially along road verges, of these six species, one is classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Verbena bonariensis* (Purple top). As expected, exotic species density and diversity was found to be higher along road and railway verges, the edges of crop fields and in proximity to residential areas.

Although this VU is considered to be moderately disturbed, watercourses and wetlands are considered high sensitivity. The majority of VU2 is located on areas designated as CBA and ESA in terms of the Gauteng Conservation Plan. VU2 is located within ecosystems categorised as Vulnerable (Soweto Highveld Grassland and Eastern Highveld Grassland) and Critically Endangered (Blesbokspruit Highveld Grassland) in terms of the NEMBA.

10.9.4.1.3 Vegetation Unit 3 (VU3)

Vegetation Unit 5 occurs on the areas which have been totally transformed, i.e. currently being used for crop cultivation, infrastructure and residences. The majority of the project footprint and 200 m extended project buffer is located on areas delineated as VU3, i.e. 330.6 ha. Most of the vegetation in this unit has either been entirely removed for cropland, infrastructure such as railways and residences or has been severely disturbed due to the aforementioned activities.

The vegetation unit is classified as having a low sensitivity due to the transformed state of the vegetation composition of the vegetation unit or lack of vegetation.

10.9.5 SUMMARY OF FLORISTIC COMPOSITION OF THE STUDY AREA

A total of 64 plant species were recorded in the study area during the time of the study and indicates moderate species diversity, taking into consideration the transformed areas of VU3. 81% (52 of 64) of the recorded plant species are indigenous to South Africa. Twelve exotic species were recorded as occurring on the study area, of which three are listed as AIP in terms of the NEMBA. From available literature it was established that at least five of the recorded plant species in the study area are to some extent used for medicinal purposes.

Two of the species recorded on the project area are endemic to South Africa. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 and is provincially protected in terms of the TNCO. No national SCC were identified to occur on the project footprint during the site survey. However, six flora SCC were identified for the project area during the desktop assessment, of which two were considered to be moderately or highly likely to occur on the project footprint (refer to Table 36).

Table 36: Plant species identified during the site survey

Species	Common name	Red List Status	Ecology / Conservation Status	VU 1	VU 2
Agrostis lachnantha	Bent grass	LC		X	X
Andropogon appendiculatus	Blue grass	LC		X	
Andropogon huillensis	Large silver Andropogon	LC		X	
Argemone ochroleuca	White-flowered Mexican poppy		NEMBA: AIP Category 1b	X	
Aristida congesta	Tassel three-awned grass	LC		X	
Asclepias gibba	Humped turret-flower	LC			X
Berkheya radula	Boesmanrietjie	LC	Obligate	X	X
Bidens pilosa	Common black-jack		Exotic	X	X
Bromus catharticus	Rescue grass	NE	Exotic, obligate		X
Calamagrostis epigejos	Reed grass	LC	Obligate		X
Commelina africana	Common yellow Commelina	LC		X	X
Conyza bonariensis	Flax-leaf fleabane		Exotic	X	X
Conyza podocephala	Bakbossie			X	
Crabbea acaulis	Prickle head	LC		X	
Crinum bulbispermum	Orange river lily	LC	Obligate, Medicinal, TNCO: Protected		X
Cynodon dactylon	Couch grass	LC		X	
Cyperus articulatus	Jointed flatsedge	LC	Obligate		X
Cyperus esculentus	Earth Almond				X
Cyperus semitrifidus		LC			X
Denekia capensis		LC		X	X

Species	Common name	Red List Status	Ecology / Conservation Status	VU 1	VU 2
Dicoma anomala	Fever bush			X	
Eleocharis dregeana	Finger sedge	LC	Obligate		X
Eragrostis chloromelas	Curly leaf	LC		X	
Eragrostis curvula	Weeping love grass	LC	Facultative upland	X	X
Eragrostis patentipilosa	Footpath love grass	LC		X	
Eragrostis racemosa	Narrow heart love grass	LC		X	
Eucalyptus sp.			NEMBA: AIP Category 1b	X	
Euryops gilfillanii		LC	Endemic	X	X
Falkia oblonga	Obligate	LC			X
Felicia muricata	Wild Aster	LC		X	
Fingerhuthia africana	Thimble grass	LC		X	
Fuirena stricta		LC	Obligate		X
Gazania krebsiana	Botterblom				X
Geigeria burkei	Knoppiesvermeerbos	LC	Endemic	X	
Gomphocarpus fruticosus	Milkweed	LC	Medicinal	X	
Gomphrena celosioides	Bachelor's button		Exotic	X	
Haplocarpha scaposa	Common Haplocarpha	LC		X	
Helichrysum aureonitens	Golden everlasting	LC		X	
Helichrysum rugulosum		LC		X	
Hilliardiella oligocephala	Bicoloured Vernonia	LC	Medicinal	X	
Hyparrhenia hirta	Common thatching gras	LC	Medicinal	X	X
Hyperthelia dissoluta	Yellow thatching grass	LC		X	
Hypochaeris radicata	Common cat's-ear		Exotic	X	
Imperata cylindrica	Cotton wool grass	LC			
Juncus effusus	Soft rush	LC			
Justicia anagalloides		LC		X	
Melinis repens	Natal red-top	LC		X	
Monopsis decipiens	Butterfly Monopsis	LC			
Paspalum dilatatum	Dallis grass	NE	Exotic	X	X
Persicaria lapathifolia	Spotted knot-weed		Exotic		X
Phragmites australis	Common reed	LC			X
Plantago lanceolata	Narrow-leaved Ribwort	LC	Exotic	X	
Polygala hottentotta	Small Purple Broom	LC		X	
Schistostephium crataegifolium	Golden Flat-flower	LC		X	
Schoenoplectus brachyceras		LC			X
Schoenoplectus corymbosus	Common sedge	LC			
Schoenoplectus decipiens		LC	Obligate	X	X
Setaria sphacelata	Bristle grass	LC			X
Syncolostemon canescens	Los-my-uit	LC		X	

Species	Common name	Red List Status	Ecology / Conservation Status	VU 1	VU 2
Tagetes minuta	Tall khaki weed		Exotic	X	
Themeda triandra	Red Grass	LC		X	X
Typha capensis	Bulrush	LC	Obligate, Medicinal		X
Verbena bonariensis	Purple top		NEMBA: AIP Category 1b	X	X
Wahlenbergia undulata	African bluebell	LC		X	

10.9.6 FAUNAL ASSESSMENT RESULTS

The area in question including a 200 m buffer surrounding the footprint was assessed during the field assessment as required by GDARD Minimum Requirements. The area (specifically where the footprints are proposed) has been largely transformed based on agricultural activities ranging between pasture and active crop planting. An area also consisted of a dumping area where several informal recyclers were sighted within the dumps. 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 area where the Siding infrastructure is focussed.

The areas surrounding the croplands is the only remaining habitat left and therefore has valuable corridor movement ecological value including habitat and refuge to species utilising this type of terrain.

Large sections of the area under investigation consisted of secondary (impacted) grassland between the agricultural areas as shown above. Although most of these areas have been transformed and other signs of overgrazing were visible, however, wetlands also occurred within this habitat types, as with most grassland associated habitats.

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.

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 (avifaunal and/or predatory species).

Sensitive invertebrate species are expected to be associated with the grassland areas as these represent specialised niches.

No SCC animals were sighted to occur within the area, since the area was found to be impacted, but the overall most important feature will be the protection of the water resources, wetlands and remaining natural grasslands within the area, it will by default protect all other endemic, sensitive and specialised species found to occur within the area.

Table 37: Species observed within and around the project area

Family	Species	Common Name	Sighting/Finding	Status and IUCN
Invertebrates				
Termitaria sp. Prominent to the landscape			Large mounds	Least Concern
Cetoniidae	*Mausoleopsis amabilis*	White-spotted Fruit Chafer	Sightings	Least Concern
Spirostreptidae	*Doratogonus*	Millipedes	Sightings	Several Millipede species are listed in the IUCN Database
Agelenidae	*Sp. unknown*	Funnel-web spiders	Sightings specifically in grassland areas	Least Concern
Sparassidae	*Pseudomicrommata longipes*	Grass huntsman/ groot-dwaal krap spinnekop	Sightings	Least Concern
List to include all other aquatic invertebrates as included within the Aquatic Ecology report				
Butterflies				
Pieridae	*Eurema brigitta*	Broad border grass yelllow	Sightings	Least Concern
Nymphalidae	*Danaus chrysippus*	African Monarch	Sightings - General	Least Concern
Pieridae	*Belenois aurota*	Brown-veined white	Sightings - General	Least Concern
Mammals				
Herpestidae	*Galerella sanguinea*	Slender Mongoose	Sighted	Least Concern
Pedetidae	*Pedetes capensis*	Springhare	Sighted	Least Concern
Reptilians				
No reptilian species have been sighted				
Avifauna				
Threskiornithidae	*Bostrychia hagedash*	Hadeda Ibis	Sightings	Least Concern
Threskiornithidae	*Threskiornis aethiopicus*	African Sacred Ibis	Sightings	Least Concern
Laniidae	*Lanius collaris*	Fiscal shrike	Sightings	Least Concern
Hirundinidae	*Ptyonoprogne fuligula*	Rock Martin	Sightings	Least Concern
Muscicapidae	*Cossypha caffra*	Cape Robin-Chat	Sightings	Least Concern
Phasianidae	*Scleroptila shelleyi*	Francolin, Shelley's	Sightings	Least Concern
Pycnonotidae	*Pycnonotus barbatus*	Black-eyed Bulbul	Sightings	Least Concern
Numididae	*Numida meleagris*	Guineafowl, Helmeted	Sightings	Least Concern
Cuculidae	*Centropus burchelli*	Burchell's Coucal	Sightings	Least Concern
Turnicidae	*Turnix sylvaticus*	Buttonquail	Sightings	Least Concern
Ploceidae	*Euplectes orix*	Southern Red Bishop	Sightings	Least Concern
Ploceidae	*Euplectes afer*	Yellow-crowned bishop	Sightings	Least Concern

Family	Species	Common Name	Sighting/Finding	Status and IUCN
Ploceidae	*Plocepasser mahali*	White-browed sparrow-weaver	Sightings	Least Concern
Ploceidae	*Euplectes ardens*	Red-Collared Widowbird	Sightings in Grasslands	Least Concern
Viduidae	*Vidua macroura*	Pin-tailed Whydah	Sightings in Grasslands	Least Concern
Ploceidae	*Ploceus velatus*	Masked-weaver, Southern	Sightings	Least Concern
Burhinidae	*Burhinus capensis*	Thick-knee, Spotted	Sightings	Least Concern
Columbidae	*Streptopelia Senepalensis*	Laughing Dove	Sightings	Least Concern
Columbidae	*Streptopelia Capicola*	Cape Turtle Dove	Sightings	Least Concern
Corvidae	*Corvus albus*	Pied Crow	Sightings at dumps	Least Concern
Charadriidae	*Vanellus armatus*	Lapwing, Blacksmith	Sightings	Least Concern
Charadriidae	*Vanellus coronatus*	Lapwing, Crowned	Sightings	Least Concern

Other grassland related species, such as 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 this is not an ideal habitat for this species (especially when it is constantly cut/ploughed), as this species prefers very thick grassland vegetation, since they make nest on the ground in areas of long grass.

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. No 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. However, this is not the case for the protected and sensitive ecosystems in the vicinity, such as the IBA and RAMSAR site, and these may likely be valuable habitat for SCC and impacts to these systems should be prevented at all times.

10.9.7 SENSITIVITY MAPPING AND GEOSPATIAL ANALYSIS

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. Mostly ESA areas as per Conservation Plan intercept with the Layout proposed.

The Andesite Mountain Bushveld is classified as Least Concern, and the Soweto Highveld Grassland and Eastern Highveld Grassland as Vulnerable and in the “National List of Ecosystems that are Threatened and need of protection”, which is also reflected by the 2018 National Biodiversity Assessment.

Additionally, the project area is located within a nationally threatened ecosystem, namely, the Blesbokspruit Highveld Grassland (GP1) which is currently listed as Critically Endangered in terms of Section 52 of NEMBA. The ecosystem is delineated by the Blesbokspruit and its tributaries together with associated wetlands and pans.

The study area contains the following biodiversity classes from the Gauteng Conservation Plan:

- CBA: A section of the proposed railway line, approximately 480 m, is located on areas categorised as CBA. The CBA area is located on areas which have been delineated in this report as VU1 (grassland). These areas were most likely denoted as a CBA due to the appearance of the presence of habitat for red listed species, and natural grassland. Although the grassland vegetation (VU1 in this report) has been impacted and are moderately disturbed, the specialist does not dispute the designation of the areas categorised as CBA.
- ESA: The majority of the project footprint has been categorised as ESA by the Gauteng Conservation Plan. These ESA areas were most likely denoted as ESA due to their current and historic association with wetlands, and watercourses, their function as ecological corridors, high ecosystem services and the possible presence of habitat for SCC. However, the majority of these areas have been transformed by current crop cultivation (VU3 in this report). It is the specialist's opinion that the areas of the project footprint delineated in the GCP as ESA fulfil the functions of ESAs, as they are contemplated in the Gauteng Conservation Plan. However, it is important to note that, due to their transformation, these areas provide severely limited ecosystem services.

The Marievale Nature Reserve, which is protected in terms of the NEMPAA, is situated 4 km south-west of the project footprint. No other areas protected in terms of the NEMPAA are situated within 10 km of the project footprint.

The Blesbokspruit RAMSAR site is located approximately 2.6 km west of the project footprint. No NPAES areas are situated within 10 km of the project footprint.

The National Web Based Environmental Screening Tool indicated that the project footprint is of moderate and low sensitivity in terms of plant species, very high sensitivity in terms of terrestrial biodiversity and low and medium sensitivity in terms of animal species (refer to figures below). The site verification in terms of plant, animal and terrestrial biodiversity themes found that the majority of the project footprint is of low sensitivity (VU3), with riparian zones rated as high sensitivity (VU2) and grasslands as moderate sensitivity (VU1).

Based on the findings of both the desktop assessment and the site survey, the Vegetation Units have been assigned the following sensitivity ratings in terms of terrestrial ecology aspects:

1. Impacted grassland (VU1) – Moderate sensitivity
2. Riparian vegetation (VU2) – high sensitivity
3. Transformed land (VU3) – low sensitivity

The figure below illustrates the sensitivity of the project footprint, based on the findings of the desktop assessment and site survey.

It is important to note that sensitivity buffers as calculated and determined in the Wetland Assessment have not been considered for the Terrestrial Ecology Sensitivity. It is none-the-less important the buffer areas indicated in the Wetland Assessment are considered in the project planning and implementation.

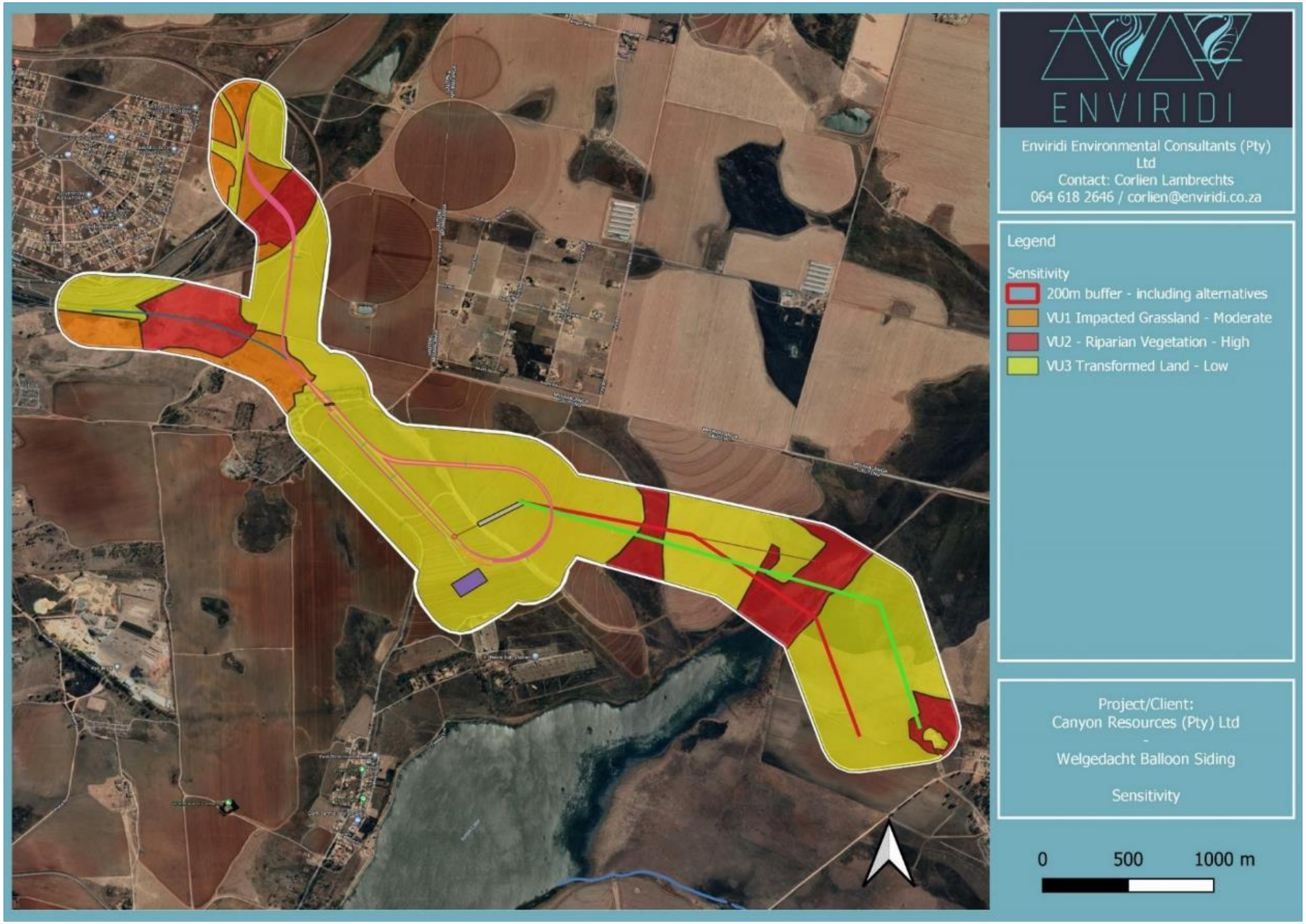


Figure 43: Sensitivity delineated according to habitat remaining condition thereof including Preferred Conveyer Route (including other ecological considerations)

Opposed to the field supported sensitivity delineated above, the following is provided in accordance with the National Screening Tool, which needs to be considered as per minimum requirements for Ecological and Terrestrial Biodiversity Assessments.

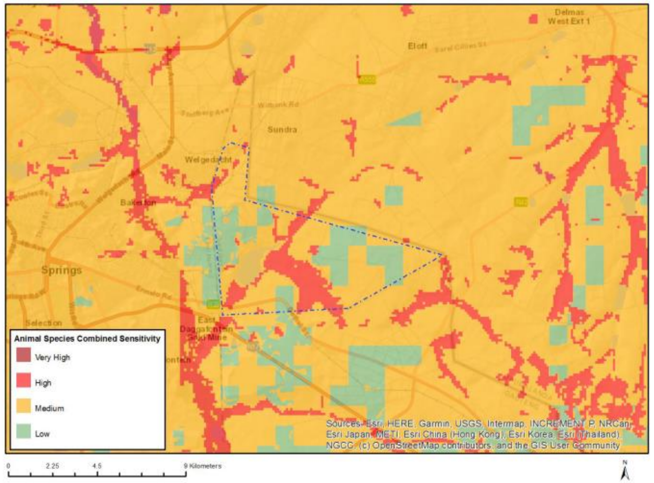


Figure 44: Animal Species Sensitivity – National Screening Tool

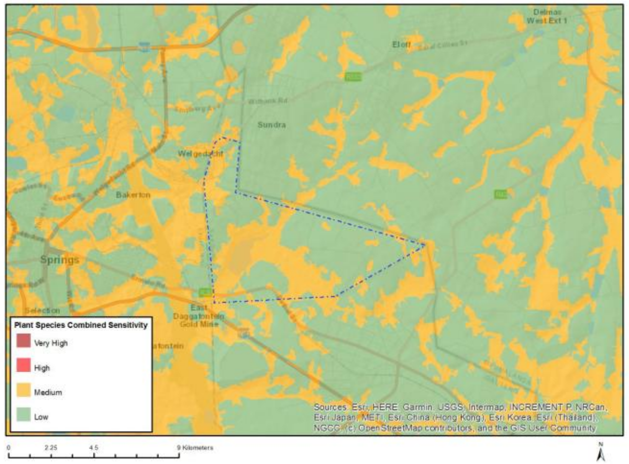


Figure 45: Plant Species Sensitivity – National Scrreening Tool

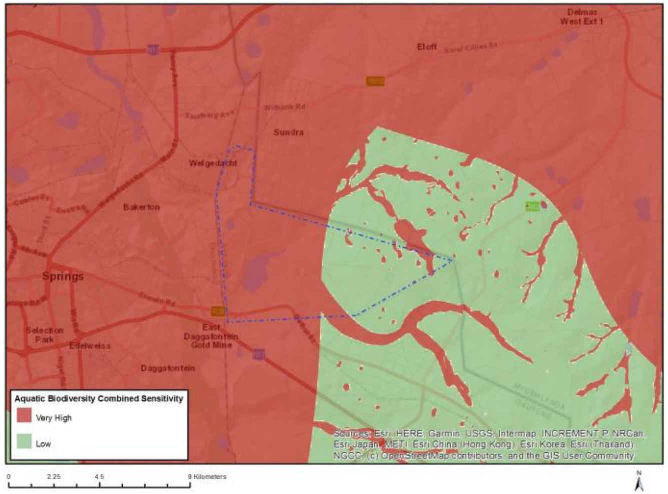


Figure 46: Aquatic Biodiversity Sensitivity – National Screening Tool

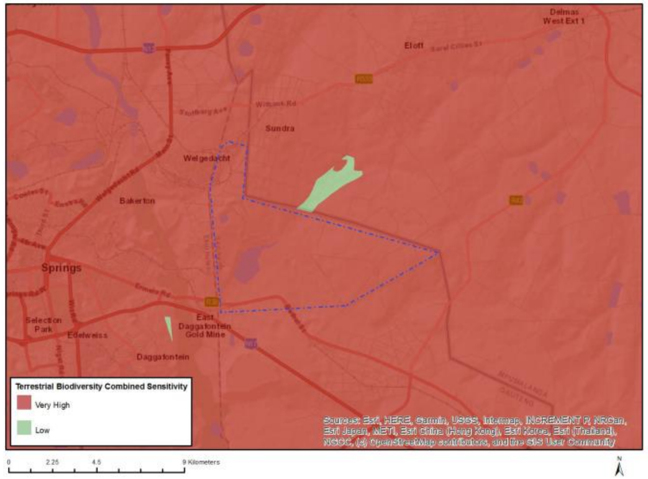


Figure 47: Terrestrail Biodiversity Sensitivity – National Screening Tool

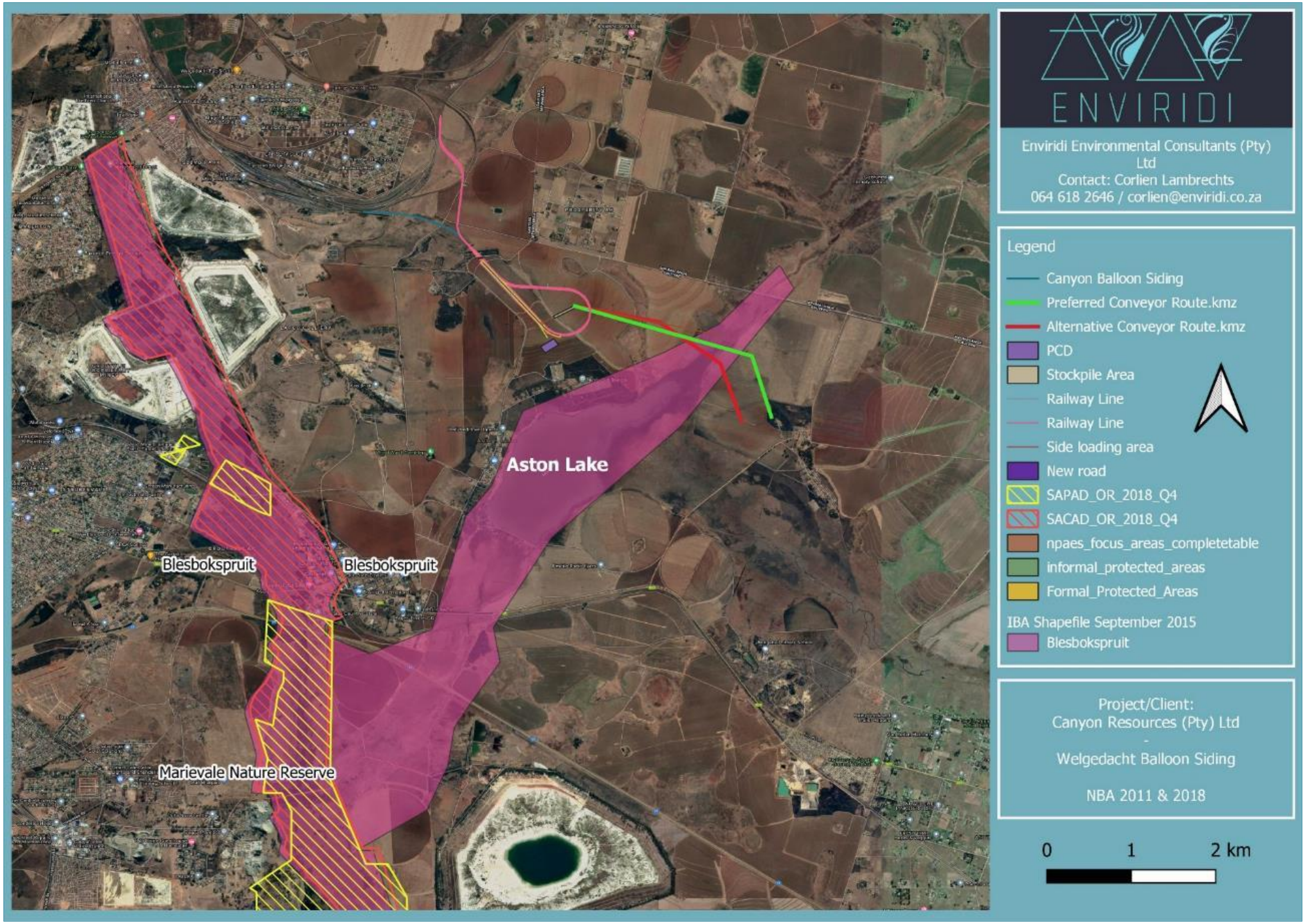


Figure 48: Important Biodiversity and Birding Areas and Protected Areas (NPAES and IBAs)

10.9.7.1 PROTECTED AREAS, NPAES, IBAS AND OTHER

The Siding areas falls adjacent to the Blesbokspruit Important Birding Area (Refer to Figure 48).[3] The areas intercepting with the IBA is the conveyer belt and service road (both options). The Blesbokspruit IBA is a large, highly modified, high-altitude wetland with a narrow fringe of degraded grassland. It extends along the Blesbokspruit, one of the Vaal River's larger tributaries, from the Grootvaly Wetland Reserve (R555) in the north to the Marievale Bird Sanctuary (R42) in the south.

On the BirdLife South Africa database, it is stated that the water levels in the Blesbokspruit are artificially maintained by the inflow of mining, industrial and municipal effluents that are contained by embankments. The addition of organic matter produces the highly eutrophic conditions that are favoured by marginal vegetation. Reedbeds (*Phragmites australis* and *Typha capensis*) are estimated to cover more than 70% of the Marievale Bird Sanctuary (Joshua 2014) and the remainder of the IBA is similarly affected.

<u>*Birds*</u>

The Blesbokspruit, which in the past regularly supported 20 000 waterbirds, was designated a Ramsar Wetland of International Importance for waterbirds in 1986.

The water is highly productive, providing ample food for Lesser Flamingo (*Phoeniconaias minor*) and Greater Flamingo (*Phoenicopterus roseus*). The system supports a diversity of waterbird species, including Goliath Heron (*Ardea goliath*), Purple Heron (*A. purpurea*), African Spoonbill (*Platalea alba*), Glossy Ibis (*Plegadis falcinellus*), Pied Avocet (*Recurvirostra avosetta*), Red-knobbed Coot (*Fulica cristata*) and White-winged Tern (*Chlidonias leucopterus*). African Marsh Harrier (*Circus ranivorus*), which has been displaced from much of the surrounding veld as a result of intense industrialisation, urbanisation and habitat modification, is a breeding resident. African Grass Owl (*Tyto capensis*) is now rarely recorded along the Blesbokspruit, its local population decline being attributed to a reduction in its preferred rank grassland habitat adjacent to the wetland. Large volumes of water discharged upstream have increased the extent and permanence of flooded ground, while reed encroachment, unplanned fires, uncontrolled grazing by cattle and invasion by alien forbs contribute to the degradation of the remaining terrestrial habitat.

<u>*IBA trigger species*</u>

There is insufficient data to indicate that any species pass the IBA criteria. However, since the wetland is thought to hold more than 20 000 waterbirds, its importance for waterbird conservation should not be underestimated.

<u>*Conservation action*</u>

The IBA incorporates a 220-ha municipal protected area (Grootvaly Wetland Reserve) and a 1 012-ha provincial protected area (Marievale Bird Sanctuary) managed by the GDARD. Daggafontein, a 550-ha property that borders Marievale to the north, was donated to GDARD by AngloGold. However, due to financial and capacity constraints, this property has not yet been fully incorporated into the day-to-day management of the provincial protected area.

[3] BirdLife South Africa (2021) https://www.birdlife.org.za/iba-directory/blesbokspruit/

The rest of the properties between Daggafontein and Grootvaly are in the hands of private individuals and companies. This diverse ownership makes it difficult to implement conservation actions within the IBA. There is an environmental management plan for the reserve and the officer-in-charge is supported by a management plan committee that meets several times a year, as well as by the Friends of Marievale. The reserve is under-resourced and not all actions included in the management plan can be implemented at present.

Despite regular waterbird counts along sections of the Blesbokspruit, there are no reliable population estimates for individual species in the whole IBA. Although it is possible that some species, such as Spur-winged Goose (*Plectropterus gambensis*), do pass the IBA criteria, this cannot be stated with certainty. The IBA does pass the sub-regional IBA criteria of 10 000 waterbirds and, on occasion, also the 20 000 waterbird criteria for a global IBA. More frequent monitoring and an intensive ringing programme are needed to better understand waterbird population dynamics at this site.

10.10 AGRICULTURAL AGRO ECOSYSTEM ANALYSIS

Index (Pty) Ltd. undertook an Agricultural and Land Capability Impact Assessment. Refer to Appendix 13.

The assessment included the following:

- The site survey indicating the soil form and depth. The information, together with other data such as contours, was used to classify the area into land capability classes following both the DAFF system. The agricultural potential of the area was determined using the baseline soil properties as well as climate data;
- The area was also assessed for other agricultural production options such irrigated agriculture and livestock production; and
- Soil samples were analysed of basic soil fertility and informed the soil monitoring programme.

10.10.1 AGRICULTURAL LAND USES

Figure 49 indicates the land uses within and around the proposed Welgedacht Balloon Siding. The land uses for the proposed project site are as follows:

1) The 18,3 hectare of land within the balloon is surrounded by rail and not considered as arable.
2) A further 10,98 hectare is taken up by the existing railway lines.
3) Approximately 151 hectares is used by for agriculture and will be impacted on by the development.

Most of the land outside of the watercourses is cultivated.

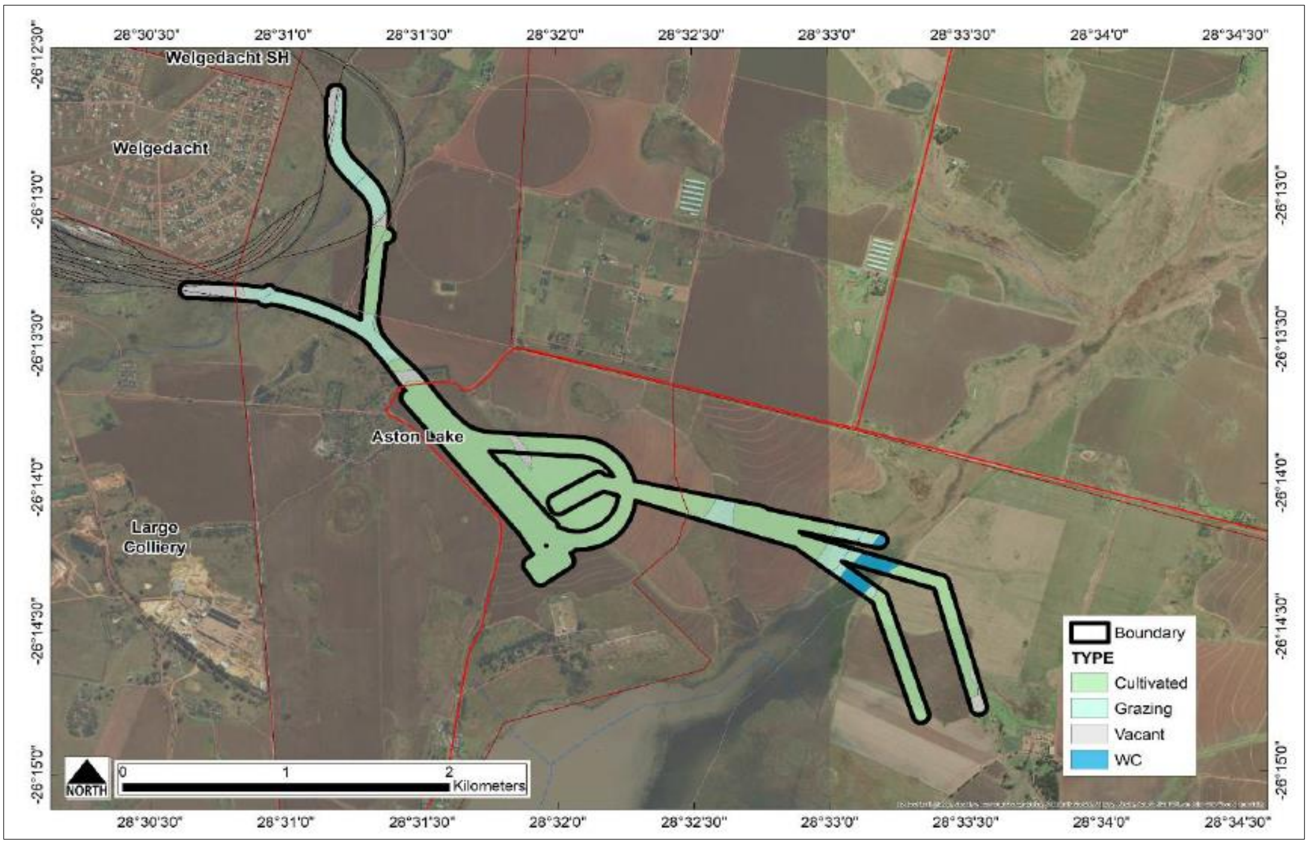


Figure 49: Present land uses

10.10.2 REGIONAL LAND USES

Land uses within a 10 km radius around the centroid of the siding were delineated from Google and Bing images to determine the dominant activities.

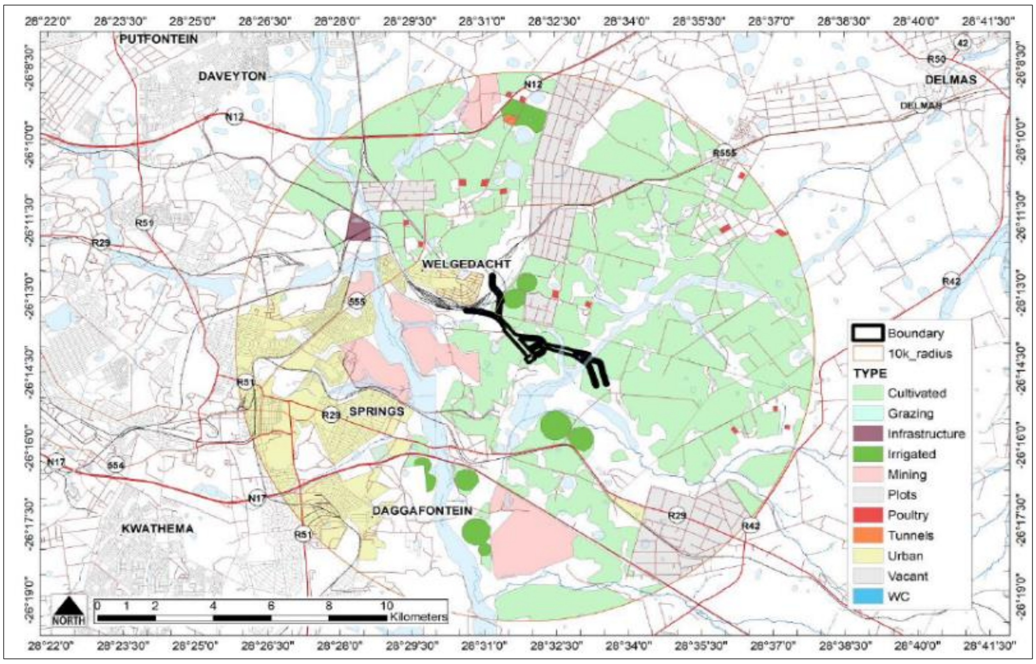


Figure 50: Regional Land Uses

The following was found:

- Poultry units of which 2 are abandoned.
- One hydroponic unit.
- East of the site is mostly cultivated (where a mining right occurs).
- There are 10 centre pivot irrigation machines of which only two are adjacent to the site.
- West of the site is mostly urban.
- Agricultural smallholdings occur directly north of the site, which are mostly residential.

Concern was raised by the interested and affected parties that the activities at the siding will influence poultry production. This report deals specifically with the siding and not with the mining activities. The only possible impact that the siding can have on poultry is from noise generated by railway tracks, loading of product and possible vehicle movement.

A spatial analysis found that there are two poultry houses and both of them are further than 1.6 km form the project infrastructure. Due to the distance, it is thus not anticipated that chickens will be influenced.

Figure 51: Distance to nearest poultry houses

10.10.3 SOIL

Soil derived from weathering of sandstone. The site is located on the ancient African Erosion Cycle on which depressions are common (King, 1962). There is a pan just the affected land that is considered as sensitive.

Soils on the properties are generally sandy loam with poorly developed structure, often blocky or massive grainy for the Avalon and Clovelly soils, and moderately strong blocky structure for the Hutton soils. The texture is sandy clay loam with a clay content of 18-35%. The watercourses were classified as Rensburg. Other forms identified are Willowbrook, Longlands and Champagne.

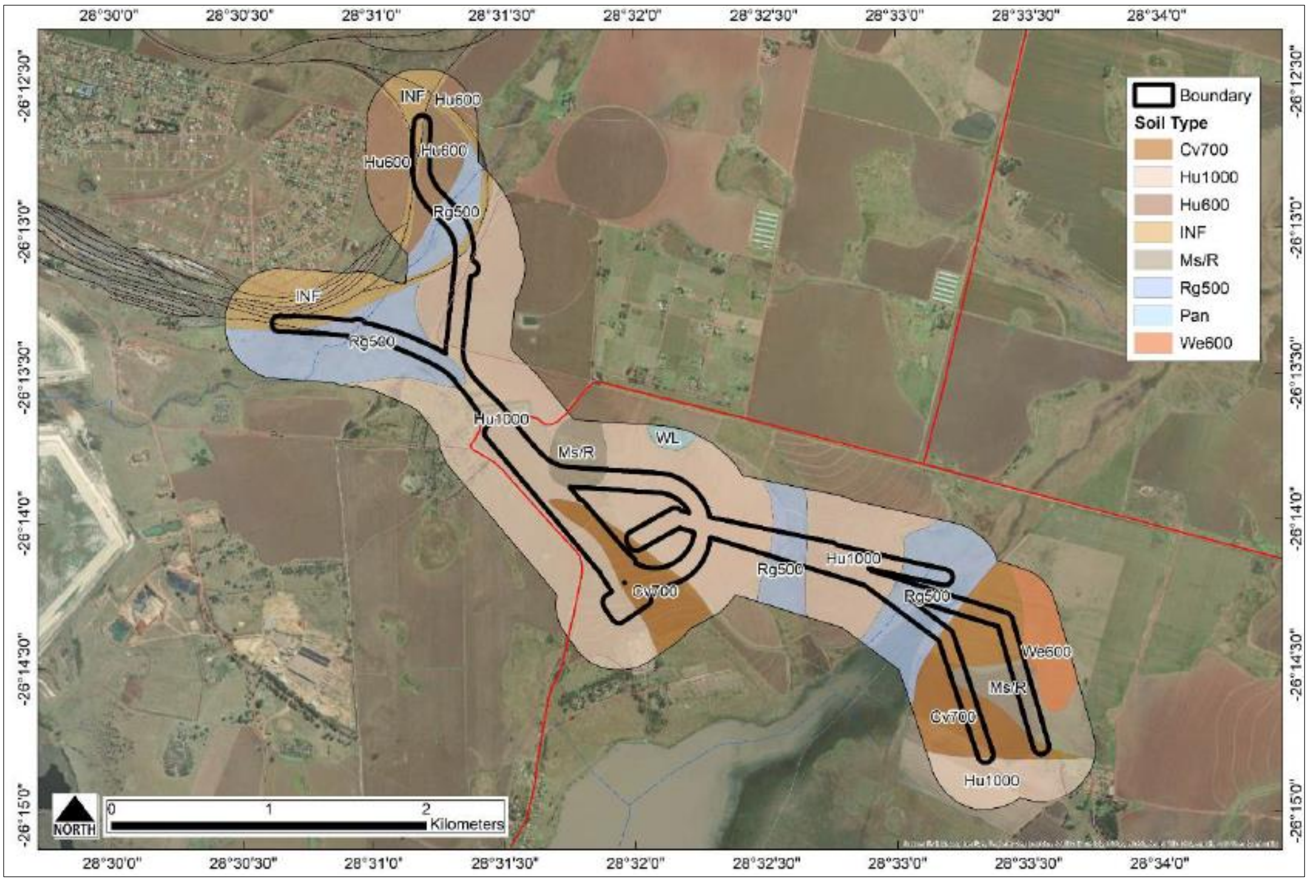


Figure 52: Soil Map

Table 38: Soil Descriptions

Soil type	Description	AREA (ha)
Cv700	Moderately deep, yellowish sandy, clay loam soils with a poorly developed blocky structure. The soil is free of course fragments and mottles. All soil in this category is cultivated.	27,36
Hu1000	Deep, reddish sandy, clay loam soils with a poorly developed blocky structure. The soil is free of course fragments and mottles. All soil in this category is cultivated.	71,50
Hu600	Moderately deep, reddish sandy, clay loam soils with a poorly developed blocky structure. The soil is free of course fragments and mottles. All soil in this category is vacant.	4,49
INF	Rail and roads. Not used for farming purposes	5,73
Ms/R	Shallow and rocky soils that is not used for farming.	10,41
TOTAL		**148,7**

10.10.4 SOIL FERTILITY

Soil nutrient status does not determine potential, it only indicates the fertilisation practices of the farmer. It is dynamic and changes over time. The analyses indicate that the fertility levels of the cultivated land are high. Some of the lands have recently received dolomitic lime, which is indicated by the higher level of calcium and magnesium. The P level is high. These applies for both the Hutton and Clovelly soils (Hu1000, Hu600 and Cv700)

As expected, the floodplain soils have elevated calcium and magnesium levels (Rg500). The Rensburg soils occur in the wetlands and are not arable. The clay content is high.

10.10.5 DEFINING HIGH LAND POTENTIAL

The potential of land is defined in terms of a viable farming unit as described in *Conservation of Agricultural Resources Act* (CARA) and *National Policy of the Preservation of High Potential Land* (HUAL) and in other legislation and guidelines that are used by the Department of Agriculture Land Reform and Rural Development. National policy on the protection of high potential and unique agricultural land published by Department of Agriculture in 2006 relates to subdivision of land and a change in land use, states that *Protection of high potential agricultural land for food security remains the primary responsibility of the Department of Agriculture*.

High potential cropping land means land best suited to, and capable of, consistently producing acceptable levels of goods and services for a wide range of agricultural enterprises in a sustainable manner, taking into consideration expenditure of energy and economic resources; and includes:

- Land capability classes i to iii;
- Unique agricultural land;
- Irrigated land; and
- Land that is suitable for irrigation and where irrigation water is available.

The objective of CARA is to protect high potential land from being used for non-farming purposes.

Change of land use applications must be submitted to the Minister of Agriculture for approval. The deeds office will only consider the application for rezoning and subdivision if rezoning authorisation has been approved.

10.10.6 LAND CAPABILITY

The Soil Management Directorate published a dataset in 2014 that evaluate soil properties, land characteristics and climate, which then culminates into land use capability classes. The main deciding criterion in the case of this site is the soil potential (or capability). Figure 53 indicates the land use capability from this dataset. Accordingly, the soil has a moderate or high capability. The watercourses are incorrectly indicated as moderate potential land. The onsite evaluation largely found the same trend, except the land that is at the existing siding. This, as well as the wetlands are not suitable for farming and have a low capability.

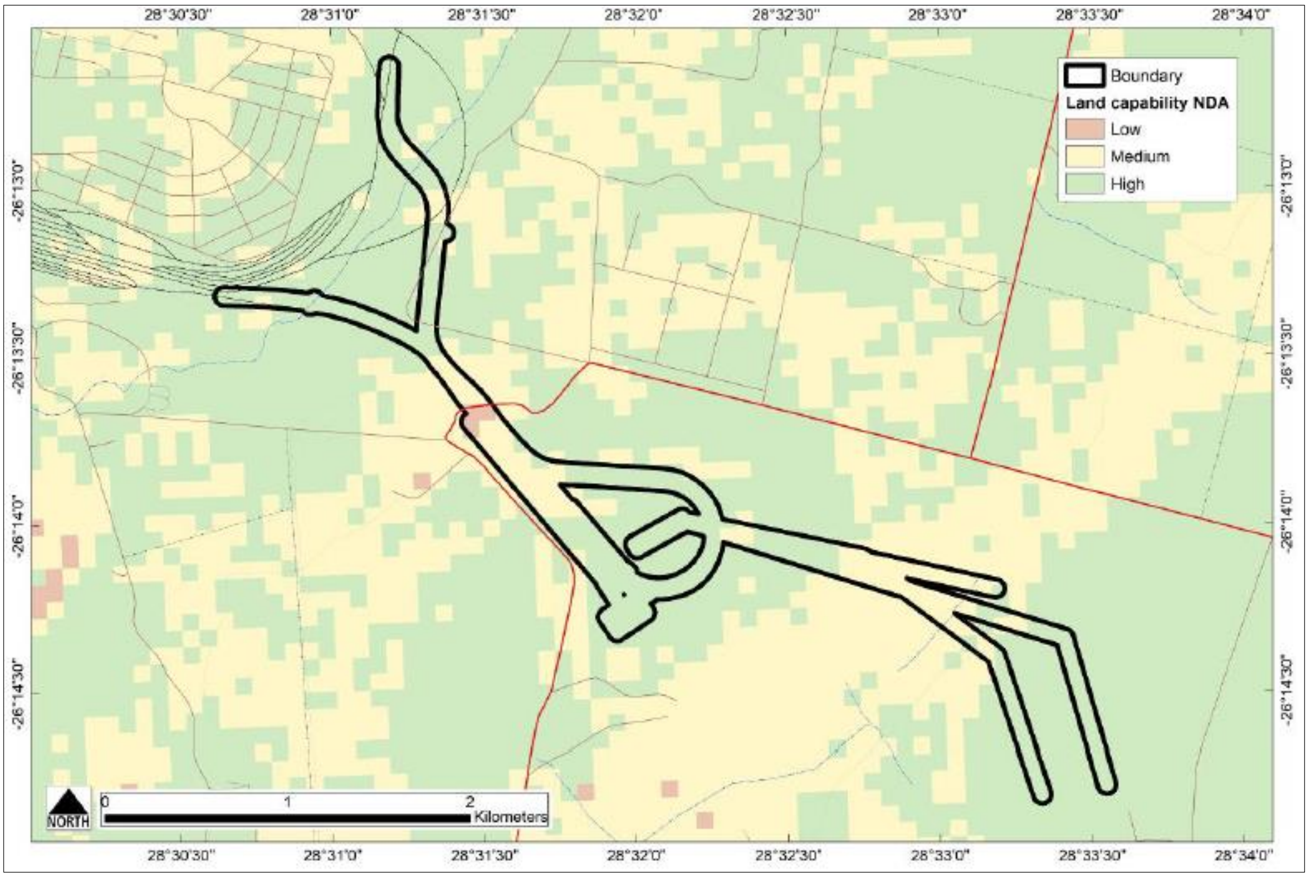


Figure 53: Land use capability

Land capability is classified according to guidelines published by the National Department of Agriculture in AGIS. Land Capability is determined by the collective effects of soil, terrain and climate features and shows the most intensive long-term use of land for rain-fed agriculture. At the same time, it indicates the permanent limitations associated with the different land-use classes:

- Order A: Arable land – high potential land with few limitations (Classes i and ii)
- Order B: Arable land – moderate to severe limitations (Classes iii and iv)
- Order C: Grazing and forestry land (Classes v, vi and vii)
- Order D: Land not suitable for agriculture (Class viii)

LAND CAPABILITY			Wildlife	Grazing and Forestry			Crop production			
Order		Class		Forestry	Veld	Pastures	Limited	Moderate	Intensive	Very
Arable	A	i								
		ii								
	B	iii								
		iv								
Non arable	C	v								
		vi								
		vii								
	D	viii								

Figure 54: Land capability classes – intensity of land uses (shaded area indicate the suitable land use)

10.6.6.1 SOIL USE CAPABILITY ON THE SITE

The analysis indicates that there is 71,5 ha high potential land that falls into Land Capability Classes ii or iii. The balance of the land is Class iv and poorer.

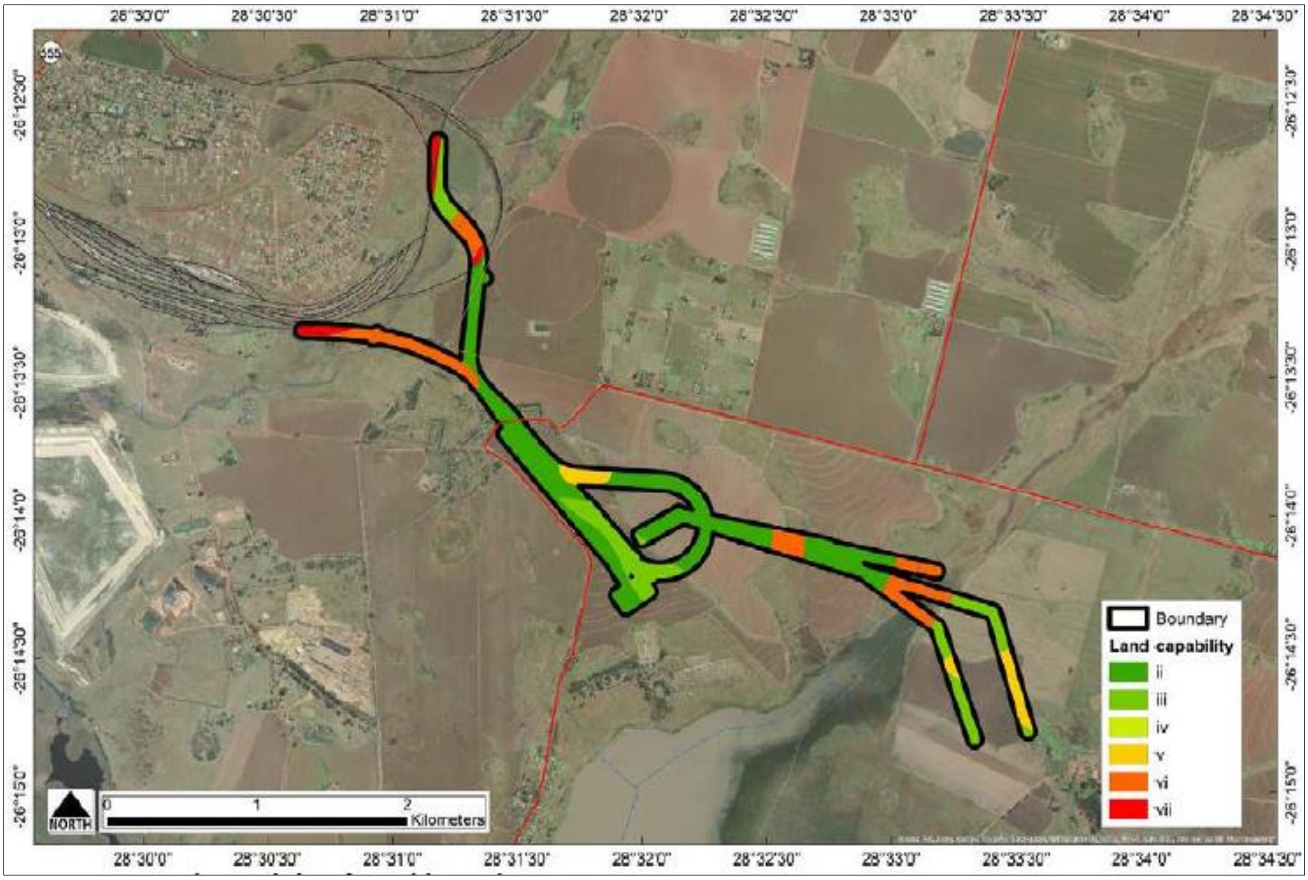


Figure 55: Land Capability found by Index

Table 39: Soil capability per category

Land capability	Area (ha)
ii	71.50
iii	31.85
iv	0.13
v	10.41
vi	29.08
vii	5.73
Total	**148.70**

10.10.7 FARM ENTERPRISE PRODUCTION POTENTIAL

10.10.7.1 FARMING ENTERPRISE SUITABILITY

The enterprises that the farmer endeavours in are determined by the agricultural potential, and very often the preference of the farmer and the prevailing socio-economic condition. While there are irrigated lands close to the alignments, the possibility of irrigation farming is determined by water availability and a water use licence from a recognised source. In this instance, one assumes that irrigation infrastructure is installed in line with the approved water quota. The irrigation potential of the soil is low because there is no irrigation water available.

Table 40: Soil Suitability for the farming enterprises

Soil type	Cultivation	Livestock	Horticulture	Poultry	AREA (ha)
Cv700	High	High	High	High	27,36
Hu1000	High	High	High	High	71,50
Hu600	High	High	High	High	4,49
INF	None	None	None	None	5,73
Ms/R	Low	High	Low	Low	10,41
TOTAL			**148,7**		

10.10.7.2 CROP FARMING

The site is located in an established crop production area. Maize, soya and dry beans are the major crops that are produced in the region. Maize was selected as the indicator crop to calculate the impact that mining will have on the agricultural production if the cultivated land is removed from farming and used to build the siding. According to DALRRD, 2019. http://daffarcgis.nda.agric.za /Comp_Atlas_v2/ and the South African Atlas of Agrohydrology and Climatology published by the Water Research Commission, Pretoria, the long term maize yield is estimated at 3,7 tonnes per hectare. However, with new cultivars that have come on the market over the past few years, the average yield is likely higher. For the purposes of this study, a yield of 5 tonnes per hectare is accepted.

Land capability Class ii and iii are arable and able to consistently producing crops. Approximately 103 hectares of land falls into these classes. This is the area size that was used in calculations on the financial impact assessment. The sales price for yellow maize declined drastically from 2016 to 2017, after which there has been a steady rise to the present season. For the purposes of this study a value of R3 200 per tonne was used on the farm.

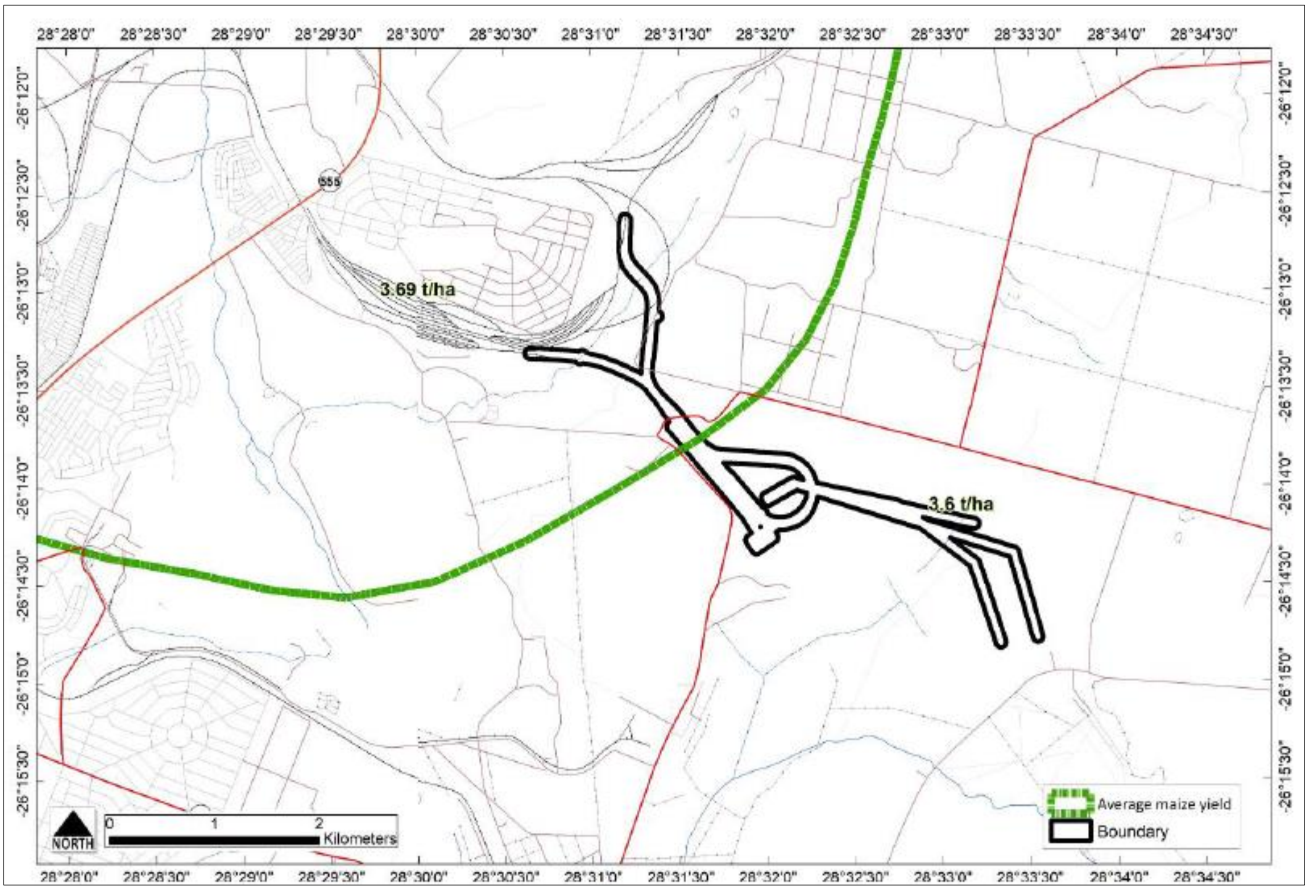


Figure 56: Average maize yield (DALRRD)

10.10.7.3 LIVESTOCK

There are only small areas that are still under natural veld on the particular site. It is estimated that the livestock carrying capacity on the combination of pastures and stover is 3,5 hectares per LSU. There are about 29 hectares of land that is considered to be grazing land. The rail line and the 50-metre buffer around it could accommodate about 8 livestock.

10.10.8 FINANCIAL IMPLICATIONS

10.10.8.1 ASSUMPTIONS

The gross margins on which further calculations are based are indicated below.

Table 41: Gross margins of farming enterprises

Gross income	R8 750	R16 000,00
Direct costs	R3 697	R8 804,95
GROSS MARGIN	**R5 053**	**R6 785,21**

10.10.8.2 INCOME

The total income that could be around R1,03 million for the farming activities as per the land use plan indicated in the previous section. The area within the proposed Welgedacht Balloon siding will also be affected although it is outside the 50m buffer.

Use	Size of land in balloon	Size of site	TOTAL	Income	Costs	Margins
Cultivated	18.3	103.7	122.0	1 951 878	1 067 433	884 445
Grazing		29.4	29.4	256 872	108 532	148 340
Vacant	0.4	11.0	11.4			
WC		4.7	4.7			
TOTAL	**18.7**	**148.8**	**167.5**	**2 208 750**	**1 175 965**	**1 032 784**

Figure 57: Income from the proposed Welgedacht Balloon Siding

10.10.9 ECOLOGICAL SENSITIVITY

The Department of Environmental Affairs published Notice 648 of the National Environmental Management Act in May 2019 that describes the minimum criteria when applying for environmental authorisation. The notice relates specifically to energy generation projects. Nevertheless, it is more broadly applied to also include other developments.

This protocol provides the criteria for the assessment and reporting of impacts on agricultural resources for activities requiring environmental authorisation. The assessments requirements of this protocol are associated with a level of environmental sensitivity determined by the national web-based environmental screening tool for agricultural resources. It is based on the most recent land capability evaluation as provided by the DALRRD.

The sensitivity analyses, although not perfect in terms of describing the impact because it is based on very broad information.

Figure 58 indicates the result of the screening tool.

According to the screening tool, the site has mostly a high sensitivity. The result of the Tool is provided in the addenda.

The detailed assessment performed by Index found the following:

- The Clovelly and Hutton soils that occur on most of the property have high sensitivity.
- All remaining soil is waterlogged or shallow and rocky. These have a low to very low sensitivity.
- In general, the tool is correct in its assessment. The wetlands and shallow soils is not high sensitivity land.

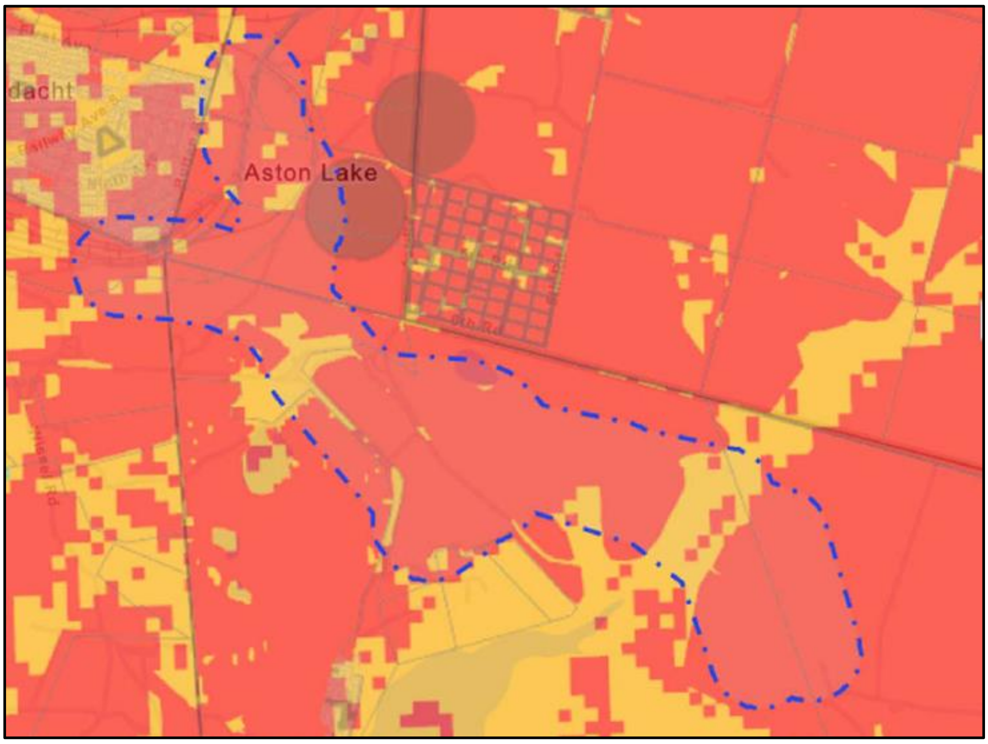


Figure 58: Agricultural sensitivity according to the Screening Tool (yellow indicates moderate and red, high sensitivity.

A site assessment found that the delineation of sensitivity according to the tool is accurate. Only small portions are wetlands or shallow soils that are incorrectly graded.

10.11 VISUAL

A Visual Impact Assessment was undertaken by Elemental Sustainability (Pty) Ltd. The report is included as Appendix 14.

10.11.1 METHODOLOGY

The following sequence was employed in this Visual Assessment Report:

1. Viewshed and viewing distance using GIS analysis up to 10 km from the proposed activities.
2. To model the decreasing visual impact of the activities, concentric radii zones of 1 km to 10 km from the activities were superimposed on the viewshed to determine the level of visual exposure. The closest zone to the proposed activities indicates the area of most significant impact, and the zone further than 10 km from the activities indicates the area of least impact. The visual ratings of the zones have been defined as follows:
    - <1 km (very high);
    - 1 – 2 km (high);
    - 2 – 5 km (moderate); and
    - 5 -10 km (low).
3. A Visual Analysis was conducted with the following parameters:

- Visual Exposure and Viewing Distance
- Viewpoints / Sensitive Receptors
- Viewshed
- Visual Absorption Capacity
- Magnitude of Visual Impact

4. A Landscape Assessment included the following:
   - Landscape Integrity and Character
   - Landscape Scenic Quality
   - Landscape Sensitivity
   - Sense of Place

The VIA was undertaken in accordance with the Guidelines for Involving Visual and Aesthetic Specialists in EIA process, as issued by the Western Cape Government's Department of Environmental Affairs and Development Planning (DEADP) during 2005. These guidelines were used to evaluate the visual effects that may occur because of the proposed activities

Visual effects assessment is concerned with how the surroundings of individuals or groups of people may be specifically affected by change in the landscape. This means assessing changes in specific views and in the general visual amenity experienced by particular people in particular places (GLVIA, 1996).

10.11.2 AFFECTED LANDSCAPE AND VISUAL ANALYSIS

Visual representations of the land are presented to assist the reader with a better understanding of the visual absorption capacity and the sense of place of the proposed activities in question. This ultimately provides a baseline context for the visual impact assessment of the proposed activities.

10.11.2.1 TRIGGERS AND CATEGORISATIONS

Based on the guidelines as set out in Section 3.1 and 3.2 of the Visual Assessment (Appendix 14), the proposed Siding and its associated activities fall within the Category 5 development, with a **High** visual impact expected (Table 42). This translates to the proposed Siding, stockpile area and the railway and conveyor lines potentially having a significant effect and a noticeable change on the quality and scenic appearance of the immediate environment.

Table 42: Visual Impact Criteria

Visual impact criteria	
Very high visual impact expected:	Potentially significant effect on wilderness quality or scenic resources; Fundamental change in the visual character of the area; Establishes a major precedent for development in the area.
High visual impact expected:	**Potential intrusion on protected landscapes or scenic resources; Noticeable change in visual character of the area; Establishes a new precedent for development in the area.**
Moderate visual impact expected:	Potentially some effect on protected landscapes or scenic resources; Some change in the visual character of the area; Introduces new development or adds to existing development in the area
Minimal visual impact expected	Potentially low level of intrusion on landscapes or scenic resources; Limited change in the visual character of the area; Lowkey development, similar in nature to existing development
Little or no visual impact expected:	Potentially little influence on scenic resources or visual character of the area; Generally compatible with existing development in the area; Possible scope for enhancement of the area.

10.11.3 LANDSCAPE ASSESSMENT

10.11.3.1 LANDSCAPE INTEGRITY AND CHARACTER

10.11.3.1.1 EXISTING LAND USE AND HERITAGE FEATURES

The proposed project area falls in the Gauteng Province under the jurisdiction of the Steve Lesedi Local Municipality, situated within the Sedibeng District Municipality. The area is situated 9 km north-east of Springs Municipality, 2 km southeast of the Welgedacht Community and 1.3 km northwest of Aston Lake. The proposed project area is characterised by agricultural land uses, mainly crop fields. Various dirt roads traverse the project area, and several wetlands are present. Current land uses in the area surrounding the proposed project area include commercial crop farming, residential farms, Eskom substation and powerlines, Transnet railway lines, Aston Lake sports and recreation facilities and various residential smallholdings and communities.

10.11.3.1.2 GEOLOGY

The study site falls within the Springs-Vischkuil Coalfield (Digby Wells, 2017) and is underlain by sandstone, shale and coal beds of the Vryheid formation (Ecca Group; Karoo Supergroup), which are in turn underlain by the Dwyka formation diamictite which has been mapped at the northern extent of the study site and 2.5 km west and south of the study site. Dolomite and chert of the Malmani subgroup are located at the northern extent and 3 km west and south of the study site with quaternary alluvial deposits located 1 km east and 2 km south of the proposed Welgedacht Balloon Siding. The Vryheid formation is comprised predominantly of sandstone and shale, with subordinate coal beds, with a maximum thickness of 500 m in the deeper parts of the Karoo basin and 80-170 m in the Witbank Coalfield and marginal areas (GPT, 2018). The study site is underlain predominantly by shale, sandstone and coal of the Vryheid formation based on the 1:250’000 geological map series 2628 East Rand.

10.11.3.1.3 TOPOGRAPHY

The proposed project area is situated in an area of the landscape that is relatively flat, no steep slopes, rocky terrain or ridges have been found to occur within the site nor on the larger properties. Surface elevations at the study site range between 1580 and 1610 m above mean sea level (mamsl), with the general slope direction being from northwest to southeast at the southern sector of the Site and southeast to northwest on the northern sector of the Site.

The proposed Welgedacht Balloon Siding is located on a rather flat area of 1600 metres above sea level. Average slope is given as 1.6% - 1.2%. The dips shown in Figure 60, Figure 61 and Figure 62 are a result of the river systems and drainage lines and the slope indicate that the remainder of the landscape do not vastly differ in heigh which is to be expected for agricultural lands (which requires gradual gradients). Several drainage areas occur in the vicinity and the area is drained by the Blesbokspruit.

10.11.4 LANDSCAPE SCENIC QUALITY

The scenic quality of the landscape is based on its value as a visual resource. The visual resource value of the proposed Welgedacht Balloon Siding area is rated as **Moderate**, *which is defined by a common landscape that exhibits some positive character, but which has evidence of alteration / degradation / erosion of features resulting in areas of more mixed character*. The site is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with, but change may not require special or particular attention to detail.

10.11.5 LANDSCAPE SENSITIVITY

The Landscape sensitivity change criteria**,** indicates a landscape of **Medium** sensitivity, which refers to a "*landscape of regional or local value, quality, or rarity, exhibiting some distinct features, considered tolerant of some degree of change e.g., within a locally designated landscape or with landscape elements of local importance".*

10.11.6 SENSE OF PLACE

A large change will be expected in the "sense of place" created by the predominant agricultural nature and residential activities in the area. Aston Lake towards the south of the proposed area is used for recreational purposes and will possibly be affected. The proposed Welgedacht Balloon Siding and its related infrastructure, product stockpiles, railway, conveyor, and increased road activity will affect the visual landscape and surrounding "sense of place" for agriculture communities.

10.11.7 VISUAL ANALYSIS

10.11.7.1 VIEWPOINTS / SENSITIVE RECEPTORS

For the proposed development area, several Viewpoints (VP) were identified, however, not all are sensitive receptors that will be negatively impacted. The Viewpoints were identified as the residents of the surrounding farming communities, Aston Lake and its associated residents and guests, residential communities, Eskom substation, Transnet railway, some major roads used by the surrounding communities, along with the residents of the Towns/suburbs of Endicott, Welgedacht, Bakerton, Slovo Park and Sundra, and some mining and industrial facilities. The sensitivity of the receptors rate **High** (Table 43). Reference points of the sensitive receptors (Viewpoints) are indicated in Figure 59. These reference points were selected based on their distance and as central viewpoint of the specific receptor area.

Viewpoints were selected within 5 km radius around the entire proposed Welgedacht Balloon Siding area. Viewpoints 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 is situated within one (1) kilometre from the proposed development activities. Between 1 and 2 km from the proposed area, Viewpoints 1, 2, 13, 14, 15, 16, 17, 18 and 19 occur. Viewpoints 20 through to 30 is situated within 5 km away from the proposed Siding.

Table 43: Categorisation of Sensitive Receptors for the proposed area

Sensitivity of receptors	Types of receptors
High	Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape; **Important public sites** used by many people; Tourist, **Resident**

10.11.7.2 VISUAL EXPOSURE AND VIEWING DISTANCE

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases. (Hull and Bishop, 1988). A 10 km Zone of Influence was determined for the proposed development area, and all related infrastructure. It is evident from the viewshed map (Figure 65) that the surface infrastructure visibility diminishes as the distance from the site increases. Most of the visibility occurs within 0-2 km which results in a high visibility impact according to the impact table below. (
Table 49). Between 2 - 5 km, several Viewpoints might still have visibility due to the flat landscape, however, because much of the area consists of tall growing maize fields, visibility will be obscured during certain times of the year. Over 5 - 10 km the impact of the proposed infrastructure would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze) on visibility. In this study, Viewpoints situated more than 5 km away from the proposed area is rated N/A due the diminishing effect of visibility from the surrounding environment`s topography and vegetation.

Table 44: Sensitive viewing distance from the proposed development activities.

	Viewing distance sensitivity	Viewpoints
High	Viewing distance that is between 0 - 2 km of the proposed development area	Viewpoints 1 - 19
Moderate	Viewing distance that is between 2 - 5 km of the proposed development area	Viewpoints 20 - 30
Low	Viewing distance that is 5 km -10 km of the proposed development area	N/A

From the Digital Elevation Model (DEM) drawn for the site, it is evident that the highest peaks are situated in the central regions of the proposed Siding (Figure 60). However, the surrounding topography is relatively flat, therefore, visibility is expected to be high. No definitive slope can be observed that will have an impact on the visibility of residents (Figure 62). A Viewshed was developed and is presented in Figure 65. Factors, such as slope elevation, steepness and slope aspect also contributed to the Viewshed analysis (Figure 63 and Figure 64).

The visibility of the infrastructure is categorised as **Moderate to High** due to the visibility covering more than 25 to 50% of the 10 km zone of influence (Table 45).

Table 45: Viewshed Evaluation Criteria

High	>50% of Zone of Influence (ZOI) is visible
Moderate	25% - 50% of Zone of Influence (ZOI) is visible
Low	>25% of Zone of Influence (ZOI) is visible

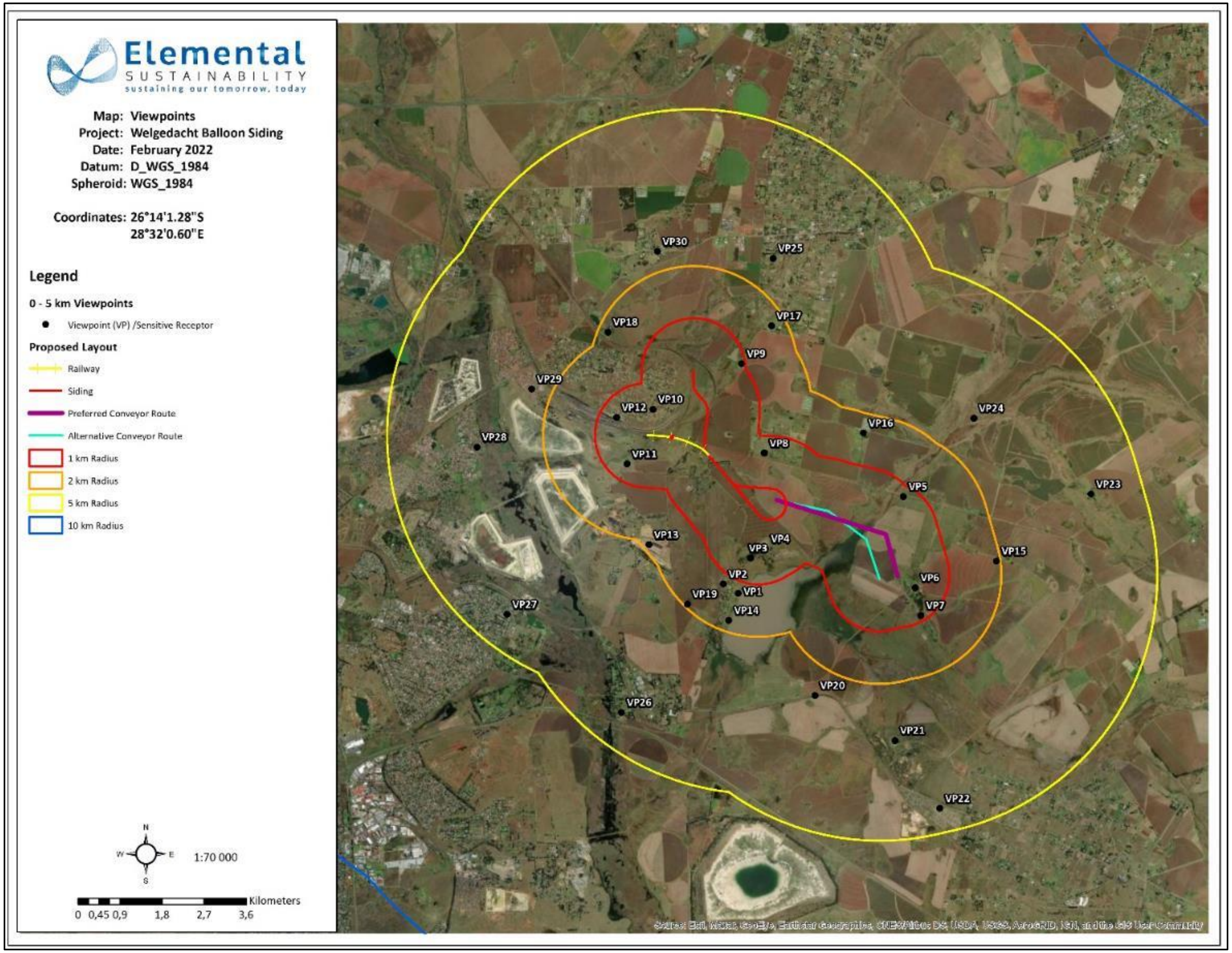


Figure 59: Surrounding Land Users and Sensitive Receptors (Viewpoints)

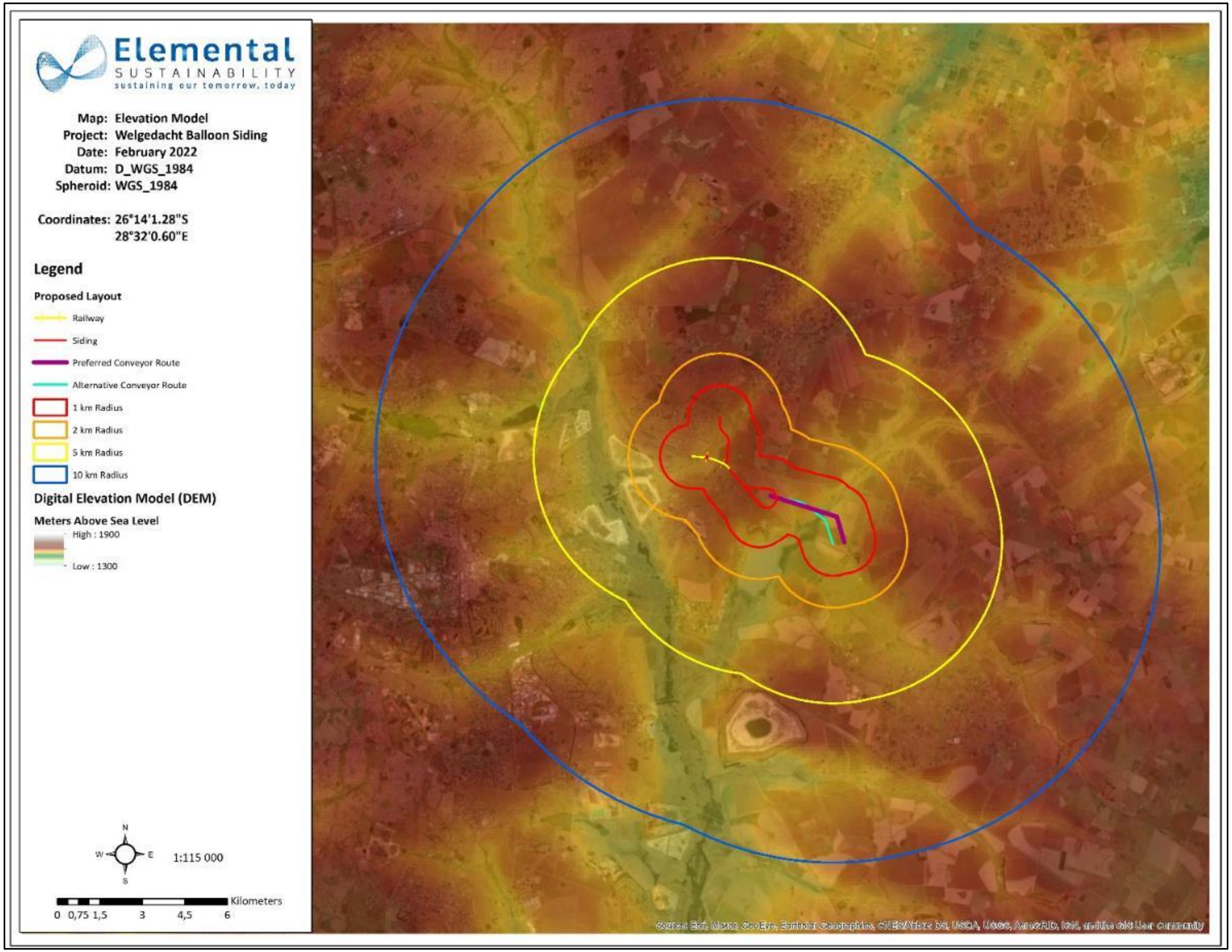


Figure 60: Digital Elevation Model (DEM) of the terrain in the 10 km surrounding area

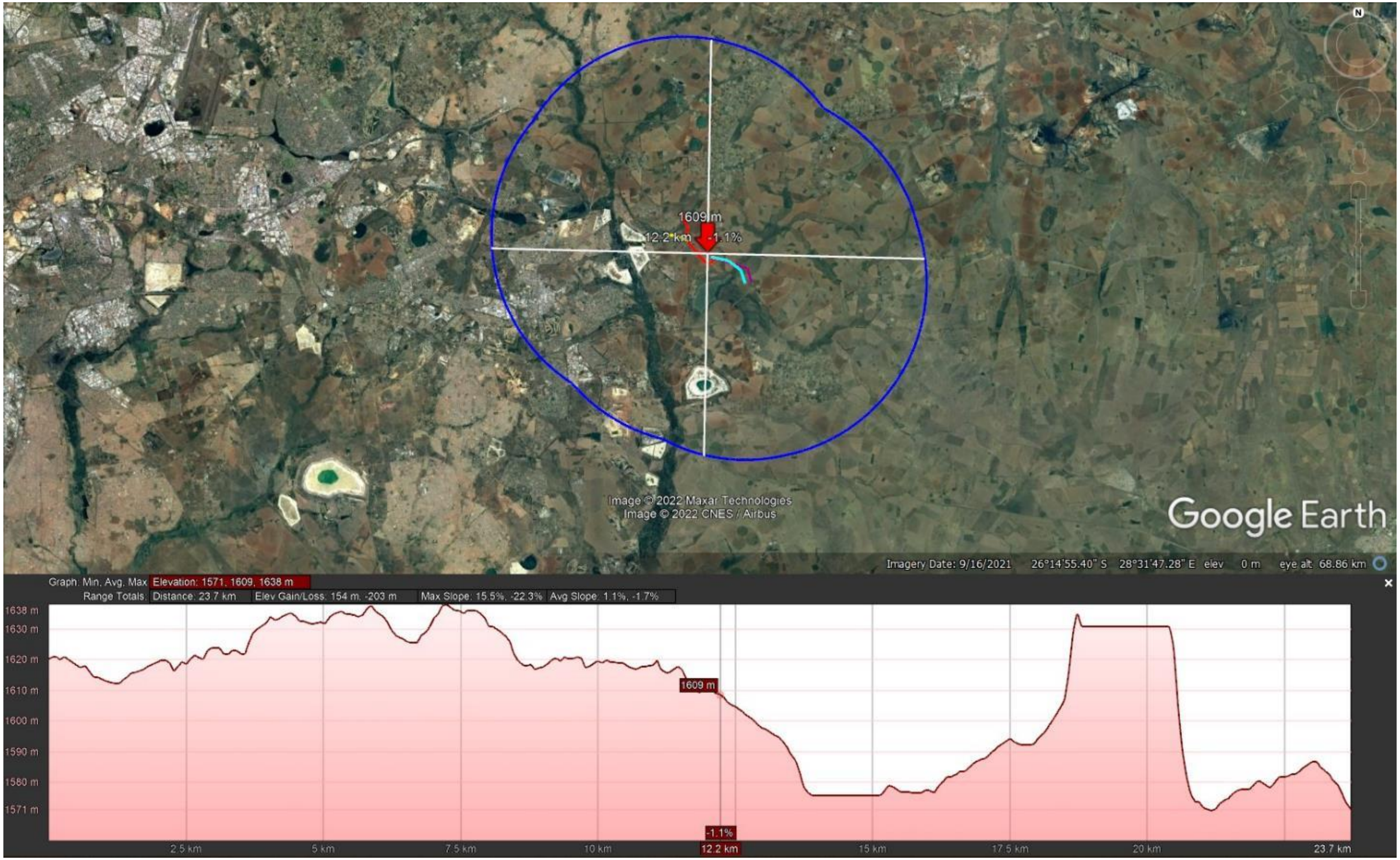


Figure 61: Elevation profile from the northern boundary to the southern boundary of the 10 km surrounding landscape (Google Earth 2022)

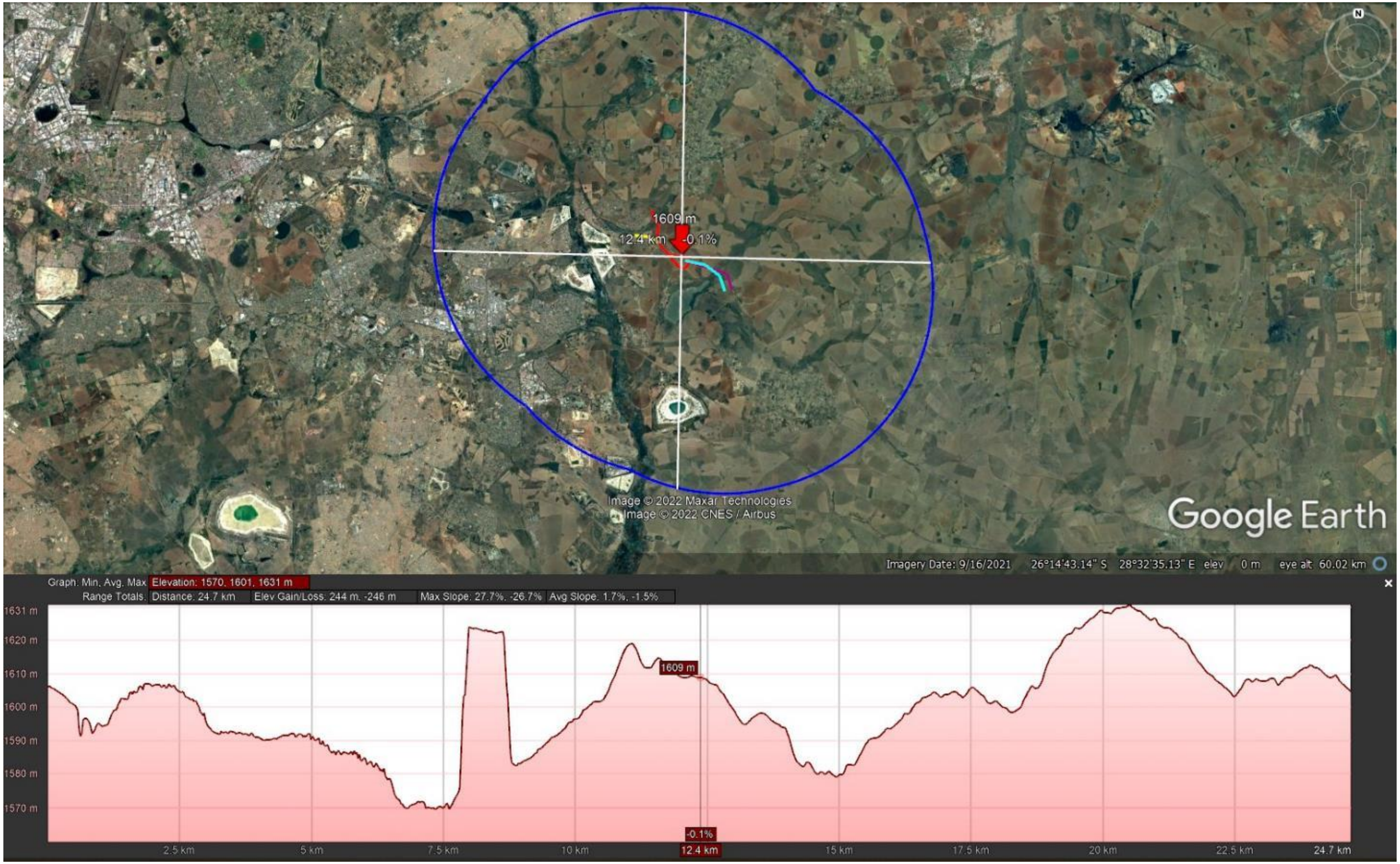


Figure 62: Elevation profile from the western boundary to the eastern boundary of the 10 km surrounding landscape (Google Earth 2022)

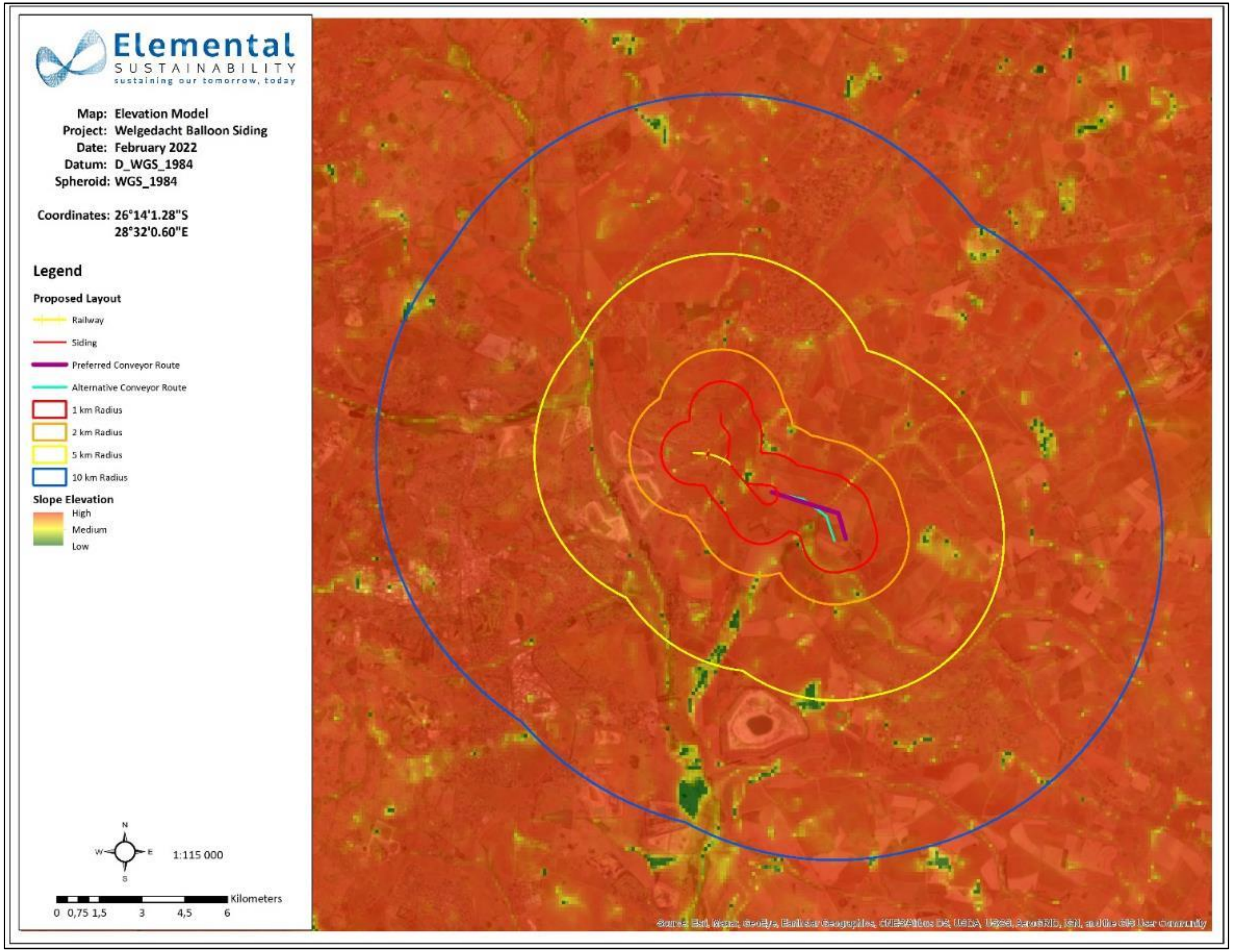


Figure 63: Slope elevation and steepness of the terrain in the 10 km surrounding area

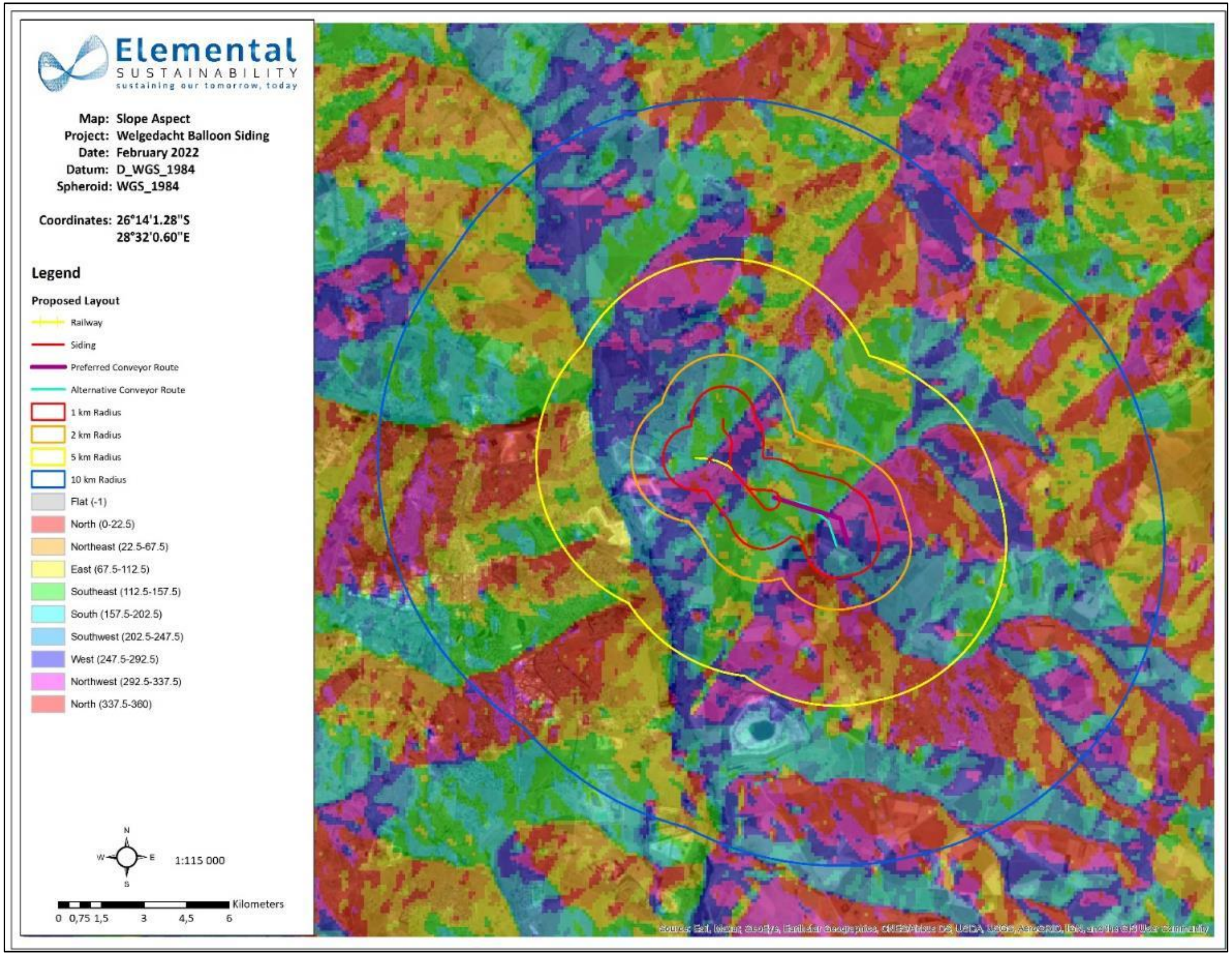


Figure 64: Slope Aspect direction of the terrain in a 10 km surrounding area

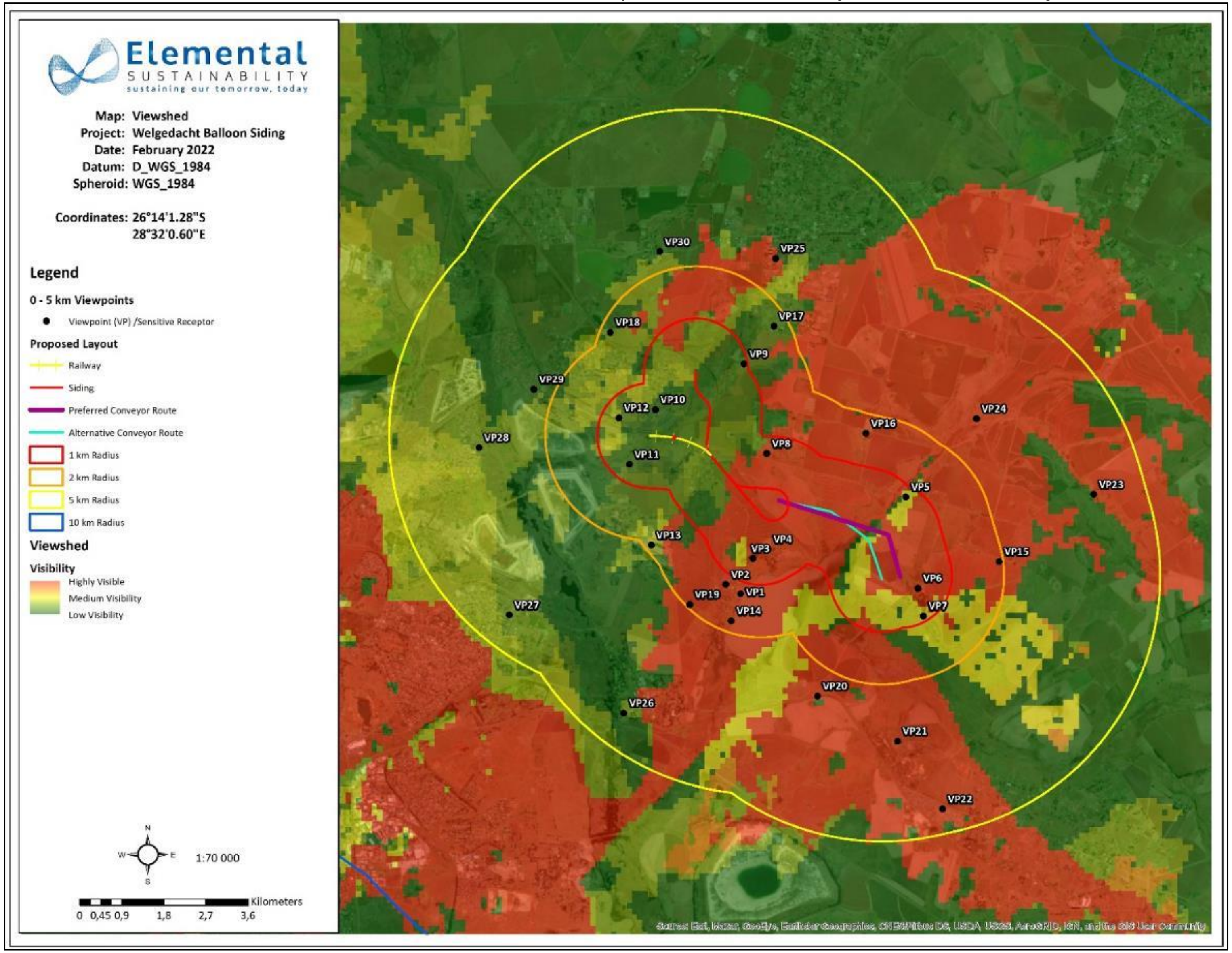


Figure 65: Viewshed Model of the 5 km surrounding area

10.11.7.4 VISUAL ABSORPTION CAPACITY (VAC)

The proposed project site, as well as most of the 10 km surrounding area, overlaps with three (3) vegetation types, namely the Soweto Highveld Grassland (Gm8), the Andesite Mountain Bushveld (SVcb11) and the Eastern Highveld Grassland (Gm12) (Figure 66) (Mucina & Rutherford 2006/2018). Most of the immediate project site is located in the Soweto Highveld Grassland (Gm 8) vegetation type.

The Visual Absorption Capacity (VAC) of the receiving environment is deemed to be **Low to Moderate** due to the following:

- **Low -** By virtue of the grassland vegetation found on the proposed site, as it is too low growing to act as visual and noise barriers.
- **Low -** In terms of the position of the proposed site relative to elevation and slope of terrain. The proposed Siding is situated on a relatively flat landform type with little elevated topographical features in the surrounding areas.
- **Low -** In terms of existing built environment, most of the area surrounding the project site consist of agricultural and residential land uses.
- **Low** - The topography does not limit the view for surrounding land users.
- **Low -** The colour and contrast of the proposed operation is in contrast with the current natural colour of the area.
- **Moderate** - The landscape and associated environment is mainly disturbed by human settlements, an Eskom substation and powerlines, Transnet Railways Lines, large scale farming activities and existing aesthetic activities associated with Aston Lake. In the southern regions, some historical and current mining activities are visible.
- **Moderate -** The proposed Siding would not be entirely alien but will still be intrusive to the surrounding environment and land use.

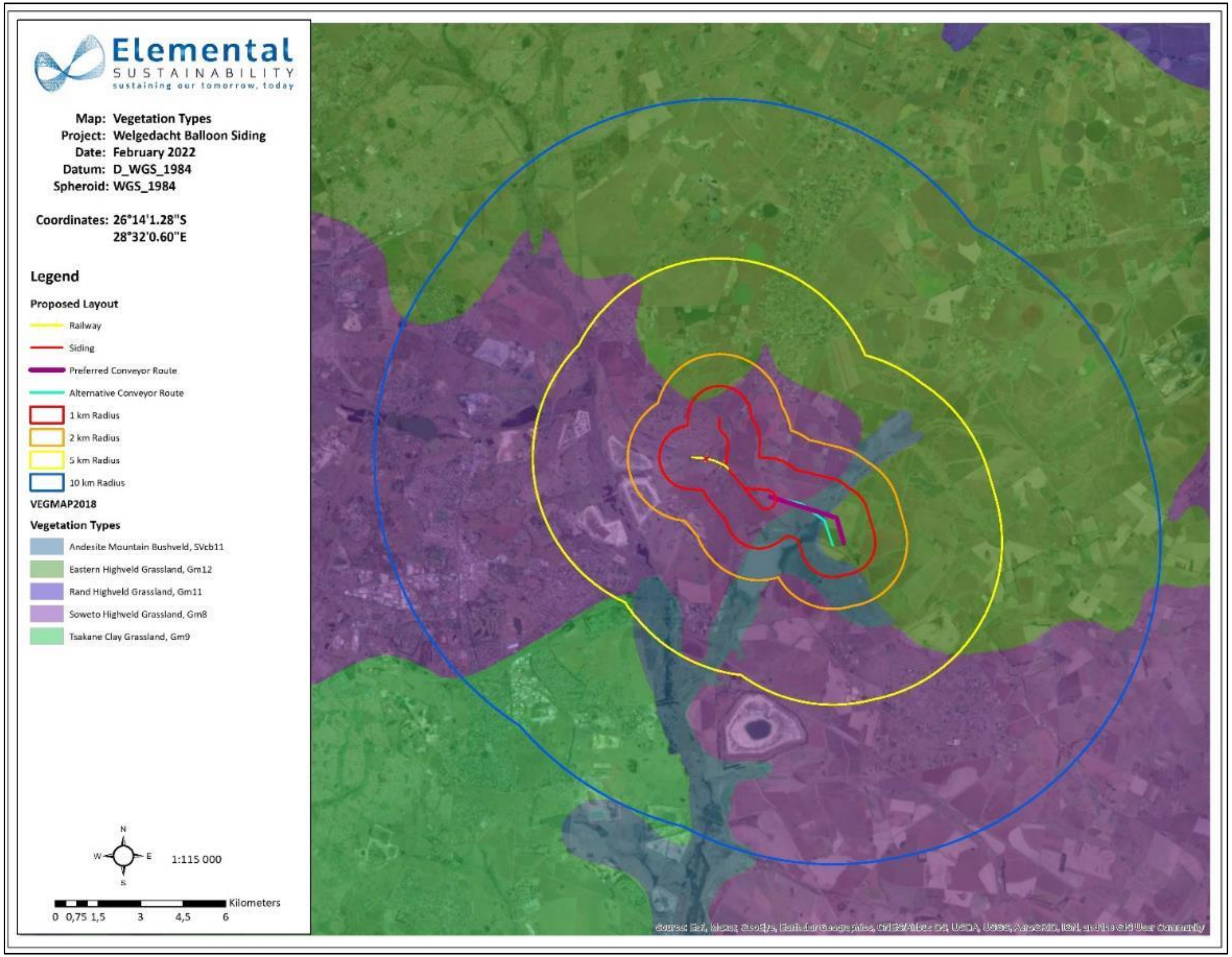


Figure 66: Vegetation Types associated with the Project Area.

10.11.7.5 MAGNITUDE OF VISUAL IMPACT

In synthesising the criteria used to establish the magnitude of visual impact, a numerical or weighting system is avoided. This table is arrived at by combining the ratings of each of the sections above (viewshed, viewing distance, visual absorption capacity, and sensitivity receptors). The ratings for each of these criteria are indicated in (Table 46) and derived from the discussion in the preceding sections. These results are based on worst-case scenarios i.e. (at full size and extent of the proposed Welgedacht Balloon Siding and its related infrastructure in the operational phase) when the impact of all aspects is taken together. It is evident that the Visual impact is expected to be **High** before mitigation measures are implemented.

Table 46: Magnitude of Visual Impact Results

Triggers & Category of Environment	Viewshed Analysis Results	Viewing Distance & Visual Exposure Results	Sensitive Receptors / Viewpoints	Visual Absorption Capacity Results
High visual impact expected	**Moderate** 25 to 50% of zone of influence is visible	**High** - Various sensitive receptors within 2 km from the proposed area	**High** – Includes residents near the proposed site	**Low to Moderate**

10.12 ARCHAEOLOGY AND HERITAGE

A Phase 1 Archaeological Impact Assessment was undertaken by Mr. Tobias Coetzee. A copy of the report is attached as Appendix 15. A desktop study and site visits were undertaken for the project.

10.12.1 ARCHAEOLOGICAL AND HISTORICAL REMAINS

A list of heritage sites is indicated in Table 47.

Table 47: Site coordinates and description

Abbreviated name	Site / Survey Point Name	Longitude	Latitude	Description	Current Status	Identification Source
BA01	2628BA-01	28.525554	-26.214341	Cemetery	In-tact	Field
BA02	2628BA-02	28.524466	-26.227059	Building ruins	Ruins	Aerial (1944)
BA03	2628BA-03	28.548107	-26.229526	Grave	In-tact	Field
BA04	2628BA-04	28.522154	-26.223871	Building	Demolished	Aerial (1961)
BA05	2628BA-05	28.522527	-26.218126	Building	Demolished	Aerial (1961)
BA06	2628BA-06	28.551121	-26.230983	Building	Demolished	Aerial (1944)
BA07	2628BA-07	28.520738	-26.221363	Building	Demolished	Aerial (1944)
BA08	2628BA-08	28.555246	-26.231974	Building	Demolished	Aerial (1953)
BA09	2628BA-09	28.559237	-26.246305	Building	Demolished	Aerial (1953)

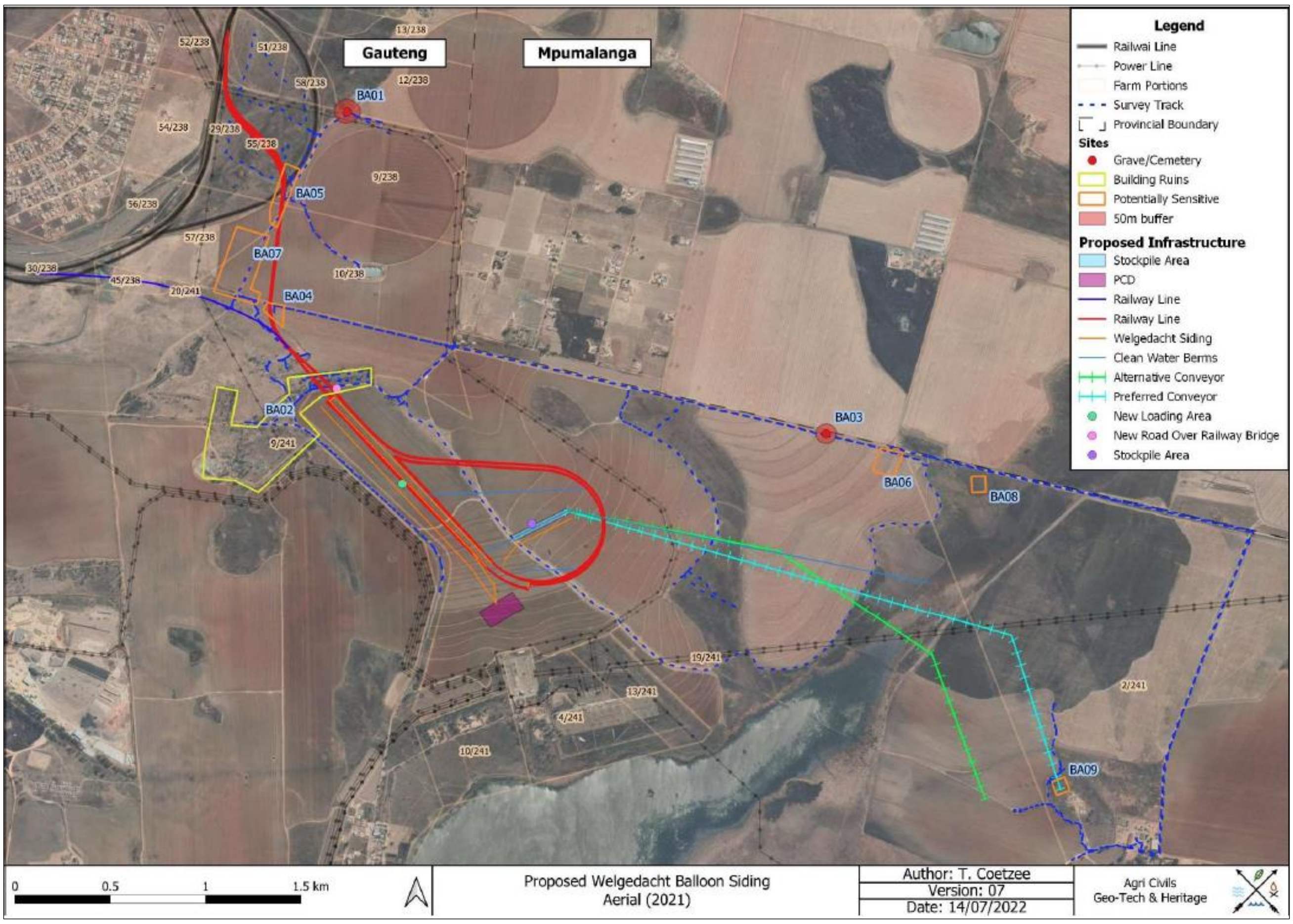


Figure 67: Study area with recorded sites portrayed on a 2021 satellite image

10.12.1.1 STONE AGE REMAINS

No Stone Age archaeological remains were located within the demarcated study area. Although no Stone Age archaeological remains were located, such artefacts may occur in the area. These artefacts are often associated with rocky outcrops or water sources. Archaeological studies conducted in the surrounding areas also did not locate material pertaining to the Stone Age, but the study by Van der Walt (2019) noted that LSA material might be present in the general area. According to Bergh (1999: 5), no major Stone Age archaeological sites are located in the direct vicinity of Springs

10.12.1.2 IRON AGE FARMER REMAINS

No Iron Age Farmer remains were located within the demarcated study area. The heritage study conducted by Du Piesanie (2016) recorded heritage sites in the general area that belong to Late Farming Communities.

10.12.1.3 HISTORICAL

Seven historical sites were identified on historical aerial images and topographical maps, seven of which have completely been demolished and are not associated with surface material (Table 47). The only site associated with surface remains consists of several demolished buildings.

Sites BA02, BA06 and BA07 were identified on the aerial image dating to 1944 (Appendix A: Figure 33). Site BA02 consists of the building and infrastructure remains of the historical Palmietkuilen Mine. The section of the site where the railway siding is proposed is characterised by the remains of 11 residential houses. A tar road is found on the northern, eastern and southern sides of the residences and the entire complex of surrounded by a line of trees. Each erf measures approximately 1000m². It should be noted that the general mining area was not surveyed due to it falling outside of the proposed siding impact area, as well as the area appearing unsafe. The residential remains intersecting the proposed railway siding is in a severely dilapidated state as the buildings have completely been demolished. Remains include building rubble consisting of bricks and cement, foundations and the bordering tar road (Figure 68 and Figure 69). These buildings appear to be intact on the 1969 aerial image, but based on topographical maps, have been demolished between 1977 and 1995. The trees associated with the residences are barely visible on the 1944 aerial image, but are clearly visible by 1953 (refer to Appendix A of the specialist report attached as appendix to this EIAR). Research has shown that the Palmietkuil Mine remained in operation between 1910 and 1953. East Rand Mining Estates, however, sold the Grootvlei and Palmietkuil coal deposits to the Old Largo Company in 1919. According to a map depicting the Largo Colliery Workings of 1936, the residences associated with Site BA02 were the married quarters for the mine's employees. The structures are therefore at least 86 years old.

Figure 68: BA02

Figure 69: Site road at BA02

Sites BA06 (Figure 70) and BA07 (Figure 71), identified as buildings on the aerial image dating to 1944, are at least 78 years old. Site BA06 appears to have been a relatively small building to the north of the proposed conveyor belt on Portion 19/241. The building remains are visible until 1976, whereafter it was demolished to make room for the expansion of the bordering cultivated field. The topographical map of 1977, however, is the only topographical map to indicate the building. Site BA07 on Portions 10/238, 57/238 and 9/241 remained visible to a certain extent on the 1991 aerial image but was subsequently completely demolished and replaced by cultivated fields. According to the topographical maps, Site BA07 was demolished between 1965 and 1977 (refer to the topographical maps in Appendix A of the specialist report attached as Appendix to this EIAR).

Figure 70: Environment at BA-06

Figure 71: Current environment associated with BA07

Sites BA05 (Figure 72), B08 and BA09 first appear on the 1953 aerial image and are therefore at least 69 years old. Site BA05 was associated with several buildings on portions 9/238, 10/238, 55/238 and 57/238 util 1958 (Appendix A: Figure 35), but appear to have been demolished by 1961, most likely due to expanding crop cultivation. Between 1976 and 1985 a railway line was constructed that intersected the site and further disturbed the archaeological context.

Figure 72: Potentially sensitive area at Site BA05

Site BA08 is located to the north of the proposed conveyor belt on Portion 2/241. The site is visible on the 1953 and 1958 aerial images as what appears to be a small building (Appendix A: Figure 34 & 35). No structure or building, however, is visible on aerial imagery thereafter. According to the 1965 topographical map (Appendix A: Figure 41), a hut was present at this location, but was demolished by 1977 (Appendix A: Figure 42). At present, Site BA08 is associated with open veldt (Figure 73).

Figure 73: Environment at Site BA08

The structure or building associated with Site BA04 on Portion 9/241 first appears on the 1961 aerial image and appears to have been expanded by 1969. The initial structure, therefore, is at least 61 years old. By 1976, however, the building is no longer visible and by 1991 part of the site was replaced by cultivated crops. At present, the eastern section of the site still consists of crop cultivation, while the western section is characterised by open veldt. No surface remains were observed at the site (Figure 74).

Figure 74: Current BA04 site conditions

Site BA09 is located at the eastern end of the proposed Preferred Conveyor belt on Portion 2/241. Buildings are visible on the 1953, 1958, 1961 and 1969 aerial images, as well as on the 1965 and 1977 topographical maps. No buildings, however, are indicated on the 1995 topographical map, while one building and a ruin are shown on the 2010 topographical map. According to the 1965 topographical map, the buildings were used as a piggery. Currently Site B09 is not associated with buildings/structures, but traces of demolished structures are visible on contemporary satellite imagery. It should be noted that buildings potentially belonging to the piggery are located further to the southeast of the end of the proposed Preferred Conveyor belt, but fall outside of the development footprint and are therefore not at risk of being impacted by the proposed Welgedacht Balloon Siding project.

10.12.1.4 CONTEMPORARY REMAINS

Contemporary building rubble was observed between the two exiting railway lines towards the northern edge of the study area (Figure 75). No structures or buildings are visible at this locality on historical aerial imagery and topographical maps (Appendix A of the specialist report attached as Appendix), which suggests that the rubble was either moved to the area form somewhere else, or resulted from the building of the railway.

Figure 75: Contemporary building rubble to the north of the proposed siding

10.12.1.5 GRAVES

One grave and one cemetery were observed during the pedestrian survey and are listed in Table 48 Cemetery BA01 is located on Portions 12/238 and 9/238 and approximately 400 m northeast of the proposed railway siding (Figure 76 and Figure 77). The cemetery borders a local dirt road to the east and a dam/quarry to the north.

The cemetery consists of approximately 26 unfenced graves and it is unclear whether it is still in use. Surface dressings vary between formal dressings, single rows of stones outlining the graves and elongated stone cairns. Only a few headstones were noted. The earliest date observed was 1979 and the most recent 1985. Several of the graves are also associated with grave goods in the form of ceramic cups, mugs, saucers, consol jars and ceramic pots. All the graves are also oriented in an east-west direction and are in various stages of preservation. It appears that the cemetery is still visited and at least one surface dressing consisting of stacked stones was replaced by a modern dressing.

Figure 76: Site BA01

Figure 77: Packed stones demarcating a grave at Site BA01

Site BA03 consists of one unfenced grave on Portion 19/241 (Figure 78). The grave is located directly next to a dirt road and except for the headstone, no surface features were observed due to extremely dense vegetation cover. The inscriptions on the headstone, which is oriented in an east-west direction, is unclear. However, the date ‘1903’ appears to be inscribed in the top left corner. It is unclear whether this grave is still visited. According to Mr. Visser (pers. Comm 2021), another grave is located in relatively close proximity to this grave, but due to the dense vegetation cover, is not visible. Also, grave site BA03 is indicated on the 1965 topographical map (Appendix A of the specialist report attached as Appendix of this EIAR).

Figure 78: Grave at Site BA03

Table 48: Graves/cemeteries associated with the study area

Name	Type	Source	Status	Estimated extent	Parcel	Number of Graves
BA01	Cemetery	Field	Intact	400	9/238	±26
BA02	Grave	Field	Intact	Unknown	19/241	±2

10.13 PALEONTOLOGICAL ASSESSMENT

A Paleontogical Impact Assessment was undertaken by Prof Marion Bamford from the University of Witwatersrand. A copy of the report is attached in Appendix 16.

10.13.1 PROJECT LOCATION AND GEOLOGICAL CONTEXT

The Welgedacht Balloon Siding lies in the north-eastern margin of the Karoo Basin and in the western portion of the Witbank coalfield. In this area all five coal seams of the Vryheid Formation are present but at varying depths and thicknesses because of the uneven basal topography (Snyman, 1998). The Main Karoo Basin is a huge area stretching from Middelburg in the northeast to around Touws Rivier in the southwest. It unconformably overlies much older rocks, such as the Transvaal Supergroup in the north-eastern part and Cape Supergroup rocks in the southwest. At the base of the Karoo Supergroup are the Dwyka Group tillites, diamictites, mudstones and shales that were deposited when the various ice sheets covering the continent melted and filled the lowland. At this time, the continent was positioned over the South Pole, but it moved slowly northward and warmed up. The next stratum is the Ecca Group and the Vryheid Formation overlies the basal Pietermaritzburg Formation.

Composed of shales, mudstones, sandstones and coal seams the Vryheid Formation was deposited in warmer and wetter conditions where there was abundant plant biomass as well as a depositional setting with water to bury vegetation and exclude oxygen. The peats were buried under more sediments and over time altered by increased pressure and temperature to form coal seams. Overlying the Vryheid Formation is the Volksrust Formation that was deposited in deep or shallow water but did not include coal. Overlying the Ecca Group are the rocks of the Beaufort and Stormberg Groups, but not exposed in this region. Much more recently in the Quaternary, soils have formed from the weathering of the underlying rocks, and in river or stream valleys the soils are washed away and transported downstream, forming alluvium or colluvium. Much older rocks occur to the northwest, the dolomites and cherts of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup; blue in Figure 79), and the Karoo rocks lie unconformably on these.

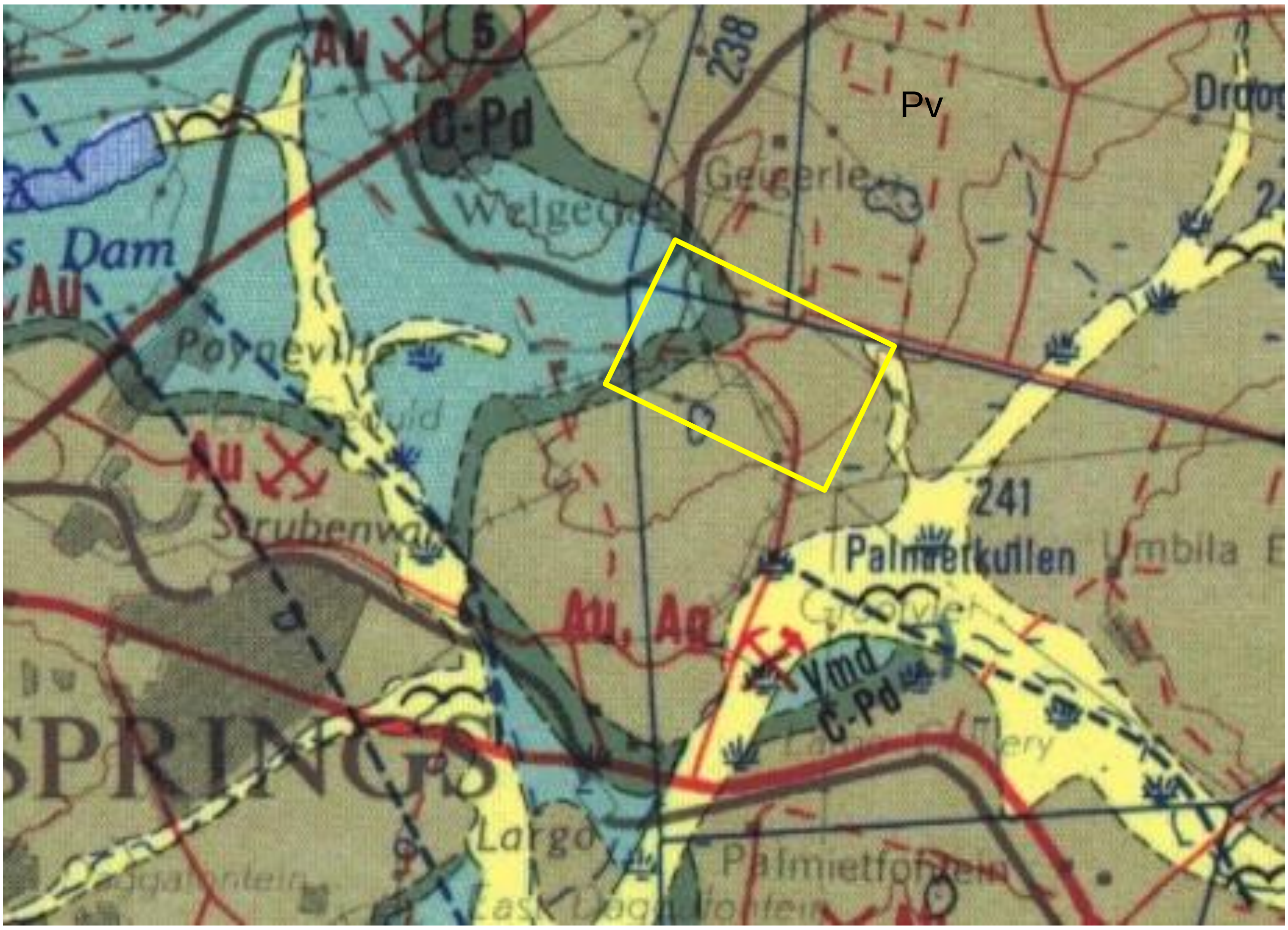


Figure 79: Geological map of the area around the northeast of Springs and the Welgedacht Balloon Siding.

The location of the proposed project is indicated within the yellow rectangle. Abbreviations of the rock types are explained in
Table 49.

Table 49: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006. Johnson et al., 2006; McCarthy et al., 2006).

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 2.5 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma

Symbol	Group/Formation	Lithology	Approximate Age
Pv	Vryheid Fm, Ecca Group, Karoo SG	Shales, sandstone, coal	Lower Permian, Middle Ecca
C-Pd	Dwyka Group, Karoo SG	Tillites, diamictites, mudstone	Late Carboniferous to early Permian
Vmd	Malmani Subgroup, Chuniespoort Group, Transvaal SG	Dolomite, chert	Ca 2222Ma or younger

SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project

10.13.2 PALAEONTOLOGICAL CONTEXT

The palaeontological sensitivity of the area under consideration is presented in Figure 80, with the very highly sensitive areas (red) corresponding to the Vryheid Formation and the moderately sensitive areas (green) referring to the Dwyka Group tillites in the northwest corner, and Quaternary soils and alluvium in the southeast corner.

Dwyka Group sediments only rarely preserve fossils and they would be fragments from the *Glossopteris* flora, and only in the mudstone facies of the seven facies that occur in this group (Johnson et al., 2006).

Coals are formed from the burial and alteration of peats to such an extent that the original plants forming the peats can no longer be recognised. The higher the quality of the coal the more transformation has taken place. Coals per se, are not of interest to palaeontologists. In the shale lenses between coal seams, however, impressions of the plant material are often preserved and, in some settings, can be very well preserved. Plants making up the Vryheid Formation coals belong to the *Glossopteris* flora. The glossopterids are an extinct group of seed ferns that dominated the Gondwanan landscape during the Permian period. Other plants that occurred in this flora are a variety of lycopods, sphenophytes, ferns and some early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004).

Vertebrate fossils have not been recorded from any Vryheid Formation sites because the conditions for preservation of plants and animals are different. Plants require an anoxic reducing environment whereas the animals need an oxidising environment (Briggs and McMahon, 2016). Furthermore, very few land vertebrates were present at this time, just rare fish and amphibians (Rubidge, 2005).

Modern soils and alluvium do not preserve fossils as they are the product of weathering of rocks and then transportation of the sediments and modern organic matter. Very rarely some robust fossils, such as bones or silicified wood fragments, can be incorporated in the alluvium, but they would be out of primary context and so are of very limited scientific interest.

From the SAHRIS map above the area is indicated as very highly sensitive (red), therefore, a site visit was undertaken on 27th January 2021 with the objective of looking for fossils of the *Glossopteris* flora in the Vryheid Formation.

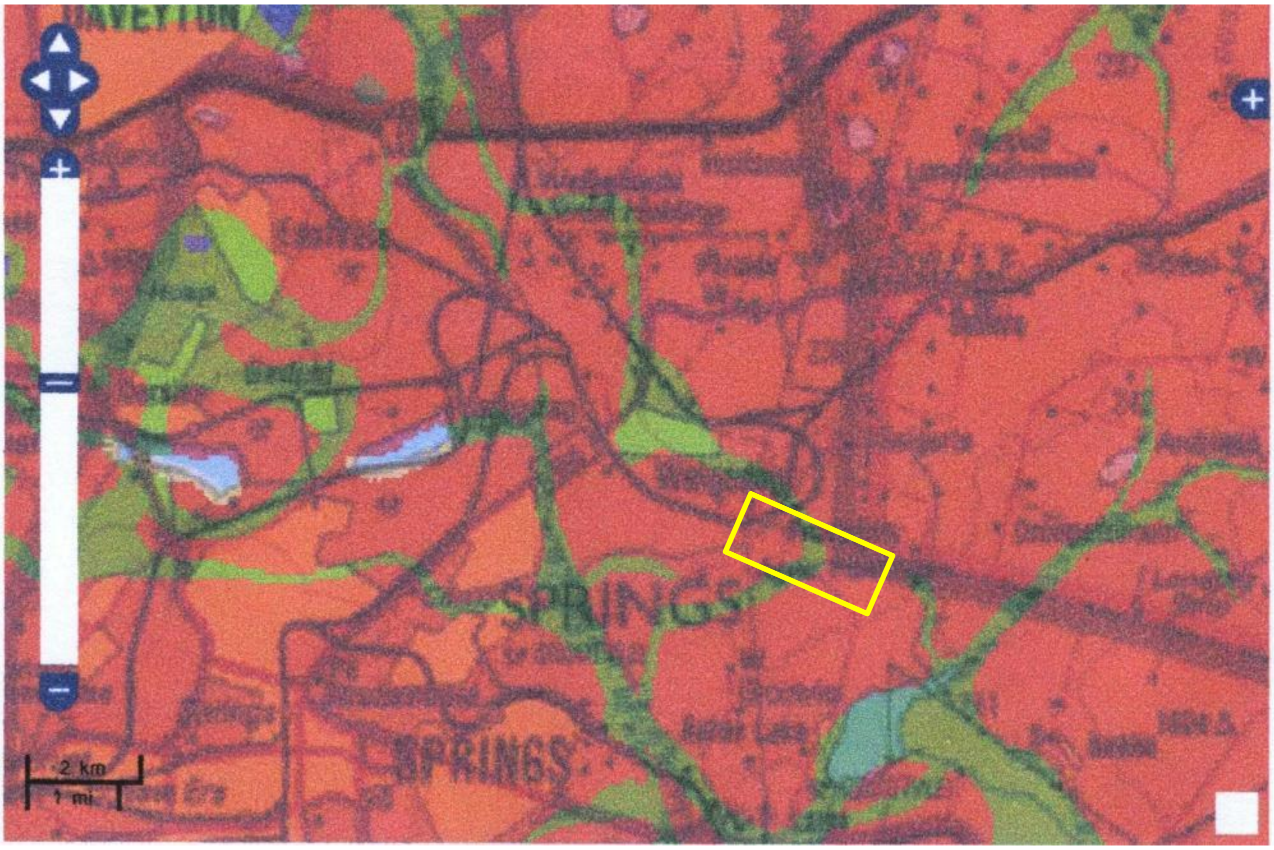


Figure 80: SAHRIS palaeosensitivity map for the site for the proposed diverted road route shown within the yellow rectangle.

Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blu

10.13.2.1 SITE VISIT OBSERVATIONS

The proposed route for the diverted road was traversed on foot and any break in the vegetation was studied. The existing farm road has been widened and graded so the soils were exposed but the route across the river was undisturbed.

Table 50: Site visit observations (Figures refer to the photographs presented after this table)

GPS coordinates	Observations	Figure
Stop 1 S26° 13’ 50.3226” E28° 33’ 9.41108” 1627m	General view of the area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	a, b
Stop 2 S26° 13’ 51.03503” E28° 33’ 10.59122” 1615m	General view of the area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	c, d

GPS coordinates	Observations	Figure
Stop 3 S26° 13' 56.92455" E28° 33' 13.54655" 1609m	General view of the area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	e, f
Stop 4 S26° 14' 4.14343" E28° 33' 8.13499" 1612m	General view of the wetland area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	g, h
Stop 5 S26° 14' 8.52678" E28° 33' 13.69591" 1609m	Dense vegetation and no fossils	n/a
Stop 6 S26° 13' 51.23493" E28° 33' 14.58969" 1615m	General view of the area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	n/a
Stop 7 S26° 13' 52.55554" E28° 33' 20.15333" 1606m	Dense vegetation and deep soils	n/a
Stop 8 S26° 14' 2.96013" E28° 34' 4.99829" 1612m	General view of the area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	i, j
Stop 9 S26° 14' 11.59089" E28° 34' 2.11478" 1622m	Dense vegetation and no fossils	n/a
Stop 10 S26° 14' 27.26944" E28° 33' 56.01222" 1613m	General view of the area; general view with the exposed soils in the foreground. Deep soils and densely vegetated so there are no rocky or shale outcrops and no fossils	k, l

	
Fig a: Stop 1 – general view of the field with thick vegetation indicating deep soil cover	Fig b: Stop 1 – only small stones, probably imported road metal, present.
	
Fig c: Stop 2 -	Fig d: Stop 2 -

	
Fig e: Stop 3 -	Fig f: Stop 3 -
	
Fig g: Stop 4 -	Fig h: Stop 4 -

	
Fig i: Stop 8 -	Fig j: Stop 8 -
	
Fig k: Stop 10 -	Fig l: Stop 10 -

10.13.3 CONCLUSION

Based on the geology of the area and the palaeontological record, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and could contain fossil plant, insect, and invertebrate material. The sands of the Quaternary period would not preserve fossils. From the site visit survey and observations, there are no fossils in the surface soils and alluvium, and there are no exposures of shales where fossil leaf impressions could be preserved. It is unknown if there are fossils below the land surface. A chance find protocol is recommended to be implemented on site.

10.14 TRAFFIC

A Traffic Impact Assessment was undertaken by Corli Havenga Engineers. Refer to Appendix 17 for a copy of the report.

10.14.1 EXISTING ROAD NETWORK

The site is depicted on an extract of the Gauteng RAMS Geo-spatial Decision Support System below.

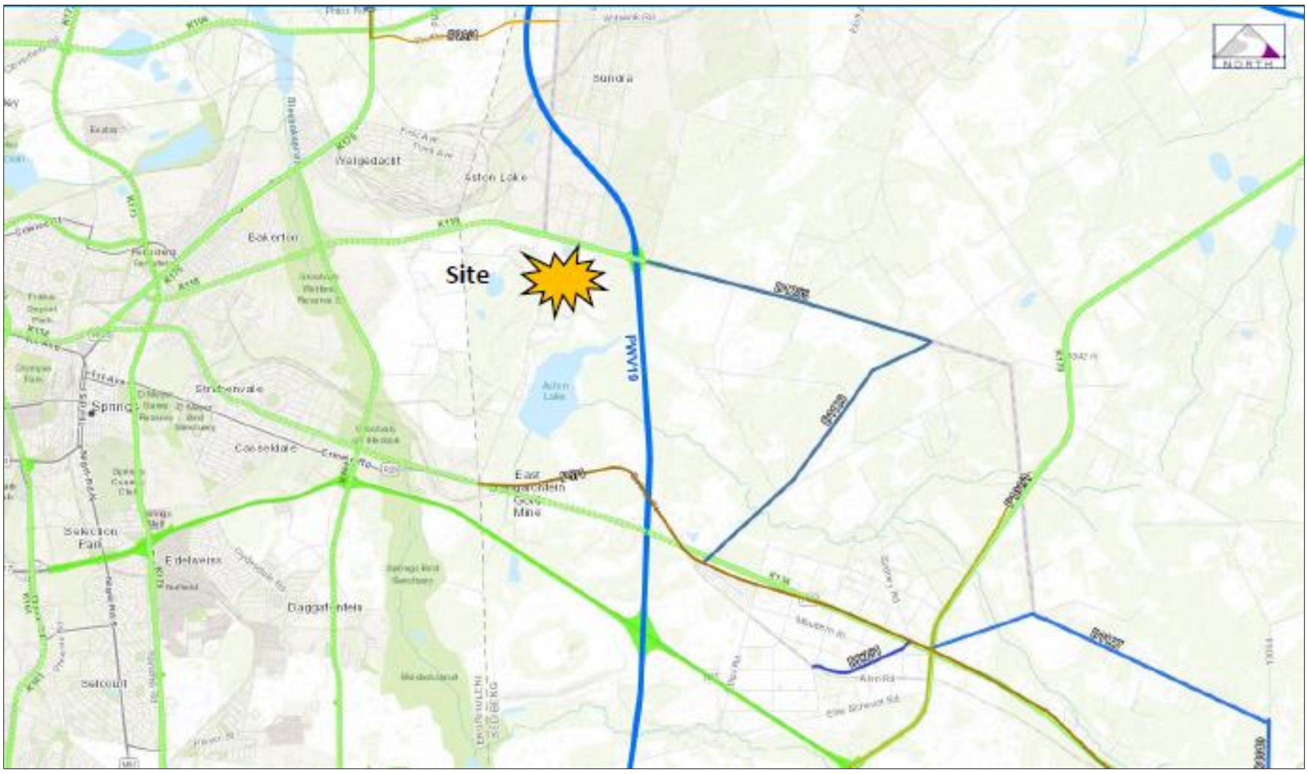


Figure 81: Extract from Gauteng RAMS

Road D1255 runs on the border of Gauteng and Mpumalanga between the proposed PWV19 and Road D1133. An extract of the Mpumalanga Road Asset Management System (RAMS) is presented below.

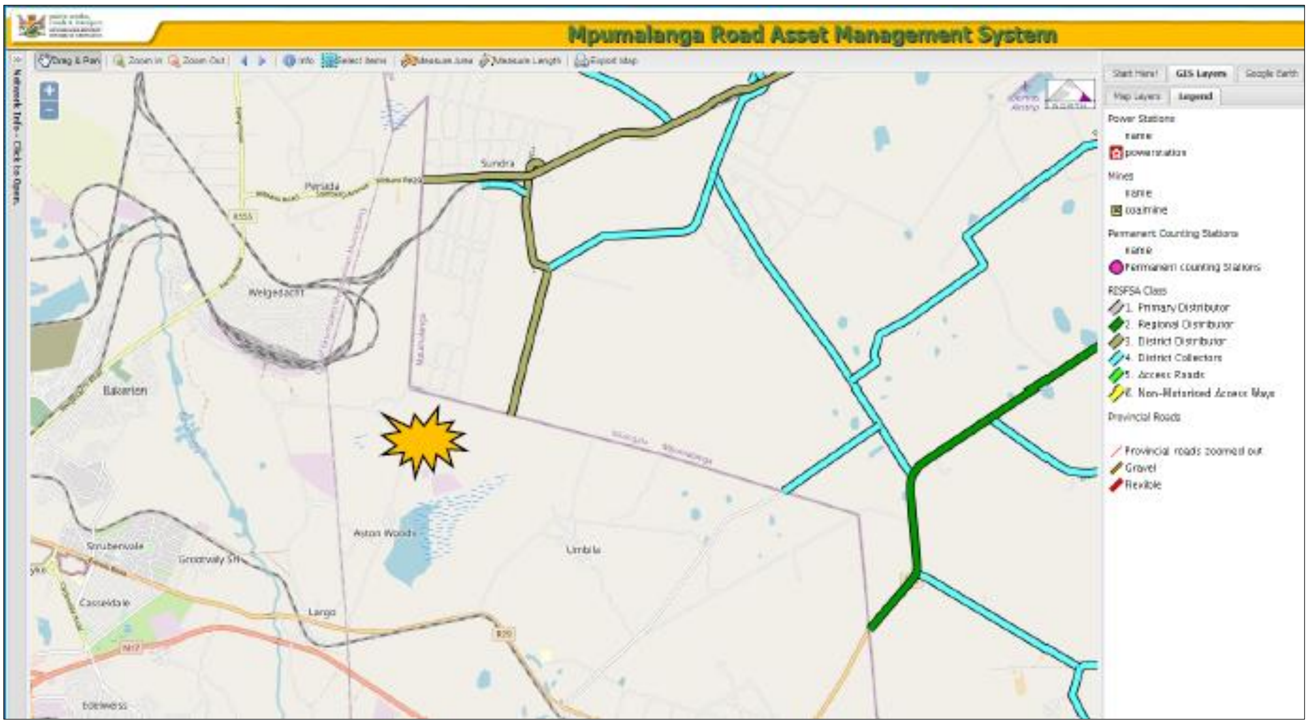


Figure 82: Extract Mpumalanga RAMS

The existing access roads, except for the first ±1.3km of Wissel Road which is surfaced, are all gravel roads and some are in very poor condition. In terms of road network it is important to take note that significant changes are planned to the road network and that this should be taken into consideration when planning access points and access roads and the location of overland conveyor systems.

10.14.2 FUTURE ROAD NETWORK

The site is depicted on an extract of the Gauteng RAMS Geo-spatial Decision Support System below. There are two major future roads planned in this area, PWV19 and K118 as indicated in the extracts below. This planning is protected in terms of the Gauteng Transport Infrastructure Act and the road reserves of these roads should be excluded from the development area in terms of the Act.

Figure 83: Extract Gauteng RAMS (with aerial photo)

Planning for these roads is depicted in Plan No PRS 86/186/7Bp, PRS 80/88/6Bp and PRS 86/186/8Bp, copies are presented in the annexure. The planned K118 will link to Road D1255 and will cross the PWV19 with an access interchange. It should be note that Road D1255 is only indicated up to the future PWV19 and on the planning it then follows the District Distributor (Eloff Road) alignment.Access may be required off the existing gravel road (future K118) for the siding. Two potential accesses are envisaged as part of the K118 planning: opposite Vyfdeweg; and opposite Eersteweg, as depicted in Plan No PRS 86/186/6Bp and PRS 86/186/7Bp. There is another planned access further west but it may be affected by the rail siding. It is therefore proposed that access be located directly opposite one of these streets.

The future road reserve of K118 is 62m and the standard building restriction line applicable on these roads is 95m from the centre line of the future K118. It is also noted that a rail siding was planned in the past and the siding can be seen on Plan no PR 80/88/6Bp, (Refer to te TIA attached in Appendix 17). This planning was done is 1981. The status of the rail planning is unknown. The siding crossing is now planned approximately 400m further west at more or less the planned access on K118. The proposed additional railway line coming into the main siding (marked in blue) will also need to cross the planned K118. Approval for this will be required from Gautrans.

Access to the Welgedacht Balloon Siding will be off Welgedacht Road via Wissel Road/Milner Road. The first section (±1.3km) is surfaced. The next ±1.3km is a graded gravel road (still Wissel Road). From this point there is no formal road only a farm road. It is proposed that the alignment of the proposed K118 be used to establish a road between Wissel Road and Road D1255. No implementation plan is available for K118. Alternatively the existing farm road can be upgraded and used as an access road to the Welgedacht Balloon Siding. Both these options will need to be approved by Gautrans.

Figure 84: Proposed access road to the Welgedacht Balloon Siding

The Welgedacht Balloon Siding will be accessed off D1255.

10.14.3 EXISTING TRAFFIC DEMAND

The peak traffic hours were identified as follows:

- Weekday morning peak hour 06:45 – 07:45
- Weekday afternoon peak hour 17:00 – 18:00

The traffic data is available at the following intersections:

- Intersection Welgedachts Road/Main Road & Milner Street (signalised)

The existing morning and afternoon peak hour traffic demand is depicted below.

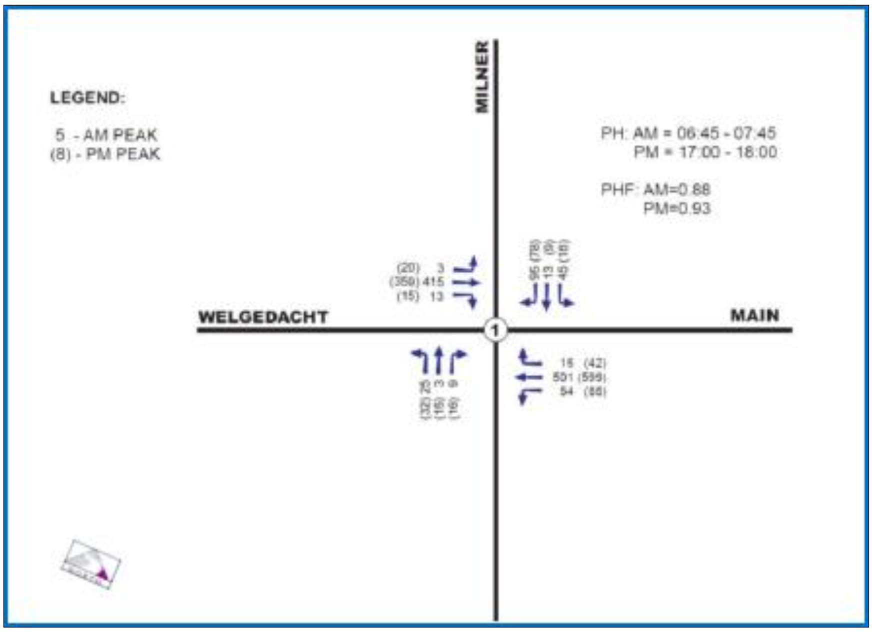


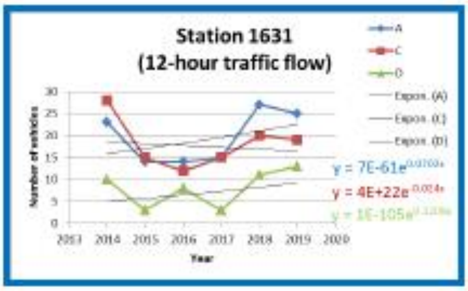
Figure 85: Existing peak hour traffic demand

The Gauteng RAMS Geo-spatial Decision Support System presents traffic flow data at a few Manual Counting Stations in the area as depicted below.

Gauteng RAMS Location of Manual Counting Stations

1630	12-hour traffic flow		
Year	A	B	D
2014	32	31	5
2015	16	11	9
2016	19	20	7
2017	17	10	12
2018	18	13	15

1631	12-hour traffic flow		
Year	A	C	D
2014	23	28	10
2015	14	15	3
2016	14	12	8
2017	15	15	3
2018	27	20	11
2019	25	19	13



1629	12-hour traffic flow			
Year	A	B	C	D
2014	345	2798	2	3053
2015	426	3381	3	3688
2016	394	3012	1	3331
2017	437	3234	5	2900
2018	536	3328	12	3373
2019	346	3423	33	3315

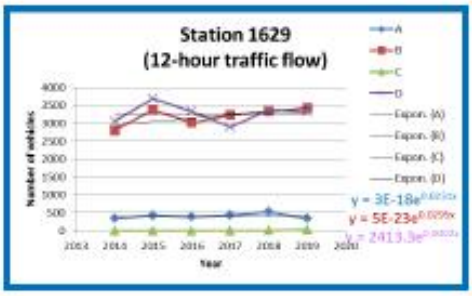


Figure 86: Gatengs RAMS traffic counts

The data shows very low traffic volumes on Road D1255 with no clear indication of a consistent growth between 2014 and 2018/2019. On Ermelo Road (R29) 12-hour traffic flow of above 3 000 vehicles were recorded with a growth rate of 2.95% on the western leg of R29, 0.2% on the eastern leg of R29 and 2.31% on the Aston Lake Road (Dagbreek Road).

10.14.4 TRIP GENERATION

For the Balloon Rail Siding a total of 150 people will be employed during construction phase. For the operational phase the expected employment opportunities at the siding will be 35 people. The working hours during both phases will be 24 hours 7 days a week. The highest peak hour is expected to be at shift change times. To work 24 hours will require 3 shifts.

The following assumptions are made for peak hour trip generation purposes:

Construction phase:

Private vehicle use 20%

Vehicle occupancy:

Private cars 1 per vehicle (50%)

Private cars 2 per vehicle (50%)

Public/company transport use 80%

Vehicle occupancy:

Public transport 13-15 passengers per vehicle

Construction vehicles:

External truck trips: 1 in-bound and 1 outbound during peak hours

Operational phase:

Private vehicle use 33%

Vehicle occupancy:

Private cars: 1 per vehicle (100%)

Public/company transport use 67%

Vehicle occupancy:

Public transport 13-15 passengers per vehicl

The expected weekday peak hour trip generation of the Balloon Siding is presented in Figure 87.

Project phase	Modal split	Morning peak hour		Afternoon Peak hour	
		In	Out	In	Out
Construction	Private Vehicles	7	7	7	7
	Public Transport	3	3	3	3
	Construction vehicles	1	1	1	1
	Total	**11**	**11**	**11**	**11**
Operational	Private Vehicles	4	4	4	4
	Public Transport	1	1	1	1
	Total	**5**	**5**	**5**	**5**

Figure 87: Expected weekday peak traffic for the proposed Welgedacht Balloon Siding

The implementation of the Rail siding will eliminate the transport of coal via interlink trucks from the proposed Palmietkuilen Mine. Coal will be transported from the plant via an overland conveyor belt to the rail siding.

10.14.5 CAPACITY ANALAYSIS

The South African Traffic Impact and Site Traffic assessment Manual (3) states the following:

"A Traffic Impact Assessment shall be undertaken and submitted when an application is made for a change in land use and when the highest total additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application exceeds 50 trips per hour."

The implementation of the Welgedacht Balloon Siding will not result in more than 50 peak hour trips, therefore, no capacity analysis was done for this report.

10.14.6 CONVEYOR OPTIONS

The future road planning will affect the route planned for the overland conveyor belt and supporting infrastructure. The rail siding and two overland conveyors route options are indicated on the extract of the Gauteng RAMS below.

Figure 88: Future road planning and planned overland conveyor location

Gautrans approval will be required to cross future planned roads (in this case PWV19).

10.14.7 ACCESS CONTROL

The standard provincial road planning requirements are applicable for access off Road D1255 to the rail siding.

- No access within 100m from the future K118 road reserve;
- 45m x 15m splays at the access on the K118 road reserve; and
- Minimum road reserve width of 25m

If access control is implemented the following is proposed for the access control point(s):

- Inbound lane: at least 4m wide

- Outbound lane: at least 4m wide with a guardhouse on the side of the road:

A typical access opposite Vyfdeweg is depicted on the extract from Plan No PRS 86/186/7Bp below.

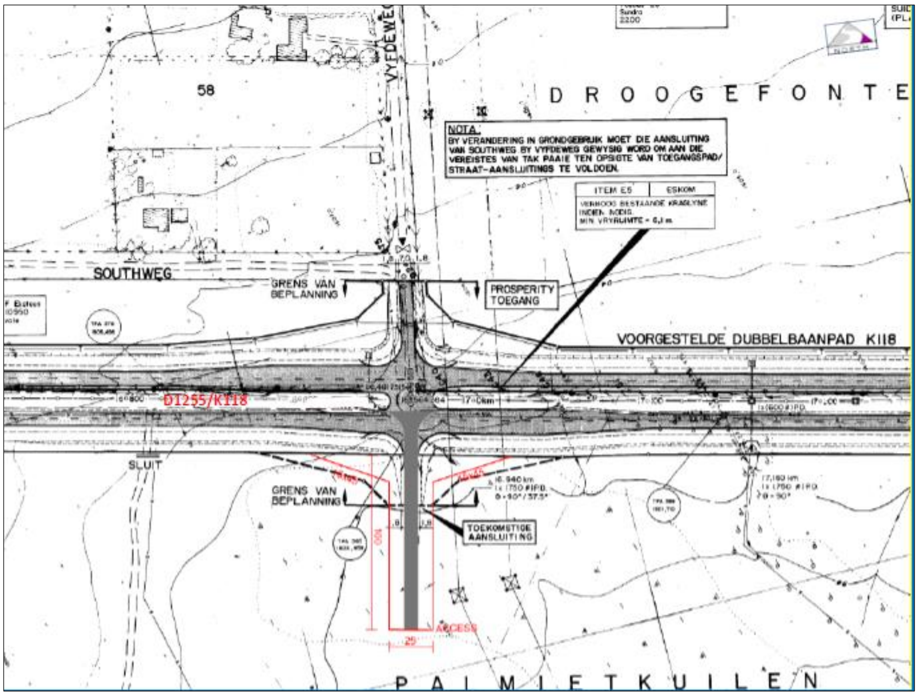


Figure 89: Typical access to rail siding

10.14.8 PUBLIC TRANSPORT

Public transport will unlikely play a major role. At most special transport (staff busses) will be provided by Canyon. These will transport employees to and from the railway siding and not drop-off and pick-up at the access on Road D1255.

10.15 NOISE

A Noise Impact Assessment was undertaken by Enviroroots (Pty) Ltd. A copy of the report is attached as Appendix 18.

The procedures, as detailed in SANS 10328:2008 and SANS10103:2008 were applied to the noise measurements and assessments made in this report. Field assessments in and around the site were undertaken. This included the identification of the noise sensitive stakeholders, existing noise sources and other baseline noise contributors. Viable and alternative measurement localities at the identified monitoring localities were further investigated to ensure measurements were not influenced by extraneous noise sources. A summary of the approach is included in the Noise Impact Assessment Report.

Baseline measurements were conducted on the 13th. March 2022 at two (2) localities. Measurements were analysed to compile a subjective and objective determination of the Rating levels (LReq) based on the LAIeq measurements. Measurements were conducted at a minimum of 10-minutes.

10.15.1 MODELLED SCENARIOS

The modelled scenario was designed and based on the layout as supplied by the client. 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) were sourced online.
- Numerous methodologies will be incorporated/considered for modelling and calibration (increased confidence in findings). These include CoRTN: 1996 (UK), RLS90 (German), IS9613-2, SANS 10357:2008, CoRN Calculation of Railway Noise (1995 - Department of Transport, UK) etc.
- Contours represented illustrate LAeq,T. If any corrections were considered, it will be stated within the modelled scenario namely:
    - T = correction for a kn night correction.
    - Specified adjustments for tonal character, impulsiveness (impulsive or highly impulsive).
    - LReq,n and LReq,d.
- Noise contour representation.

10.15.2 IDENTIFICATION OF NOISE SENSITIVE RECEPTORS

Interested and Affected Parties (I&AP's, Noise-Sensitive Developments (NSD) or receptors) were identified by means of desktop assessment (GoogleEarth®, +-1,000m from the project footprint). Certain receptors were assessed up to +-2,000m if within this radius of a large Sound Power Level low frequency noise source. Assessed receptor localities are presented in Figure 90.

The receptors were referenced as R1 to R4 and consisted of singular dwellings and communities/ suburbs or portions thereof. Receptor R1 is the community of Welgedacht, while receptor R3 is the community of Prosperity AH. Receptor R4 is the community of Aston Lake.

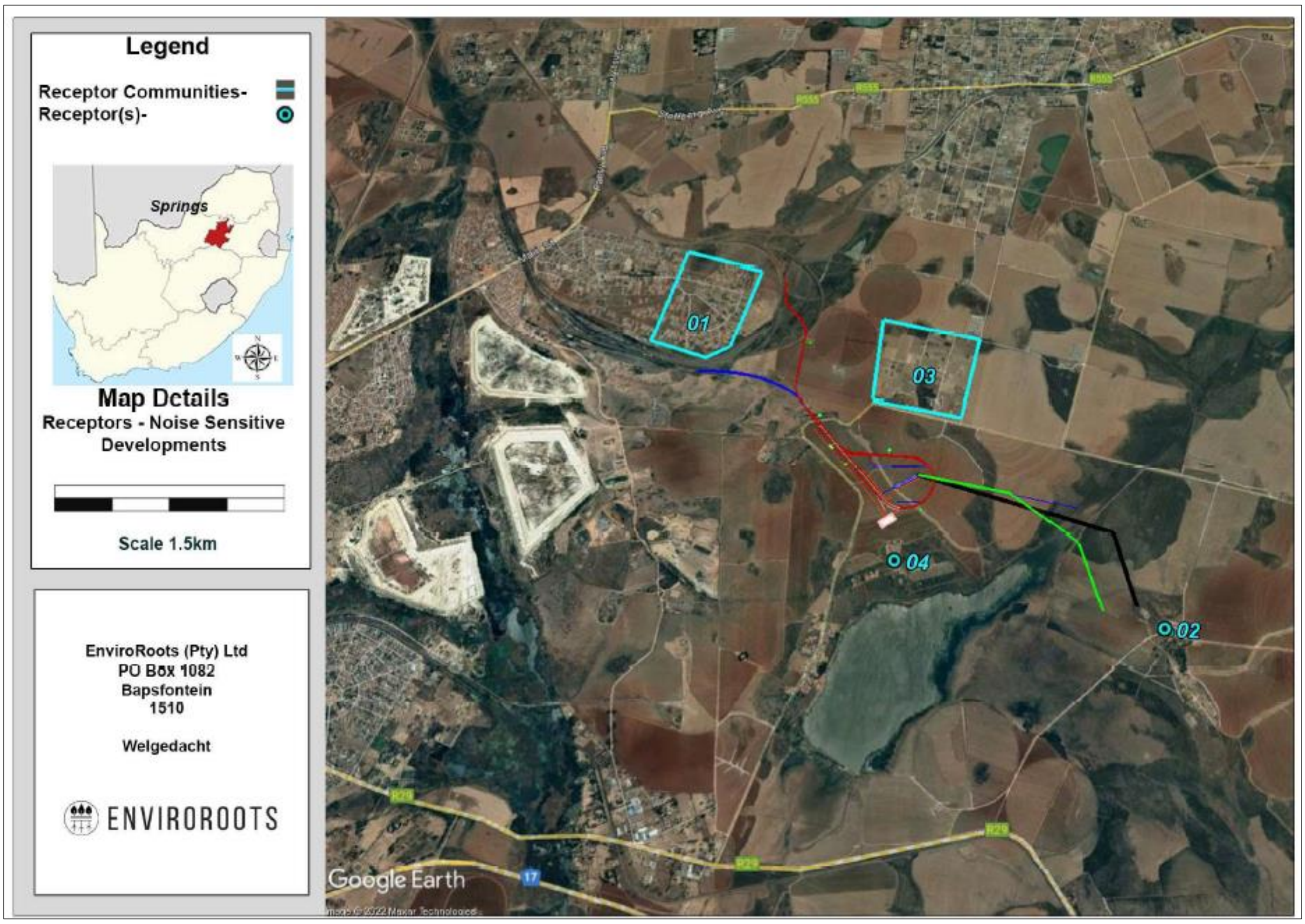


Figure 90: Interested & Affected Parties (NSD)

10.15.2 BASELINE SOUND PRESSURE MEASUREMENTS

Measurement localities are presented in Figure 91 below. The noise measurement localities were decided on based on receptors identified prior to fieldwork, via a desktop assessment and with discussions with the project team. Ten-minute LAIeq (SANS10103:2008) measurements were conducted during the daytime (22:00 – 06:00 8) safe periods within the study area.

10.15.2.1 ATTENDED MEASUREMENTS – RS01

The measurements were conducted along a secondary road in the local community (receptor R1 -Welgedacht). A minimum 10-minute measurement was conducted on the outside of the dwelling properties. Equivalent values (impulse setting) are presented in Table 51. Subsequent analysis of the data, desktop information and onsite investigations concluded the following:

- Calculated LAIeq was 43,7 dBA – There is a moderate confidence that measurements represent the Rating level of the community.

Table 51: Shorter-term measurements

Point	Locality	Measured LAIeq,10min (dBA)
RS01	Receptor R1	LAIeq,10m in = 43.7

10.15.2.2 ATTENDED MEASUREMENTS – RS02

A minimum 10-minute measurement was conducted in an open area on the area in the community of receptor(s) R3 (Prosperity AH). Equivalent values (impulse setting) are presented in Table 52.

Subsequent analysis of the data, desktop information and onsite investigations concluded:

- Calculated LAIeq was 42,5 dBA – There is a moderate confidence that measurements represent the Rating level of the community.
- There were several vehicles on the route during measurements, with one vehicle passing near measurements. Industries was lightly audible (farming industries).

Table 52: Shorter-term measurements

Point	Locality	Measured LAIeq,10min (dBA)
RS02	Receptor R2	LAIeq,10m in = 42,5

10.15.2.3 BASELINE NOISE LEVELS FINDINGS AND IDENTIFIED SANS10103:2008 RATING LEVELS

Based on the measurements the following Rating Levels were proposed for receptors:

- Suburban Rating – The area is sufficiently developed (as reflected in LAI,eq,10min) to have a Rating level of Suburban for all receptors.

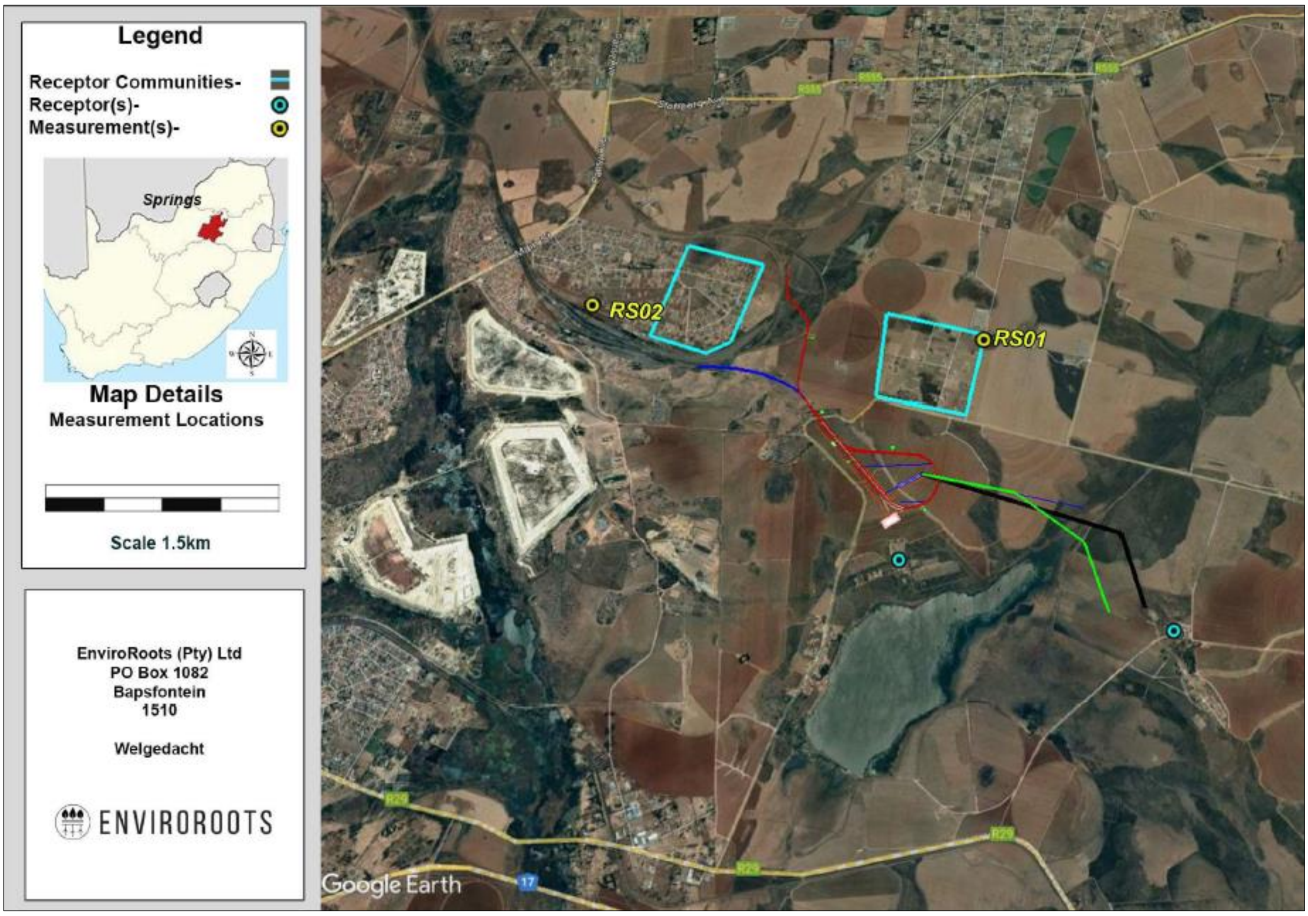


Figure 91: Measurement localities within the study area

10.15.3 NOISE IMPACT ASSESSMENT

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 were assessed namely the Planning, Construction, Operational, Closure and Post Closure Phases. The noise impact assessment is discussed in Section 14 of this EIA report.

10.16 AIR QUALITY

Eco Elementum (Pty) Ltd. undertook the Air Quality Impact Assessment. A copy of the report is included in Appendix 19A.

10.16.1 DISPERSION MODEL

Emission factors are quantified using the Australian National Pollutant Inventory (NPI) which is an improvement on the US Environmental Protection Agency (US.EPA) AP-42 document of Air Pollution Emission Factors for Australian conditions, for fugitive dust deriving from material handling, on-site roads, milling and crushing operations, drilling and blasting, and wind erosion from exposed surfaces. Various mitigation measures were incorporated into the project design as discussed in the emission factor section.

Dispersion models represents the most likely outcome of experimental results; it does not contain all the features of a real-world system but contain the feature of interest for management of an issue. Gaussian plume models have an uncertainty range of between -50% to 200%.

There will always be some error in any geophysical model, the total uncertainty can be described as the sum of three components:

- Uncertainty due to errors in the model physics;
- Uncertainty due to data errors; and
- Uncertainty due to the atmospheric conditions.

10.16.1.1 MODEL SELECTION

The regulatory model of the US.EPA, AERMET/AERMOD dispersion model suite, was chosen for the study. AERMET uses both surface and upper air data. The model also has a terrain pre-processor (AERMAP) for including a large topography into the model. The AERMET / AERMOD suite was developed with the support of the AMS/EPA Regulatory Model Improvement Committee (AERMIC), whose objective was to include state-of the-art science in regulatory models.

1. AERMOD is an advanced new-generation model. It is designed to predict pollution concentrations from continuous point, flare, area, line, and volume sources.
2. AERMET is a meteorological pre-processor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters.
3. AERMAP is a terrain pre-processor designed to simplify and standardise the input of terrain data for AERMOD. Input data includes receptor terrain elevation data which are used for the computation of air flow around hills.

Input data required for the AERMOD model include:

- Source emissions and type data;
- Meteorological data (pre-processed by the AERMET model);
- Terrain data; and
- The receptor grid.

10.16.1.2 METEOROLOGICAL DATA

AERMOD requires two specific input files generated by the AERMET pre-processor. AERMET is designed to be run as a three-stage processor and operates on three types of data (upper air data, on-site measurements, and the national meteorological database). Use was made of the WRF AERMET ready weather data for the period 1 January 2019 to 31 December 2021.

10.16.1.3 SOURCE DATA

AERMOD is able to model point, area, volume, and line sources. Wind erosion sources such as stockpiles and unpaved roads modelled as area sources. Material transfer points and crushing and screening were modelled as volume sources. With the input sources using factors applied to the emission as described in the Australian NPI.

10.16.1.4 SENSITIVE RECEPTOR GRID

The pollutant dispersion is setup for a modelled domain of 10 km (north-south) by 10 km (east-west) with the centre of the proposed project area in the centre of the modelling domain. The area was divided into a variable grid with the following resolutions:

- 1 km from Centre:
    - 50 m (north-south) by 50 m (east-west).
- 2.5 km from boundary of first grid box:
    - 100 m (north-south) by 100 m (east-west).
- 4 km from the boundary of the second grid box:
    - 200 m (north-south) by 200 m (east-west).

10.16.2 MODELLING RUNS

Modelling was undertaken for two proposed operational phase scenarios.

1. Unmitigated – Material handled dry.
2. Mitigated – Mitigation measures applied.

The construction and decommissioning phases were qualitatively assessed.

10.16.2.1 MODEL RESULTS

Dispersion modelling was undertaken to determine 2nd highest daily and annual average ground level concentrations (GLCs) for PM10 Total daily dust fallout rates were also simulated. These averaging periods are selected to draw comparisons between PM10 predicted concentrations / deposition with relevant air quality guidelines and dust fallout limits, respectively. Isopleths plots are also generated, to visually display the interpolated values from the concentrations predicted by the model for each of the receptor grid points. Plots reflecting daily averaging periods contain only the 2nd highest predicted ground level concentrations for the daily concentration, over the entire period for which simulations were undertaken. It is therefore possible that even though a high hourly or daily average concentration is predicted at certain locations, this may only be true for one day during the modelling period.

10.16.3 DISCUSSION OF BASELINE AIR QUALITY

10.16.3.1 SENSITIVE RECEPTORS

Sensitive receptors identified in the immediate vicinity (Figure 92) of the study area and proposed project area have been listed below:

- Various dispersed homesteads.
- The town of Springs.

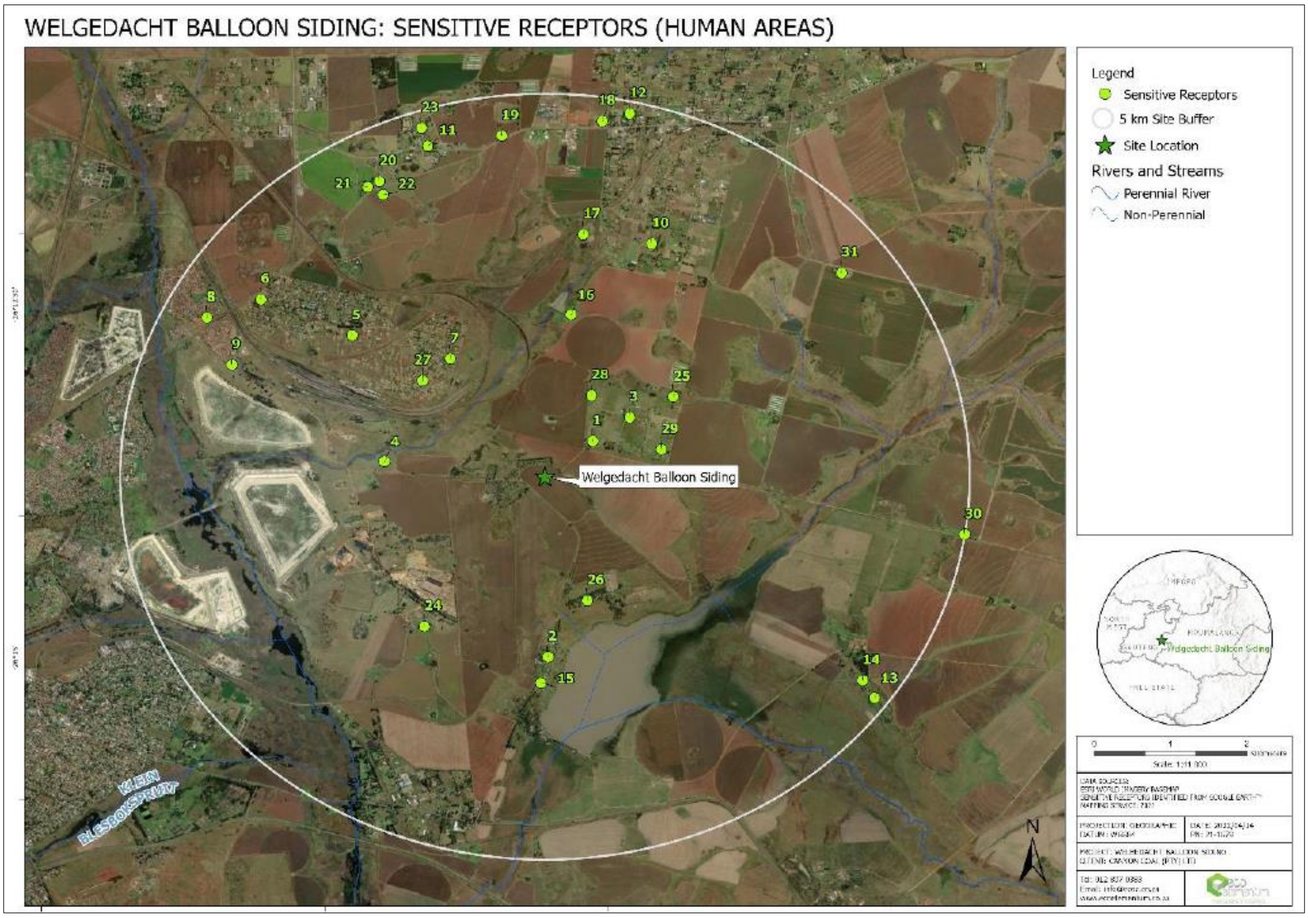


Figure 92: Sensitive Receptors

10.16.3.2 SOURCES OF BASELINE EMISSIONS

10.16.1.2.1 VEHICLE EXHAUST GASES

Vehicle exhausts contain a number of pollutants including carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbons, oxides of nitrogen (NOx), sulphur and PM10. Tiny amounts of poisonous trace elements such as lead, cadmium and nickel are also present. The quantity of each pollutant emitted depends upon the type and quantity of fuel used, engine size, speed of the vehicle and abatement equipment fitted. Once emitted, the pollutants are diluted and dispersed in the ambient air. Pollutant concentrations in the air can be measured or modelled and then compared with ambient air quality criteria.

10.16.1.2.2 VELD FIRES

Veld fires are widespread across the world, occurring in autumn, winter and early spring. In addition to controlled burning for fire-breaks and veld management, many fires are set deliberately for mischievous reasons. Some are accidental, notably those started by motorists throwing cigarettes out of car windows. Emissions from veld fires are similar to those generated by coal and wood combustion. Whilst veld fire smoke primarily impacts visibility and landscape aesthetic quality, it also contributes to the degradation of regional scale air quality. Dry combustible material is consumed first when a fire starts. Surrounding live, green material is dried by the large amount of heat that is released when there are veld fires, sometimes this material also burn. The major pollutants from veld burning are particulate matter, carbon monoxide, and volatile organics. Nitrogen oxides are emitted at rates from 1 to 4 g/kg burned, depending on combustion temperatures. Emissions of sulphur oxides are negligible (USEPA, 1996).

10.16.1.2.3 TRUCKS PASSING ON THE ROADS, LOADING AND OFFLOADING RAW MATERIALS

Dust emissions occur when soil is crushed by a vehicle, as a result of the soil moisture level being low. Vehicles used on the roads will generate PM-10 emissions throughout the area and they carry soils onto the paved roads which would increase entrainment PM-10 emissions. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic.

10.16.1.2.4 MINING ACTIVITIES IN THE AREA

Mining operations in the area contribute to emissions in the project area, the following an be likely sources:

- Particulate emissions generated due to wind erosion from exposed areas;
- Material handling; and
- Vehicle entrained dust on paved and unpaved road surfaces.

10.17 CLIMATE CHANGE ASSESSMENT

Kijani Green Energy compiled a Climate Change Assessment Report for the proposed Welgedacht Baloon Siding project. A copy of the report is included in Appendix 19B.

10.17.1 CLIMATE CHANGE EMISSION LEGISLATION

The project is situated in the Gauteng Province, in the Lesedi Local Municipality. This area has been formally declared as an Air Quality Priority Area in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (AQA). South Africa is a signatory of international climate change commitments, including the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the COP 21 Paris Agreement. As part of these commitments, the South African National Climate Change Response White Paper was published in 2011. The National Greenhouse Gas Emission Reporting Regulations (GG No. 40762, Notice 275) in terms of NEMAQA were promulgated in April 2017. Informed by these, South Africa tabled the Climate Change Bill (GG No. 41689, Notice 580) in October of 2021.

10.17.2 CLIMATE CHANGE ASSESSMENT

The eastern summer rainfall region of South Africa is expected to experience warming over the coming years as a result of global climate change. With this, seasonal variability in rainfall, in particular, is expected to increase, with wetter wet periods and more extreme droughts forecast1. With this in mind, it is worth noting that historical flood lines may need to be reassessed and decisions on the placement of infrastructure be made extremely conservatively.

10.17.3 METHODOLOGY

10.17.3.1 METEOROLOGICAL DATA

Following discussions with the South African Weather Service (SAWS), the nearest available long-term dataset was identified is Johannesburg, Gauteng Province, South Africa.

10.17.3.2 EMISSION FACTORS

When modelling emissions from a site where real data is not available, it is possible to estimate the emissions generated by using a series of equations to determine the likely emission of each process. These are called emission factors. An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. A broad overview of potential emissions likely to result from the operation of the proposed facility can be obtained through the use of the NPI's general equation:

$$E_{kpy,i} = [A * OpHrs] * EF_i * [1 - (CE_i/100)]$$

where:

$E_{kpy,i}$ = emission rate of pollutant i, kg/yr

A = activity rate, t/h

OpHrs = operating hours, h/yr

EF_i = uncontrolled emission factor of pollutant i, kg/t

CE_i = overall control efficiency for pollutant i, %

10.17.4 CLIMATE CHANGE IMPACTS

10.17.4.1 GREENHOUSE GASES

A greenhouse gas (GHG) is defined as any gas that enhances the greenhouse effect prevalent in our planet. The greenhouse effect is the natural phenomenon whereby energy emitted from a sun-warmed earth is trapped within the atmosphere by certain gases, thus stabilising the earth's energy balance and allowing our planet to be habitable. Naturally, this role is played by a range of gases, of which by far the most common are water vapour (H2O) and carbon dioxide (CO2). Of concern is the enhanced greenhouse effect, whereby the earth warms unnaturally because of the addition into our atmosphere of a range of gases that are usually the by-product of industrial processes, most notably, the burning of fossil fuels.

In addition to the gases mentioned above, many other gases also play a role in the greenhouse effect. The most common and readily reported ones are listed in Table 53.

Table 53: Common Reportable Greenhouse Gases

Gas name	Symbol	Global warming potential (GWP)	Unnatural sources
Carbon dioxide	CO_2	1	Fossil fuel combustion, forest clearing
Methane	CH4	21	Landfills, petroleum industry, livestock, rice cultivation, fossil fuel combustion
Nitrous oxide	N_2O	320	Fossil fuel combustion, fertilizers, nylon production, manure
Hydro fluorocarbons	HFCs	140 - 11700	Refrigeration gases, aluminium smelting, semiconductor manufacturing
Per fluorocarbons	PFCs	6500 - 9200	Aluminium production, semiconductor industry
Sulphur hexafluoride	SF_6	23 900	Electrical transmissions and distribution systems, circuit breakers, magnesium production

Of those gases listed above, only those associated with the burning of fossil fuels are relevant to this project, in this case, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Refrigeration systems within the project may emit trace amounts of hydro fluorocarbons which are not included. These are easily mitigated through the proper maintenance of any refrigeration or air conditioning equipment on site. It is not expected that these emissions would make a material difference to the overall carbon equivalent profile of the siding. Similarly, some sulphur hexafluoride emissions may result from electricity distribution infrastructure on the proposed project. These facilities belong to Eskom and are included in Eskom's carbon equivalent emission factor.

10.17.4.2 GLOBAL WARMING POTENTIAL

A gas's global warming potential (GWP) or its carbon equivalence (CO2eq) is a measure of its efficacy at trapping outgoing longwave radiation and contributing to the atmospheric greenhouse effect. This potential is expressed as a ratio to the global warming potential of carbon dioxide. Thus, one unit of methane, with a GWP of 21, is 21 times as effective at contributing to global warming as carbon dioxide. When making carbon footprint calculations, all greenhouse gases are aggregated together, and the total is expressed as units of carbon equivalents (CO2eq).

10.17.4.3 REPORTING REQUIREMENTS

It is important to differentiate between GHGs emitted as a part of the siding's operations and those that will result from the combustion of the coal that the mine associated with the siding will produce. While the former (those emissions resulting from the combustion of fuel and the use of electricity by the siding) should make up the annual reporting done by Canyon Resources , an assessment of the actual global impact of the mine must consider the contribution of the coal that will be mined over the mine's lifespan, even though, when this coal is burnt, those emissions will be accounted for by the end-user of the coal, not the mine itself. Whether Canyon Resources will trigger the reporting requirement for GHGs under the National Greenhouse Gas Emission Reporting Regulations (GG No. 40762, Notice 275) will be determined by the overall project emissions which include the proposed Palmietkuilen Colliery. It is unlikely that the proposed Welgedacht Balloon Siding would trigger these reporting requirements on its own.

10.17.4.4 COMBUSTION SOURCED GHGS (SCOPE 1 EMISSIONS)

Scope 1 emissions are those GHG emissions that are a direct result of the activity of an emitter. They primarily include fuel burnt in the conduct of the activity by engines owned by the emitter. No material onsite combustion sources were identified.

10.17.4.5 ELECTRICITY-SOURCED GHG (SCOPE 2 EMISSIONS)

Scope 2 emissions refer to those second-party emissions that result from the use of grid electricity supplied by a third party, in this case, Eskom. Eskom heavily dominates the South African electricity supply. Recent years have seen the rise of private or municipal power producers, but their contribution to the national grid so small, thus negligible. Of Eskom's power, approximately 90% is still derived from coal fired power stations, resulting in significant indirect emissions for South African customers. In addition to this, recent shortages in power supply have forced the utility to increase the power produced using diesel generation. The emission factors related to the use of Eskom power change subtly year on year. The figures in this report reflect those published by Eskom for the year ending March 2019, the last time that these were updated by Eskom.

No figures are available for potential electricity consumption for the operation of the siding. For illustrative purposes, a figure of 1000MWh is used in this estimate. This represents approximately 15% of a typical coal mine's annual power consumption.

	Electricity Consumption	Coal Use	Water Use	Particulate Emissions	CO_2 Emissions[4]	CO_2 Emissions[5]	SOx emissions	NOx Emissions
	Factor	0.55	1.4	0.48	1.04	1.06	8.9	4.27
Units	MWh	t	kl	t	t	t	t	t
Welgedacht siding	1000	550	1400	0	1040	1060	9	4

Figure 93: GHG Emissions from proposed Welgedacht Siding for estimated electricity consum

10.17.4.6 THIRD-PARTY GHG (SCOPE 3 EMISSIONS)

Scope 3 emissions are typically emissions that result from the activities of third-party suppliers to a project, or emissions related to the sale, use and disposal of the product of an activity. In the case of a coal mine, where the product has no value unless used for fuel, this results in a significant emission.

10.17.4.7 LOCOMOTIVE DIESEL

It is assumed that the locomotives expected to be active on the site are owned by a third party supplier (likely, Transnet). Thus, the emissions are considered to be Scope 3. It is unknown how far the coal will be transported once leaving the confines of the siding, so only those emissions within the proposed siding's loop are considered. Emission factors were sourced from the *US EPA AP-42, Chapter 3.3: Stationary Diesel Sources*. An activity rate of one train per day through the loop of the siding is estimated, with that train operating at slow, stop / start levels of diesel consumption6 which is approximately 25l per km, per engine.

		Total CO2 emissions	NOx emissions	SOx emissions	VOC emissions	Carbon monoxide emissions	Particulate emissions	Carbon equivalents
	Factor	164	4.41	0.29	0.36	0.95	0.31	2.68
Units	Litres	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Train diesel	328500	839	23	1	2	5	2	880
TOTAL		839	23	1	2	5	2	880

Figure 94: Estimated GHG Emissions from locomotive diesel consumption per annum

10.17.4.8 COAL PRODUCED

It is unclear to what extent the Palmietkuilen Colliery is dependent on the construction of the siding to be viable, but it is fair to assume that the siding will not go ahead without the colliery. It is thus reasonable to consider the coal produced by the proposed Palmietkuilen Colliery, and transported through the siding, as a part of the project's Scope 3 emissions.

Table 54: Scope 3 emissions resulting from product of the proposed Palmietkuilen Colliery

	Coal produced	**CO2 Emissions**
	Factor	**2.280967**
Units	Tons per year	Tons per year
Palmietkuilen	2400000	5474304

The proposed Palmietkuilen Colliery is expected to generate a total of 2.4Mt of coal per year over a 20-year life of mine. Assuming that all of this is purchased and burnt locally, this would increase South Africa's carbon emissions by 5.4 $MtCO_2eq$ per year, or by approximately 1.4% of total emissions. However, a significant proportion of this coal is likely to be marked for export. While this would still have a global impact, this exported product would not count against South Africa's carbon budget. This impact does, however, contribute to the cumulative impact of the mine.

10.17.5 CLIMATE CHANGE SUMMARY

As is evident in the table below, by far the greatest climate change impact that the proposed Welgedacht Balloon Siding will have, is through the sale (and subsequent Scope 3 emissions that result from) the combustion of coal which is the product of the project. This means that no energy efficiency programmes within the mine's operation will be sufficient to offset the substantial Scope 3 emissions impact that will result from the project.

However, energy efficiency programs typically aim to balance the impact of Scope 1 and Scope 2 emissions, both of which are modest enough to be viably offset by the company. Modest Scope 3 emission offsets could be achieved through partnerships and collaboration with the customer and the general value chain.

Table 55: Scope emissions from the proposed Welgedacht Balloon Siding project

	Tons (annual)	% of project total emissions
Scope 1	0	0.00%
Scope 2	1060	0.02%
Scope 3	5475184	99.98%

10.18 SOCIAL-ECONOMIC ENVIRONMENT

Socio-economic impacts, as with the environmental impacts, specifically deal with the proposed Welgedacht Balloon Siding, its infrastructure and relevant activities and do not take mining activities of the proposed Palmietkuilen Colliery into account. A Socio-Economic impact assessment has been included as part of the Agricultural Impact Assessment Report (refer to Appendix 13).

10.18.1 A SUMMARY OF THE SOCIO-ECONOMIC ENVIRONMENT WITHIN THE PROJECT AREA

The following section provides a summary of the social and economic environment that may be influenced by the proposed project. Information in this section was sourced from Stats SA and the Integrated Development Plans (IDP's) for the Sedibeng District Municipality. The information provided in the IDP's and the Stats SA website are based on a 2011 National census and well as the 2016 Community Survey[4].

According to the National Environmental Management Act (NEMA, 1998) environment refers to the surroundings in which humans exist. When viewing the environment from a socio-economic perspective the question can be asked what exactly the social environment is. Different definitions for social environment exist, but a clear and comprehensive definition that is widely accepted remains elusive.

The environment influences and constrains behaviour, but behaviour also leads to changes in the environment. The impacts of a project on people can only be truly understood if their environmental context is understood. The baseline description of the social environment will include a description of the area within a provincial, district and local context that will focus on the identity and history of the area as well as a description of the population of the area based on a number of demographic, social and economic variables.Table 56 presents a summary of the socio-economic aspects which may have a bearing on the proposed project.

Table 56: Summary of the socio-economic aspects (Sedibeng District Municpality)

Aspect	**Local Municipality**
District Municipality	Sedibeng District Municipality

[4] It is acknowledged that this data may be outdated as no more recent census has been undertaken (Stats SA) and in addition, the municipal IDP 2020-2021 is still in draft mode and may be updated after review.

Province	Gauteng Province
Location	The Project area is situated within Sedibeng District Municipality (SDM), which comprise three local municipalities (LMs); Midvaal, Emfuleni and Lesedi. The Project Area is located entirely within Ward 12 of Lesedi Local Municipality (LLM) and directly borders Ward 7 of the Victor Khanye LM (VKLM), located in the Nkangala District Municipality (Mpumalanga Province) and Ward 75 and 76 of the Ekurhuleni Metropolitan Municipality (EMM). Human settlements closest to the site include Aston Lake and Prosperity (directly adjacent), Endicott and Vischkuil (2km south), Sundra (2.5km north), Welgedacht (3km north-west) and Springs (4km east). Agricultural activities within the Project area comprise irrigated and dry-land commercial maize and soya farming operations. Farmlands are under the ownership of privately owned companies and generally produce for the local market within Gauteng and Mpumalanga. Farmland is either used by owners or leased out on an annual basis to other farmers who will cultivate the land and/or use it to graze livestock. Farms provide permanent employment for a number of permanent employees, which include unskilled farm labour and semi-skilled managerial staff. Farming operations are solely dependent on ground and surface water as well as extensive support infrastructure, which include pivoted irrigation systems, warehouses, workshops, farm office and worker accommodation, etc.
Local Municpality	Lesedi Local Municipality (LLM)
Ward	12
Population composition	Black African (65%), White (32%), Other (2%)
Languages	IsiZulu (37%), closely followed by Afrikaans (31%)
Age and Gender	The age distribution of the surveyed population indicates a relatively old population with only 17% of household members being younger than 10 years, and an average age of almost 30 years. The population's gender ratio indicates that females and males are equally distributed.
Household Size	The average household size (calculated by dividing the total number of household members recorded during the survey by the number of surveyed households) is between four and five members. It is relatively uncommon for extended family members to share the same household.
Education	School attendance is relatively high amongst those of school going age (6-18 years), with most children (83%) attending primary school. Attendance varies considerably between boys (94%) and girls (69%), with attendance amongst girls being 25% lower.

Housing	In addition to permanent household members several homesteads also offer accommodation to tenants. Just more than a quarter of households (27%) rent out rooms to tenants, with the average number of tenants per affected household being between two and three persons.
Household Services	Household's access to regional water schemes is the lowest within Ward 12 of LLM (64%). Households also seem to have limited access to flush sanitation facilities, with only 51% of households in Ward 12 having access to flush sanitation facilities. Household access to electricity for lighting, heating and cooking on Ward level is generally lower than the corresponding municipal average.
Employment Trends	In 2011, the employment rate among the Ward's labour force was about 45% of the total population (older than 15) and 81% among the economically active population. Employment was mostly provided within the formal sector (82%), which is likely driven through activities within the manufacturing, wholesale and trade, energy, as well as services and finance sectors (StatsSA, 2013). Major economic activities in the Ward consist of commercial agriculture and dryland crop production, in addition to a small number of light industries. Unemployment among the economically active population (11%) is low when compared to the corresponding figure for the LLM. Employment and unemployment patterns vary considerably across genders with a greater percentage of females who are classed as unemployed and not economically active. Males far outnumber (18%) females among those who are employed on both a Ward and Municipal level.
Economic Sector Performance	The economic baseline revealed that the LLM is a relatively small economy and makes a minor contribution towards the economies of the Sedibeng DM and Gauteng Province, although the economy has shown above average growth in the past few years mainly due to the growing tertiary industries. In addition, the primary sector has a negligible impact on employment and GDP in the local economy of Lesedi. Lastly, the municipality is dominated by low income earners. The planned Siding project should assist in improving the economic environment. Providing employment to the local labour will have a positive impact on the employment creation, skills development, household earnings and local economy activity.

10.18.2 DIRECT SOCIO-ECONOMIC IMPACTS

To calculate direct socio-economic impacts industry standards of labour requirement for different farming activities are applied. It is normally accepted that one labourer is required for every 40 to 60 ha of cultivated land and one per 200 to 400 ha for cattle, depending on the total size of the farm.

Following these criteria, the cultivated land will require two labourers and less than one for the livestock. At most the number of jobs that will temporarily be lost, is three. These can easily be taken up on the existing farms or be employed at the siding. These farm related opportunities will temporarily reduce and then again increase to its pre-mining status after decommissioning. The loss of income from farming is estimated at approximately R1,03 million per year. These impacts have been rated and are included in Table 63 in the previous section.

10.18.3 INDIRECT SOCIO-ECONOMIC IMPACTS

Activities associated with the proposed Welgedacht Balloon siding could result in indirect social and/or socio-economic impacts for surrounding agricultural land uses, landowners and farm workers. These include:

- Loss of access to livelihoods (incomes);
- Resettlement of farm workers / Relocation of households;
- Devaluation of surrounding farming land;
- Security impacts;
- Impacts on the sense of place.

These indirect impacts are discussed in the section below and assessed and rated in Table 63.

11 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

11.1 ENVIRONMENTAL FEATURES

The project area and surrounds has been transformed for crop cultivation, with fragmented sections of grassland and wetlands, both visibly negatively impacted on by anthropogenic activities. All land uses on and adjacent to the proposed development area consist of croplands, wetland and watercourses, sections of grassland, farming and rural residences, railway lines, Eskom powerlines and substations, along with livestock grazing in some areas. There are several watercourses and wetland areas present within and surrounding the 500 m DWS Regulated Area. The area is drained by the Blesbokspruit in the west, which is a listed RAMSAR site. Aston Lake is also situated just south of the proposed conveyor belt and its associated infrastructure.

11.2 EXISTING INFRASTRUCTURE ON THE STUDY AREA AND IN CLOSE PROXIMITY

Existing infrastructure in close proximity includes various roads, theTransnet Railway Line and an Eskom substation. The Aston Lake Community is located approximately 2 km southwest of the proposed project site.

11.3 WATER

Municipal water will be utilised on site for domestic purposes. All dirty water will be collected in the dirty water berms and channelled to the pollution control dam. This dirty water will be used for dust suppression on site.

11.4 POWERLINES AND/OR SERVITUDES

An Eskom substation is located in close vicinity to the project and various powerlines cross in close proximity the project site.

11.5 ROADS

Access to the Welgedacht Balloon Siding will be off Welgedacht Road via Wissel Road/Milner Road. The first section (±1.3km) is surfaced. The next ±1.3km is a graded gravel road (still Wissel Road). From this point there is no formal road only a farm road. It is proposed that the alignment of the proposed K118 be used to establish a road between Wissel Road and Road D1255.

11.6 SEWAGE

Portable toilets will be used at the siding, a licensed sewerage removal company will be appointed for handling and maintenance of the toilets.

12 DESCRIPTION OF THE CURRENT LAND USES

(Show all environmental and current land use features)

The proposed development site, along with the 500 m DWS Regulated Area is located on land mainly transformed for crop cultivation, with fragmented sections of grassland and wetlands, both visibly negatively impacted on by anthropogenic activities. All land uses on and adjacent to the proposed development area consist of croplands, wetland and watercourses, sections of grassland, farming and rural residences, railway lines, Eskom powerlines and substations, along with livestock grazing in some areas. There are several watercourses and wetland areas present within and surrounding the 500 m DWS Regulated Area. The area is drained by the Blesbokspruit in the west, which is a listed RAMSAR site. Aston Lake is also situated just south of the proposed conveyor belt and its associated infrastructure.

12.1 SENSITIVE LANDSCAPES

The occurrence of possible sensitive landscapes at the project site is outlined in the Table 57 below.

Table 57: Sensitive Landscapes within the Project Area

Types of sensitive landscapes	Occurrence at the Project Area
Nature conservation or ecologically sensitive areas - indigenous plant communities (particularly rare communities and forests), wetlands, rivers, riverbanks, lakes, islands,	Ecological assessments have been conducted for the Welgedacht Balloon Siding area. Refer to Sections 10.4, 10.5 and 10.8 above for the baseline findings regarding the wetlands found, hydropedological and hydrogeological found and assessed on-site (and within 500 m of the project area).

lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species.	
Sensitive physical environments - such as unstable soils and geo-technically unstable areas.	None known. A Hydropedology assessment has been undertaken as required for the WUL process and this will aim to connect the wetlands found and Hydrogeological assessment and describe the movement between the two water environments. An additional Geotechnical assessment could be requested by DWS during the WUL commenting phase, but it will remain the decision of the CA.
Important natural resources - river systems, groundwater systems, high potential agricultural land.	All of these aspects have been assessed by specialists and is described in the baseline environment section (Section 10). Due to the nature of the proposed Welgedacht Balloon Siding, the final significance of surface impacts will be low.
Sites of special scientific interest	None known.
Sites of social significance - including sites of archaeological, historic, cultural, spiritual or religious importance and burial sites.	Marked and unmarked graves are located outside of the project area. Various structures older than 60 years (protected by Act 25 of 1999 (National Heritage Resources Act)) are situated around the study area, but none on the site earmarked for planned infrastructure. A heritage feature has been identified on the eastern section of the preferred conveyor route, but the impact of the conveyor route on this is low.
Sites of outstanding natural beauty, panoramic views and scenic drives	The area has already been impacted by agricultural activities, the Transnet railway line, the Eskom sub station and various secondary roads. The Blesbokspruit Ramsar declared wetland is located approximately 2.6 km west of the project footprint.
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 AGRICULTURAL

No gaps in knowledge were found for the agriculutural assement. All relevant impacts

13.2 AQUATIC BIODIVERSITY

The limitations and assumptions in terms of the aquatic biodiversity study include the following:

- Several alternatives have been applicable to the Balloon Siding project, however, the activities have been finalised before the compilation of this report. Assessment was focused on areas where impacts are expected and other sensitive areas identified in the vicinity, such as pans, wetlands and water features.

- 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 during the beginning of high flow season at the time of assessment, the flow was not sufficient in all the areas assessed, but long-term sampling will be viable, specifically within the eastern tributary.
- 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.
- A wetland assessment has been conducted by an appropriate specialist appointed and is the subject of a separate report by another consultant.
- 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 ECOLOGICAL ASSESSMENT

The following limitations and assumptions are applicable to the biodiversity assessment:

- Several alternatives have been applicable to the Balloon Siding project (specifically for the conveyer belt). The assessment focussed on areas where impacts are expected, and other sensitive areas identified in the vicinity.
- 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.
- Spring conditions were encountered during the time of this study (18th of November 2020), although rainfall have not been prevalent within the Province before the field assessment date and the area was found to be visibly dry.
- 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.
- 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.
- No scientific data was collected or analysed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and

relevant professional experience of the specialist investigators.

- Wetlands occur within the project area associated with the water resources in the area (Dwars-in-die-wegvlei and Blesbokspruit). A Wetland specialist has been appointed and consulted to delineate, prescribe buffers and assess the wetlands and is the subject of a separate wetland report.
- 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 following assumptions and limitations are applicable to the groundwater model:

- Model hydraulic parameters were based on literature values and previous investigations completed at the Site and within the region and were assumed to be representative of Site conditions;
- Flow model calibration was completed using a combination of Site-specific and regional data which was assumed to be representative of Site conditions;
- No final source concentration values were available for the Site contaminant sources (only a draft geochemical report was available), thus transport modelling was completed using a source concentration of 100% and an initial concentration of 0%. This was done to show the potential contaminant plume extent, travel direction and magnitude of contamination and was assumed to be representative of final transport conditions;
- The source concentration at the stockpile area was considered to be 100% for the entire operational life of the Site, which was conservative as the coal will only be temporarily stored at the Site for loading purposes and leaching potential will thus be limited. Thus, the simulated contaminant plume for the Site should be considered as a worst-case representation;
- A numerical model does not provide a unique solution. Therefore, numerical modelling will always have inaccuracies due to the uncertainty in data, the capabilities/limitations of numerical modelling code to describe the natural processes and the factors selected by the modeller to resolve the non-unique solution;
- The complexities of fractured rock aquifers imply that the model can only be used as a guide to determine the order of magnitude of dewatering and contaminant transport; and
- The interpretation of modelled results should be based on the assumptions the model was built on and actual results will vary as unknown aquifer conditions and parameters vary in the natural system.

13.5 HYDROPEDOLOGICAL ASSESSMENT

The assumptions and limitations applicable to the hydropedological assessment include:

- Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment. Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment.

- The wetland's catchment determines the relative extent of different hydrological response types in the catchment and within specific hillslopes contained within the catchment. 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:
  - Rainfall 100% of flow input
  - Evapotranspiration is 50 – 70% of rainfall (outflow)
  - Runoff is 10% (outflow)3
  - Groundwater recharge is 5%4 (outflow)
  - 20 -30 % 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 Welgedacht Balloon Siding area. Based on the site visit, historic activity 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, however it was deemed necessary to indicate the impact on the existing seepage wetland.

13.6 SURFACE WATER ASSESSMENT

The assumptions and limitations for the surface water assessment include the following:

- 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 drainage lines were identified and assessed, some smaller ephemeral drainage lines may have been overlooked.
- The obtained buffer zones for streams, rivers and/or drainage lines, were calculated using the WRC Report No. TT 610/14 Tool, at the practitioner's own discretion and based on desktop and field assessments.
- As most of the streams and rivers related to the proposed project are associated with wetland zones, the buffer zones used for delineated wetland zones were obtained from the Wetland Assessment undertaken for the project.
- 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 site survey for the surface water and aquatic ecology assessment was undertaken during the wet season (November 2020). The timing of the site visits was thus optimal, and the seasonal constraints on the comprehensiveness of the findings are considered to be low. The data gathered during the site visit is considered sufficient for the purposes of this report and the Scope of Work for this study.
- 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 limitations and assumptions for the Wetland Assessment include the following:

- The fieldwork component of the assessment comprised of one assessment only, during the wet season in March 2021. No temporal trends for the respective seasons have been assessed. Follow-up photographs were however taken in areas where access is allowed in March of 2022.
- The study focussed on the identification, delineation and functional assessment of wetlands found within/along the proposed development footprint. Although all wetlands occurring within 500 m of the proposed Welgedacht Balloon Siding and its associated infrastructure were mapped at a desktop level in fulfilment of Regulation GN509 of the NWA, the field assessment was confined to only those areas to be impacted by the proposed activities.
- Sampling by its nature means that not all parts of a study site is visited, in this case, either due to time constraints or access restrictions. Therefore, the assessment findings are only applicable to the areas sampled and extrapolated to the rest of the study site. Some reliance was also made on previous wetland assessments in the surrounding area conducted by Digby Wells Environmental (2016) and SiVEST (2015).
- Whilst every effort was made to ensure that all wetland features potentially within the 500 m investigation area were identified and delineated, less distinct features within these access-controlled areas may not have been identified.
- The assessment was conducted on the portions of the study site as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report.
- Formal vegetation sampling was not done by the specialist, a separate Terrestrial Fauna and Flora Assessment was undertaken by an Ecologist. All vegetation information recorded was based on the onsite visual observations of the author. Furthermore, only dominant, and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- This study consisted only of the assessment of the construction, operational and decommissioning phase impacts of the proposed Welgedacht Balloon Siding and its associated infrastructure on wetland ecosystems. Impacts to river ecosystems, drainage areas and other water resources was not assessed.
- Description of the depth of the regional water table and geohydrological and hydropedological processes falls outside the scope of the current assessment.
- Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage.

- 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
- Scientifically calculated buffer zones indicated this report serves to highlight an ecologically sensitive area in which activities should be conducted with this sensitivity in mind. However, if approval and authorisation is obtained, the conveyer and future planned railway extension of the proposed Welgedacht Balloon Siding will be constructed within the wetland areas and therefore the buffer zones will not be upheld in these areas.
- Buffer zone calculations do not consider climate change or future changes to wetlands and watercourses resulting from increasing catchment transformation.
- The realistic good mitigation scenario impact assessment assumes that all the mitigation measures recommended in Section 5.4 will be adhered to.
- Uncertainty exists regarding the following:
    - The potential impact of the railway, the conveyer, and its associated service road on the subsurface water flow and the impact this might have on the existing and surrounding wetland areas.
    - The number and extent of wetlands to be affected downstream of the proposed activities.
    - As a condition of the Environmental Authorisation (EA) and Water Use License (WUL) these impacts will need to be better assessed and understood prior to commencement of activities.

13.8 ARCHAEOLOGICAL/HERITAGE ASSESSMENT

The limitations for the heritage assessment included:

- During the initial survey (November 2020), the majority of the study area was characterised by a combination of burnt grassland, recently cultivated maize fields, demolished buildings and dumping areas. Visibility at this time was generally considered to be good. The areas characterised by dumping limited access to a certain extent due to a potentially unsafe situation. These areas, however, were mostly encountered to the west of the proposed siding at the location of a historical mine.
- The surveying of the initially proposed conveyor belts that took place during January 2021 saw a generally densely vegetated environment as a result of heavy rainfall. Wet conditions also hampered access to the eastern-most section of the study area. Personal communication with the farm manager, however, confirmed the absence of structures and buildings on the concerned section and aided in locating burial sites. The location of the proposed conveyor belt routes, however, were subsequently changed and an additional railway line to the northwest of the study area (marked in blue) was added. These areas were inspected during July 2022. The entire proposed conveyor belt routes could not be surveyed due to wet conditions. However, the proposed conveyor belt routes are largely located on cultivated land that is not considered to be as sensitive from a heritage perspective. It should be noted that the eastern end of the preferred conveyor belt route is located in the vicinity of demolished buildings. This area was accessed and inspected. The new railway line that is proposed to the northwest of the study area falls on open veldt. Sections of the new railway line are associated with dumping and some areas could not be assessed due to a potentially unsafe situation. Historical aerial imagery and

topographical maps, however, indicate the absence of buildings and structures in the direct vicinity of the proposed railway line.

13.9 NOISE ASSESSMENT

The noise assessment included the following limitation and assumptions:

13.9.1 MEASUREMENT

There are limitations and uncertainties regarding acoustical measurements. Noise levels have the potential to fluctuate based on numerous components, including:

- The noise level may change from day to day due to activities within a community (e.g. road traffic fluctuations, see point below) or even at a singular dwelling itself. Dwelling related infrastructure (e.g. air-conditioning units, swimming pool pumps etc.) that has the potential to influence noise levels in terms of dB.
- Seasonal changes have the potential to influence sound levels directly (e.g. rain, wind) or indirectly (influence from faunal communication, see point below).
- Faunal communication measurement fluctuations due to seasonal, time of day or night etc. Certain fauna communicates during certain hours e.g. cicada may only audible during nighthours, crepuscular birds are only audible during evening or night hours, crickets may be more audible active as seasons get hotter etc.
- Measurements near mining and industries fluctuates depending on equipment in use, capacity load in use, unforeseen equipment in care and maintenance. Certain equipment may not be running optimally, with the consequence been excessive elevated noise levels (e.g. gas leaks, conveyor pulley roller squeaking, excessive vibrations (and associated noise) from unmaintained dampers on equipment etc.
- Road traffic noise fluctuates due to time of measurement investigation (e.g. peak traffic morning or evening conditions, early morning hours etc.; and
- Meteorological conditions can influence noise measurements. These include inversion and diffraction in the temperature layer, change in temperature and humidity etc.
- Where necessary longer-term measurements may be required to be conducted. For a Rating level determination, 10-minute measurement (day and night), desktop assessment (of development of the area) as well as onsite investigations can be considered sufficient. For a noise source investigation (e.g. operational monitoring) longer-term measurements may counter above limitations (if confidence in 10-minute measurements is low).

13.9.2 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.

13.9.3 PROJECT SPECFICATION LIMITATIONS

Project specific limitations included:

- Longer-term measurements (as well as night measurements) were unfeasible due to safety issues of equipment. Site investigations, measurements (in terms of the SANS10103:2008) and desktop assessment is deemed as sufficient to determine the Rating level.

13.10 VISUAL ASSESSMENT

The assumptions and limitations determined by the specialist for the Visual Assessment include the following:

- Due to the terrain of the study area, the core study area can be defined as an area with a radius of not more than 5 km from the activities and a total study area with a radius of 10 km from the activities. This is because the visual impact beyond 6 km would be so reduced that it can be considered negligible even if there is direct line of sight.

- Only viewpoints within 5 km from the activities were assessed for potential impacts.
- It is assumed that there are no alternative locations for the proposed activities and the visual assessment, therefore, the assessment focussed only the proposed site. Only an alternative conveyor route was provided, however, this will not have a major impact on the Visual Assessment, as both the Preferred and Alternative routes are situated in close proximity to each other.
- The assessment was undertaken during the planning stage of the project and is based on the information available at that time.
- Closure Phase impacts were not considered as part of the assessment as closure activities will be of short duration, and mainly rehabilitation monitoring practices will take place in the long term.
- Visual perception is by nature a subjective experience, as it is influenced largely by personal opinions and world views. For instance, what one viewer may experience as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education, and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. To limit such subjectivity, combinations of quantitative and qualitative assessment methods were used. A high degree of reliance was placed on GIS-based analysis viewshed and visibility analysis, and on making transparent assumptions and value judgements where such assumptions or judgements are necessary.
- The viewshed generated with Geographic Information Systems (GIS) and Google Earth Pro are not 100% accurate due to unknown developments and modification of the natural environment and presents a limitation. Site visits are therefore used to verify the physical land conditions, such as natural vegetation, topography and or recent building or construction developments.

13.11 AIR QUALITY AND CLIMATE CHANGE ASSESSMENTS

Dispersion models represents the most likely outcome of experimental results; it does not contain all the features of a real-world system but contain the feature of interest for management of an issue. Gaussian plume models have an uncertainty range of between -50% to 200%. There will always be some error in any geophysical model, the total uncertainty can be described as the sum of three components:

- Uncertainty due to errors in the model physics;
- Uncertainty due to data errors; and
- Uncertainty due to the atmospheric conditions

For the climate change assessment no real time climate information is available, therefore, when modelling emissions from a site where real data is not available, it is possible to estimate the emissions generated by using a series of equations to determine the likely emission of each process. The eastern summer rainfall region of South Africa is expected to experience warming over the coming years as a result of global climate change. With this, seasonal variability in rainfall, in particular, is expected to increase, with wetter wet periods and more extreme droughts forecast1. With this in mind, it is worth noting that historical flood lines may need to be reassessed and decisions on the placement of infrastructure be made extremely conservatively.

13.12 TRAFFIC ASSESSMENT

In terms of the traffic assessment, assumptions and limitations are made for peak hour trip generation purposes:

Construction phase:

- Private vehicle use 20%
- Vehicle occupancy:
  - Private cars 1 per vehicle (50%)
  - Private cars 2 per vehicle (50%)
- Public/company transport use 80%
- Vehicle occupancy:
  - Public transport 13-15 passengers per vehicle
- Construction vehicles:
  - External truck trips: 1 in-bound and 1 outbound during peak hours

Operational phase:

- Private vehicle use 33%
- Vehicle occupancy:
  - Private cars: 1 per vehicle (100%)

13.13 PALEONTOLOGICAL ASSESSMENT

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and could contain fossil plant, insect, and invertebrate material. The sands of the Quaternary period would not preserve fossils. From the site visit survey and observations, there are no fossils in the surface soils and alluvium, and there are no exposures of shales where fossil leaf impressions could be preserved. It is unknown if there are fossils below the land surface.

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:

14.2 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

No site alternatives were considered for the main siding due to the location of the proposed site to the Palmietkuilen Colliery. Two different locations were considered for the proposed conveyor belt from the Palmietkuilen Colliery to the proposed Welgedacht Balloon Siding. The results of the specialist studies did not indicate that the preferred conveyor route would have greater impact on the environment. Only the heritage assessment indicated a possibility of the building ruins being impacted on by the preferred conveyor route, however, the impact was determined to be low. Also refer to Section 15 of this EIAr.

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 Appendix 6). 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 58.

Table 58: Summary of specialist investigations

Aspect	Specialist Study	Specialist	Terms of Reference
Surface water and Aquatic Ecology	Surface Water Assessment	Red Kite Environmental Solutions (Pty) Ltd	The Scope of Work for the Surface Water Assessment for the Proposed Welgedacht Siding will include the following tasks: • A desktop review of available information for the project area, including satellite images, databases and specialist studies performed for the area;

Aspect	Specialist Study	Specialist	Terms of Reference

			• Identify impactable water resources, with their accompanying catchments, and sub-catchment areas as well as setting forth information on which measures and legislation will be applicable to the project;
			• Field visit to survey the affected watercourses;
			• If site conditions allow, two monitoring sites in the Dwars-in-die-wegvlei will be assessed for the aquatic assessment, the following methodology will be used: o SASS5 (South African Scoring System version 5),
			  ○ IHAS (Invertebrate Habitat Assessment system)'
			  ○ Upstream and downstream water quality sampling (2 samples)'
			• Determine or recommend ranges of acceptability for water quality for affected watercourses and compare to existing water quality monitoring data;
			• Determination of watercourse buffers as per Buffer Zone Guidelines for Wetlands, Rivers and Estuaries by Macfarlane and Bredin (2017);
			• Surface Water Assessment Report describing the affected surface water environment and condition;
			• NEMA 2014 impact assessment;
			• Developing a sensitivity map based on field visits and supported by appropriate regional information to inform the impact assessment;
			• Recommendation of site-specific mitigation measures;
			• Compilation of a specialist assessment report detailing the methodology and findings of the assessment.

Water Balance	Water Balance Report	Red Kite Environmental Solutions (Pty) Ltd	The approach as contained in the Department of Water and Sanitation's "Best Practice Guideline G2: Water and Salt Balances", with the following Scope of Work to be undertaken: • Define water balance boundaries; • Identify water circuits and develop schematic flow diagram; • Data collection; • Solve water balance for identified units; and • Compile conceptual water balance report.
Air Quality and Climate Change	Air Quality Impact Assessment and Climate Change Assessment	Eco Elementum Environmental and Engineering	The purpose of this study will be to: • Study the available information relevant to the pre-and post-development ambient air quality pollution concentrations in the environment; • Identify the major existing air emission sources in the environment; • Identify the existing sensitive air pollution areas in the environment; • Estimate by means of measurements and integration of the results with those of any relevant existing information the present ambient air quality climate; • Identify the project related processes and equipment that will cause the major contribution to the future air quality impact; • Dispersion modelling to compute ambient concentrations as a function of source configurations, and meteorological characteristics, calculating the spatial and temporal patterns in the ground level concentrations arising from the emissions of emissions sources.

Aspect	Specialist Study	Specialist	Terms of Reference
			• Consider, evaluate and rate the potential air quality impacts; and • Propose relevant management and mitigation measures to lessen the anticipated impacts. The scope of work in this Climate Change Assessment will include: • Data collection and analysis o Process data collection and analysis o Climate data collection and analysis
Noise	Environmental Noise Impact Assessment	Enviro Routes (Pty) Ltd.	The study will determine the potential noise impact on the surrounding environment due to the proposed development of a coal mine. The purpose of this study will be to: • Establish baseline conditions of the area; • Model noise generated by proposed activities through Measurements conducted at receptors (I&AP's or noise sensitive developments) in terms of SANS10103:2008, National environmental Act (Act No. 107 OF 1998), GN NO. 326 and GN R154 (National Noise Control Regulation) methodology. A minimum of 10-minute day and night measurements will be conducted (day/night as per SANS10103:2008).; • Determine impact of activities; • Identify gaps and limitations; • Establish mitigation and management measures
Groundwater	Groundwater Impact Assessment	Alicanto (Pty) Ltd	The following scope of work as per the requirements for an EIA assessment and a water use license application will be undertaken: • Assessments of potential impacts associated with the proposed project on the receiving environment as well as the cumulative impact of the entire operation • Geohydrological report A hydrocensus/site visit and discussion with relevant mine personnel 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, 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 project area) • Site visit and discussions with relevant personnel • Initial conceptual model o Conceptual Modelling o Using existing monitoring data, a conceptual model will be constructed with the aim of describing flow mechanisms and contaminant transport from the proposed project. o Numerical Modelling o Predictive modelling pre-project for impact prediction will be done to quantify potential impacts from the project: o Groundwater flow, transport modelling to predict the impacts of the project on groundwater quantity and

Aspect	Specialist Study	Specialist	Terms of Reference
			quality in the region of the mine (Positive and negative). • A groundwater management and a monitoring network plan will be included in the report. • Reporting A report detailing the findings of the study will provided in the format of regulations regarding the procedural requirements for water use licence applications and appeals, specialist groundwater study.
Hydropedological	Hydropedological Assessment	GPT (Pty) Ltd	Hydropedological Assessment Report: • Hydropedological modelling to assess impacts on wetlands.
Heritage	Heritage Impact Assessment	Mr. Tobias Marais.	Phase 1 Heritage Impact Assessment (HIA) for the proposed project area.
Paleontological Assessment	Paleontological Impact Assessment	University of Witwatersrand Dr. Miriam Bamford	Phase 1 Paleontological Impact Assessment will be undertaken for the proposed project area.
Biodiversity Assessment	Biodiversity Impact Assessment	Enviridi Environmental Consultants (Pty) Ltd	The terms of reference for this bird impact assessment study will be as follows: • To qualitatively and quantitatively assess the significance of the avifaunal habitat components, and current general conservation status of the property; • To comment on ecologically sensitive areas; • To comment on connectivity with natural vegetation and habitats on adjacent sites; • To highlight and assess potential impacts of the proposed development on the avifauna of the study site, and • To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved
			The terms of reference for the Vegetation Assessment will be 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.
			The main objectives of the fauna study will be 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;

Aspect	Specialist Study	Specialist	Terms of Reference
			• 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.
Alien Vegetation Management	Alien Vegetation Management Plan	Red Kite Environmental Solutions (Pty) Ltd.	The Scope of Work for the Management Plan will include the following: • Desktop study of alien and invasive flora that may potentially occur in the study area and review of available studies. • Field study to verify the presence and extent of distribution of AIP and other problem plants (encroaching species). The site survey was completed as part of the survey undertaken for the Terrestrial Ecology Assessment. • GIS mapping and distribution of affected areas. • Prioritising areas into management units for eradication and control. • Recommendations for control measures and steps for eradication. • Recommendations for species to be used in revegetation efforts to enable sustainable indigenous vegetation establishment in line with future land use.
Pans and Wetlands	Wetland Impact Assessment	Elemental Sustainability (Pty) Ltd	The main objectives of wetland delineation study will be as follows: • Delineate and classify wetlands within 500m of the development site • Discusses drivers of wetlands • Ground truthing 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; • To provide mitigation measures to limit and/or eliminate the anticipated impacts.
Soil and Agriculture	Soil and Agricultural Agro-Ecosystem Assessment	Terra Africa	• The entire project area will be assessed using available desktop data. • The desktop survey will inform the most suitable options for the conveyor belt alignment. • Two possible conveyor belt alignments will be surveyed in detail together with the land where the project infrastructure will be located. • The detailed assessment includes:

Aspect	Specialist Study	Specialist	Terms of Reference
			○ The site survey will be conducted by physical soil classification at a survey point every 150 m apart. The information, together with other data such as contours, will be used to classify the area into land capability classes following both the DAFF system as well as the guidelines outlined by the South African Chamber of Mines. ○ Soil samples will be collected for soil analysis of basic soil fertility parameters and also to inform the soil monitoring recommendations. ○ The agricultural potential of the area will be determining using the baseline soil properties as well as climate data. The area will also be assessed for other agricultural production options such irrigated agriculture and livestock production. ○ The report will be compliant with the NEMA regulations for specialist studies as well as other legislation relevant to the fields of soil and agricultural potential. ○ For the impact assessment, a methodology recommended by Elemental Sustainability (Pty) Ltd will be used. ○ The report will also include a Soil Management Plan that will include soil quality monitoring parameters.
Traffic	Traffic Impact Assessment	Corli Havenga (Pty) Ltd.	This study would be conducted by traffic specialists from the consulting engineering firm Corli Havenga Transportation Engineer. The study would establish the baseline traffic volumes by means of traffic counts, calculate project-related contributions to baseline traffic volumes, evaluate the performance and layout of intersections, provide input on road conditions and the design of the access point, assess potential impacts associated with each of the project phases, recommend any road and safety improvements and develop a traffic management plan.
Visual	Visual Impact Assessment	Elemental Sustainability (Pty) Ltd.	The scope of work for this Visual Impact Assessment will include: • Describe the existing visual characteristics of the proposed sites and its environs; • Viewshed and viewing distance using GIS analysis up to 15 km from the proposed structures; • Visual Exposure Analysis; • Consider, evaluate and rate the potential visual impacts; and • Propose relevant management and mitigation measures to lessen the anticipated impacts.
Geotechnical Assessment Floodline Determination and Engineering Designs	Geotechnical Impact Assessment	WRM Consulting Engineers	Determination of floodlines for streams crossing the project area; • Geotechnical assessment; • Clean and dirty water separation berms; • Preliminary Pollution Control Dam designs; • Preliminary overburden, ROM and Stockpile pad designs; • Preliminary domestic water and sewage disposal designs; • Preliminary drawings for access control, fences and roads; and

Aspect	Specialist Study	Specialist	Terms of Reference
			• Preliminary design report for WULA.

14.9 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 8 – 19). The specialist investigations which included modelling, such as groundwater, noise, visual, air and blasting, included the modelling results below as per relevant heading.

14.9.1 IMPACTS ON GROUNDWATER

During the construction phase at the Site, the activities would include the removal of vegetation and compaction of soil at the stockpile and PCD. The potential impact on groundwater quantity during the construction phase would localize groundwater dewatering (if groundwater is used to supply construction activities). Should groundwater be used to supply the construction activities (e.g. drinking water or dust suppression), localized dewatering at the borehole(s) could occur. This would be a low impact both before and after management measures are put in place due to the localized extent of dewatering and the short duration of the impact. Borehole abstraction (if any) should be managed effectively and borehole water levels and abstraction volumes from the borehole should be recorded at regular intervals, ideally monthly.

Hydrocarbon spills from construction vehicles and/or fuel storage areas could result in localised groundwater contamination, which is a medium impact on the receiving environment. In order to manage these impacts all staff and supervisors at workshops, yellow metal laydown areas and fuel storage areas should be trained in hydrocarbon spill response and each of these areas should be equipped with the appropriate spill response kits and any contaminated soil must be disposed of correctly at a suitable location. Should these management measures be put in place the impact on the receiving environment would be reduced to a low impact. Domestic waste will be generated by contractors and staff. This would be a low impact both before and after management measures are put in place. Domestic waste should be disposed of at a dedicated, suitable landfill site and managed according to the applicable legislation and Standard Operating Procedures (SOP's) of the Site.

During the operational phase groundwater will be used as water supply for operational activities (e.g. domestic water), localized dewatering at the borehole(s) could occur. This would be a low impact both before and after management measures are put in place due to the localized extent of dewatering and the short duration of the impact. Borehole abstraction (if any) should be managed effectively and borehole water levels and abstraction volumes from the borehole should be recorded at regular intervals, ideally monthly. The potential impacts on groundwater quality during operations at the Site would be the seepage of poor-quality leachate into the groundwater environment from the Site PCD and coal stockpile area. These will be lined using an HDPE liner in the Base Case and Scenario 2 simulations, with the stockpile lined using a Class C liner in the Base Case Scenario and Class D liner in Scenario 2. Scenario 1 considered a 'worst case' scenario where neither the PCD or the stockpile area were lined. The numerical model simulated a source concentration of 100% for the PCD's (1 and 2) and stockpile area, where a threshold of 0.5% was used to determine the potential impacts per scenario (i.e. concentrations below 0.5% were considered negligible).

For the base case scenario, no contamination was simulated over the LOP (Figure 95), with maximum concentrations of <0.1% simulated at both the stockpile area and PCD. Thus, a low impact rating was assigned for the operational phase impacts for the base case scenario. Coal product should be stored at the coal stockpile area for as limited time possible to reduce the oxidation potential of the material and groundwater monitoring of water levels and quality should be conducted regularly at boreholes installed at the stockpile area. The PCD should be lined using HDPE liner, which should be regularly inspected for leakages, and groundwater level and quality monitoring should be conducted regularly at boreholes near to the PCD. Following the implementation of these management measures the magnitude and probability of seepage occurring at the Site stockpile area and PCD is reduced and the impact rating becomes neutral.

For model Scenario 1 the simulated contaminant plume extended ~350 m south of the Site boundary towards the non-perennial river south west of the Site (Figure 95), with maximum concentrations of ~5% simulated at the stockpile area and ~2.5% at the PCD. A low impact rating was assigned for the operational phase impacts for Scenario 1 due to the low magnitude of the simulated contamination. Coal product should be stored at the coal stockpile area for as limited time possible to reduce the oxidation potential of the material and groundwater monitoring of water levels and quality should be conducted regularly at boreholes installed at the stockpile area. The PCD should be lined using HDPE liner, which should be regularly inspected for leakages, and groundwater level and quality monitoring should be conducted regularly at boreholes near to the PCD. Following the implementation of these management measures the magnitude and probability of seepage occurring at the Site stockpile area and PCD is reduced and the impact rating becomes neutral.

For model Scenario 2 the simulated contaminant plume at the Stockpile area did not extend past the boundary of the stockpile and no contamination was simulated at the PCD (Figure 95), a maximum concentration of ~0.55% simulated at the stockpile area. A low impact rating was assigned for the operational phase impacts for Scenario 2 due to the low magnitude and limited extent of the simulated contamination. Coal product should be stored at the coal stockpile area for as limited time possible to reduce the oxidation potential of the material and groundwater monitoring of water levels and quality should be conducted regularly at boreholes installed at the stockpile area.

The PCD should be lined using HDPE liner, which should be regularly inspected for leakages, and groundwater level and quality monitoring should be conducted regularly at boreholes near to the PCD. Following the implementation of these management measures the magnitude and probability of seepage occurring at the Site stockpile area and PCD is reduced and the impact rating becomes neutral.

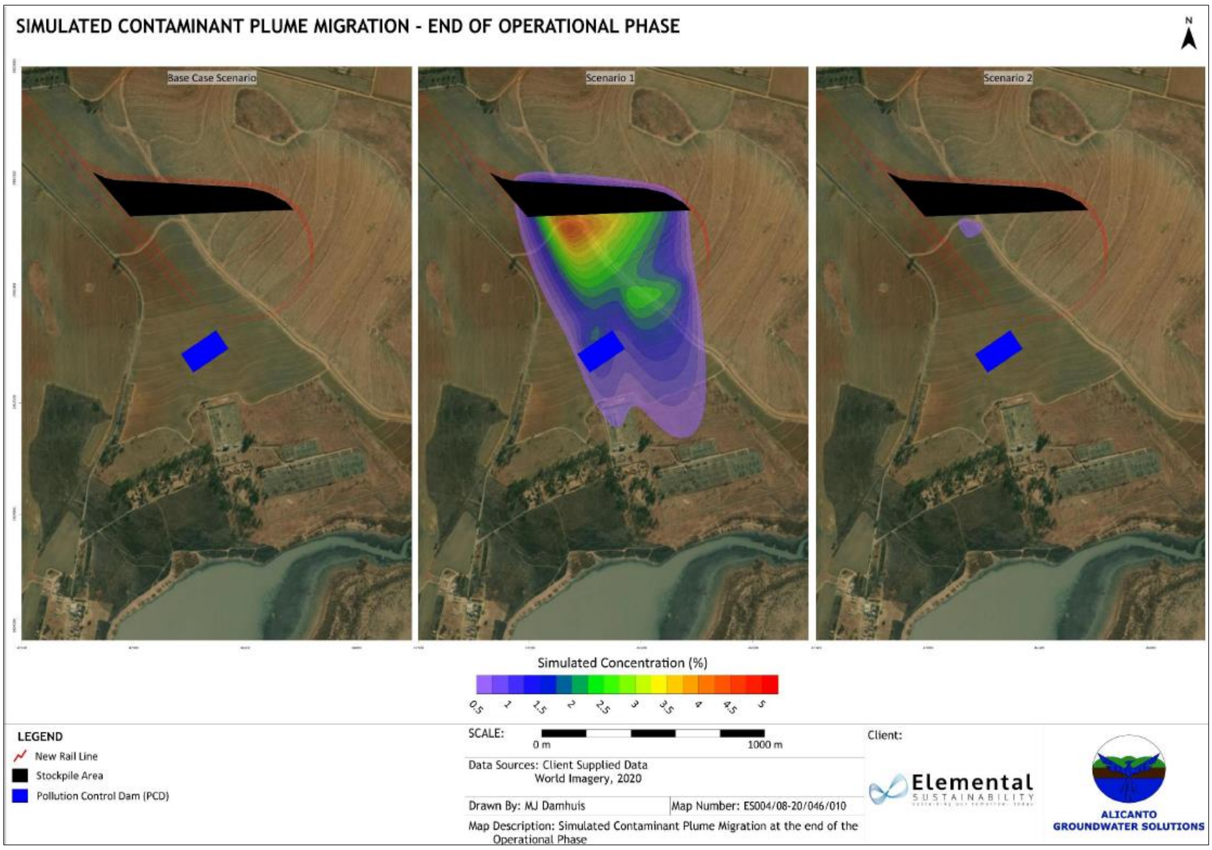


Figure 95: Simulated Contaminant Plume Results (Operational Phase)

Following cessation of Site activities, the groundwater levels at the production borehole(s) will recover to natural, pre-Site activity levels. There is no mitigation required for groundwater level rebound and due to the nature of Site activities no decant will occur at the Site. The impact rating for post-closure groundwater level rebound was low. Groundwater levels at the Site should be monitored continuously during the closure and post-closure phases until the groundwater level has recovered fully.

During the closure phase of the project all infrastructure at the Site will be broken down and removed, with the stockpile area and PCD footprint area levelled and rehabilitated. The simulated contaminant plume for the base case scenario and model scenario 2 showed no contaminant plume, while the simulated contaminant plume for scenario 1 showed the contaminant plume reaching Aston Lake and the non-perennial river south of the Site at maximum concentrations of ~0.6%. A neutral impact rating for the base case scenario and scenario 2 was assigned as no contamination was present. A low impact rating was assigned for scenario 1 due to the low magnitude of contamination and the low probability of the scenario occurring. During closure all of the coal product material should be removed and the top 0.5 m of the stockpile area excavated to be disposed of at a suitable landfill Site, with the removed soil replaced with suitably graded materials. The PCD should be drained and the areas rehabilitated to pre-Site conditions. Groundwater quality monitoring should continue at the Site for at least 2 years prior to closure as per the groundwater management plan. Following the implementation of these measures at the Site the impact rating for the base case scenario, scenario 1 and scenario 2 was neutral due to the low magnitude, scale and duration of the impact (due to source removal).

Climate change impacts were simulated for each of the model scenarios using the predicted future rainfall values as discussed in the Hydrogeological Impact Assessment Report, were the maximum positive change (i.e. increase in rainfall), average change and maximum negative change (i.e. decrease in rainfall) predictions for MAP at the Site were incorporated into the model simulations for each of the SSP's simulated in the CMIP 6 program.

The simulated contaminant plumes for the model Base Case Scenario, Scenario 1 and Scenario 2 showed little change over the model period, thus, impact ratings assigned under baseline conditions will not change due to the predicted effects of climate change over the operational, closure and post-closure phase of the LOP. No contamination was simulated for the Base Case Scenario. The simulated contaminant plumes under climate change conditions for model Scenario 1 and Scenario 2 are shown in
Figure 96 and Figure 97, respectively.

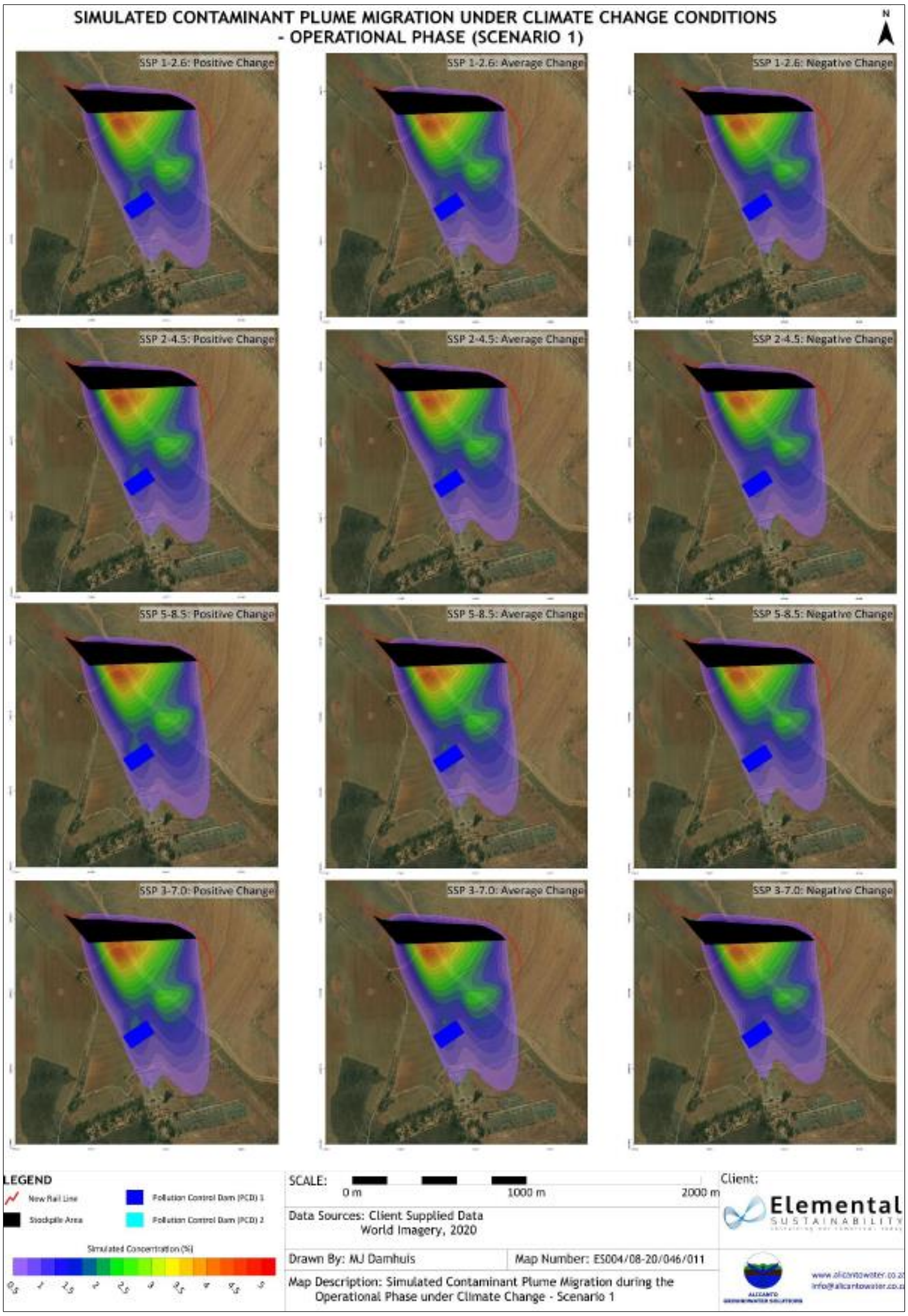


Figure 96: Simulated Contaminant Plume during Operational Phase considering Climate Change Predictions (Scenario 1)

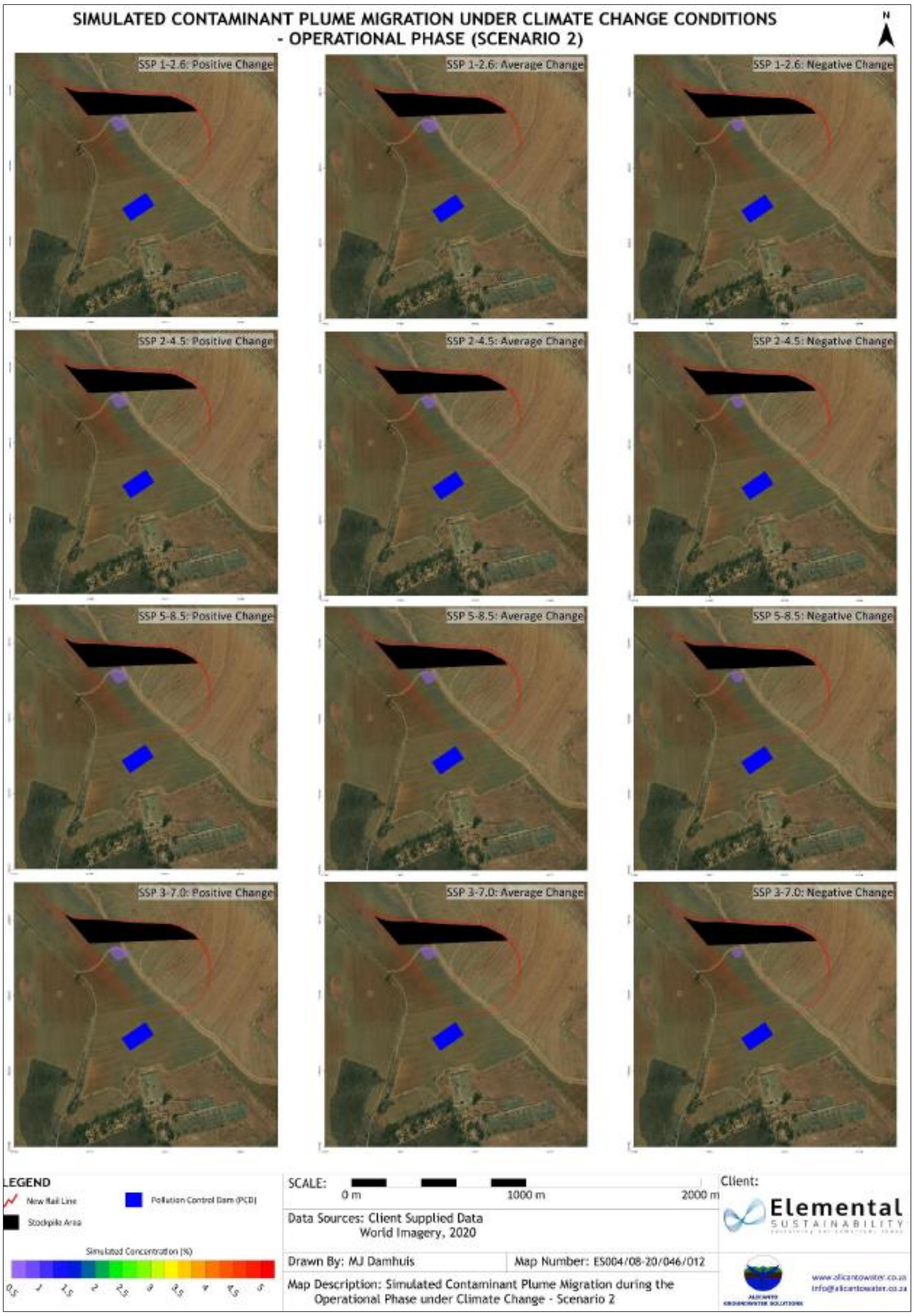


Figure 97: Simulated Contaminant Plume during Operational Phase considering Climate Change Predictions (Scenario 2)

14.5.2 IMPACTS ON SURFACE WATER

The construction phase includes the potential impacts associated with the implementation of the proposed infrastructure, before the active operation of said infrastructure. Activities that may potentially occur during the construction phase are listed below:

- Site clearing, including the removal of topsoil and vegetation.
- Construction of related infrastructure, including:
  - Site office,
  - Balloon siding and railway,
  - Conveyor;
  - Access and maintenance roads,
  - Stormwater infrastructure and dam,
  - Power lines, and
  - Development of on surface stockpiles.

The removal of vegetation for site clearance and the development and establishment of infrastructure will expose soils which may lead to erosion. Eroded material may cause sedimentation in downstream rivers and streams and from there the Blesbokspruit, Suikerbosrand River and Vaal River.

The movement of heavy machinery and vehicles during the construction phase may cause compaction of soils resulting in reduced infiltration of surface water and reduced baseflow. The utilisation, maintenance and refuelling of vehicles and machinery may result in hydrocarbon spills that may contaminate surface water resources.

A further impact as a result of this interaction is the alteration in current surface water drainage patterns. This is also applicable to areas where impermeable surfaces such as a site office will be developed. Increased runoff velocity as a result of impermeable surfaces and compaction may further result in erosion and sedimentation.

The implementation of the storm water management system will provide the separation of clean and dirty water runoff areas, however, this will alter the normal flow of the clean water areas, as well as reduce the expected flow to the receiving surface water resources. Runoff quantity and quality will be affected for the surrounding and downstream streams, rivers and wetlands.

The balloon siding, conveyor, power lines and access/maintenance roads will be constructed within or in close proximity to wetland areas and non-perennial rivers and streams. This may have negative impacts on the surface water quality, quantity, hydrological connectivity and aquatic ecology of these affected and downstream sensitive areas.

Changes in flow, flow patterns, water quality and riparian vegetation will impact the aquatic ecology of the surrounding surface water resources.

The operational phase entails the period during which operations are in progress. The following project activities are likely to cause an impact to surface water during the operation phase:

- Utilisation of the balloon siding to transport coal,
- Loading and potential temporary stockpiling of coal,
- Use and maintenance of access and maintenance roads,
- Transportation of coal through the conveyor, and
- Storm water management at the balloon siding area.
- Dirty water runoff, laden with carbonaceous material from the contaminated surfaces and the infrastructure within the siding operation, has the potential to contaminate and silt up the natural surface

water resources or streams, should it not be contained within the project area. These impacts can therefore potentially deteriorate the water quality in the downstream Blesbokspruit resulting in non-compliances with the RQO for the catchment.

- The transportation of coal over the conveyor to the balloon siding section may lead to coal dust, spills and contaminated runoff from the infrastructure. This combined with the lack of dirty water containment surrounding the conveyor may lead to contamination of the sensitive wetlands and rivers this infrastructure is traversing, as well as the downstream surface water resources. Transportation of the coal through the balloon siding to its destination may have similar effects as with the conveyor section.
- Run-off from coal material may lead to the release of heavy metals and toxins into the downstream resources, acid formation from the coal storage.
- Operation within and around sensitive areas may result in a loss of biodiversity and ecological function. Contamination though waste and spills as well as changes in sediment concentrations, alterations in flow volumes and patterns may impact the aquatic ecology of the surrounding and downstream water resources.

This closure phase commences at the stage when all activities have ceased and entails the following activities:

- Demolition and removal of all infrastructures, including transporting materials off site.
- Rehabilitation, including shaping, spreading of soil and re-vegetation.
- Removing of roads and 100 mm of underlying material.
- Clearing of stockpile areas and subsequent general surface rehabilitation.
- Removal of the storm water management infrastructure.
- Updating and implementing a monitoring programme appropriate for the closure phase.

The movement of heavy machinery and vehicles during the decommissioning phase may cause compaction of soils resulting in reduced infiltration of surface water. A further impact as a result of this interaction is the alteration in current surface water drainage patterns. Increased runoff velocity as a result of compaction may further result in erosion and sedimentation of the Blesbokspruit and downstream rivers.

Potential impact of acid formation to surface water from a rehabilitated area used for coal storage and transport as a result of increased ingress of surface water runoff due to the decommissioned storm water management system. This impacts the catchment RQO and may lead to long term residual impacts.

Potential changes in flow, flow patterns, water quality and riparian vegetation may impact the aquatic ecology of the surrounding surface water resources.

14.5.3 IMPACTS ON AQUATIC ECOLOGY

During Construction and Operation that could potentially create impacts to the aquatic ecological environment:

- Loss of Biodiversity and Ecological function – Possible riparian zone impacts – such as the road crossing and conveyer crossing the river (both alternatives)
- Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning between surface water features
- Alteration of local drainage patterns as a result of stormwater management features
- Water quality impacts - Nutrient increase and Pollution from waste reaching the aquatic environment

- Sedimentation of water resources by means of increasing load upstream, such as increased erosion, clearance of areas which could lead to the loss of topsoil or generally mismanagement during construction and establishment of infrastructure;
- If the river is negatively affected, it may lead to a deterioration of the Present Ecological Status (PES) and impact downstream water systems. This could be a cumulative impact that will not be easily reversed;
- Impacts to Streamflow Regulation - Water Quantity impacts (possibly diverting or impeding water flow) reducing water available to sustain Aquatic diversity.
- Impacts to Biodiversity and Ecological function of Riparian zone or within buffer zones/regulated zones;
- Leading to decrease and changes in water quantity and availability in the Ecological Reserve; and
- Possible water quality impacts - Leading to decrease and changes in water quality and availability in the Ecological Reserve.

14.5.4 IMPACTS ON WETLANDS

Impact of the proposed Welegdacht Balloon on the wetlands were identified as follows:

- The compaction of soil, the removal of vegetation, surface water redirection during construction activities may result in permanent changes to water flows and loss of important habitat may occur.
- The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills. This can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.
- Permanent loss and disturbance of wetland habitat and vegetation due to direct development in the wetland.
- The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a wetland system, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented alien plants can easily colonise and impact on downstream users.
- Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands.

14.5.5 IMPACT ON THE HYDROPEDOLOGY

Due to the nature of the project, the impact on the flow driver impact will be low during operation of the proposed Welgedacht Balloon Siding.

14.5.6 ECOLOGICAL IMPACTS

The site has sections which ranges between slightly to severely degraded, and habitat has mostly been transformed, however, the onset of additional activities and road construction might result in impacts to the natural environment due to vegetation clearance, 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. Development related activities may lead to damage or degradation of highly sensitive habitats (VU2) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction activities additional fragmentation, degradation or compression may occur.

Development related activities may lead to the loss of floral species of conservation concern. Although no national SCC were found to occur on the project footprint, two SCC species are considered to be moderately or highly likely to occur on the project footprint. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 outside the project footprint and is provincially protected in terms of the TNCO. A permit application will be required if this plant is to be cleared at any stage and the conveyer belt area is to be surveyed again before the onset of construction for SCC. Development and related activities could impact on the sensitive habitats (VU2) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.

Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas and these could become established along the service road to be established along the conveyer belt as well. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas. Impacts on the water resources (and potential wetlands) located within and around the area designated for development may occur. This may be due to pollutants entering the water resource, specifically waste products which could possibly spread from the road access points, during construction or during operational phase from sources such as the loading zones/stockpile areas, or other vehicle related zones. Acid formation as a result of coal could occur, but is unlikely due to the activities proposed. However, the applicant will need to monitor for coal related impacts and pollution.

Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU2). Impacts reaching downstream may impact on sensitive landscapes found (RAMSAR, IBA and Blesbokspruit). Impacts on the wetland and water resources located downstream during and after closure and demolition. 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. However, since railway (and specifically siding) developments or other municipal/governmental linked projects (such as Transnet, Eskom and Spoornet) do not usually have a closure phase, no impacts are predicted.

14.5.7 IMPACTS ON HERITAGE

All heritage 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 indicated in Table 59 below are prescribed by SAHRA.

Table 59: Field Ratings

Rating	Field Rating/Grade	Significance	Recomendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3A	High	Mitigation not advised
Local	Grade 3B	High	Part of site should be retained
General Protection A	4A	High/Medium	Mitigate site
General Protection B	4B	Medium	Record site
General Protection C	4C	Low	No recording necessary

The individual site ratings identified for the proposed Welgedacht Balloon Siding project are indicated in Table 60 below.

Table 60: Individual Site Ratings

Site/Survey Point	Type	Rating	Field Rating/Grade	Significance	Recommendations
BA01	In-tact Cemetery	Local	Grade 3 A	High	Mitigation not advised
BA02	Building ruins	4 B	Medium	Record Site	4 B
BA03	Grave	Local	Grade 3 A	High	Mitigation not advised
BA04	Demolished Building	General Protection C	4 C	Low	No recording necessary
BA05	Demolished Building	General Protection C	4 C	Low	No recording necessary
BA06	Demolished Building	General Protection C	4 C	Low	No recording necessary
BA07	Demolished Building	General Protection C	4 C	Low	No recording necessary
BA08	Demolished Building	General Protection C	4 C	Low	No recording necessary
BA09	Demolished Building	General Protection C	4 C	Low	No recording necessary

14.5.8 IMPACT ON PALEONTOLOGY

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The site visit confirmed that there are no fossils along the proposed route exposed on the surface or where the topsoils have been removed. The geological structures suggest that the rocks are the right age and type to preserve *Glossopteris* fossils BUT none was seen. Since there is a small chance that fossils from the Vryheid Formation may be preserved below the land surface in shales, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is low.

14.5.9 IMPACT ON AGRICULTURE

The following impacts were identified by the specialist:

- Loss of high potential agricultural land:
  - 122 ha of arable land will be lost for the medium term. Although difficult to reinstate the present soil conditions, it is possible. The land will be restored after the life of the mine.
- Loss of grazing land:
  - 29 ha of grazing land will be lost for the medium term. The land will be restored after the life of the Palmietkuilen mine has been completed.
- Loss of agricultural production:
  - It is estimated that the farm income from cropping for the land used for the siding is R884 445 per year for the duration of the mine. Mitigation can be achieved through compensation. The land will be restored after the life of the mine.
  - The potential loss from livestock is estimated at R 148 340 per year for the duration of the mine. Mitigation can be achieved through compensation.
- Loss of Agricultural Infrastructure:
  - No farming infrastructure will be lost.
- Loss of jobs from farming:
  - The affected land is part of a larger land holding. The employees can be reemployed or can be taken up by the employment opportunities that the mine will create.

14.5.10 IMPACTS ON SOCIO-ECONOMIC ENVIRONMENT

14.5.10.1 DIRECT SOCIO-ECONOMIC IMPACTS

To calculate direct socio-economic impacts industry standards of labour requirement for different farming activities are applied. It is normally accepted that one labourer is required for every 40 to 60 ha of cultivated land and one per 200 to 400 ha for cattle, depending on the total size of the farm. Following these criteria, the cultivated land will require two labourers and less than one for the livestock. At most the number of jobs that will temporarily be lost, is three. These can easily be taken up on the existing farms or be employed at the siding. These farm related opportunities will temporarily reduce and then again increase to its pre-mining status after decommissioning.

14.5.10.2 INDIRECT SOCIO-ECONOMIC IMPACTS

Activities associated with the proposed Welgedacht Balloon siding could result in indirect social and/or socio-economic impacts for surrounding agricultural land uses, land owners and farm workers. These include:

- Loss of access to livelihoods (incomes);
- Resettlement of farm workers / Relocation of households;
- Devaluation of surrounding farming land;
- Security impacts;

- Impacts on the sense of place.

Loss of access to livelihoods (incomes)

Within the 500m buffer agricultural land uses mainly pertain to crops and grazing. The following pre-mitigation impacts associated with the siding could indirectly impact these land uses:

- Surface water pollution as a result of coal dust affecting crops and livestock;
- Groundwater pollution due to seepage of poor quality leachate from the PCD's and coal stockpile area;
- Coal dust and dust generated by traffic on access/service roads that settle on crops;
- Mismanagement of waste, coal spills and insufficient hazardous substance storage that results in surface and groundwater pollution, which impact livestock and human health;
- Livestock being killed due to speeding and negligent drivers.

These activities and the potential devaluation of agricultural land could result in economic displacement (loss of income, farming assets/fields, business infrastructure, etc.) on affected land portions. The nearest poultry houses are situated more than 1.6 km from the siding infrastructure and noise impacts, which could potentially impact poultry production, are unlikely.

Resettlement of farm workers / Relocation of households

Economic displacement in the agricultural sector (loss in livelihoods) and impacts on the sense of place could result in the physical displacement of farming ventures/households/farm workers. Since indirect impacts cannot easily be measured, affected parties are usually not compensated and have to carry the financial burden to impacts and a change in current land uses might be the trigger and/or cause for any impacts on sense of place. The proposed project area is situated in an area characterised by agricultural land uses, wetlands, road and rail infrastructure, Eskom infrastructure, residential farms, Aston Lake sports and recreation facilities and various residential smallholdings and communities.

The Visual Impact Assessment determined that specifically the infrastructure in the eastern region of the proposed Welgedacht Balloon siding may potentially have a significant effect and noticeable change on the agricultural quality and scenic appearance of the immediate environment. The siding will establish a new precedent for development in a largely agricultural area and a noticeable change in the visual character of the area is expected. Mitigation is however possible and would reduce visual impacts on scenic resources and surrounding land users. It is thus likely that impacts on sense of place will occur and can be mitigated to a certain extent by implementing the recommendations and mitigations as proposed by the Visual Specialist.

Security impacts

Crime and security issues and the rise in stock theft numbers are often associated with the influx of workers, jobseekers and an increase in jobless people. An increase in human activities, roads that become more accessible to the wider public, and materials and equipment that are brought to site could further attract criminals. Indirectly an increase in crime has the potential to result in the economic displacement (loss of income and farming resources) and physical displacement of current farming ventures and workers.

The Delmas SAPS precinct reported an 18% increase in total contact crimes between the period January 2017 to March 2021. These crimes specifically include attempted murder, assault with the intent to inflict grievous bodily harm, common assault and robbery with aggravated circumstances. Carjacking and robberies at non-residential premises increased significantly during the same period (50 and 160% respectively) (www.saps.gov.za).

However, during this same period the Springs SAPS precinct reported a reduction in crime. Total contact crimes reduced with 13% and carjackings and robberies at non-residential premises decreased (-38 and -30% respectively) (www.saps.gov.za).

The following observations are made:

- Even though Springs SAPS reported a reduction in certain crime categories, existing crime levels in the study area remain high;
- Crime often increases during construction and appropriate mitigation measures are required;
- During the operational phase, no additional employment will be created at the siding and an influx of jobseekers as a result of this Project is unlikely;
- The purpose of the conveyor belt and railway line is to reduce road transport and additional movement into the area;
- Existing land uses include agriculture, residential, mining, electricity (substation) and railway infrastructure and the Project activities and associated infrastructure are not in contradiction with these;
- An increase in security issues as a direct result of this Project over the long-term is not likely.

Indirect impacts associated with the proposed Welgedacht Balloon siding is not likely to have a significant impact on surrounding landowners and land users (medium to low significance). Impacts on sense of place is, however, anticipated to be the greatest and is rated with medium significance.

14.5.11 AIR QUALITY AND CLIMATE CHANGE IMPACTS

The emission released during the operation of the proposed Welgedacht Balloon Siding were modelled and the results are provided in Figure 98.

Emissions Released								
	Unmitigated			Mitigated				
Operation	TSP	PM10	Unit	TSP	PM10	Unit	Reduction	Method
Material Handling ROM - Conveyor	2.24E+00	1.12E+00	g/s	1.12E+00	5.60E-01	g/s	50%	Water Sprays
Loading Trains	1.12E+00	4.85E-01	g/s	5.60E-01	2.43E-01	g/s	50%	Water Sprays
Wind Erosion	1.11E-05	5.56E-06	g/s/m²	5.56E-06	2.78E-06	g/s/m²	50%	Water Sprays

Figure 98: Emissions released during operation of the proposed Welgedacht Balloon Siding

Isopleth plots are shown in the images below to visually show the predicted ground level concentrations of PM10 and dust fallout levels.

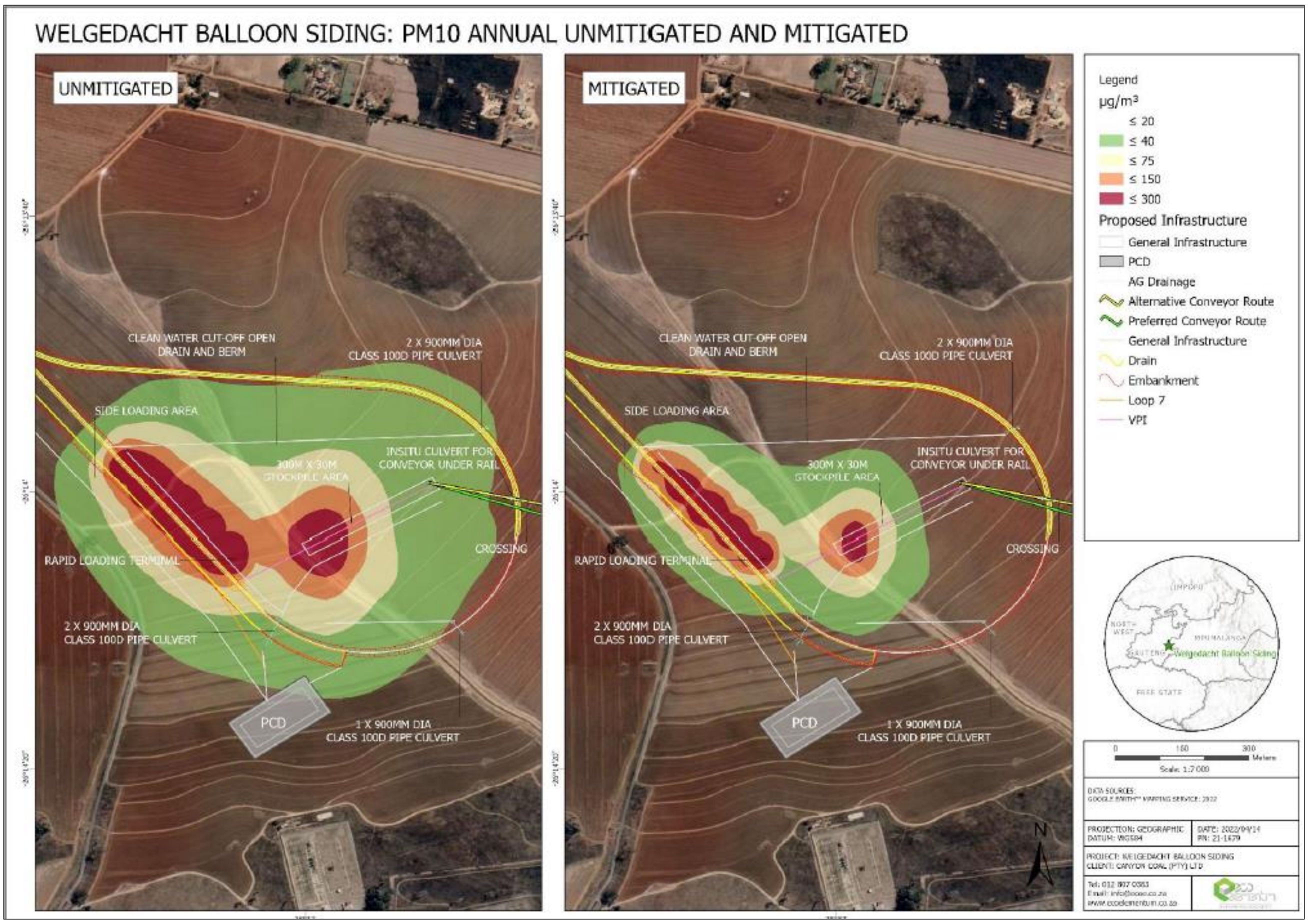


Figure 99: Predicted average annual concentrations for PM10 for the proposed Welgedacht Balloon Siding project

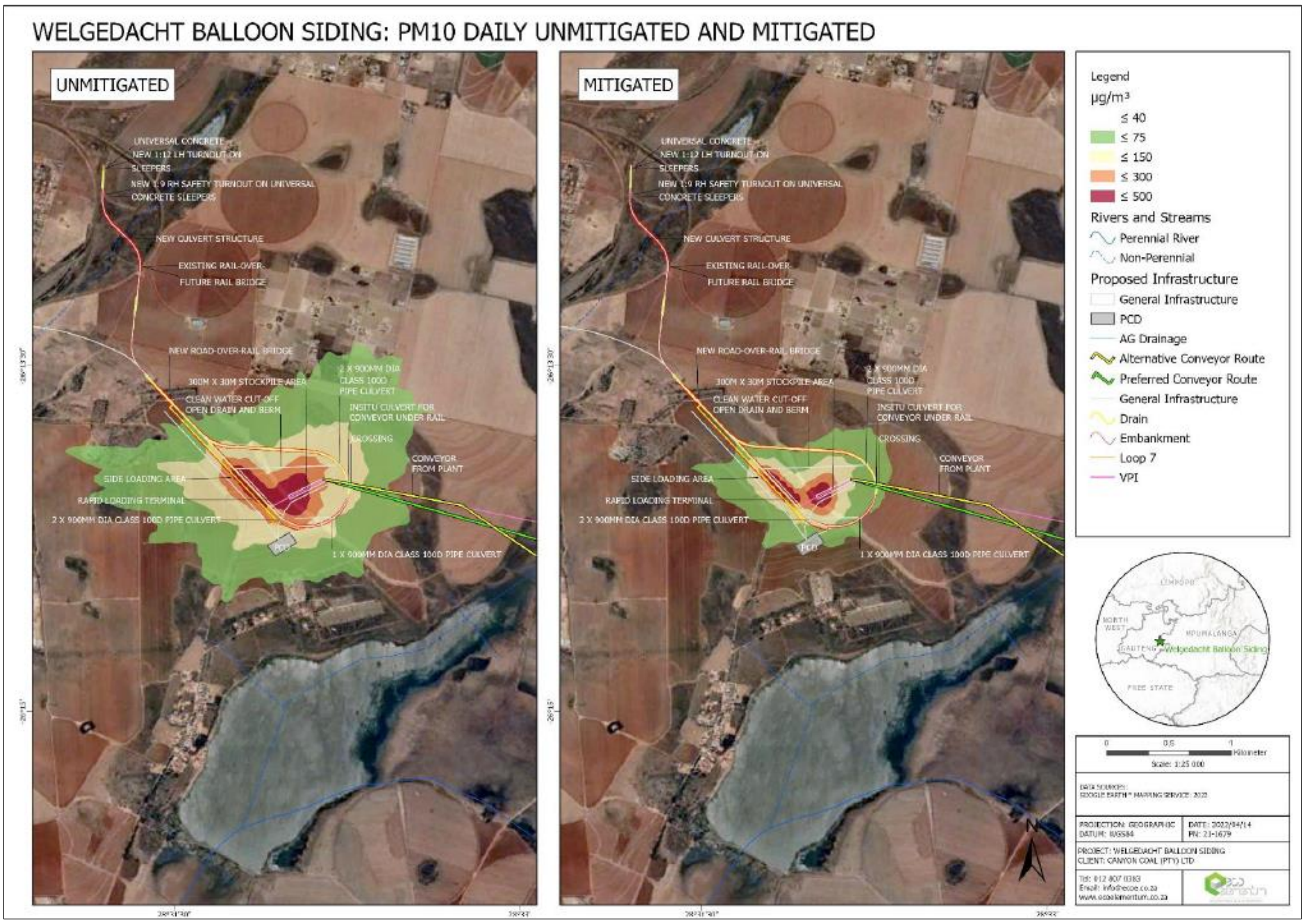


Figure 100: Predicted 2nd Highest daily concentrations for PM10 for the proposed project operations

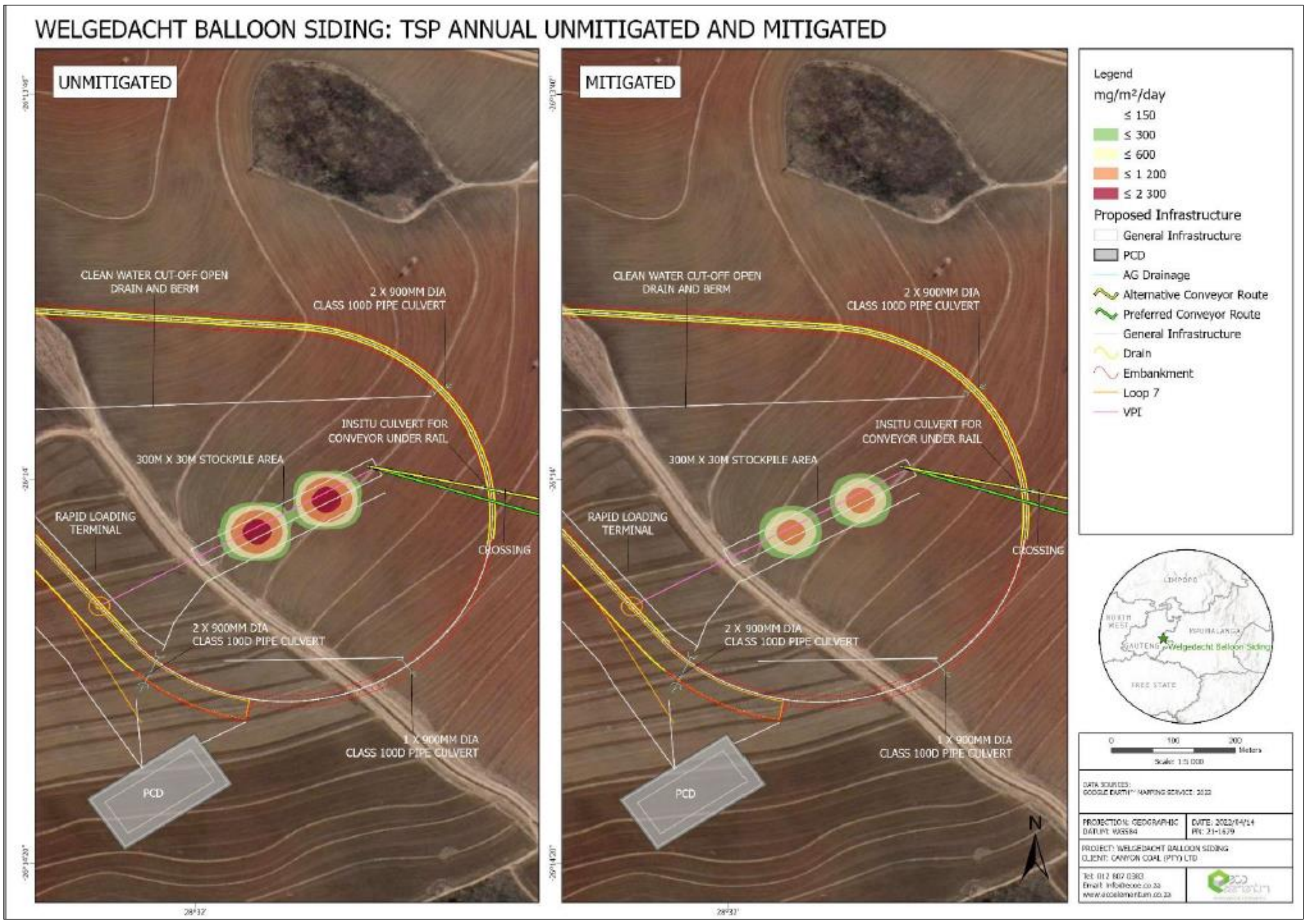


Figure 101: Predicted average annual deposition for TSP for the proposed Welgedacht Balloon Siding project operations

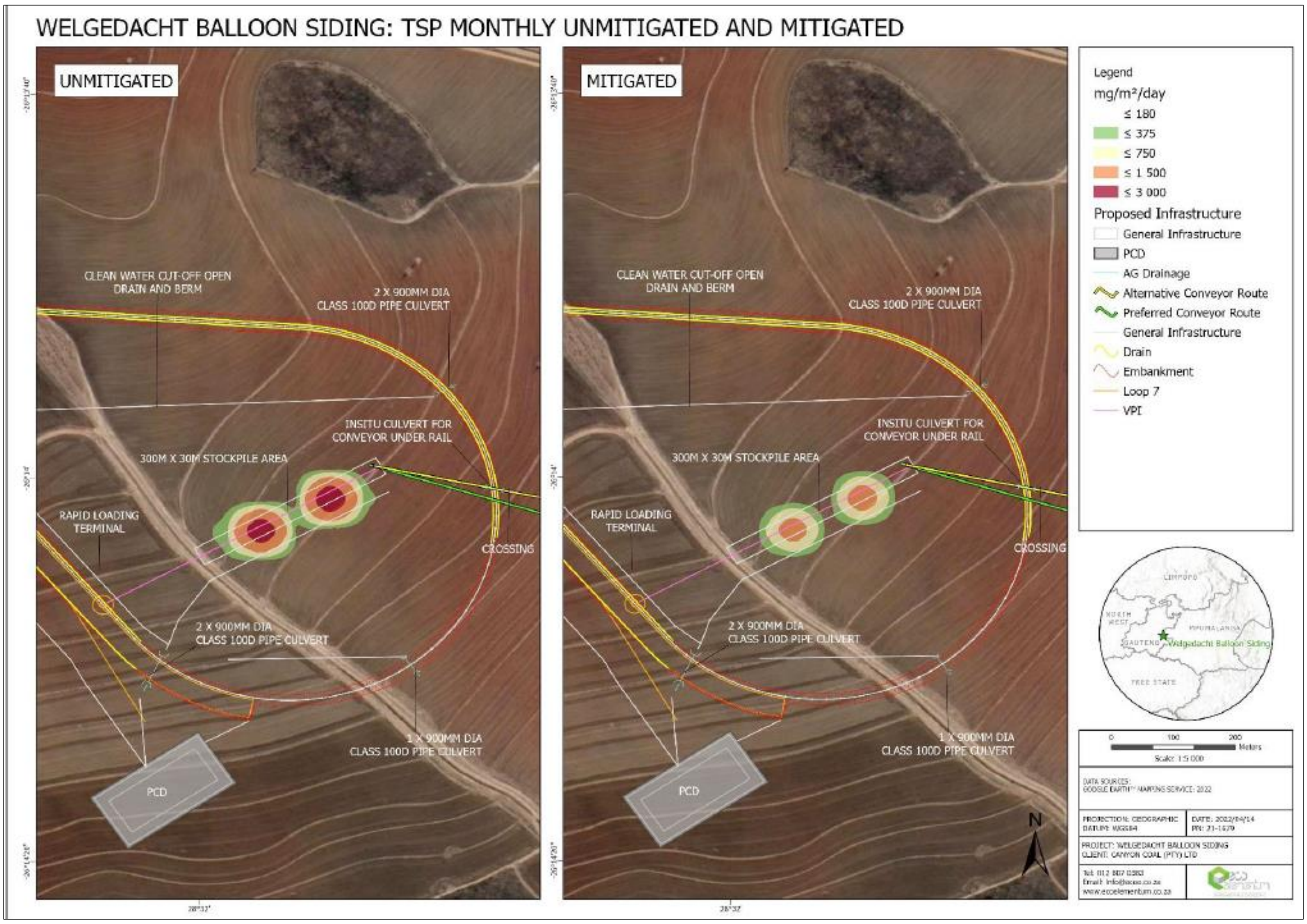


Figure 102: Predicted highest monthly deposition for TSP for the proposed Welgedacht Balloon Siding project operations

During construction site clearing, removal of topsoil and vegetation, construction of Infrastructure, general transportation and hauling of material may result in fugitive dust emissions which will have a moderate significance.

The following activities during the Operational Phases are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers:

- Dust from material handling.
- Receiving coal via Conveyor belt.
- Loading trains.
- Wind erosion from stockpiles.

These sources were uses as inputs in the AERMOD model as unmitigated and mitigated

14.5.11.1 PM10

For the unmitigated and mitigated Daily PM10 concentrations it was predicted not to be higher than the 75 µg/m³ limit for any of the sensitive receptors as can be seen in Table 61. This as well is the 2nd highest levels predicted for a 24 hour period within the period. Due to site specific atmospheric conditions these exceedances may still occur within the limit of 4 per year. The annual average PM10 limit of 40 µg/m³ are predicted not to exceed at any of the identified sensitive receptors for the unmitigated or mitigated scenarios.

Table 61: PM Concentrations at sensitive receptors

Receptor	PM10 2nd Highest Daily (µg/m³)		PM10 Annual Average (µg/m³)	
	Unmitigated	Mitigated	Unmitigated	Mitigated
1	28.83	14.44	3.98	1.99
1	28.83	14.44	3.98	1.99
2	13.81	6.91	1.39	0.70
3	26.87	13.44	3.37	1.69
4	12.35	6.18	0.76	0.38
5	7.04	3.52	0.29	0.14
6	6.18	3.09	0.19	0.10
7	10.83	5.42	0.57	0.28
8	2.57	1.29	0.17	0.08
9	5.37	2.69	0.24	0.12
10	9.02	4.52	0.67	0.34
11	3.83	1.91	0.19	0.10
12	5.47	2.74	0.37	0.18
13	7.03	3.52	0.35	0.18
14	8.73	4.37	0.39	0.19
15	13.15	6.58	1.07	0.54
16	10.94	5.48	0.93	0.47
17	9.06	4.54	0.60	0.30
18	6.68	3.34	0.34	0.17
19	3.42	1.71	0.22	0.11
20	3.33	1.67	0.20	0.10
21	3.57	1.79	0.20	0.10
22	3.71	1.86	0.21	0.11
23	3.62	1.81	0.18	0.09
24	10.39	5.20	0.67	0.33
25	27.97	13.99	2.27	1.13
26	28.69	14.37	4.20	2.10
27	11.02	5.52	0.50	0.25
28	17.58	8.80	2.10	1.05
29	42.10	21.06	4.43	2.22
30	3.07	1.53	0.23	0.11
31	7.29	3.65	0.41	0.20

14.5.11.2 TOTAL DUST FALLOUT

In the unmitigated and mitigated scenarios, no sensitive receptors are predicted to exceed the monthly dust fallout for the highest month residential limit of 600 mg/m²/day. The predicted annual dust fall out for the unmitigated and mitigated scenarios are not predicted to exceed the annual limit of 300 mg/m²/day at any of the sensitive receptors.

Table 62: TSP Deposition rates at the sensitive receptors

Receptor	TSP Highest Monthly (mg/m²/day)		TSP Annual Average (mg/m²/day)	
	Unmitigated	Mitigated	Unmitigated	Mitigated
1	0.14	0.07	0.05	0.03
2	0.16	0.08	0.04	0.02

Receptor	TSP Highest Monthly (mg/m²/day)		TSP Annual Average (mg/m²/day)	
	Unmitigated	Mitigated	Unmitigated	Mitigated
3	0.18	0.09	0.06	0.03
4	0.06	0.03	0.01	0.01
5	0.01	0.01	0.00	0.00
6	0.01	0.00	0.00	0.00
7	0.02	0.01	0.01	0.00
8	0.01	0.00	0.00	0.00
9	0.01	0.00	0.00	0.00
10	0.02	0.01	0.01	0.00
11	0.00	0.00	0.00	0.00
12	0.01	0.00	0.00	0.00
13	0.06	0.03	0.02	0.01
14	0.08	0.04	0.03	0.01
15	0.12	0.06	0.03	0.01
16	0.03	0.02	0.01	0.00
17	0.02	0.01	0.00	0.00
18	0.01	0.00	0.00	0.00
19	0.01	0.00	0.00	0.00
20	0.01	0.00	0.00	0.00
21	0.01	0.00	0.00	0.00
22	0.01	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00
24	0.04	0.02	0.01	0.01
25	0.18	0.09	0.06	0.03
26	0.40	0.20	0.11	0.05
27	0.03	0.02	0.01	0.00
28	0.06	0.03	0.03	0.01
29	0.58	0.29	0.18	0.09
30	0.02	0.01	0.01	0.01
31	0.03	0.02	0.01	0.00

Demolition & Removal of all infrastructure (incl. transportation off site) and Rehabilitation (Spreading of soil, revegetation, profiling / contouring may also have a moderate impact on the receptors. The immediate climate change impacts of the project itself are negligible. However, if the climate change impacts of the *product* of the project are considered, a moderate impact is anticipated. The mining and combustion of coal will unavoidably add to South Africa's (or South Africa's trading partners') global climate impact. Climate change is a global issue and cannot be materially mitigated at the project scale. An aggressive offset program can reduce the net, direct (Scope 1 and 2) carbon emissions of the project to zero.

14.5.12 IMPACT ON NOISE ENVIRONMENT

The results of the noise modelling indicated that during construction The outcome of the modelled scenario and impact assessment highlighted the following key points:

- During the day – Negligible Environmental Consequence for receptors.
- Construction activities will not change the Rating level (legislation limits) during worst case daytime scenario.

- Some mitigation is recommended to ensure compliance with the Gauteng Noise Control Regulations under all circumstances, to cover unforeseen circumstances and to ensure the change of Rating level (as per impact assessment) does not occur.

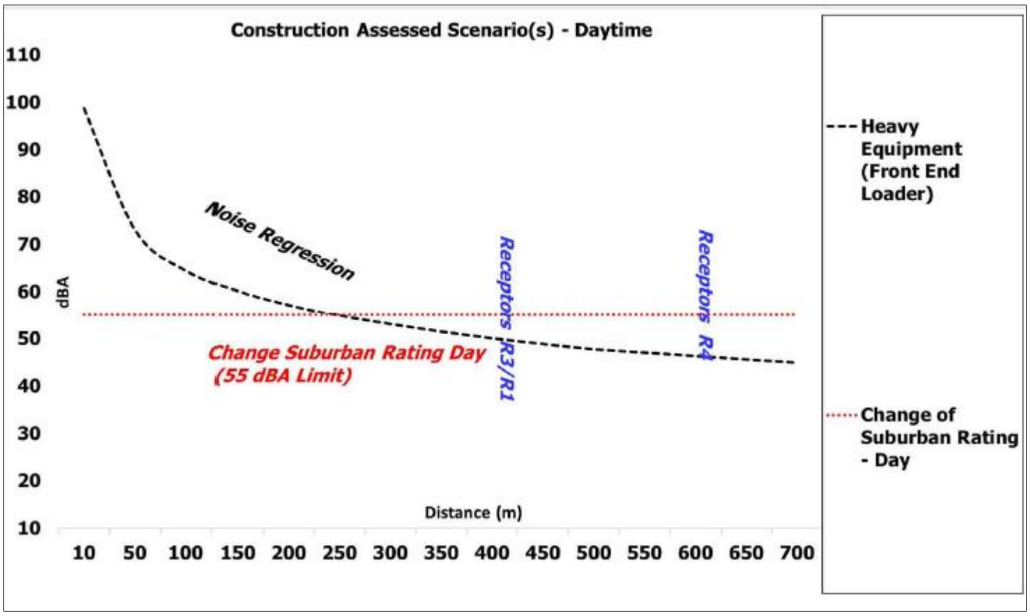


Figure 103: Construction noise levels – Linear representation of certain construction

Calculated Noise and Baseline Rating Levels				
I&AP	**Rating Level (Day dBA)**	**Calculated $L_{Req,T}$ (dBA)**	**Increase above Rating (dBA)**	**Comments**
R1	50	<50	No	Noise levels remain below 7 dBA limits.
R2	50	<50	No	
R3	50	<50	No	
R4	50	<50	No	

Figure 104: Calculated Noise and Baseline Rating Levels –Construction (Day)

During the operational phase modelled scenarious were considered for the conveyor belt. The outcome of the modelled contours is presented in Figure 105. Modelled contours are presented in increments of 5 dBA from the 35 dBA indicator. The outcome of the assessment (Figure 106) indicated the following:

- During the night – Moderate Environmental Consequence for receptors R3 – R4. Mitigation is proposed for receptors R3 – R4.
- To ensure noise levels are kept below 7 dBA at receptors (legislation limits above Rating level) and 60 dBA LAeq,24 hour at the boundary of the footprint, mitigation is proposed. (Only applicable to coal loading).
- No cumulative assessment was conducted, however the worst-case scenario considered sufficient.

- The most important phase is this Operational Phase, with the outcome highlighting the requirements for mitigation.

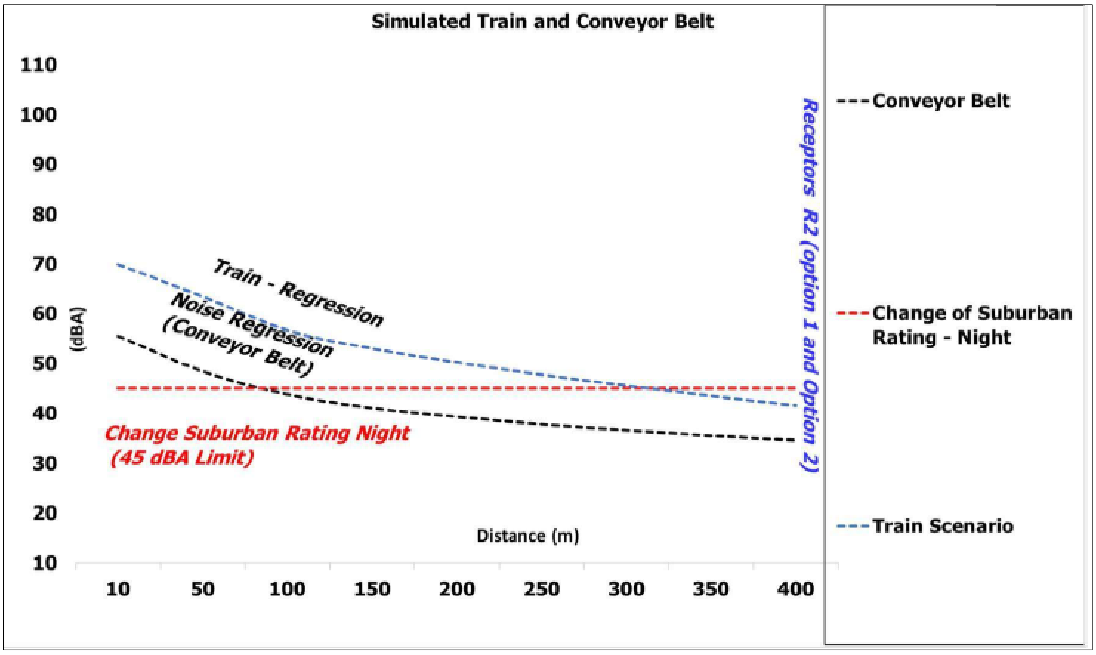


Figure 105: Linear representation – No Impulse Corrections

Calculated Noise and Baseline Rating Levels				
I&AP	**Rating Level (Night dBA)**	**Calculated $L_{Req,T}$ (dBA)**	**Increase above Rating (dBA)**	**Comments**
***R1**	40	<40	0	Receptors R4 and R3 require some mitigation
***R2**	40	<40	0	
***R3**	40	+43	*3	
***R4**	40	+42	*2	

Figure 106: Calculated Noise and Baseline Rating Levels –Operational Phase (Night)

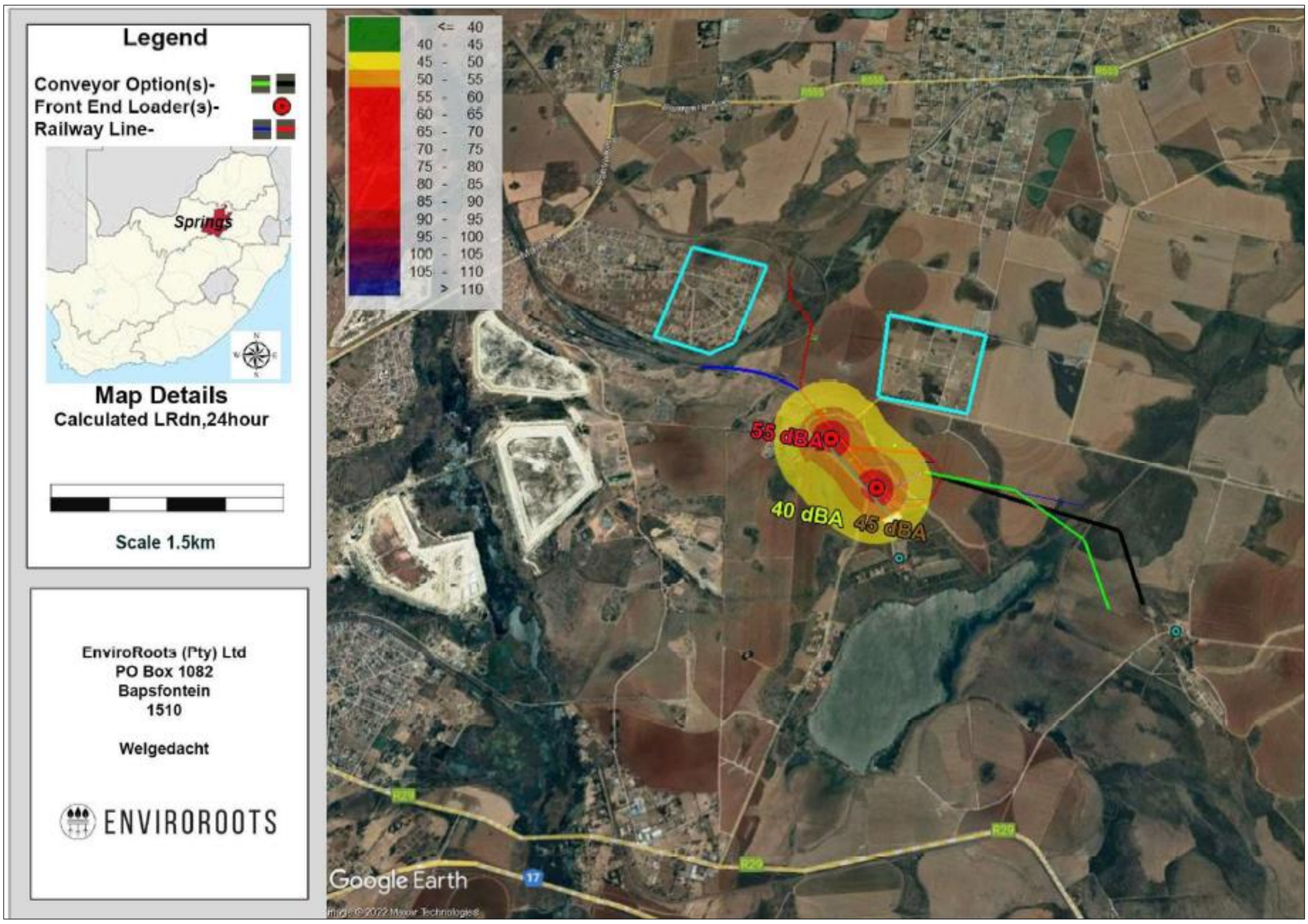


Figure 107: Equivalent Continuous Rating Level - noise contours LReq,T – Operational Phase

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.

14.5.13 IMPACTS ON TRAFFIC

The Welgedacht Balloon Siding will have a reduced traffic impact on the road network with the proposed Palmietkuilen Colliery operational. The implementation of the rail siding will eliminate the transport of coal via interlink trucks. Coal will be transported from the plant via an overland conveyor belt to the rail siding. The anticipated external peak hour trip generation of the mine will therefore be reduced by at least 25 truck trips per hour.

The expected weekday peak hour trip generation of the Welgedacht Balloon Siding is:

- 11 trips in and 11 trips out (construction phase)
- 5 trips in and 5 trips out (operational phase)

The Welgedacht Balloon Siding will therefore result in a reduced number of peak hour trips (15 trips) during the operational phase. The implementation of the Welgedacht Balloon Siding will not result in more than 50 peak hour trips therefore no capacity analysis was done for the trafiic assessment.

14.5.14 VISUAL IMPACTS

The potential visual impact on the viewpoints during the construction phase is expected to have a High impact before mitigation and Moderate after mitigation. The impact on the surrounding residential farming communities and land users will be Moderate due to the short time the proposed construction activities will be undertaken. The construction activities will not be highly visible due to the topography, and the short time of exposure. Also, depending on the time of the planned construction, if it intersects with the growing season of the surrounding maize fields, visibility will be low, and thus the impact on the users will be Moderate after mitigation measures have been implemented.

The proposed key infrastructure for the project will include railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt with access/service road. Aston Lake situated approximately 1 km towards the south of the site is a popular attraction for recreational and sport activities. The surrounding topography is relatively flat and the only remaining natural vegetation consist of wetland areas and small grassland pockets. Most of the surrounding area has been transformed to agricultural practices, apart from the Eskom substation in the east and the existing railway lines of Transnet in the west, the proposed Siding and its related infrastructure will establish a new precedent for development in the area and a noticeable change in the visual character of the area is expected. Without rehabilitation and mitigatory measures, this will have a high visual impact.

The potential visual impact on the viewpoints during the operational phase is expected to have a High impact before mitigation and Moderate to High after mitigation. The proposed Welgedacht Balloon Siding and related structures will possibly be visible from most Viewpoints within a 2 km radius, depending on topography and vegetation occurrence, and more specifically the time of season for maize crops. All Viewpoints consist of residential farming and crops fields, along with housing and related infrastructure. The time of exposure however is long term and thus the impact on the land users remains Moderate to High after mitigation.

The long-term impact on the surrounding residential communities and land users will be increased due to the activities added to the area and an increase in heavy vehicles on the roads in the region. The topography will not allow for many visual barriers as it is relatively flat. Road users of the area, as well as haul trucks leaving the site, will only have a short exposure time, therefore this impact will not be significant.

14.5.15 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 proposed Welgedacht Balloon Siding could potentially result in cumulative effects such as:

- Increase in impacts to the environment already present from the existing land uses;
- Additional risk of soil, air and water pollution due to all the combined activities (mining, industrial and agricultural activities) of the region.
- Increased ecological (aquatic and terrestrial) impacts to the environment already present and degraded nature of the surrounding landscape, and
- 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.

14.10 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 mε 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 an management measures. Some time and resources required.
3	Partly reversible	The impact is only reversible with the implantation of mitigation an 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 an 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).

Refer to Table 63.

Table 63: 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
Natural Environment																			
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
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
Groundwater																			
Groundwater Dewatering	Localized dewatering could occur if groundwater is used for water supply during construction.	Construction	Site	2	Short term	2	High	4	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	
Hydrocarbon Spills	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally	Construction	Site	2	Medium term	3	Very High	5	Partly reversible	3	13	High	4	Medium	52	Medium to High	0,4	Low	20,8
Waste Generation	During construction domestic waste will be generated by contractors and staff	Construction	Site	2	Medium term	3	Low	2	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Groundwater Dewatering	Localized dewatering could occur where groundwater is used for water supply during operations.	Operational	Site	2	Short to medium term	2	Low	2	Nearly completely reversible	2	8	Medium	3	Low	24	Low to medium	0,8	Very Low	19,2
Poor quality seepage from stockpile area	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Base Case Scenario	Footprint	1	Permanent	5	Neutral	0	Completely	1	7	Improbable	1	Very Low	7			Neutral	0
Poor quality seepage from stockpile area	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Scenario 1	Local	3	Low	2	Low	2	Nearly completely reversible	2	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2
Poor quality seepage from stockpile area	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Scenario 2	Site	2	Permanent	5	Minor	1	Nearly completely reversible	2	10	Medium	3	Low	30	Medium	0,6	Very Low	18

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Base Case Scenario	Footprint	1	Permanent	5	Neutral	0	Completely	1	7	Improbable	1	Very Low	7			Neutral	0
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 1	Local	3	Permanent	5	Minor	1	Completely		9	Low	2	Very Low	18	Medium	0,6	Very Low	10,8
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 2	Local	3	Permanent	5	Neutral	0	Nearly completely reversible	2	10	Low	2	Very Low	20	Medium	0,6	Very Low	12
Groundwater Dewatering	Following cessation of Site activities, groundwater levels at abstraction boreholes will recover to their original levels	Closure: All scenarios	Local	3	Short to medium term	2	High	4	Nearly completely reversible	2	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Poor quality seepage from stockpile area	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter the groundwater system	Operational: Base Case Scenario	Footprint	1	Permanent	5	Neutral	0	Completely	1	7	Neutral	0	Neutral	0			Neutral	0
Poor quality seepage from stockpile area	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter the groundwater system	Operational: Scenario 1	Footprint	1	Permanent	5	Neutral	0	Completely	1	7	Neutral	0	Neutral	0			Neutral	0

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Poor quality seepage from stockpile area	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter the groundwater system	Operational: Scenario 2	Site	2	Permanent	5	Low	2	Nearly completely reversible	2	11	Low	2	Low	22	Medium	0,6	Very Low	13,2
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Base Case Scenario	Footprint	1	Permanent	5	Neutral	0	Completely	1	7	Neutral	0	Neutral	0			Neutral	0
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 1	Neutral	0	Neutral	0	Neutral	0	Neutral	0	0	Improbable	1	Neutral	0			Neutral	0
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 2	Footprint	1	Permanent	5	Minor	1	Nearly completely reversible	2	9	Low	2	Very Low	18	Medium	0,6	Very Low	10,8
Hydropedological																			
Proposed siding infrastructure	Flow drivers to wetland may be impacted	Operational	Site	2	Medium term	3	Medium	3	Nearly completely reversible	2	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Surface Water																			
Site clearing, including the removal of topsoil and vegetation, the Construction and operation of siding related infrastructure	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Construction, Operation and Closure	Local	3	Long term	4	Very High	5	Partly reversible	3	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	
Runoff from the dirty water areas (Balloon siding, PCD and temporary stockpiles) and hydrocarbon and coal spillage and runoff from coal stockpiles, loading coal and transportation (conveyor) of coal	Surface water quality - Deterioration of surface water quality as a result of toxin and heavy metal contamination.	Operation and Closure	Local	3	Long term	4	High	4	Partly reversible	3	14	Medium	3	Medium	42	Medium	0,6	Low	25,2
Alteration of drainage patterns due to infrastructure	Surface water quantity - Reduction of Catchment Yield as dirty water runoff within the mine will be contained in the PCD.	Operational	Local	3	Medium term	3	Medium	3	Completely	1	10	High	4	Low	40	Medium	0,6	Low	24
Establishment of stormwater management infrastructure	Surface water quantity - alteration of flow due to the diversion of clean water areas	Operational	Local	3	Medium term	3	Medium	3	Completely	1	10	High	4	Low	40	Medium	0,6	Low	24
The closing of operations, site clean-up and rehabilitation of the area	Surface water quantity - Reinstatement of surface drainage patterns (Positive Impact)	Closure	Local	3	Medium term	3	Medium	3	Completely	1	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Aquatic Ecology																			
Site preparation and activities in close proximity or within regulated buffer zones of water resources	Loss of Biodiversity and Ecological function – Possible riparian zone impacts – such as the road crossing and conveyer crossing the river (both alternatives)	Construction and Operation	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
All activities in close proximity of the Dwars-in-die-wegvlei	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning between surface water features	Construction and Operation	Local	3	Medium term	3	Medium	3	Completely	1	10	Medium	3	Low	30	Medium	0,6	Very Low	18
All activities in close proximity of the Dwars-in-die-wegvlei	Alteration of local drainage patterns as a result of stormwater management features	Construction and Operation	Local	3	Medium term	3	Medium	3	Completely	1	10	Medium	3	Low	30	Medium to high	0,4	Very Low	12
Deterioration of water quality in the spruit and Blesbokspruit 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	Water quality impacts - Nutrient increase and Pollution from waste reaching the aquatic environment	Construction and Operation	Regional	4	Long term	4	Medium	3	Partly reversible	3	14	Medium	3	Medium	42	Medium	0,6	Low	25,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Inadequate waste and soil management – Direct or Indirect nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Sedimentation of water resources by means of increasing load upstream, such as increased erosion, clearance of areas which could lead to the loss of topsoil or generally mismanagement during construction and establishment of infrastructure	Construction and Operation	Local	3	Short term	2	Low	1	Nearly completely reversible	2	8	Medium	3	Low	24	Medium	0,6	Very Low	14,4
Waste entering the water environment leading to possible changes in PES of the downstream system – impacts to the RAMSAR and Blesbokspruit Aquatic Ecosystems	If river is negatively affected, it may lead to a deterioration of the Present Ecological Status (PES) and impact downstream water systems.	Construction and Operation	Regional	4	Long term	4	Medium	3	Partly reversible	3	14	High	4	Medium	56	Medium to low	0,8	Medium	44,8
Stormwater management features, berms, culverts, low water bridges, diverting and impeding structures within 500m of river systems	Impacts to Streamflow Regulation - Water Quantity impacts (possibly diverting or impeding water flow) reducing water available to sustain Aquatic diversity	Construction and Operation	Regional	4	Long term	4	Medium	3	Partly reversible	3	14	High	4	Medium	56	Medium	0,6	Low	33,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Decommissioning and material movement in proximity of water resources and rehabilitation of the beds or banks	Impacts to Biodiversity and Ecological function of Riparian zone or within buffer zones/regulated zones	Decommissioning and Closure	Local	3	Short term	2	Low	2	Partly reversible	3	10	Medium	3	Low	30	Medium to high	0,4	Very Low	12
Alteration of drainage patterns after or during removal of the infrastructure and rehabilitation of footprint	Leading to decrease and changes in water quantity and availability in the Ecological Reserve	Decommissioning and Closure	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	Low	2	Low	24	High	0,2	Very Low	4,8
Insufficient waste management practices during decommissioning	Possible water quality impacts - Leading to decrease and changes in water quality and availability in the Ecological Reserve	Decommissioning and Closure	Local	3	Medium term	3	Medium	3	Completely	1	10	Low	2	Low	20	High	0,2	Very Low	4
Wetlands																			
Compaction of soil, the removal of vegetation and surface water redirection during construction activities.	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	Construction and Closure	Local	3	Permanent	5	High	4	Nearly irreversible	4	16	High	4	High	64	Medium to high	0,4	Low	25,6
Compaction of soil, the removal of vegetation and surface water redirection during construction activities	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	Operational	Local	3	Long term	4	Medium	3	Partly reversible	3	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	
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	Construction and Closure	Local	3	Long term	4	High	4	Partly reversible	3	14	Definite	5	High	70	Medium to high	0,4	Low	28
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	Operational	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	Construction and Closure	Local	3	Long term	4	High	4	Partly reversible	3	14	Definite	5	High	70	Medium to high	0,4	Low	28
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	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	
The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles.	Introduction and spread of alien vegetation which can impact on hydrology, by reducing the quantity of water entering a wetland system, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment.	Construction, Operation and Closure	Local	3	Long term	4	High	4	Partly reversible	3	14	High	4	Medium	56	Medium	0,6	Low	33,6
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	Construction and Closure	Local	3	Permanent	5	High	4	Partly reversible	3	15	High	4	High	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, causing sedimentation. Disturbance of soil surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).																			
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil surface.	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	Operational	Local	3	Medium term	3	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	
Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).																			
Ecological																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	The site has sections which ranges between slightly to severely degraded, and habitat has mostly been transformed, however, the onset of additional activities and road construction might result in impacts to the natural environment due to vegetation clearance, 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. Development related activities may lead to damage or degradation of highly sensitive habitats (VU2) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction activities additional fragmentation, degradation or compression may occur.	Construction and Operation	Regional	4	Permanent	5	Medium	3	Partly reversible	3	15	High	4	Medium	60	Medium	0,6	Low	36

Development and operation of infrastructure	Development related activities may lead to the loss of floral species of conservation concern. Although no national SCC were found to occur on the project footprint, two SCC species are considered to be moderately or highly likely to occur on the project footprint. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 outside the project footprint and is provincially protected in terms of the TNCO. A permit application will be required if this plant is to be cleared at any stage and the conveyer belt area is to be surveyed again before the onset of construction for SCC. Development and related activities could impact on the sensitive habitats (VU2) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	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	
Development and operation of infrastructure	further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas and these could become established along the service road to be established along the conveyer belt as well. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Construction and Operation	Site	2	Permanent	5	Medium	3	Partly reversible	3	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	
Development and operation of infrastructure	Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU2). Impacts reaching downstream may impact on sensitive landscapes found (RAMSAR, IBA and Blesbokspruit).	Construction and Operation	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Definite	5	High	65	Medium	0,6	Low	39
Agriculture, Land Use and Land Capability																			
Development and operation of infrastructure	Direct occupation / loss of land	Construction and operation	Footprint	1	Medium term	3	Low	1	Partly reversible	3	8	High	4	Low	32	Medium	0,6	Very Low	19,2
Development and operation of infrastructure	Loss of grazing land	Construction and operation	Footprint	1	Medium term	3	Low	1	Partly reversible	3	8	High	4	Low	32	Medium	0,6	Very Low	19,2
Development and operation of infrastructure	Loss of crop production	Construction and operation	Footprint	1	Medium term	3	Low	1	Completely	1	6	High	4	Low	24	Medium	0,6	Very Low	14,4
Development and operation of infrastructure	Loss of animal production	Construction and operation	Footprint	1	Medium term	3	Low	1	Partly reversible	3	8	High	4	Low	32	Medium	0,6	Very Low	19,2
Development and operation of infrastructure	Loss of agricultural infrastructure	Construction and operation	Footprint	1	Short term	1	Low	1	Completely	1	4	Improbable	1	Very Low	4	Medium	0,6	Very Low	2,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	Direct loss of jobs from farming	Construction and operation	Footprint	1	Medium term	3	Low	1	Nearly completely reversible	2	7	Low	2	Very Low	14	Medium	0,6	Very Low	8,4
Visual																			
Construction of siding infrastructure	Impact on Sensitive Receptors/Viewpoints	Construction	Regional	3	Medium term	2	High	4	Nearly irreversible	4	13	Definite	5	High	65	Low to medium	0,8	Medium	52
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Impact on the surrounding residential communities and land users will be increased due to the activities added to the area and an increase in heavy vehicles on the roads	Operation	Regional	3	Long term	4	High	4	Nearly irreversible	4	15	Definite	5	High	75	Low to medium	0,8	Medium	60
Heritage																			
Development and operation of infrastructure	Historical sites, (BA06, BA07, BA08) have been demolished, fall outside of the demarcated surface infrastructure area boundary and are not associated with material remains.	Construction and Operation	Footprint	1	Long term	4	Minor	1	Completely	1	7	Improbable	1	Very Low	7	Medium	0,6	Very Low	4,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	Demolished historical sites within or near areas demarcated for surface development. Three Historical sites (BA04, BA05, BA09) have been identified falling within or within close proximity of the areas demarcated for surface development. These sites have been demolished and are not associated with surface remains.	Construction and Operation	Footprint	1	Long term	4	Minor	1	Completely	1	7	Improbable	1	Very Low	7	Medium	0,6	Very Low	4,2
Development and operation of infrastructure	Building ruins within or near areas demarcated for surface development. Site BA02 falls within the boundary of the area demarcated for surface development and consists of historical building ruins dating to at least 1936. The building ruins were identified as the married quarters of the old Palmietkuil Mine that operated between 1910 and 1953. It is envisaged that Site BA02 will be impacted by the proposed construction of the railway siding as the layout places the railway line directly in the path of the site.	Construction and Operation	Footprint	1	Long term	4	Minor	1	Completely	1	7	Improbable	1	Very Low	7	Medium	0,6	Very Low	4,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	Graves/Cemeteries located in the vicinity of the study area. Two sites (BA01 & BA02) were identified as graves/cemeteries in the vicinity of the proposed siding. It is likely that cemetery BA01 contains graves older, as well as younger than 60 years and are significant from a heritage perspective	Construction and Operation	Site	2	Long term	4	Minor	1	Completely	1	8	Improbable	1	Very Low	8	Medium	0,6	Very Low	4,8
Paleontological																			
Development and operation of infrastructure	Surface activities may impact upon the fossil heritage if preserved in the development footprint	Construction	Site	2	Medium term	3	Minor	1	Nearly completely reversible	2	8	Low	2	Very Low	16	Medium to high	0,4	Very Low	6,4
Traffic																			
Construction of surface infrastructure related to the railway siding	Construction of the proposed infrastructure may result in an increase of traffic on the site	Construction	Local	3	Short term	1	Medium	2	Nearly completely reversible	2	8	Definite	5	Low	40	Medium to high	0,4	Very Low	16
Operation of the railways siding and conveyor belt	Operating of the railways siding may result in increased traffic on site	Operational	Local	3	Long term	3	Low	1	Nearly completely reversible	2	9	High	4	Low	36	Medium to high	0,4	Very Low	14,4
Noise																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of haul routes and conveyor routes and the implementation of concrete and surface related infrastructure	Construction activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	Construction and Closure	Local	3	Medium term	3	Low	2	Partly reversible	3	11	Low	2	Low	22	Medium	0,6	Very Low	13,2
Operation of the siding and related activities	Operation activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	Operation	Local	3	Long term	4	Medium	3	Partly reversible	3	13	High	4	Medium	52	Medium	0,6	Low	31,2
Air Quality																			
Site clearing, removal of topsoil and vegetation, Construction of Infrastructure, Conveyor Belt, General Transportation and hauling of material	Activities during the construction phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	Construction	Site	1	Short to medium term	2	Medium	3	Partly reversible	3	9	Definite	5	Medium	45	Medium	0,6	Low	27
Operation of conveyor belt and railway siding	Activities during the operation phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	Operation	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Definite	5	High	65	Medium to high	0,4	Low	26

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Closure of siding and related activities	Activities during the closure phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	Closure	Local	3	Short to medium term	2	Medium	3	Partly reversible	3	11	Definite	5	Medium	55	Medium to high	0,4	Low	22
Climate Change																			
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Climate change impacts may occur as a result of the product of the project	Operation	Regional	4	Long term	4	Medium	3	Partly reversible	3	14	Medium	3	Medium	42	Medium	0,6	Low	25,2
Socio-Economic																			
Construction, operation and closure of the railways siding and related activities	Poor management of siding activities that result in economic displacement.	Construction, Operation and Closure	Site	2	Medium term	3	Low	2	Partly reversible	3	10	Low	2	Low	20	Medium	0,6	Very Low	12
Construction, operation and closure of the railways siding and related activities	Resettlement/ relocations may manifest as a result of economic displacement (loss of access to livelihoods) and impacts on the sense of place.	Construction, Operation and Closure	Site	2	Medium term	3	Low	2	Partly reversible	3	10	Low	2	Low	20	Medium	0,6	Very Low	12

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction, operation and closure of the railways siding and related activities	Devaluation as a result of combined impacts that could include:potential impacts on water resources; intrusion impacts; crime; establishment of new informal settlements; trespassing; fragmentation of farmland.	Construction, Operation and Closure	Site	2	Medium term	3	Low	2	Partly reversible	3	10	Low	2	Low	20	Medium	0,6	Very Low	12
Construction, operation and closure of the railways siding and related activities	Change in sense of place as a result of visual and land use impacts	Construction, Operation and Closure	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Construction, operation and closure of the railways siding and related activities	Security impact may be Indirect impact as a result of activities/influx of people to and from siding.	Construction, Operation and Closure	Site	2	Medium term	3	Low	2	Partly reversible	3	10	Low	2	Low	20	Medium	0,6	Very Low	12

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 14.9).**

Table 64: Cumulative Impact Assessment

Impact	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation		Management and Mitigation Measures
Impact on groundwater quantity	Local	3	Long term	4	Low	2	Completely reversible	1	10	Medium	3	Low	30	Medium to high	0,6	Very Low	18	Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements.
The deterioration of groundwater quality due to pollution from stockpile	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8	Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements;
Reduction in land capability after rehabilitation	Footprint	1	Long term	4	Medium	3	Nearly irreversible	4	12	Possible	2	Low	24	Medium	0,6	Very Low	14,4	Optimise the limited topsoil resources available on site; Utilize the stored topsoil for the sole purpose of rehabilitation, no topsoil should be used for landscaping or construction purposes such as roads or embankments; Analysis of topsoil for fatality and apply require amelioration where required; Apply agricultural lime and fertiliser to soil profile

Incremental losses and fragmentation of habitat	Site	2	Short term	2	Low	2	Nearly completely	2	8	Medium	3	Low	24	Medium	0,6	Very Low	14,4	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
Decrease in Air Quality due to addiional pollution	Region	4	Long term	4	Medium	3	Nearly completely	2	13	Medium	3	Low	39	Medium	0,6	Very Low	23,4	Ensure implementation of dust monitoring plan. Continuous dust suppression on site.
Loss and fragmentation of wetland habitat are two of the more serious impacts, as this may result in the loss of broad-scale ecological processes, cumulative habitat loss, connectivity, or potential for the area to meet long-term conservation objectives (such as CBAs, ESAs, IBAs and NPAES areas).	Local	3	Long term	4	Medium	3	Partly reversible	4	14	High	4	Medium	56	Medium	0,6	Low	33,6	Buffer zones should be maintained, in order to minimise sedimentation of the downstream areas. Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities. Alien and invasive vegetation control should take place throughout all phases. Monitor the occurrence of erosion during the rainy season and take immediate corrective action where needed

Deterioration of downstream surface water resources quality.	Region	4	Long term	4	Medium	3	Nearly completely	2	13	Medium	3	Low	39	Medium	0,6	Low	23,4	Develop and maintain a surface water monitoring program in line with the WUL requirements; Ensure stormwater management plan is implemented and stormwater infrastructure is maintained and functioning correctly. Implement soil erosion management plan
Contamination of the surrounding environment, especially in this case with coal or effluent related waste products stemming from loading/stockpile areas and vehicle access and this impact is not easily reversed and remediated if it reaches the downstream important wetlands (RAMSAR/Blesbokspruit) and/or surface water environments.	Region	4	Long term	4	Medium	3	Nearly completely	2	13	High	3	Low	39	Medium	0,6	Low	23,4	Adequate monitoring to detect changed in the surface and groundwater environment must be initiated by the applicant, with special focus on contaminants associated with coal and the possibility of formation of Acid water in the area.

Disturbing noise levels: The project has the potential to cause noise pollution through the operation of the siding.	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8	Implementation of berms and operation of siding during daylight hours
Loss of heritage/cultural and palaeontological resources: The project has the potential to damage heritage/cultural and palaeontological resources.	Site	2	Short term	2	Low	2	Nearly completely	2	8	Low	2	Very Low	16	Medium	0,6	Very Low	9,6	Monitoring of any heritage or palaeontological features on site
The project would be adding a coal siding and railway to the region with no planned closure and this will add to some extent to the existing railway lines in the west of the region and planned project area but will create a new president to the landscape and visual scene of the proposed site in the eastern section of the proposed project area.	Local	2	Short term	2	Low	2	Nearly Irreversible	4	10	Defnite	5	Medium	50	Medium	0,6	Low	30	Plant indigenous trees, occurring in Grasslands, in the areas surrounding the proposed Siding, its offices, workshops and railway lines.

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 65: Summary of the key environmental impacts and Management Objectives and Mitigation Type

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	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
Natural Environment					
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
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
Groundwater					
Groundwater Dewatering	Localized dewatering could occur if groundwater is used for water supply during construction.	Prevent hydrogeological impacts and prevent contamination of water resources	Any borehole abstraction should be sufficiently managed and water levels monitored at the abstraction wells and nearby boreholes.	Very Low	19,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Hydrocarbon Spills	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally	Prevent hydrogeological impacts and prevent contamination of water resources	Staff at workshop areas, yellow metal laydown zones and fuel storage areas should be sufficiently trained in hydrocarbon spill response. Each area where hydrocarbons are stored or likely to spill should be equipped with sufficient spill response kits and personnel, contaminated soil should be disposed of correctly at a suitable location	Low	20,8
Waste Generation	During construction domestic waste will be generated by contractors and staff	Prevent hydrogeological impacts and prevent contamination of water resources	Domestic waste should be disposed of at a dedicated, suitable landfill site and managed appropriately.	Very Low	18
Groundwater Dewatering	Localized dewatering could occur where groundwater is used for water supply during operations.	Prevent hydrogeological impacts and prevent contamination of water resources	Any borehole abstraction should be sufficiently managed and water levels monitored at the abstraction wells and nearby boreholes.	Very Low	19,2
Poor quality seepage from stockpile area – Base Case	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Prevent hydrogeological impacts and prevent contamination of water resources	Coal product should be stored at the Site for as limited a period as possible prior to loading to prevent/reduce the potential for oxidation of the product. Groundwater quality samples should be taken at monitoring boreholes around the stockpile area on a regular basis. Groundwater quality samples should be taken at monitoring boreholes around the stockpile area on a regular basis.	Neutral	0
Poor quality seepage from stockpile area - Scenario 1	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Prevent hydrogeological impacts and prevent contamination of water resources		Very Low	16,2
Poor quality seepage from stockpile area - Scenario 2	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Prevent hydrogeological impacts and prevent contamination of water resources		Very Low	18

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Poor quality seepage from Site PCD - Base Case	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Prevent hydrogeological impacts and prevent contamination of water resources	Groundwater quality samples and water levels should be taken at monitoring boreholes around the PCD areas as per the Groundwater Management Plan. The PCD's should both be lined using HDPE and inspected regularly for leakages.	Neutral	0
Poor quality seepage from Site PCD - Scenario 1	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Prevent hydrogeological impacts and prevent contamination of water resources		Very Low	10,8
Poor quality seepage from Site PCD - Scenario 2	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Prevent hydrogeological impacts and prevent contamination of water resources		Very Low	12
Groundwater Dewatering	Following cessation of Site activities, groundwater levels at abstraction boreholes will recover to their original levels	Prevent hydrogeological impacts and prevent contamination of water resources	No mitigation required. Groundwater levels should be monitored around the Site and any trends noted (increasing/decreasing).	Very Low	19,8
Poor quality seepage from stockpile area – Base case	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	Prevent hydrogeological impacts and prevent contamination of water resources	At closure and rehabilitation coal product material should be removed and the top 0.5 m of the stockpile area excavated to be disposed of at a suitable landfill Site, with the removed soil replaced with suitably graded materials. Groundwater quality samples should be taken at monitoring boreholes around the stockpile area on a regular basis for at least 2 years post-closure.	Neutral	0
Poor quality seepage from stockpile area - Scenario 1	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	Prevent hydrogeological impacts and prevent contamination of water resources		Neutral	0
Poor quality seepage from stockpile area Scenario 2	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	Prevent hydrogeological impacts and prevent contamination of water resources		Very Low	13,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Poor quality seepage from Site PCD – Base Case	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Prevent hydrogeological impacts and prevent contamination of water resources	The PCD should be drained and the area rehabilitated to pre-Site conditions. Groundwater quality samples should be taken at monitoring boreholes around the PCD areas on a regular basis for at least 2 years post-closure.	Neutral	0
Poor quality seepage from Site PCD – Scenario 1	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Prevent hydrogeological impacts and prevent contamination of water resources		Neutral	0
Poor quality seepage from Site PCD – Scenario 2	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Prevent hydrogeological impacts and prevent contamination of water resources		Very Low	10,8
Hydropedological					
Proposed siding infrastructure	Flow drivers to wetland may be impacted	Prevent hydropedological impacts on the wetlands.	Diversion of clean surface water from upgradient of the siding catchment to the seep wetland in the south east. Culverts to be installed where the railway crosses the wetland areas.	Very Low	18
Surface Water					
Site clearing, including the removal of topsoil and vegetation, the Construction and operation of siding related 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	Development and implementation of the storm water management structures to ensure that sediment generated during the construction phase is conveyed to the silt trap/PCD, and clean water is diverted away from dirty water areas. Soils compacted by heavy machinery in areas that are not utilised post construction should be ripped to allow infiltration. Roads should be maintained regularly to ensure that surface water drains freely off the road preventing erosion. Ensure that storm water management structures are in good working condition through regular inspection, especially after large storm events. Limit refuelling and maintenance of machinery and vehicles to specified locations and ensure the appropriate spill prevention and incident management measures are in place. Avoid encroaching on natural areas directly adjacent to proposed activities. Proliferation of alien and invasive species is expected within any disturbed areas. AIP species should be eradicated and controlled to prevent their spread within or	Low	36
Runoff from the dirty water areas (Balloon siding, PCD and temporary stockpiles) and hydrocarbon and coal spillage and runoff from coal stockpiles, loading coal and transportation (conveyor) of coal	Surface water quality - Deterioration of surface water quality as a result of toxin and heavy metal contamination.	Prevent hydrological impacts and prevent contamination of water resources		Low	25,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Alteration of drainage patterns due to infrastructure	Surface water quantity - Reduction of Catchment Yield as dirty water runoff within the mine will be contained in the PCD.	Prevent hydrological impacts and prevent contamination of water resources	beyond the footprint. An AIP Control Plan should be compiled and implemented for the proposed project. Where feasible, rehabilitate disturbed areas as soon as possible after construction and include the areas in and around wetland features. Avoid sensitive areas identified in the sensitivity section. Where sensitive areas are unavoidable, limit the exposure of these areas to construction activities as far as possible. River crossings / wetland (if necessary) should be designed by an engineer to prevent impacts and failing structures. During the river / wetland crossing construction period, all care should be taken to prevent further impacts on the watercourse and riparian areas and the surrounding natural environment by keeping the construction footprint as small as possible. Flow must be maintained throughout the construction phase of the development and all contractors must be made aware of the high importance of instream flow maintenance. Erosion and incision within riparian and wetland areas are to be prevented during the implementation / construction phase of the proposed development. Where areas within the riparian and wetland habitat are at risk of such erosion and incision, immediate measures have to be taken in order to prevent erosion from occurring. This is especially applicable to the area immediately downstream of crossings. If excessive erosion is observed, soil management and erosion protected structures and measures should be implemented. No stockpiles and storage of construction material may be located within the riparian and wetland areas or buffer zones, without the required permits. Any litter or waste material potentially generated on site as part of the construction process and excavation activities must be removed from the riparian and wetland areas and disposed of at a suitable landfill site. If possible, implementation / construction activities should be scheduled for the drier months / low flow season to decrease the risk of erosion during heavy thunderstorms. Ensure that effective separation of clean and dirty water systems is implemented, as designed by an engineer. No contaminated (“dirty”) water should be allowed to enter the natural environment, clean water systems or water resources. Ensure that all the dirty water emanating from the dirty water areas is collected via silt traps before entering the PCD for re-use within the operation, to prevent unnecessary discharge into the environment. The dirty water collection trenches should be cleaned regularly to reduce the build-up of coal material and to ensure they are able to accommodate and convey the 1:50 year peak flows. This material should be disposed to an appropriately	Low	24
Establishment of stormwater management infrastructure	Surface water quantity - alteration of flow due to the diversion of clean water areas	Prevent hydrological impacts and prevent contamination of water resources		Low	24

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			licenced facility. Stockpiling areas need to be licenced and constructed as per the requirements of the Competent Authority. Water quality in the PCDs should be monitored. This ensures that pollution sources are monitored during the operational phase and in the unlikely event of any spillages the downstream impacts can be estimated. The main constituents to check would be the TDS, EC, salts and some chemical parameters such as (pH, SO4 and other metals). Seepage or discharge of waste water from the waste water containment facilities should be prevented to reduce pollution of surface water resources as well as to improve water conservation. Dirty water containment facilities and residue stockpiles should be appropriately lined as per the recommendations of the Geohydrological and/or Waste Classification Study. Cover any method of the coal transportation to minimize potential contamination. Use a covered and efficient conveyor to limit any spills during the conveying process. Corridor movement and hydrological connectivity associated with water resources should not be hampered by the development. No sections of the streams/rivers should be cordoned off. Implementation of the recommended monitoring plan to ensure that impacts to the surface water environment are detected timeously. Implement erosion prevention measures and structures. Avoid contamination of soils and implement appropriate remedial measures if incidents of spillage occur. Alien invasive control should be implemented, specifically for disturbed areas.		
The closing of operations, site clean-up and rehabilitation of the area	Surface water quantity - Reinstatement of surface drainage patterns (Positive Impact)	Prevent hydrological impacts and prevent contamination of water resources	Leaving the storm water management structures in place during the decommissioning and post closure phase until the rehabilitation process is completed. This will ensure that sediment generated during this phase is captured. Keeping the storm water management systems in place will reduce potential impacts of pollutants due to the prolonged conveying and transportation of coal. Storm water management structures should be inspected after large storm events to ensure that there are no blockages or damage. Should blockages or damage occur, immediate action should be undertaken to remove debris or to repair damaged areas. 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. Establish free-draining final landform.	Very Low	18

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Aquatic Ecology					
Site preparation and activities in close proximity or within regulated buffer zones of water resources	Loss of Biodiversity and Ecological function – Possible riparian zone impacts – such as the road crossing and conveyer crossing the river (both alternatives)	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. This will be applicable to the alternatives proposed for the conveyer as it will cross the river section upstream of the dam. 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. Rehabilitate affected areas as soon as possible after construction and include the areas where river-crossings have taken place. The crossings (if necessary, depending on conveyer design and if roads are applicable to cross as well) should be designed by a suitable engineer to prevent impacts and failing structures. 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.	Low	26,4
All activities in close proximity of the Dwars-in-die-wegvlei	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning between surface water features	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Corridor movement associated with water resources should not be hampered by the development. No sections of the river should be cordoned off (only during construction if it will help prevent access and impacts). 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; No fishing, hunting or trapping should be allowed by the employees or other parties on the 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.	Very Low	18
All activities in close proximity of the Dwars-in-die-wegvlei	Alteration of local drainage patterns as a result of stormwater management features	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Adherence to the engineered Storm Water Management Plan as compiled by an accredited engineer is crucial.	Very Low	12
Deterioration of water quality in the spruit and Blesbokspruit River due to contaminated soil	Water quality impacts - Nutrient increase and Pollution from waste reaching the aquatic environment	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.		Low	25,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
and storm water runoff affecting aquatic communities found within water systems and may lead to death and shifts in community structures occurring					
Inadequate waste and soil management – Direct or Indirect nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Sedimentation of water resources by means of increasing load upstream, such as increased erosion, clearance of areas which could lead to the loss of topsoil or generally mismanagement during construction and establishment of infrastructure	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Erosion protection and appropriate energy dissipation structures should be implemented Monitor Water Quality - every month and Aquatic Health bi-annually (wet and dry season)	Very Low	14,4
Waste entering the water environment leading to possible changes in PES of the downstream system – impacts to the RAMSAR and Blesbokspruit Aquatic Ecosystems	If river is negatively affected, it may lead to a deterioration of the Present Ecological Status (PES) and impact downstream water systems. This could be a cumulative impact that will not be easily reversed	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	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. Adequate monitoring to detect changed in the surface and groundwater environment must be initiated by the applicant, with special focus on contaminants associated with coal and the possibility of formation of Acid water in the area.	Medium	44,8
Stormwater management features, berms, culverts, low water bridges, diverting and impeding structures within 500m of river systems	Impacts to Streamflow Regulation - Water Quantity impacts (possibly diverting or impeding water flow) reducing water available to sustain Aquatic diversity	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	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. Protect or license impacts to wetlands, to ensure proper management and prevention of unnecessary impacts. Divert clean water around the site – implement formal SWMP Optimise water use by means of reuse and recycling; Implement divergences or impedances (crossings specifically) as per designs and	Low	33,6

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			formal management plans.		
Decommissioning and material movement in proximity of water resources and rehabilitation of the beds or banks	Impacts to Biodiversity and Ecological function of Riparian zone or within buffer zones/regulated zones	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Rehabilitate affected areas immediately to prevent sedimentation and protect against erosion. Implement divergences or impedances (crossings specifically) as per designs and formal management plans. Continued monitoring to detect changed in the surface and groundwater environment must be initiated by the applicant, with special focus on contaminants associated with coal and the possibility of formation of Acid in the area. 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.	Very Low	12
Alteration of drainage patterns after or during removal of the infrastructure and rehabilitation of footprint	Leading to decrease and changes in water quantity and availability in the Ecological Reserve	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.		Very Low	4,8
Insufficient waste management practices during decommissioning	Possible water quality impacts - Leading to decrease and changes in water quality and availability in the Ecological Reserve	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.		Very Low	4
Wetlands					
Compaction of soil, the removal of vegetation and surface water redirection during construction activities.	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	To protect wetlands and ensure their ecological function continues.	Construction affecting wetlands should be restricted to the dryer winter months. A temporary fence or demarcation must be erected around no-go areas outside the proposed works area prior to any construction taking place as part of the contractor planning phase when compiling work method statements to prevent access to the adjacent portions of the wetlands. Effective stormwater management should be a priority during all phases of the project. This should be monitored as part of the EMPr. Monitor for changes to the PES of the downstream wetland and watercourses. A 115 m buffer area has been placed around the wetlands; all activities should take place outside of the buffer areas, except authorized activities. For the proposed conveyor, the buffer zone will not be implemented. However, it is imperative that the service road and any other vegetation clearing, excavations, infilling and/or deposition activities remain outside of the calculated buffer zones. For the proposed railway line in the north western section, the buffer zone will not be implemented, however due to the degraded state of the wetland in the area and the existing railway crossings, further impact is expected to be low. Demarcate the wetland areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas. Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities. All areas should be re-sloped and top-soiled where necessary and reseeded with indigenous grasses to stabilise the loose material. Monitor the occurrence of erosion during the rainy season and take immediate	Low	25,6
Compaction of soil, the removal of vegetation and surface water redirection during construction activities	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	To protect wetlands and ensure their ecological function continues.		Low	31,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			corrective action where needed. As far as possible the existing road network should be utilised, minimising the need to develop new access routes resulting in an increased impact on the local environment.		
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	To protect wetlands and ensure their ecological function continues.	Implementation of appropriate stormwater management around the proposed Welgedacht Balloon Siding and associated infrastructure to prevent contaminated runoff into the wetlands. A 115 m buffer area has been placed around the wetlands; all activities should take place outside of the buffer areas, except for authorized activities. For the proposed conveyor, the buffer zone will not be implemented. However, it is imperative that the service road and any other vegetation clearing, excavations, infilling and/or deposition activities remain outside of the calculated buffer zones. For the proposed railway line in the north western section, the buffer zone will not be implemented, however due to the degraded state of the wetland in the area and the existing railway crossings, further impact is expected to be low. Maintenance of construction vehicles / equipment should not take place within the wetlands or wetland buffers. All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent hydrocarbon pollution. All spills should be cleaned up immediately and disposed of. Littering must be prevented by effective site management and the provision of bins. Effective stormwater management should be implemented to avoid runoff to the wetlands. Maintenance of buffer zones to trap sediments with associated toxins. Control of waste discharges and do not allow dirty water from operational activities to enter the wetlands. Treatment of pollution identified should be prioritised accordingly.	Low	28
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	To protect wetlands and ensure their ecological function continues.		Low	28,8
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	To protect wetlands and ensure their ecological function continues.	A 115 m buffer area has been placed around the wetlands; all activities should take place outside of the buffer areas. During the construction of the proposed conveyer that will cross the wetland, all excavations should be limited and no unnecessary vehicle movement to take place within the buffer zones. For the proposed railway line in the north western section, the buffer zone will not be implemented, however due to the degraded state of the wetland in the area and the existing railway crossings, further impact is expected to be low. No service roads or other unauthorized activities to place within the buffer zones.	Low	28
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	To protect wetlands and ensure their ecological function continues.		Very Low	19,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Demarcate the wetland areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas. Alien and invasive vegetation control should take place throughout all phases to prevent loss of floral habitat. Monitor the occurrence of erosion during the rainy season and take immediate corrective action where needed.		
The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles.	Introduction and spread of alien vegetation which can impact on hydrology, by reducing the quantity of water entering a wetland system, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment.	To protect wetlands and ensure their ecological function continues.	Relocate conservation-worthy species under the supervision of a vegetation or horticultural specialist. Proliferation of alien and invasive species is expected within any disturbed areas particularly as there are extensive alien and invasive species present within the study site. These species should be eradicated and controlled to prevent further spread beyond. An alien invasive vegetation management plan should be developed and implemented. Alien and invasive vegetation control should take place throughout all phases to prevent loss of floral habitat. Footprint areas should be kept as small as possible when removing alien plant species. No vehicles should be allowed to drive through designated sensitive areas during the eradication of alien and weed species. Rehabilitate or revegetate disturbed areas.	Low	33,6
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	To protect wetlands and ensure their ecological function continues.	It is possible that water will be contaminated within earthworks and should thus be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water thus reducing the risk of erosion. Effective sediment traps should be installed. Construction in and around wetlands must be restricted to the dryer winter months where possible. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005). Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover. Buffer zones should be maintained, in order to minimise sedimentation of the downstream areas. Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities.	Low	36

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).					
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	To protect wetlands and ensure their ecological function continues.		Low	28,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Ecological					
Development and operation of infrastructure	The site has sections which ranges between slightly to severely degraded, and habitat has mostly been transformed, however, the onset of additional activities and road construction might result in impacts to the natural environment due to vegetation clearance, 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. Development related activities may lead to damage or degradation of highly sensitive habitats (VU2) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction activities additional fragmentation, degradation or compression may occur.	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 coal, petroleum and other hydrocarbons associated with the trucks and railway-based activities could be spilled in the environment if not managed well. Sediments from road construction next to the conveyer could also enter the water environment and this should be prevented.	Low	36

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Development and operation of infrastructure	Development related activities may lead to the loss of floral species of conservation concern. Although no national SCC were found to occur on the project footprint, two SCC species are considered to be moderately or highly likely to occur on the project footprint. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 outside the project footprint and is provincially protected in terms of the TNCO. A permit application will be required if this plant is to be cleared at any stage and the conveyer belt area is to be surveyed again before the onset of construction for SCC. Development and related activities could impact on the sensitive habitats (VU2) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	Early detection of impacts and remediation thereof.	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. A permit application will be required if this plant is to be cleared at any stage and the conveyer belt area is to be surveyed again before the onset of construction for SCC. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 outside the project footprint and is provincially protected in terms of the TNCO. A permit application will be required if this plant is to be cleared at any stage.	Low	28,8

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Development and operation of infrastructure	Further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas and these could become established along the service road to be established along the conveyer belt as well. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Early detection of impacts and remediation thereof.	Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2016 (Department of Environmental Affairs, 2016). Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora. 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	Low	31,2
Development and operation of infrastructure	Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU2). Impacts reaching downstream may impact on sensitive landscapes found (RAMSAR, IBA and Blesbokspruit).	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 the 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 and maintenance of this system. Stormwater management will prevent impacts reaching the natural environment.	Low	39
Agriculture, Land Use and Land Capability					
Development and operation of infrastructure	Direct occupation / loss of land	Limit impacts on agricultural activities.	Although difficult to reinstate the present soil conditions, it is possible. The land will be restored after the life of the mine and siding.	Very Low	19,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Development and operation of infrastructure	Loss of grazing land	Limit impacts on agricultural activities.	29 ha of grazing land will be lost for the long term. The land will be restored after the life of the mine and siding.	Very Low	19,2
Development and operation of infrastructure	Loss of crop production	Limit impacts on agricultural activities.	It is estimated that the farm income from the land used for the siding is R884 445 per year for the duration of the project. Mitigation can be achieved through compensation or purchasing the property The land will be restored after the life of the mine and siding.	Very Low	14,4
Development and operation of infrastructure	Loss of animal production	Limit impacts on agricultural activities.	It is estimated that the farm income from the land used for the siding is R148 340 per year for the duration of the mine. Mitigation can be achieved through compensation. The land will be restored after the life of the mine and siding.	Very Low	19,2
Development and operation of infrastructure	Loss of agricultural infrastructure	Limit impacts on agricultural activities.	No farming infrastructure will be lost.	Very Low	2,4
Development and operation of infrastructure	Direct loss of jobs from farming	Limit impacts on agricultural activities.	The affected land is part of a larger land holding. The employees can be reemployed or can be taken up by the employment opportunities that the mine and siding, , will create.	Very Low	8,4
Visual					
Construction of siding infrastructure	Impact on Sensitive Receptors/Viewpoints	Early detection of impacts and remediation thereof.	Reduce the construction period through careful planning and productive implementation of resources. Clearly define areas to be cleared. Do not clear past designated areas. Retain natural vegetation outside of clearance zone. Plan the placement of lay-down areas and any potential temporary construction camps to minimise vegetation clearing. Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. Ensure that all infrastructure and the site and general surrounds are maintained in a neat and appealing way. Use material with colours that will visually blend with the natural environment. Screen the whole construction site via fence cover. Reduce and control construction dust using approved dust suppression techniques. Implement daily dust suppression and pave roads where possible to avoid transport related dust pollution. Restrict construction activities to daylight hours to negate, or reduce, the visual impacts associated with lighting. Direct light downwards to avoid illumination to the sky. Use motion light sensor to avoid lighting unused places.	Medium	52
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches,	Impact on the surrounding residential communities and land users will be increased due to the activities added to the area and an increase in heavy vehicles on the roads	Early detection of impacts and remediation thereof.	Planning infrastructure in accordance with the topography and agricultural fields in the surrounding area to limit visual impact on surrounding residential communities. Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way. Use material with colours that will visually blend with the natural environment. Maintain stockpiles to the recommended minimum height. Rehabilitation of disturbed areas and re-establishment of vegetation.	Medium	60

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
security offices, fuel storage and a conveyor belt			Restrict activities to daylight hours to negate or reduce the visual impacts associated with lighting. Keep lighting to minimum. Direct light downwards to avoid illumination to the sky. Use motion light sensor to avoid lighting unused places.		
Heritage					
Development and operation of infrastructure	Historical sites, (BA06, BA07, BA08) have been demolished, fall outside of the demarcated surface infrastructure area boundary and are not associated with material remains.	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).	Care should be exercised during the construction phase and should cultural material be discovered; a qualified archaeologist must be contacted.	Very Low	4,2
Development and operation of infrastructure	Demolished historical sites within or near areas demarcated for surface development. Three Historical sites (BA04, BA05, BA09) have been identified falling within or within close proximity of the areas demarcated for surface development. These sites have been demolished and are not associated with surface remains.	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).	Archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the construction phase, 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).	Very Low	4,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Development and operation of infrastructure	Building ruins within or near areas demarcated for surface development. Site BA02 falls within the boundary of the area demarcated for surface development and consists of historical building ruins dating to at least 1936. The building ruins were identified as the married quarters of the old Palmietkuil Mine that operated between 1910 and 1953. It is envisaged that Site BA02 will be impacted by the proposed construction of the railway siding as the layout places the railway line directly in the path of the site.	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).	Archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the construction phase, 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)).	Very Low	4,2
Development and operation of infrastructure	Graves/Cemeteries located in the vicinity of the study area. Two sites (BA01 & BA02) were identified as graves/cemeteries in the vicinity of the proposed siding. It is likely that cemetery BA01 contains graves older, as well as younger than 60 years and are significant from a heritage perspective BA03 is single grave.	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).	Should the dirt road be used as an access road, a fenced-off conservation buffer of 50 m must be established around the cemetery and a qualified archaeologist mustcompile a Conservation Management Plan to ensure the safeguarding of the graves. Access to the cemetery must not be refused. The vegetation surrounding the grave must be cut to verify the presence of additional graves. A fenced-off conservation buffer of 50 m should also be established around the graves and a qualified archaeologist must compile a Conservation Management Plan to ensure the safeguarding of the graves. Access to the 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.	Very Low	4,8
Paleontological					
Development and operation of infrastructure	Surface activities may impact upon the fossil heritage if preserved in the development footprint	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).	Implement chance finding protocol if any fossils are found on site.	Very Low	6,4
Traffic					

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Construction of surface infrastructure related to the railway siding	Construction of the proposed infrastructure may result in an increase of traffic on the site	To limit impacts on traffic as a result of the project.	The road used for access should be upgraded with the relevant road pavement design to an appropriate standard. Additional access is required off Road D1255 the standard provincial road planning requirements are applicable: No access within 100m from the future K118 road reserve; • 45m x 15m splays at the access on the K118 road reserve; and • minimum road reserve width of 25m • 95m building restriction line from the centre line of the future K118 and PWV19. The crossings of both the Balloon Siding and the main siding of K118 will require approval from Gautrans (in terms of the Gauteng Transport Infrastructure Act).	Very Low	16
Operation of the railways siding and conveyor belt	Operating of the railways siding may result in increased traffic on site	To limit impacts on traffic as a result of the project.		Very Low	14,4
Noise					
Construction of haul routes and conveyor routes and the implementation of concrete and surface related infrastructure	Construction activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	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. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g., concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	Very Low	13,2
Operation of the siding and related activities	Operation activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	To limit the nuisance of noise pollution.	EMPr – The developer must consider the following in relation to the Coal Siding loading and shunting. The options to be implemented are for the developer to consider as the feasibility cannot be established by the author (not compulsory if unfeasible in terms of engineering speciation's, management options etc). Shunting should be considered for daytime hours only – Shunting has a high probability to garner noise complaints/noise nuisance in the area. The least sensitive hours should be considered for shunting (e.g. daytime 09:00 till 17:00). Coal loading (if/where feasible) should be considered for daytime hours only – Continuous reversing of Front-End Loaders (FEL) has a high probability to garner noise complaints/noise nuisance in the area, and due to continuous reverse alarms during loading. The least sensitive hours should be considered for loading (e.g. daytime 09:00 till 17:00). If the Precision Loading System is implemented the chute should be attempted to be obscured by the berms proposed below (if feasible). Berms are highly recommended, fully enclosing the operations in relation to receptors R4 and R3. The coal stockpile itself would suffice as a berm (however the height needs to be maintained to act as a sufficient acoustical shield). If a berm is to be constructed facing receptors, the following berm/stockpile specifications should be noted: o The berms should be solid (aggregate, brick etc. no foliage e.g. trees). o The height should be a minimum of two (2) meters higher than the highest noise source from the noise area to the receptors visual. o Berms or the selected acoustical barrier should enclose all sides of the area when facing a receptor with no gaps, entrances or apertures facing I&AP's. A controlled point (if feasible) is further recommended where shunting is to take place. When rail is to shunt an acoustical wall or enclosed structure (enclosed by	Low	31,2

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			walls, or a wall in relation to receptors R4 to R3) can be implemented to acoustically absorb, deflect and scatter acoustical sound waves, and in relation to the eastern boundary. This can be a nominated area whereby shunting can take place as a controlled acoustical shielded area (if feasible). The Front-End Loaders loading at the siding 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 reverse alarms are less intrusive (less tonal more broadband character etc.). A noise complaints communication line could be established, where receptors can be made aware of times of shunting as well as loading. Should the Precision Loading System 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 (R4 and R3). Although these alarms are exempt from this acoustical assessment, they (should they go off frequently) have a potential to cause a noise nuisance should it be measurable/audible at receptors. When the first loading and shunting takes place, a nominated acoustical consultant should be contacted to measure the scenario, and to determine if the mitigation the developer has implemented is successful in terms of legislation. It should be noted that the monitoring protocol is the measurement of coal loading, and not the measurement of a developed industrial rail track. Recommended – The project must ensure maintenance programme of the conveyor belt and rubberised rollers. Should squealing occur, then immediate action taken to remove squeal. - EMPr – Should a power boost be required at one the localities along the conveyor belt (e.g. drivetrain), and within 750 m of a receptor, the drivetrain be enclosed in relation to the receptor (e.g. a berm). Recommended –Should evaluated receptors in this report be relocated, the impact assessment (and proposed mitigation) be considered as negligible. Should a receptor be derelict as identified in this report (owner has moved), the impact assessment (and proposed mitigation) be considered as negligible. Should shunting and/or train hooters be used on the portion, the surrounding receptors made aware of these impulse noises prior to project implementation. Mitigation is proposed should shunting be considered. EMPr – It is highly recommended that the Environmental Co-ordinator keep continuous communication with receptors regarding loud noises and potential loud noise events. Prior knowledge of a noise event will be far more ideal than a receptor being unaware of a loud noise circumstance. Various communication tools are available for consideration, the platform of choice up to the developer to consider. EMPr – A contact line should be made available to receptors should a valid noise complaint arise whereby receptors could lodge a complaint (and documented), and for the loading of coal at the loop. 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.		

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Inclusion in Authorisation – An Environmental Noise Measurement Programme (Monitoring Programme) needs to be implemented. 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.		
Air Quality					
Site clearing, removal of topsoil and vegetation, Construction of Infrastructure, Conveyor Belt, General Transportation and hauling of material	Activities during the construction phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	To decrease impacts on air quality as a result of the project.	Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere. Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur. Topsoil should be re-vegetated to reduce exposure areas. During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised. Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads. When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads. Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form. Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect. Any crusting of the surface binds the erodible material. All stockpiles to be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation). Successful trialling of broad acre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop, providing an established vegetative stabilisation to minimise the potential for windblown dust generation. Constricting the areas and time of exposure of pre-strip clearing in advance of development.	Low	27
Operation of conveyor belt and railway siding	Activities during the operation phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	To decrease impacts on air quality as a result of the project.		Low	26
Closure of siding and related activities	Activities during the closure phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	To decrease impacts on air quality as a result of the project.	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase. The area of disturbance must be kept to a minimum, as demolition should be done judiciously to avoid the exposure of larger areas to wind erosion. Cabs of machines should be swept or vacuumed regularly to remove accumulated dust. Exhaust pipes of vehicles should be directed so that they do not raise dust. Engine cooling fans of vehicles should be shrouded so that they do not raise dust. Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust. Dust suppression of roads being used during rehabilitation should be enforced.	Low	22

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion. Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. Spreading of soil must be performed on less windy days. The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels. Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks. The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall. Cabs of machines should be swept or vacuumed regularly to remove accumulated dust. Exhaust pipes of vehicles should be directed so that they do not raise dust. Engine cooling fans of vehicles should be shrouded so that they do not raise dust. Hard surfaced haul roads or standing areas to be washed down and swept to remove accumulated dust. Dust suppression of roads being used during rehabilitation should be enforced. It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion. These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.		
Climate Change					
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Climate change impacts may occur as a result of the product of the project	Minimise the impact of the project on climate change.	Due to the global nature of climate change impacts, it is possible to mitigate and offset project-scale emissions at the scope 1 and Scope 2 level. The following is recommended: Implementation of energy efficiency programmes, wherever possible; Use of renewable energy, wherever possible; and Purchasing of carbon offset products (or the implementation of auditable carbon offset programs) to offset the remainder of the net carbon emissions of the immediate project. There are no viable offset programs that would be able to offset the Scope 3 emissions of the project, especially as regards the eventual combustion of the product.	Low	25,2
Socio-Economic					

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
Construction, operation and closure of the railways siding and related activities	Poor management of siding activities that result in economic displacement.	Minimise impacts on socio-economic environment.	Implement the EMPr and Specialist recommendations for the duration of the operations.	Very Low	12
Construction, operation and closure of the railways siding and related activities	Resettlement/ relocations may manifest as a result of economic displacement (loss of access to livelihoods) and impacts on the sense of place.	Minimise impacts on socio-economic environment.	Implement the EMPR for the duration of the operations. Communicate with landowners on regular basis and make the contact details of the Site Manager available. Complaints register at entrance to siding and attend to matters expediently.	Very Low	12
Construction, operation and closure of the railways siding and related activities	Devaluation as a result of combined impacts that could include potential impacts on water resources; intrusion impacts; crime; establishment of new informal settlements; trespassing; fragmentation of farmland.	Minimise impacts on socio-economic environment.	Proper management of siding operations and implementation of the EMPr for the duration of the operations.	Very Low	12
Construction, operation and closure of the railways siding and related activities	Change in sense of place as a result of visual and land use impacts	Minimise visual impact of sensitive receptors	Implement all recommendations / mitigations of the Visual Impact Assessment and EMPr for the duration of the project. Plan construction during the maize growing season, this will allow for some visual barrier of the construction site. It is recommended that the construction site be screened by using meshing fencing in natural colour (green). The surface infrastructure should use material with colours that blend in with the environment. Retain the natural vegetation as much as possible for visual screening of the infrastructure. Keep Infrastructure and stockpile to the minimum height prescribed. **Rectification:** Rectify the impact by repairing, rehabilitating, or restoring the affected environment. It is recommended that the area be revegetated with indigenous grassland vegetation with the help of a botanist/rehabilitation specialist as soon as infrastructure has been established. Reshape berms, stockpiles, and all affected areas to be free draining and follow the natural drainage line. Plant indigenous trees, occurring in Grasslands, in the areas surrounding the proposed Siding, its offices, workshops and railway lines. **Reducing or eliminating over time**: Preservation and maintenance operations during the life of the action.	Low	26,4

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION / RESIDUAL	
			Continued removal of invasive plants species arising from site disturbance. Monitor rehabilitated areas. Dismantle and remove all surface infrastructure. In addition, the following measures are recommended: Planting / avoid removal of indigenous vegetation to create a visual barrier for the surrounding residential areas. Dust suppression measures must be implemented on roads and in stockpile area to prevent excessive dust. Institute a rehabilitation monitoring program with a rehabilitation specialist.		
Construction, operation and closure of the railways siding and related activities	Security impact may be Indirect impact as a result of activities/influx of people to and from siding.	Minimise impacts on socio-economic environment.	24-hour security at site. Participate/join existing community policing forums and other community structures.	Very Low	12

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 66: 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.
Land Capability and Agricultural Economic Assessment	Land capability Class ii and iii are arable and able to consistently producing crops. Approximately 103 hectares of the project area falls into these classes. There are about 29 hectares within the project area and the buffer that is grazing land. The siding infrastructure and the 50-metre buffer around it could accommodate about 8 livestock. According to the screening tool, the site has mostly a high sensitivity. This is largely correct but the boundaries of the watercourse were amended. The detailed assessment performed by Index found the following: • The Clovelly and Hutton soils that occur on most of the property have high sensitivity. • All remaining soil is waterlogged or shallow and rocky. These have a low to very low sensitivity. • In general, the tool is correct in its assessment. The wetlands and shallow soils is not high sensitivity land. ***IMPACTS*** LOSS OF HIGH POTENTIAL LAND 122 ha of arable land will be lost for the medium term. Although difficult to reinstate the present soil conditions, it is possible. The land will be restored after the life of the mine. LOSS OF GRAZING LAND 29 ha of grazing land will be lost for the medium term. The land will be restored after the life of the mine. LOSS OF AGRICULTURAL PRODUCTION It is estimated that the farm income from cropping for the land used for the siding is R884 445 per year for the duration of the mine. Mitigation can be achieved through compensation. The land will be restored after the life of the mine. The potential loss from livestock is estimated at R 148 340 per year for the duration of the mine. Mitigation can be achieved through compensation.	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	LOSS OF AGRICULTURAL INFRASTRUCTURE No farming infrastructure will be lost. LOSS OF JOBS FROM FARMING The affected land is part of a larger land holding. The employees can be reemployed or can be taken up by the employment opportunities that the mine will create. ***Recommendations*** The impact of the development is low – it is recommended that the Departments involved approve the application. **AGRICULTURAL AGRO-ECOSYSTEMS ASSESSMENT AND STATEMENT** • Details and relevant experience as well as the SACNASP registration number of the soil scientist/agricultural specialist/s preparing the assessment including a curriculum vita. A signed statement of independence by the specialist – Refer to Paragraph 1 • The duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment. The main criteria for farming potential are soils, climate and water availability. These are not bound to seasons. • A description of the methodology used to undertake the on-site assessment inclusive of the equipment and models used, as relevant. Refer to Paragraph 3. • A map showing the proposed development footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on the agricultural sensitivity map generated by the national environmental screening tool. Refer to Paragraph 9. • An indication of the potential losses in production, profits and employment from the change of the agricultural land use as a result of the proposed development. Refer to Paragraph 11. • Confirmation that the proposed development will generate more long-term economic and social benefits for the country as a whole than that which would be generated by agricultural activities on the affected land with regards to agricultural resources. Mining, which is the activity that the siding supports generated many times the income and employment that farming can create. The area already has high employment and poverty. It is my view that socio-economic benefit if the activity far outweighs that of farming.		

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.
	• Additional environmental impacts expected from the proposed development based on the current status quo of the land including erosion, alien vegetation, waste, etc. As long as the EMP is followed, then no additional impacts are foreseen. • Information on the current agricultural activities being undertaken on adjacent land parcels. Refer to Paragraph 5. • Confirmation from the soil scientist/agricultural specialist that all reasonable measures have been considered in the micro-siting of the development to minimise fragmentation and disturbance of agricultural activities. It is my view that all planning issues have been considered and that changing the route will not reduce the impact of the development. • A substantiated statement from the soil scientist/agricultural specialist with regards to agricultural resources on the acceptability of the development and a recommendation on the approval or not of the development. The development is a line activity and takes up only a small area of land. High potential land will only take up about 66% of the total area that will be influenced by the development. • Any conditions to which the statement is subjected. No conditions are required. • Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); • A description of the assumptions made and any uncertainties or gaps in knowledge. No gaps in knowledge were found.		
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: Preferred Conveyor Belt • The majority of the Preferred Conveyor Belt route is located on cultivated land, while the eastern end of the route intersects Site BA09, an area that used be associated with buildings since at least 1953. The buildings formed part of a piggery, but were demolished in later years and are no longer associated with surface remains. Since subsurface culturally significant material might be located at Site BA09, the demarcated area is considered to be potentially sensitive. Care should therefore be exercised during the construction phase and should cultural material be discovered, a qualified archaeologist must be contacted. Alternative Conveyor Belt	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	• The majority of the Alternative Conveyor Belt route is located on cultivated land. No sites op potential heritage significance were observed within close proximity of this route. The associated area is therefore not considered to be sensitive from a heritage perspective. From a heritage perspective, the Alternative Conveyor belt route is preferred. Welgedacht Balloon Siding • Site BA01, a cemetery consisting of approximately 26 graves, might be affected should the adjacent dirt road be used for access to the siding. It should be noted that the adjacent dirt road is an existing route that is currently being used for farming purposes. Should the dirt road be used as an access road, a fenced-off conservation buffer of 50 m must be established around the cemetery and a qualified archaeologist must compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemetery must not be refused. • Site BA02 exceeds 60 years of age and is subsequently protected by the NHRA 25 of 1999. However, the buildings associated with this site have completely been demolished and currently consist of building rubble. The site is therefore not considered to be significant from a heritage perspective and the recording done is deemed to be sufficient. • Site BA03 consists of a single grave directly next to a dirt road to the north of the study area. The dirt road is an existing route that is currently being used for farming purposes. Should this road be considered as an access route to the proposed siding, the grave could be impacted and the following is recommended: The vegetation surrounding the grave must be cut to verify the presence of additional graves. A fenced-off conservation buffer of 50 m should also be established around the graves and a qualified archaeologist must • compile a Conservation Management Plan to ensure the safeguarding of the graves. Access to the 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. • Sites BA04 and BA05 are considered to be potentially significant from a heritage perspective since these areas were associated with structures and buildings during historical times. Although surface indications are no longer present, subsurface cultural material might exist and care should therefore be exercised during the construction phase. Should cultural material be discovered, it is recommended that a qualified archaeologist be contacted.		

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 BA06, BA07 and BA08, associated with demolished buildings, might potentially be significant from a heritage perspective since subsurface cultural material might exist. However, these sites are located outside of the proposed development footprint and are unlikely to be impacted. No further action is required. • The area associated with the proposed railway line to northwest of the proposed siding is characterised by open veldt and dumping. A safety concern resulted in only certain sections of the proposed route being inspected. No potential sites of heritage significance, however, were noted during the inspection or on historical aerial imagery and topographical maps. The associated area is therefore not considered to be sensitive from a heritage perspective. Should potential heritage sites be observed during the proposed development, a qualified archaeologist must be contacted as soon as possible. • General Recommendations • The above recommendations are based on the specific project activities and extents as indicated in the figures of this report. Should the proposed surface impact areas be changed, a qualified archaeologist must conduct a pedestrian survey on the new area and amend the report accordingly. • Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the construction phase, 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. **Conclusion** The proposed Welgedacht Balloon Siding project consists of surface infrastructure covering approximately 56 ha and a conveyor belt of between 2.72 km and 3 km. The Archaeological Impact Assessment examined the area and identified sites of cultural significance that might be impacted by the proposed development. These sites aided in the archaeological contextualisation of the general study area. The AIA recorded nine sites that might be of heritage significance. The building ruins, potential subsurface remains and burial sites associated with these sites might be impacted by the proposed development as a result of		

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.
	surface and subsurface impacts by the proposed construction of the siding and conveyor belt. The majority of the proposed conveyor belt route options fall on cultivated land that is not considered to be sensitive from a heritage perspective. However, the eastern end of the Preferred Conveyor belt route is located on a site that used to be associated with historical buildings. Although the buildings have been demolished, subsurface cultural material might still be present. Therefore, the Alternative Conveyor belt route is considered to be less sensitive from a heritage perspective and is therefore preferred. The additional railway line proposed to the northwest of the study area is generally located on open veldt. Some sections could not be inspected due to a safety concern, but based on historical aerial imagery, historical topographical maps and the inspected sections, the associated area is not considered to be sensitive from a heritage perspective. Care, however, must be exercised during the construction phase of the project and if potential heritage sites are observed, a qualified archaeologist must be contacted as soon as possible. The demolished sites intersected by the proposed siding are not likely to be impacted due to the disturbed state of the surface, but care should be exercised during the construction phase of the project since subsurface culturally significant material might be unearthed. Also, the proposed layout of the siding will impact the building ruins to the northwest of the siding. Although this site exceeds 60 years of age and is protected by the National Heritage Resources Act (25 of 1999), the buildings have been demolished and the remains are in a severely dilapidated state and are not considered to be significant from a heritage perspective. The cemetery to the north of the project area, as well as the grave to the northeast, might be impacted should the adjacent dirt roads be used for access to the siding. Conservation measures, therefore, include a conservation buffer and conservation management plan should these roads be utilised. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Welgedacht Balloon Siding project may proceed.		
SASS Assessment	This report forms part of the Surface Water Assessment conducted for the specific project and aims to address the aquatic ecology associated with the fresh water environment found in the immediate vicinity. A site assessment was conducted on the 18th of November 2020 and the results within this report therefore constitutes as the beginning of the high flow findings (2020) for the specific development. It should be noted that minimal rainfall had been received, leading to the conclusion that the data obtained will likely match that of a dry season assessment as a result and this should be kept in mind as a limitation of the conditions encountered. The project area is located in the Grassland Biome. Sections of the portions of the farm on which the	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	Welgedacht Balloon Siding falls occur within the Threatened Ecosystem; Blesbokspruit Highveld Grassland (GP1), which has a Critically Endangered status (NBA 2011). Other area also falls within the Eastern Highveld Grassland, which is also a Threatened Ecosystem (GM12) with a status of Vulnerable (NBA 2011). The NBA 2011 does not correspond with the latest NBA 2018 in all aspects, which does not show the Blesbokspruit Highveld Grassland (Skowno, Raimondo, Poole, Fizzotti, & Slingsby, 2019), but falls in line with the 2018 Vegetation Map, showing the following statuses: • Soweto Highveld Grassland – Vulnerable (The Siding footprint falls specifically within this section); • Andesite Mountain Bushveld – Least Concern (LC); • Eastern Highveld Grassland – Vulnerable (VU). According to the National List of threatened terrestrial ecosystems the Blesbokspruit Highveld Grassland ecosystem is Critically Endangered.No SASS5 was implemented due to the fact that the waterbodies found were stagnant and not connected with wetland characteristics prevalent, therefore not suitable for the correct implementation of SASS as it will not provide comparable results. The current classes as per Biomonitoring are as follows: • All US and DS points were found to be seepage systems with wetland systems and not suitable for SASS at the time of the assessment. These points could be feasible for SASS at a later stage during the end of the High flow season when more water is present in the water resources • QHI and VEGRAI Indices were calculated for conditions encountered and both awarded a PES of Class D for the specific stretch of river assessed, which compares to the 2018 DWS PES of Class C and Class E (different stretches of the Blesbokspruit). • The REC recommended for this assessment is therefore Class C. The applicant needs to develop an Environmental Management Programme / Plan which describe in detail how identified impacts will be managed on site to ensure that impacts are minimised. The EMP must then be approved by the relevant government agencies. The management measures as indicated in Table 35 and Table 36 (Section 6) of the Aquatic Impact Assessment report (attached a Appendix 10B to this EIAR)must be implemented where applicable. It is the reasoned opinion of the specialist that the Balloon Siding may be implemented subject to stringent management and mitigation measures recommended and should be implemented and monitored to prevent impacts to the sensitive downstream aquatic ecosystems such as the Blesbokspruit and RAMSAR wetland systems found in close proximity.		

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Ecological Assessment	The proposed project will involve the development of the new Welgedacht Balloon Siding and associated infrastructure to be situated approximately 9 km east of the Springs Municipality, Gauteng Province. Key infrastructure will include railway related infrastructure, weigh bridges, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt with supporting infrastructure alongside.
	
	General Ecological Findings:
	• Three vegetation types, according to the National Vegetation Map (SANBI, 2006 – 2018), occur in the project area, namely Soweto Highveld Grassland (Gm8), Andesite Mountain Bushveld (SVcb11) and Eastern Highveld Grassland (Gm12). The majority of the project footprint is located in the Soweto Highveld Grassland, with only the conveyor and service road situated over the Andesite Mountain Bushveld and Eastern Highveld Grassland.
	• The NBA 2011 does not correspond with the latest NBA 2018 in all aspects, which does not show the Blesbokspruit Highveld Grassland (Skowno, Raimondo, Poole, Fizzotti, & Slingsby, 2019), but falls in line with the 2018 Vegetation Map, showing the following statuses:
	  ○ Soweto Highveld Grassland – Vulnerable (The Siding footprint falls specifically within this section);
	  ○ Andesite Mountain Bushveld – Least Concern (LC);
	  ○ Eastern Highveld Grassland – Vulnerable (VU).
	• Sections of the portions of the farm on which the Welgedacht Balloon Siding falls occur within the Threatened Ecosystem; Blesbokspruit Highveld Grassland (GP1), which has a Critically Endangered status (NBA 2011).
	• The Blesbokspruit RAMSAR site is located approximately 2.6 km west of the project footprint.
	• The Marievale Nature Reserve, which is protected in terms of the NEMPAA, is situated 4 km south-west of the project footprint. No other areas protected in terms of the NEMPAA are situated within 10 km of the project footprint.
	• Areas range between Critical Biodiversity Areas and Ecological Support Areas, with the Balloon Siding falling exclusively in an Ecological Support Area.
	
	Site Survey Results:
	• The majority of the proposed project footprint (and extended 200 m project buffer) is located on land transformed for crop cultivation, with smaller, fragmented sections of impacted grassland and
		X	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	wetland also occurring on the project footprint and 200 m extended project buffer. The proposed conveyor and access road crosses Aston Lake. • Land uses, on and adjacent to the project area, currently consist of cropland, wetland and riparian zones, impacted grassland, residential areas, Eskom powerlines and substations, railway lines and associated infrastructure and livestock grazing. • Vegetation units were identified according to plant species composition, previous land use and topography. The state of the vegetation of the proposed project area varies from being natural to completely degraded. The following broad classification of Vegetation Units (VU) were found to occur on the proposed project footprint and 200 m extended project area: 1. Impacted grassland (VU1); 2. Riparian vegetation (VU2); and 3. Transformed land (VU3). • A total of sixty-four (64) plant species were recorded in the study area during the time of the study and indicates moderate species diversity, taking into consideration the transformed areas of VU3. 81% (52 of 64) of the recorded plant species are indigenous to South Africa. Twelve exotic species were recorded as occurring on the study area, of which three are listed as AIP in terms of the NEMBA. • From available literature it was established that at least five (5) of the recorded plant species in the study area are to some extent used for medicinal purposes. Two (2) of the species recorded on the project area are endemic to South Africa. • Crinum bulbispermum (Orange river lily) was identified to occur in VU2 and is provincially protected in terms of the TNCO. • No SCC were identified to occur on the project footprint during the site survey. However, six (6) flora SCC were identified for the project area during the desktop assessment, of which two (2) were considered to be moderately or highly likely to occur on the project footprint. • No faunal SCC animals were sighted to occur within the area, since the area was found to be impacted, but the overall most important feature will be the protection of the water resources, wetlands and remaining natural grasslands within the area, it will by default protect all other endemic, sensitive and specialised species found to occur within the area. However, this is not the case for the protected and sensitive ecosystems in the vicinity, such as the IBA and RAMSAR site, and these may likely be valuable habitat for SCC and impacts to these systems should be prevented at all times.		

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.
	Based on the findings of both the desktop assessment and the site survey, the Vegetation Units have been assigned the following sensitivity ratings in terms of terrestrial ecology aspects: 1. Impacted grassland (VU1) – Moderate sensitivity 2. Riparian vegetation (VU2) – High sensitivity 3. Transformed land (VU3) – Low sensitivity The management and mitigation measures as indicated by the specialist must be implemented where applicable. It is the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented. Wetlands, hydrophytic and grassland vegetation habitat constitute the most important features which make up the regional area. Any wetland buffers as delineated and recommended 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, which has many environmental services, not only ecological importance.		
Alien Invasive Plant Management Plan	The majority of the proposed project footprint is located on land transformed for crop cultivation, with smaller, fragmented sections of impacted grassland and wetland also occurring on the project footprint. Bush encroachment is not a concern in actively cultivated cropland as well as wetland/ riparian zones. It is very unlikely that the proposed siding development and associated activities will cause bush encroachment within the remaining grassland areas. Therefore, management action related to bush encroachment are not included in this report. The AIP Control Plan and Priority Areas were devised by dividing the study area into Priority Areas based on the site layout, activities and the distribution of AIP species. Due to the low species counts and densities found at the site the density of AIP species was not calculated. However, all AIP species found were recorded along with their general location in terms of the Priority Areas. This information can be applied to the monitoring and progress of the AIP Control Plan as well as indicating areas for control. From the site survey and results it is evident that various AIP species are located on and in the immediate vicinity of the proposed Welgedacht Balloon Siding project footprint, however, at generally low densities. Sixteen (16) exotic plant species, not indigenous to South Africa, were identified as occurring on site, of which seven species are listed in the NEMBA Alien Invasive Species Lists (GN 864 of 2016). The study site was divided into three Priority Areas: 1. Impacted grassland (PA1) – Medium AIP management priority 2. Riparian vegetation (PA2) – High AIP management priority	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	3. Transformed land (PA3) – Low AIP management priority Twelve (12) exotic species were identified to occur in low densities within PA1, especially along road verges, of these 12 species, five are classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Argemone ochroleuca* (White-flowered Mexican poppy), *Cirsium vulgare* (Scotch thistle), *Datura stramonium* (Common thorn apple), *Eucalyptus camaldulensis* (Red gum), *Solanum sisymbriifolium* (Dense thorned bitter apple) and *Verbena bonariensis* (Purple top). *Eucalyptus* trees were found in moderate densities toward the north-western section of the project footprint. As expected, exotic species density and diversity was found to be higher along road and railway verges, the edges of crop fields and in proximity to residential areas. Watercourses and wetlands are considered high sensitivity. The majority of PA2 is located on areas designated as CBA and ESA in terms of the Gauteng Conservation Plan. PA2 is located within ecosystems categorised as Vulnerable (Soweto Highveld Grassland and Eastern Highveld Grassland) and Critically Endangered (Blesboksspruit Highveld Grassland) in terms of the NEMBA. Therefore, PA2 is of the highest priority in terms of AIP management and control. Six exotic species were identified to occur in low densities within VU2, especially along road verges, of these six species, one is classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Verbena bonariensis* (Purple top). As expected, exotic species density and diversity was found to be higher along road and railway verges, the edges of crop fields and in proximity to residential areas. Twelve (12) exotic species were identified to occur in low densities within PA3, especially along road verges and the edges of cropland, of these 12 species, five are classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Argemone ochroleuca* (White-flowered Mexican poppy), *Cirsium vulgare* (Scotch thistle), *Datura stramonium* (Common thorn apple), *Solanum sisymbriifolium* (Dense thorned bitter apple) and *Verbena bonariensis* (Purple top). Currently AIP populations are sparse which will make eradication and control relatively easy and effective. It is thus recommended that: o The control measures as described in the specialist report (Appendix 12) be followed as well as recommendations as discussed in this document;		

<table>
<tr><th>List Of Studies Undertaken</th><th>Recommendations Of Specialist Reports</th><th>Specialist Recommendations That Have Been Included In The EIA Report</th><th>Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.</th></tr>
<tr><td></td><td>

The Priority Areas as depicted in the specialist report (attached in Appendix 12) be used as a broad classification for control;
The extent, management and control of AIP’s be revised annually and adapted accordingly; and
That the Monitoring Plan as outlined in this report be implemented.

</td><td></td><td></td></tr>
<tr><td>Surface Water Assessment</td><td>
The proposed project site falls within the Vaal Water Management Area (WMA), the Upper Vaal Sub-WMA. The project falls across two quaternary catchments (C21D and C21E).
The project footprint falls across two unnamed tributaries of the Blesbokspruit. The unnamed tributary crossing the north-western section of the project area drains to the south-west into the Blesbokspruit and is located in the C21D quaternary catchment. The unnamed tributary crossing the south-eastern section of the project area also drains to the south-west into the Blesbokspruit and is located in the C21E quaternary catchment.
The Blesbokspruit continues south through Nigel before altering direction to the south-west. The Blesbokspruit converges with the Suikerbosrand River south-west of Heidelberg. The Suikerbosrand River continues west where it converges with the Vaal River at Three Rivers.
The watercourses draining the proposed project area are non-perennial have been significantly altered through the surrounding activities. Many smaller farm dams surround the project area, with Aston Lake to the south of the project area. Standing water is prominent within the non-perennial rivers during the wet season.
Sensitive areas, including streams, non-perennial rivers and wetland features, fall within the project area.
The Ecological Water Requirement Site 11 (EWR 11) is used for reserve, importance, and quality determination. This site falls in the upper section of the C21F quaternary catchment, downstream in the Blesbokspruit and the C21D and C21E quaternary catchments.

PES, EIS and REC for the relevant Quaternary Catchments:
<table>
<tr><th>EWR</th><th>Catchment/s</th><th>Resource</th><th>EIS</th><th>PES</th><th>EC</th></tr>
<tr><td>11</td><td>C21F (C21D, C21E)</td><td>Blesbokspruit</td><td>Low</td><td>D</td><td>D</td></tr>
</table>
The primary surface water users and impacts in the WMA and quaternary catchments relate to mining, agricultural, industrial and domestic. The surrounding area consists of mainly:

Agricultural land with a number of farm dams.
Coal mining operations in close proximity to the north and west.

</td><td>X</td><td>Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables</td></tr>
</table>

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	• Residential, including small holding to the north and south-east, as well as urban developments concentrated to the west (Springs). • Substations and powerlines. • Railway lines. • Industrial areas are mainly concentrated around Springs to the west and south-west of the project area. During the field survey upstream and downstream water samples were taken and analysed by a SANAS accredited laboratory. Samples are taken to provide baseline for water quality in order to assist in determining whether any future impacts to the water quality are as a result of the proposed project. All levels recorded fall within acceptable levels apart from Manganese and Aluminium. Although the pH of the sampled water was found to be acceptable, elevated concentrations of Aluminium and Manganese could be indicative of water quality impacts from upstream coal mining activities. No SASS5 was implemented since the waterbodies found were stagnant and not connected, with wetland characteristics prevalent, therefore not suitable for the correct implementation of SASS as it will not provide comparable results.		
Noise Assessment	To ensure that the noise compliance is achieved under all circumstances, to minimise the potential of a disturbing noise, and to ensure compliance of the footprint boundary limits, the following key mitigation options should be implemented: • Operational Phases – The developer must implement various management and design acoustical mitigation regarding coal loading and shunting (if required). The introduction of berms in key areas is a primary mitigation option to consider. • Should shunting and/or train hooters be used on the portion, the surrounding receptors made aware of these impulse noises prior to project implementation. Mitigation is proposed should shunting be considered. The use of reverse alarms has the potential to cause a disturbing noise, receptors should be made aware of the use of reverse alarms from loading (reverse alarms and train hooters exempt from assessment). • It is highly recommended that the Environmental Co-ordinator keep continuous communication with receptors regarding noises and potential loud noise events. Prior knowledge of a noise event will be more ideal than a receptor who has not been notified of loud noise circumstance.	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables

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<tr><td></td><td>A Bi-Annual noise measurements programme is recommended during all phases, but only for the coal loading during operational phase.
Should the layout assessed in this report change, the new layout should be reviewed in terms of environmental acoustics.
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 (Table 1.7.1- 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.</td><td></td><td></td></tr>
<tr><td>Visual Impact Assessment</td><td>Visual impacts will result from the construction and operational phases of the proposed activities within the proposed development area. Specifically, impacts will result from the construction and operation of the railway lines, stockpiles, pollution control dam, security offices and roads, in terms of the viewshed, viewing distance and visual absorption capacity on the receiving environment. The construction and operational phase of the proposed Welgedacht Balloon Siding and its related activities will have a High visual impact on the scenic resources and surrounding land users. With the correct mitigation measures, the impact can be reduced to a having a less significant visual impact. Whilst tourism activities exist in the region, specifically Aston Lake in the south, no major impacts are expected on the tourism industry.

The most significant mitigation measures are the revegetation and rehabilitation of the area after construction has been concluded. With correct rehabilitation, the impact will be minimised and there should be little visual impact after the landform has been restored, however, no closure phase is expected to occur in the near future. Based on the findings made in the report the impact can be mitigated to an acceptable level and the specialist can support the application if all mitigation measures provided in this report as well as general good practice, are strictly adhered to.
Summary of the Visual Impact Assessment
<table>
<tr><td></td><td colspan="2">Construction Phase</td></tr>
<tr><td></td><td>No Mitigation</td><td>With Mitigation</td></tr>
<tr><td>Significance Rating (SR)</td><td>High</td><td>Moderate</td></tr>
<tr><td></td><td colspan="2">Operational Phase</td></tr>
<tr><td></td><td>No Mitigation</td><td>With Mitigation</td></tr>
</table></td><td>X</td><td>Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables</td></tr>
</table>

<table>
<tr><th>List Of Studies Undertaken</th><th colspan="3">Recommendations Of Specialist Reports</th><th>Specialist Recommendations That Have Been Included In The EIA Report</th><th>Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.</th></tr>
<tr><td rowspan="2"></td><td>Significance Rating (SR)</td><td>High</td><td>Moderate to High</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Mitigation:</td><td colspan="2">Refer to Section 5.3</td></tr>
<tr><td>Geohydrological Assessment</td><td colspan="3">Alicanto Groundwater Solutions (Pty) Ltd (“AGS”) was appointed by Elemental Sustainability (Pty) Ltd (“the Client”) for the completion of a groundwater study at the proposed Welgedacht Balloon Coal Siding (“the Site”) situated along the Welgedacht railway line and located near to Springs, Gauteng Province.
The objective of the project was to develop a baseline description of the groundwater environment at the Site, identify and quantify potential impacts (if any) on the receiving environment, as well as the development of a groundwater management plan for the Site to manage and mitigate these potential impacts. The groundwater study will form part of the environmental authorisations and water use license application process for the Site.
The Site is a new rail siding development and associated infrastructure which is envisaged to support the nearby coal mining operation in terms of the transportation of coal product from the Site to market. The key infrastructure at the Site will include, but necessarily not be limited to:
• Rail infrastructure and Fuel storage,
• Weigh bridges,
• Access and haul roads,
• Product stockpile areas,
• Pollution control dam,
• Stormwater infrastructure, and
• Office and security buildings.
The Site will receive product from the nearby Palmietkuilen Coal Mine (PCM) where product will be stored at stockpile areas before being loaded onto rail cars for transport to market. Geostratum (2017) completed a geochemical assessment at PCM where forty-four (44) samples (Table 5.1) were collected from five (5) exploration boreholes. The samples were representative of raw coal, coal product and discard for PCM. Geostratum (2017) concluded that the coal product from the top coal seam has significant potential to generate acid water in the long term, while coal product from the lower seams has a lower potential for acid generation and neutralisation potential will buffer acid water formation for a suitably long period. Geostratum (2017) performed waste classification testing on coal product samples, concluding that although most material conforms to the Type 4 waste classification some of the coal product samples did exceed LCT0 values and should be considered Type 3 waste. Geostratum (2017) recommended either a</td><td>X</td><td>Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables</td></tr>
</table>

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	Class D or Class C liner is installed at the Site's discard and product stockpiles to prevent seepage of poor-quality leachate into the groundwater environment. According to Hodgson & Krantz (1998) three distinct hydrogeological units are present within the Karoo coalfields, namely: • An upper, weathered hydrogeological unit; • A fractured, Ecca sediments hydrogeological unit; and • A deeper, fractured basement hydrogeological unit. The upper, weathered hydrogeological unit is typically found between 5 and 12 m depths, with the dominant recharge mechanism being infiltration of rainwater (1-5% of MAP) (AGS, 2019). Groundwater movement in the upper, weathered hydrogeological unit is controlled by the less permeable shale found at depth, as well as outcropping intrusions, paleo-topographic highs or streams/rivers where topography cuts through the water table. The fractured Ecca hydrogeological unit is found at depths ranging between 20 and 45 m (refer to Figure 5.3) with the frequency of successful water strike intersection decreasing with depth. The matrix of the Ecca geology is well-cemented, thus lowering groundwater potential in the matrix and leading to almost all economic water strikes being associated with secondary geological features such as faults, fracture zones and intrusive contact zones. Digby Wells (2017) determined the average hydraulic conductivity and transmissivity for the fractured Ecca unit to be ~0.04 m/day and 2.44 m2/day, respectively, based on slug testing conducted on boreholes installed at the nearby Palmietkuilen site. The dominant recharge mechanism for the fractured rock unit would be from rainfall and release of groundwater from the upper weathered unit, with recharge values expected to vary between 1 and 4% of MAP. The basement hydrogeological unit is generally regarded as insignificant (AGS, 2019) due to its low yielding nature, great depth (>100 m) and limited recharge potential due to the overlying Dwyka tillite units. According to GPT (2018) water quality of the basement aquifer is poor due to fluoride associated with the granitic rocks. Aquifer testing at basement rock units showed transmissivity values to be ~0.01 m2/day up to 0.2 m2/day. The karst hydrogeological unit situated west and at the northern Site extent is not expected to interact with the proposed Site activities and was thus noted, but not analysed in great detail for this project. According to the 1:500'000 hydrogeological map series 2526 Johannesburg (Barnard, 1999) and data obtained from the NGA (DWS, 2020) the average borehole yield of the karst system west of the Site is over 5 l/s.		

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	Regional water levels obtained from the NGA (DWS, 2020) ranged between X and Y m, with an average water level of ~12 m below ground level (m bgl). During the 2020 hydrocensus a total of twenty-two (22) boreholes were identified, with most of the boreholes being inaccessible due to pumping equipment, blockage or denial of access. Digby Wells (2017) identified thirty-two (32) boreholes within the Site area, with water levels ranging between 1 and 75 m bgl, with an average of ~17 m bgl. Regional groundwater levels showed a strong correlation with surface elevations (89%) while hydrocensus results showed less of a correlation (~51%). However, it was suspected that poorly correlated water levels recorded during the hydrocensus investigations were likely to be due to abstraction at the boreholes and once the values were removed from the dataset a correlation of ~91% was achieved. The correlation with surface elevation suggests that groundwater flow at the Site takes place under semi-confined conditions and groundwater flow is likely to mimic surface topography. During the October 2020 hydrocensus investigation a total of three (3) groundwater samples were collected from boreholes within the Site locality and submitted to SANAS-accredited Aquatico Laboratories for analysis, with the laboratory certificates shown in Appendix B. The water quality results were compared with the SANS 241:2015 limits for drinking water quality and the following observations made: • The groundwater quality was generally good, and most parameters were compliant with the • SANS 241:2015 limits, except for those listed below, • Turbidity exceeded the operational limit at borehole PL50BH3, • Nitrate as N exceeded the acute health limit at borehole PL50BH3, which may be caused by • nearby agricultural activities, • EC values at borehole WS BH01 were equal to the aesthetic limit, and • E.Coli at borehole WS BH01 slightly exceeded the acute health limit. The October 2020 groundwater quality results were used to construct a tri-linear piper diagram which showed the dominant water type to be magnesium bicarbonate water. The Site aquifer vulnerability was determined using the DRASTI method with the Site aquifers being of a low vulnerability and high vulnerability zones noted at the Blesbokspruit area west of the Site and the area to the south of the Site near to Aston Lake was noted to be medium to high vulnerability. Based on the results of the hydrocensus results the Site aquifer is a ‘Major Aquifer System’, due to the majority of the local population engaged during the hydrocensus investigation being dependent on groundwater. The GQM index was calculated using the equation below, with the calculated level of protection being 4 (i.e. medium level of protection).		

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	A groundwater flow and contaminant transport model was constructed for the Site using Processing MODFLOW for Windows (PMWIN) 8 (Simcore Software, 2012) which uses the MODFLOW finite difference code developed by the USGS (Macdonald & Harbaugh, 1988) and is a widely accepted numerical modelling code for solving groundwater flow problems. Groundwater contaminant transport was simulated using the MT3D MS code within PMWIN. The objectives of the numerical model were: • To simulate contaminant plume movement (if any) at the proposed Site activities, as well as evaluate management and mitigation measures in terms of effectively reducing any contamination at the Site. Based on the proposed activities at the Site one (1) groundwater contaminant source was identified and considered in the numerical model for the Site, namely the seepage of water from the Site PCD's and stockpile area (collectively referred to as 'Storage Infrastructure' for this section only). Seepage rates were calculated for each of the Storage Infrastructure using the seepage rates described by Giroud & Bonaparte (1989) for a No Liner, Class C Liner and Class D Liner. The steady state model was run between January 2014 and December 2014 and calibrated using NGA data and time-series data provided for the Site area. Calibration achieved a final root mean square error (RMSE) of 4.96, which is considered acceptable (Mandle, 2002). The mean error (ME) and mean absolute error (MAE) were -1.66 m and 3.94 m, respectively. Transient state calibration was completed using the hydrocensus water levels obtained by Digby Wells (2017) and AGS (October 2020) during their hydrocensus investigations at the Site, as well as time series data up to February 2017. The ME, MAE and RMSE were calculated as -1.88, 3.85 and 4.56 m, respectively, which was within the calculated head variance range (6.18 m) and thus, the model was considered calibrated. Insufficient chemistry data was available for the Site to complete transport model calibration. A sensitivity analysis was done for the calibrated flow model, where changes in recharge and specific storage showed little response to changes, but recharge was the most sensitive parameter when values were increased The following assumptions and limitations are applicable to the Site groundwater model: • Model hydraulic parameters were based on literature values and previous investigations completed at the Site and within the region and were assumed to be representative of Site conditions;		

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.
	• Flow model calibration was completed using a combination of Site-specific and regional data which was assumed to be representative of Site conditions; • No final source concentration values were available for the Site contaminant sources (only a draft geochemical report was available), thus transport modelling was completed using a source concentration of 100% and an initial concentration of 0%. This was done to show the potential contaminant plume extent, travel direction and magnitude of contamination and was assumed to be representative of final transport conditions; • The source concentration at the stockpile area was considered to be 100% for the entire • operational life of the Site, which was conservative as the coal will only be temporarily stored • at the Site for loading purposes and leaching potential will thus be limited. Thus, the • simulated contaminant plume for the Site should be considered as a worst case • representation; • A numerical model does not provide a unique solution. Therefore, numerical modelling will • always have inaccuracies due to the uncertainty in data, the capabilities/limitations of • numerical modelling code to describe the natural processes and the factors selected by the • modeller to resolve the non-unique solution; • The complexities of fractured rock aquifers imply that the model can only be used as a guide • to determine the order of magnitude of dewatering and contaminant transport; and • The interpretation of modelled results should be based on the assumptions the model was • built on and actual results will vary as unknown aquifer conditions and parameters vary in • the natural system. • The following predictive scenarios were run using the calibrated Site numerical model in order to • simulate the potential impacts of the proposed Site activities on the receiving groundwater • environment: • Base Case Scenario – where the Site PCD IS lined with an HDPE liner and the • Site stockpile area was lined using a Class C liner, • Scenario 1 – where the Site PCD and stockpile area had no liners installed, and • Scenario 2 – where the Site PCD were lined with an HDPE liner and the stockpile area lined using a Class D liner. Climate change impacts were simulated for each of the model scenarios using the predicted future rainfall values as discussed in Section 4.1.2, were the maximum positive change (i.e. increase in rainfall), average change and maximum negative change (i.e. decrease in rainfall) predictions for MAP at the Site were		

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.
	incorporated into the model simulations for each of the SSP's simulated in the CMIP 6 program. Each phase of the LOP has their own unique risks to, and impacts on, the receiving hydrogeological environment. The Site is currently in the design phase and will enter the construction phase next. Sensitive receptors at the Site were Aston Lake and the non-perennial river to the south of the Site, as well as boreholes outside of the Site areas identified during the hydrocensus investigation. The hydrogeological impacts were discussed per model scenario in terms of general impacts on groundwater quantity and quality, as well as the simulated impact (if any) on sensitive receptors at the Site. The simulated contaminant plumes for the model Base Case Scenario, Scenario 1 and Scenario 2 showed little change over the model period, thus, impact ratings assigned under baseline conditions will not change due to the predicted effects of climate change over the operational, closure and post-closure phase of the LOP. The groundwater management plan (GWMP) was compiled for the site, considering the available hydrogeological information available. The GWMP is discussed in the following sections: • Objectives; • General Approach; • Water Management Controls (incl. embedded controls and mitigation measures); and • Groundwater Quality and Quantity Management Recommendations. • Best practice guidelines should be applied at the site to manage, prevent and minimize the impact of Site operations on the receiving hydrogeological environment while allowing for efficient and safe loading and transportation of coal product to take place at the Site. The following will be embedded in water management procedures at the site: • Maintenance of an effective response mechanism to deal with hydrogeological issues, including unexpected events and complaints; and • Insurance of minimal environmental impacts in terms of groundwater quality and quantity due to Site activities. • The key principles of the GWMP are as follows: • Minimize the loss of the groundwater resource through effective monitoring and management of any groundwater abstraction activities; • Minimize the impact of contamination of the groundwater resource due to coal loading and transportation activities through effective monitoring and management of the Site stockpile area and PCD 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.
	• Measure, monitor, evaluate and update management measures continuously throughout the LOP. Based on the available information, data and the results of the hydrogeological investigations it is the opinion of the author that environmental authorisation is granted for the project, based on the limited impact of the project will on both groundwater quality and quantity at the Site and its surroundings. Monitoring Network A total of four (4) new boreholes are recommended to be drilled during the construction phase of the project. Groundwater monitoring should be conducted to assess the following: • The impact of groundwater abstraction on the surrounding aquifers (if any). This will be achieved through monitoring of groundwater levels in the monitoring boreholes. If private boreholes are identified within the zone of impact on groundwater levels, these will be included in the monitoring programme; • Groundwater abstraction rates from water supply boreholes (if any). This will be achieved through monitoring of groundwater levels in the monitoring boreholes as well as measuring water volumes pumped from groundwater production boreholes (if used); • Groundwater quality trends. This will be achieved through sampling of the groundwater in the boreholes at the prescribed frequency; and • The rate of groundwater recovery after Site activities cease. This can be achieved through the continued monitoring of boreholes for a period of two years post-closure. Geochemical Assessment It is recommended that geochemical modelling and sampling is conducted at the Site on the coal product received in order to determine accurate, final geochemical characteristics of the material stored at the Site. Following which, the numerical model should be updated to include these results and the Site groundwater management and monitoring plans updated accordingly, if required.		
Hydropedological Assessment	The following conclusions could be drawn from the assessment: The proposed project will involve the development of the new Welgedacht Balloon Siding and associated infrastructure to be situated approximately 9 km east of the Springs Municipality, 2 km southeast of the Welgedacht Community and 1.3 km northwest of Aston Lake. The proposed siding is surrounded by maize fields, with fragmented sections of grassland and wetlands, both visibly negatively impacted on by anthropogenic activities. All land uses on and adjacent to the	X	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables

<table>
<tr><th>List Of Studies Undertaken</th><th>Recommendations Of Specialist Reports</th><th>Specialist Recommendations That Have Been Included In The EIA Report</th><th>Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.</th></tr>
<tr><td></td><td>proposed development area consist of croplands, wetland and watercourses, sections of grassland, farming and rural residences, railway lines, Eskom powerlines and substations, along with livestock grazing in some areas.

Drainage from the siding is expected towards the Aston lakes in the southeast at an average slope of 1 to 2%

Ten (10) auger holes were drilled to delineate the soil. No groundwater was encountered during the auger holes. However, the risk for an elevated groundwater condition is considered to be high during high rainfall seasons. The ground conditions identified within the site are inferred based on actual field test positions and are likely to variate. The subsurface soil profile comprises sandy loam outside the wetland areas to clay soil within the depressions and seep wetlands.

As the siding is situated on recharge soils and no dewatering is expected there is limited risk of wetland flow driver impacting on the depressions west and northeast of the siding or seep wetland to the east.</td><td></td><td></td></tr>
<tr><td>Wetland Assessment</td><td>The wetland assessment focussed on the proposed development footprint with an extended 500 m DWS Regulated Area (assessment area). Following the results of the site assessment, six (6) Wetland Units were identified to possibly be affected by the proposed Welgedacht Balloon Siding and its associated infrastructure. The following results were obtained:

<table>
<tr><th>Classification</th><th>Scientific Buffer</th><th>PES</th><th>EIS</th><th>REC</th></tr>
<tr><td>WU1 - Unchannelled Valley-bottom (UVB)</td><td>115 m</td><td>D</td><td>High</td><td>C/D
Improve</td></tr>
<tr><td>WU2 - Seeps</td><td>115 m</td><td>D</td><td>Mode rate</td><td>D
Maintain</td></tr>
<tr><td>WU3 - Depressions</td><td>65 m</td><td>D</td><td>Low</td><td>D
Maintain</td></tr>
<tr><td>WU4 - Seeps</td><td>115 m</td><td>E</td><td>Mode rate</td><td>D
Improve</td></tr>
<tr><td>WU5 - Unchannelled Valley-bottom (UVB)</td><td>115 m</td><td>D</td><td>High</td><td>C/D
Improve</td></tr>
</table></td><td>X</td><td>Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables</td></tr>
</table>

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<tr><td></td><td>
<table>
<tr><td>WU6 - Channelled Valley-bottom (UVB)</td><td>115 m</td><td>E</td><td>Mode rate</td><td>D Improve</td></tr>
</table>
The ecological integrity of the wetland systems has been largely transformed; however, they are ecologically significant, forming part of the larger catchment landscape and sensitive Blesbokspruit Wetland. The wetlands provide services such as catchment recharge, streamflow regulation, water quality improvement and flood attenuation. Various potential negative impacts are associated with the proposed activities and are discussed in the impact assessment scores derived according to the amended EIA Regulations (2017). The important factors relevant to the project are summarised in the table below.
<table>
<tr><td>NEMA Impact Assessment</td><td>The impacts associated with the proposed Welgedacht Balloon Siding and its associated infrastructure range from Medium-Low to High prior to mitigation taking place. With mitigation fully implemented, the significance of most impacts can be reduced to Very Low or Low.</td></tr>
<tr><td>Preferred vs Alternative</td><td>No major difference in impacts is expected for the Preferred Conveyer Route versus the Alternative Conveyer Route as long as mitigation measures are fully adhered to.</td></tr>
<tr><td>Mitigation Measures</td><td>Refer to Section 5.3</td></tr>
<tr><td>Does the Specialist support the Application?</td><td>Based on the findings made in the report the impact can be mitigated to an acceptable level and the specialist can support the application if all mitigation measures provided in this report as well as general good practice, are strictly adhered to.
Any activities that take place within 500 meters of a wetland will require a Water Use Licence in terms of the National Water Act (Act 36 of 1998).
A 115 m buffer has been placed around the wetland systems. No unauthorised activities should take place within the buffer zone. For some of the proposed infrastructure, i.e. the conveyor, the buffer zone will not be implemented. However, it is imperative that the service road and any other vegetation clearing, excavations, infilling and/or deposition activities remain outside of the calculated buffer zones. For</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

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 proposed railway line in the north western section, the buffer zone will not be implemented, however due to the degraded state of the wetland in the area and the existing railway crossings, further impact is expected to be low.		
Traffic Impact Assessment	This Traffic Impact Statement forms part of the Environmental Authorisation process for the proposed Welgedacht Balloon Siding. The Siding will serve the Palmietkuilen Coal Mine Project. The Siding is situated approximately 9.5km north-east of Springs in the Lesedi Local Municipality. The project comprises a railway line from the main Transnet line on Portions 10, 32, 51, 55 and 57 of the farm Geigerle 238 IR, with the main siding to be located on Portions 9 and 19 of the farm Palmietkuilen 241 IR. A conveyor belt is proposed running from the Plant to the siding. The proposed rail siding is not expected to have a significant peak hour trip generation. During the operational phase 35 people will be employed and these will be split in three shifts with a 24/7 operation. The impact of the rail siding on the peak hour trip generation in expected to result in a reduction in peak hour trips of 15 trips. There are two major future roads planned in this area, PWV19 and K118. The road reserves of these roads are protected in terms of the Gauteng Transport Infrastructure Act and should be excluded from the development area in terms of the Act. Access to these roads is limited to planned access points and minimum requirements are set. The future K118 is planned to link with Road D1255 and a preliminary design is available for a section of this road. The planning for K118 is depicted in Plan No PRS 86/186/7Bp, PRS 80/88/6Bp and PRS 86/186/8Bp. Access may be required off the existing gravel road (future K118) for the siding. The planning of K118 makes provision for two potential access points: opposite Vyfdeweg; and opposite Eersteweg. Access to the rail siding should be taken at a planned access. It is also noted that a rail siding was planned in the past (prior to 1981). The siding can be seen on Plan no PRS 80/88/6Bp, the siding crossing is now planned approximately 400m further west at more or less the planned access on K118. The following is recommended for the proposed rail siding: • Access to the siding off the gravel road/ future K118 to be located directly opposite either Eersteweg or Vyfdeweg as depicted in Plan no PRS 86/186/6Bp and 7Bp. • Minimum requirements for access(es):	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	• No access within 100m from the future K118 road reserve; • 45m x 15m splays at the access on the K118 road reserve; and • minimum road reserve width of 25m • In terms of the Gautrans requirements a building restriction line of 95m is applicable from the centre line of the future K118 and PWV19. • Gautrans approval will be required for the overland conveyer to cross future planned roads (in this • case PWV19). It is also noted that a rail siding was planned in the past and the siding can be seen on Plan no PRS80/88/6Bp, copy presented in the annexure. This planning was done is 1981. The status of the rail planning is unknown. The siding crossing is now planned approximately 400m further west at more or less the planned access on K118. The crossings of both the Balloon Siding and the main siding of K118 will require approval from Gautrans (in terms of the Gauteng Transport Infrastructure Act). The Gauteng Transport Infrastructure Act protects the road reserves of K118 and PWV19; it should be excluded from the development area.		
Paleontological Assessment	Based on the site visit survey and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary or of the Permian Vryheid Formation as seen to a depth of around 1m. There is a very small chance that fossils may occur in the shales below ground level of the Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found once drilling and excavations for the rail and conveyor foundations have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample. As far as the palaeontology is concerned, there is no preference for where the road should cross the stream, and the Welgedacht Balloon Siding project can proceed.	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 15 Impact Assessment and Management Tables
Social Impact Assessment	DIRECT SOCIO-ECONOMIC IMPACT The cultivated land will require two labourers and less than one for the livestock. At most the number of jobs that will temporarily lost, is three. These can easily be taken op on the existing farms or be employed at the siding. Mitigation can be achieved through compensation. INDIRECT SOCIO-ECONOMIC IMPACTS	**X**	Baseline Environment (Section 10, Impacts described as per specialist report in Section 14 and Section 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.
	Economic displacement: Activities associated with the Balloon siding and the potential devaluation of agricultural land could result in economic displacement (loss of income, farming assets/fields, business infrastructure, etc.) (operational phase). Relocations/Resettlement: Economic displacement in the agricultural sector (loss in livelihoods) and impacts on the sense of place could result in the physical displacement of farming ventures/households/farm workers (operational phase). Devaluation of farmland: Could be impacted by negative impacts on water resources, intrusion impacts, a rise in crime, trespassing and new informal settlements, fragmentation of land and sense of place impacts (operational phase). Sense of place: Mainly as a result of visual impacts, especially in the eastern region of the Balloon siding (construction and operational phase). Security impacts: Usually as a result of an influx of people, jobseekers and activities (construction phase). The impact assessment determined that the indirect socio-economic impacts on agricultural land uses and land users are of low to medium significance. All impacts can effectively be mitigated, provided that the EMPr is implemented for the duration of the siding operations and ongoing monitoring and communication takes place with affected parties.		

Attach copies of Specialist Reports as appendices.

15.4 ENVIRONMENTAL IMPACT STATEMENT

15.4.1 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.

For a summary giving only the Significance obtained, refer below. Impacts have been discussed in detail within Section 15.1.

Table 67: Summary of Key findings in terms of Impact Significance

ACTIVITY	POTENTIAL IMPACT	PHASE	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	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	Medium	45	N/A	1	Medium	45
Natural Environment								
No-Go Option	**Positive:** No additional negative impacts on I&APs or surrounding land users	N/A	Positive Medium	45	N/A	1	Positive Medium	45
No-Go Option	**Positive:** No additional negative impacts on the environment	N/A	Positive Medium	45	N/A	1	Positive Medium	45
Groundwater								
Groundwater Dewatering	Localized dewatering could occur if groundwater is used for water supply during construction.	Construction	Low	33	Medium	0,6	Very Low	19,8
Hydrocarbon Spills	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally	Construction	Medium	52	Medium to High	0,4	Low	20,8
Waste Generation	During construction domestic waste will be generated by contractors and staff	Construction	Low	30	Medium	0,6	Very Low	18
Groundwater Dewatering	Localized dewatering could occur where groundwater is used for water supply during operations.	Operational	Low	24	Low to medium	0,8	Very Low	19,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Poor quality seepage from stockpile area	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Base Case Scenario	Very Low	7			Neutral	0
Poor quality seepage from stockpile area	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Scenario 1	Low	27	Medium	0,6	Very Low	16,2
Poor quality seepage from stockpile area	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Scenario 2	Low	30	Medium	0,6	Very Low	18
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Base Case Scenario	Very Low	7			Neutral	0
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 1	Very Low	18	Medium	0,6	Very Low	10,8
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 2	Very Low	20	Medium	0,6	Very Low	12
Groundwater Dewatering	Following cessation of Site activities, groundwater levels at abstraction boreholes will recover to their original levels	Closure: All scenarios	Low	33	Medium	0,6	Very Low	19,8
Poor quality seepage from stockpile area	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Base Case Scenario	Neutral	0			Neutral	0
Poor quality seepage from stockpile area	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Scenario 1	Neutral	0			Neutral	0

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Poor quality seepage from stockpile area	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	Operational: Scenario 2	Low	22	Medium	0,6	Very Low	13,2
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Base Case Scenario	Neutral	0			Neutral	0
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 1	Neutral	0			Neutral	0
Poor quality seepage from Site PCD	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	Operational: Scenario 2	Very Low	18	Medium	0,6	Very Low	10,8
Hydropedological								
Proposed siding infrastructure	Flow drivers to wetland may be impacted	Operational	Low	30	Medium	0,6	Very Low	18
Surface Water								
Site clearing, including the removal of topsoil and vegetation, the Construction and operation of siding related infrastructure	Surface water quality - Sedimentation and pollution of surface water resources resulting in the deterioration of water quality	Construction, Operation and Closure	Medium	60	Medium	0,6	Low	36
Runoff from the dirty water areas (Balloon siding, PCD and temporary stockpiles) and hydrocarbon and coal spillage and runoff from coal stockpiles, loading coal and transportation (conveyor) of coal	Surface water quality - Deterioration of surface water quality as a result of toxin and heavy metal contamination.	Operation and Closure	Medium	42	Medium	0,6	Low	25,2
Alteration of drainage patterns due to infrastructure	Surface water quantity - Reduction of Catchment Yield as dirty water runoff within the mine will be contained in the PCD.	Operational	Low	40	Medium	0,6	Low	24

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Establishment of stormwater management infrastructure	Surface water quantity - alteration of flow due to the diversion of clean water areas	Operational	Low	40	Medium	0,6	Low	24
The closing of operations, site clean-up and rehabilitation of the area	Surface water quantity - Reinstatement of surface drainage patterns (Positive Impact)	Closure	Low	30	Medium	0,6	Very Low	18
Aquatic Ecology								
Site preparation and activities in close proximity or within regulated buffer zones of water resources	Loss of Biodiversity and Ecological function – Possible riparian zone impacts – such as the road crossing and conveyer crossing the river (both alternatives)	Construction and Operation	Medium	44	Medium	0,6	Low	26,4
All activities in close proximity of the Dwars-in-die-wegvlei	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning between surface water features	Construction and Operation	Low	30	Medium	0,6	Very Low	18
All activities in close proximity of the Dwars-in-die-wegvlei	Alteration of local drainage patterns as a result of stormwater management features	Construction and Operation	Low	30	Medium to high	0,4	Very Low	12
Deterioration of water quality in the spruit and Blesbokspruit 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	Water quality impacts - Nutrient increase and Pollution from waste reaching the aquatic environment	Construction and Operation	Medium	42	Medium	0,6	Low	25,2
Inadequate waste and soil management – Direct or Indirect nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Sedimentation of water resources by means of increasing load upstream, such as increased erosion, clearance of areas which could lead to the loss of topsoil or generally mismanagement during construction and establishment of infrastructure	Construction and Operation	Low	24	Medium	0,6	Very Low	14,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Waste entering the water environment leading to possible changes in PES of the downstream system – impacts to the RAMSAR and Blesbokspruit Aquatic Ecosystems	If river is negatively affected, it may lead to a deterioration of the Present Ecological Status (PES) and impact downstream water systems. This could be a cumulative impact that will not be easily reversed	Construction and Operation	Medium	56	Medium to low	0,8	Medium	44,8
Stormwater management features, berms, culverts, low water bridges, diverting and impeding structures within 500m of river systems	Impacts to Streamflow Regulation - Water Quantity impacts (possibly diverting or impeding water flow) reducing water available to sustain Aquatic diversity	Construction and Operation	Medium	56	Medium	0,6	Low	33,6
Decommissioning and material movement in proximity of water resources and rehabilitation of the beds or banks	Impacts to Biodiversity and Ecological function of Riparian zone or within buffer zones/regulated zones	Decommissioning and Closure	Low	30	Medium to high	0,4	Very Low	12
Alteration of drainage patterns after or during removal of the infrastructure and rehabilitation of footprint	Leading to decrease and changes in water quantity and availability in the Ecological Reserve	Decommissioning and Closure	Low	24	High	0,2	Very Low	4,8
Insufficient waste management practices during decommissioning	Possible water quality impacts - Leading to decrease and changes in water quality and availability in the Ecological Reserve	Decommissioning and Closure	Low	20	High	0,2	Very Low	4
Wetlands								
Compaction of soil, the removal of vegetation and surface water redirection during construction activities.	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	Construction and Closure	High	64	Medium to high	0,4	Low	25,6
Compaction of soil, the removal of vegetation and surface water redirection during construction activities	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	Operational	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	Construction and Closure	High	70	Medium to high	0,4	Low	28
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	Operational	Medium	48	Medium	0,6	Low	28,8
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	Construction and Closure	High	70	Medium to high	0,4	Low	28
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	Operational	Medium	48	Medium to high	0,4	Very Low	19,2
The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles.	Introduction and spread of alien vegetation which can impact on hydrology, by reducing the quantity of water entering a wetland system, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment.	Construction, Operation and Closure	Medium	56	Medium	0,6	Low	33,6
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	Construction and Closure	High	60	Medium	0,6	Low	36

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).								
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	Operational	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Ecological								
Development and operation of infrastructure	The site has sections which ranges between slightly to severely degraded, and habitat has mostly been transformed, however, the onset of additional activities and road construction might result in impacts to the natural environment due to vegetation clearance, 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. Development related activities may lead to damage or degradation of highly sensitive habitats (VU2) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction activities additional fragmentation, degradation or compression may occur.	Construction and Operation	Medium	60	Medium	0,6	Low	36

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	Development related activities may lead to the loss of floral species of conservation concern. Although no national SCC were found to occur on the project footprint, two SCC species are considered to be moderately or highly likely to occur on the project footprint. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 outside the project footprint and is provincially protected in terms of the TNCO. A permit application will be required if this plant is to be cleared at any stage and the conveyer belt area is to be surveyed again before the onset of construction for SCC. Development and related activities could impact on the sensitive habitats (VU2) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	Construction and Operation	Medium	48	Medium	0,6	Low	28,8
Development and operation of infrastructure	Further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas and these could become established along the service road to be established along the conveyer belt as well. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Construction and Operation	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU2). Impacts reaching downstream may impact on sensitive landscapes found (RAMSAR, IBA and Blesbokspruit).	Construction and Operation	High	65	Medium	0,6	Low	39
Agriculture, Land Use and Land Capability								
Development and operation of infrastructure	Direct occupation / loss of land	Construction and operation	Low	32	Medium	0,6	Very Low	19,2
Development and operation of infrastructure	Loss of grazing land	Construction and operation	Low	32	Medium	0,6	Very Low	19,2
Development and operation of infrastructure	Loss of crop production	Construction and operation	Low	24	Medium	0,6	Very Low	14,4
Development and operation of infrastructure	Loss of animal production	Construction and operation	Low	32	Medium	0,6	Very Low	19,2
Development and operation of infrastructure	Loss of agricultural infrastructure	Construction and operation	Very Low	4	Medium	0,6	Very Low	2,4
Development and operation of infrastructure	Direct loss of jobs from farming	Construction and operation	Very Low	14	Medium	0,6	Very Low	8,4
Visual								
Construction of siding infrastructure	Impact on Sensitive Receptors/Viewpoints	Construction	High	65	Low to medium	0,8	Medium	52

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Impact on the surrounding residential communities and land users will be increased due to the activities added to the area and an increase in heavy vehicles on the roads	Operation	High	75	Low to medium	0,8	Medium	60
Heritage								
Development and operation of infrastructure	Historical sites, (BA06, BA07, BA08) have been demolished, fall outside of the demarcated surface infrastructure area boundary and are not associated with material remains.	Construction and Operation	Very Low	7	Medium	0,6	Very Low	4,2
Development and operation of infrastructure	Demolished historical sites within or near areas demarcated for surface development. Three Historical sites (BA04, BA05, BA09) have been identified falling within or within close proximity of the areas demarcated for surface development. These sites have been demolished and are not associated with surface remains.	Construction and Operation	Very Low	7	Medium	0,6	Very Low	4,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Development and operation of infrastructure	Building ruins within or near areas demarcated for surface development. Site BA02 falls within the boundary of the area demarcated for surface development and consists of historical building ruins dating to at least 1936. The building ruins were identified as the married quarters of the old Palmietkuil Mine that operated between 1910 and 1953. It is envisaged that Site BA02 will be impacted by the proposed construction of the railway siding as the layout places the railway line directly in the path of the site.	Construction and Operation	Very Low	7	Medium	0,6	Very Low	4,2
Development and operation of infrastructure	Graves/Cemeteries located in the vicinity of the study area. Two sites (BA01 & BA02) were identified as graves/cemeteries in the vicinity of the proposed siding. It is likely that cemetery BA01 contains graves older, as well as younger than 60 years and are significant from a heritage perspective	Construction and Operation	Very Low	8	Medium	0,6	Very Low	4,8
Paleontological								
Development and operation of infrastructure	Surface activities may impact upon the fossil heritage if preserved in the development footprint	Construction	Very Low	16	Medium to high	0,4	Very Low	6,4
Traffic								
Construction of surface infrastructure related to the railway siding	Construction of the proposed infrastructure may result in an increase of traffic on the site	Construction	Low	40	Medium to high	0,4	Very Low	16
Operation of the railways siding and conveyor belt	Operating of the railways siding may result in increased traffic on site	Operational	Low	36	Medium to high	0,4	Very Low	14,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Noise								
Construction of haul routes and conveyor routes and the implementation of concrete and surface related infrastructure	Construction activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	Construction and Closure	Low	22	Medium	0,6	Very Low	13,2
Operation of the siding and related activities	Operation activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	Operation	Medium	52	Medium	0,6	Low	31,2
Air Quality								
Site clearing, removal of topsoil and vegetation, Construction of Infrastructure, Conveyor Belt, General Transportation and hauling of material	Activities during the construction phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	Construction	Medium	45	Medium	0,6	Low	27
Operation of conveyor belt and railway siding	Activities during the operation phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	Operation	High	65	Medium to high	0,4	Low	26
Closure of siding and related activities	Activities during the closure phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	Closure	Medium	55	Medium to high	0,4	Low	22
Climate Change								
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Climate change impacts may occur as a result of the product of the project	Operation	Medium	42	Medium	0,6	Low	25,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Socio-Economic								
Construction, operation and closure of the railways siding and related activities	Poor management of siding activities that result in economic displacement.	Construction, Operation and Closure	Low	20	Medium	0,6	Very Low	12
Construction, operation and closure of the railways siding and related activities	Resettlement/ relocations may manifest as a result of economic displacement (loss of access to livelihoods) and impacts on the sense of place.	Construction, Operation and Closure	Low	20	Medium	0,6	Very Low	12
Construction, operation and closure of the railways siding and related activities	Devaluation as a result of combined impacts that could include: potential impacts on water resources; intrusion impacts; crime; establishment of new informal settlements; trespassing; fragmentation of farmland.	Construction, Operation and Closure	Low	20	Medium	0,6	Very Low	12
Construction, operation and closure of the railways siding and related activities	Change in sense of place as a result of visual and land use impacts	Construction, Operation and Closure	Medium	44	Medium	0,6	Low	26,4
Construction, operation and closure of the railways siding and related activities	Security impact may be Indirect impact as a result of activities/influx of people to and from siding.	Construction, Operation and Closure	Low	20	Medium	0,6	Very Low	12

15.5 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.

15.6 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 58 Specialist management measures, as well as the significance of the impacts prior and post mitigation are provided in Table 63 and contained in the respective studies.

Table 68: Impact management objectives and the impact management outcomes for inclusion in the EMPr

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Socio- Economic			No management possible if no development occurs
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 if no development occurs
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 if no development occurs
Natural Environment			
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 if no development occurs
Groundwater			
Groundwater Dewatering	Localized dewatering could occur if groundwater is used for water supply during construction.	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)
Hydrocarbon Spills	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally	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)
Waste Generation	During construction domestic waste will be generated by contractors and staff	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)
Groundwater Dewatering	Localized dewatering could occur where groundwater is used for water supply during operations.	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).

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Poor quality seepage from stockpile area – Base Case	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system	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).
Poor quality seepage from stockpile area - Scenario 1	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system.	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).
Poor quality seepage from stockpile area - Scenario 2	Coal product material stored for loading at the Site stockpile area may generate poor quality leachate that would enter into the groundwater system.	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).
Poor quality seepage from Site PCD - Base Case	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	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).
Poor quality seepage from Site PCD - Scenario 1	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	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).
Poor quality seepage from Site PCD - Scenario 2	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	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).
Groundwater Dewatering	Following cessation of Site activities, groundwater levels at abstraction boreholes will recover to their original levels	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)
Poor quality seepage from stockpile area – Base case	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	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)

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Poor quality seepage from stockpile area - Scenario 1	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	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)
Poor quality seepage from stockpile area Scenario 2	Remnant coal product stored at the site stockpile area may generate poor quality leachate that would enter into the groundwater system	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)
Poor quality seepage from Site PCD – Base Case	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	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)
Poor quality seepage from Site PCD – Scenario 1	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	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)
Poor quality seepage from Site PCD – Scenario 2	Poor quality leachate may emanate from the Site PCD and enter into the groundwater system.	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)
Hydropedological			
Proposed siding infrastructure	Flow drivers to wetland may be impacted	Prevent hydropedological impacts on the wetlands.	
Surface Water			
Site clearing, including the removal of topsoil and vegetation, the Construction and operation of siding related 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
Runoff from the dirty water areas (Balloon siding, PCD and temporary stockpiles) and hydrocarbon and coal spillage and runoff from coal stockpiles, loading coal and transportation (conveyor) of coal	Surface water quality - Deterioration of surface water quality as a result of toxin and heavy metal contamination (Acid)	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

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Alteration of drainage patterns due to infrastructure	Surface water quantity - Reduction of Catchment Yield as dirty water runoff within the mine will be contained in the PCD.	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
Establishment of stormwater management infrastructure	Surface water quantity - alteration of flow due to the diversion of clean water areas	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
The closing of operations, site clean-up and rehabilitation of the area	Surface water quantity - Reinstatement of surface drainage patterns (Positive Impact)	To reinstate the surface water drainage patters	To ensure the natural surface water drainage pattern returns
Aquatic Ecology			
Site preparation and activities in close proximity or within regulated buffer zones of water resources	Loss of Biodiversity and Ecological function – Possible riparian zone impacts – such as the road crossing and conveyer crossing the river (both alternatives)	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on.	Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Early detection and prevention of possible impacts.
All activities in close proximity of the Dwars-in-die-wegvlei	Loss of Biodiversity and Ecological function. Interference with Ecological Corridor functioning between surface water features	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on.	Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Early detection and prevention of possible impacts.
All activities in close proximity of the Dwars-in-die-wegvlei	Alteration of local drainage patterns as a result of stormwater management features	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on.	Early detection and prevention of possible impacts.
Deterioration of water quality in the spruit and Blesbokspruit 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	Water quality impacts - Nutrient increase and Pollution from waste reaching the aquatic environment	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on.	Control through proper soil management procedures. Early detection and prevention of possible impacts.

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Inadequate waste and soil management – Direct or Indirect nutrient enrichment and leading to decline of Dissolved Oxygen (DO), thereby impacting the aquatic invertebrate communities found within the areas if flow is present.	Sedimentation of water resources by means of increasing load upstream, such as increased erosion, clearance of areas which could lead to the loss of topsoil or generally mismanagement during construction and establishment of infrastructure	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Waste entering the water environment leading to possible changes in PES of the downstream system – impacts to the RAMSAR and Blesbokspruit Aquatic Ecosystems	If river is negatively affected, it may lead to a deterioration of the Present Ecological Status (PES) and impact downstream water systems. This could be a cumulative impact that will not be easily reversed	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Stormwater management features, berms, culverts, low water bridges, diverting and impeding structures within 500m of river systems	Impacts to Streamflow Regulation - Water Quantity impacts (possibly diverting or impeding water flow) reducing water available to sustain Aquatic diversity	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
Decommissioning and material movement in proximity of water resources and rehabilitation of the beds or banks	Impacts to Biodiversity and Ecological function of Riparian zone or within buffer zones/regulated zones	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on,	Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Ensure biodiversity and ecological function is maintained.
Alteration of drainage patterns after or during removal of the infrastructure and rehabilitation of footprint	Leading to decrease and changes in water quantity and availability in the Ecological Reserve	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on,	Early detection and prevention of possible impacts.
Insufficient waste management practices during decommissioning	Possible water quality impacts - Leading to decrease and changes in water quality and availability in the Ecological Reserve	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. Prevent hydrological impacts and prevent contamination of water resources in order to ensure aquatic ecology is not negatively impacted on,	Ensure biodiversity and ecological function is maintained.
Wetlands			

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Compaction of soil, the removal of vegetation and surface water redirection during construction activities.	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	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.
Compaction of soil, the removal of vegetation and surface water redirection during construction activities	Changing the quantity and fluctuation properties of the watercourse by for example restricting water flow or increasing flood flows	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.
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	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.
The mishandling of hazardous substances and/or improper maintenance of machinery during construction, operation, and closure, may cause oil and diesel leaks and spills.	Changes in water quality due to pollution can result in the loss of sensitive biota in the downstream wetlands and a reduction in wetland function.	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.
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	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.
Direct development of infrastructure within wetlands	Loss and disturbance of wetland habitat; Wetland fauna fatalities	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.

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles.	Introduction and spread of alien vegetation which can impact on hydrology, by reducing the quantity of water entering a wetland system, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system alien invasive plants can spread through the catchment.	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 and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	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.

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Construction and closure activities will result in earthworks and soil disturbance. This could result in the loss of topsoil, sedimentation of the wetlands and increase the turbidity of the water. Possible sources of the impacts include: Earthwork activities during construction. Clearing of surface vegetation will expose the soils, which in rainy events would wash through the wetlands, causing sedimentation. Disturbance of soil surface. Disturbance of slopes through creation of roads and tracks adjacent to the wetlands. Erosion (e.g. gully formation, bank collapse).	Changes in sediment entering and exiting the system may result in smothering of vegetation and habitats and lead to loss of niche habitats. Furthermore, increased turbidity affects the oxygen concentration and temperature of the water. Sedimentation and erosion will lead to the degradation of wetlands	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.
Ecological			
Development and operation of infrastructure	The site has sections which ranges between slightly to severely degraded, and habitat has mostly been transformed, however, the onset of additional activities and road construction might result in impacts to the natural environment due to vegetation clearance, 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. Development related activities may lead to damage or degradation of highly sensitive habitats (VU2) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction activities additional fragmentation, degradation or compression may occur.	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.

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Development and operation of infrastructure	Development related activities may lead to the loss of floral species of conservation concern. Although no national SCC were found to occur on the project footprint, two SCC species are considered to be moderately or highly likely to occur on the project footprint. *Crinum bulbispermum* (Orange river lily) was identified to occur in VU2 outside the project footprint and is provincially protected in terms of the TNCO. A permit application will be required if this plant is to be cleared at any stage and the conveyer belt area is to be surveyed again before the onset of construction for SCC. Development and related activities could impact on the sensitive habitats (VU2) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	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.
Development and operation of infrastructure	Further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas and these could become established along the service road to be established along the conveyer belt as well. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	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.
Development and operation of infrastructure	Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU2). Impacts reaching downstream may impact on sensitive landscapes found (RAMSAR, IBA and Blesbokspruit).	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.

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Agriculture, Land Use and Land Capability			
Development and operation of infrastructure	Direct occupation / loss of land	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability.
Development and operation of infrastructure	Loss of grazing land	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability
Development and operation of infrastructure	Loss of crop production	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability.
Development and operation of infrastructure	Loss of animal production	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability.
Development and operation of infrastructure	Loss of agricultural infrastructure	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability.
Development and operation of infrastructure	Direct loss of jobs from farming	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability.
Visual			
Construction of siding infrastructure	Impact on Sensitive Receptors/Viewpoints	Early detection of impacts and remediation thereof.	Avoid and control through implementation of preventative measures
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Impact on the surrounding residential communities and land users will be increased due to the activities added to the area and an increase in heavy vehicles on the roads	Early detection of impacts and remediation thereof.	Avoid and control through implementation of preventative measures
Heritage			
Development and operation of infrastructure	Historical sites, (BA06, BA07, BA08) have been demolished, fall outside of the demarcated surface infrastructure area boundary and are not associated with material remains.	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

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Development and operation of infrastructure	Demolished historical sites within or near areas demarcated for surface development. Three Historical sites (BA04, BA05, BA09) have been identified falling within or within close proximity of the areas demarcated for surface development. These sites have been demolished and are not associated with surface remains.	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
Development and operation of infrastructure	Building ruins within or near areas demarcated for surface development. Site BA02 falls within the boundary of the area demarcated for surface development and consists of historical building ruins dating to at least 1936. The building ruins were identified as the married quarters of the old Palmietkuil Mine that operated between 1910 and 1953. It is envisaged that Site BA02 will be impacted by the proposed construction of the railway siding as the layout places the railway line directly in the path of the site.	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
Development and operation of infrastructure	Graves/Cemeteries located in the vicinity of the study area. Two sites (BA01 & BA02) were identified as graves/cemeteries in the vicinity of the proposed siding. It is likely that cemetery BA01 contains graves older, as well as younger than 60 years and are significant from a heritage perspective BA03 is single grave.	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
Paleontological			
Development and operation of infrastructure	Surface activities may impact upon the fossil heritage if preserved in the development footprint	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
Traffic			

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Construction of surface infrastructure related to the railway siding	Construction of the proposed infrastructure may result in an increase of traffic on the site	To limit impacts on traffic as a result of the project.	Traffic Control and prevention of impacts
Operation of the railways siding and conveyor belt	Operating of the railways siding may result in increased traffic on site	To limit impacts on traffic as a result of the project.	Traffic Control and prevention of impacts
Noise			
Construction of haul routes and conveyor routes and the implementation of concrete and surface related infrastructure	Construction activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	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 the siding and related activities	Operation activities may lead to an increase in noise levels to the Receptors (R1, R2, R3 and R4).	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).
Air Quality			
Site clearing, removal of topsoil and vegetation, Construction of Infrastructure, Conveyor Belt, General Transportation and hauling of material	Activities during the construction phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	To decrease impacts on air quality as a result of the project.	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact.
Operation of conveyor belt and railway siding	Activities during the operation phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers	To decrease impacts on air quality as a result of the project.	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact.
Closure of siding and related activities	Activities during the closure phase are identified as possible fugitive emission sources and may impact on the ambient air quality at the relevant environmental sensitive receivers.	To decrease impacts on air quality as a result of the project.	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact.
Climate Change			

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	Management Outcome
Operation of siding including railway related infrastructure, access roads, haul roads, product stockpile area, a pollution control dam, stormwater trenches, security offices, fuel storage and a conveyor belt	Climate change impacts may occur as a result of the product of the project	To decrease impacts on climate change as a result of the project	Early detection and prevention of possible impacts.
Socio-Economic			
Construction, operation and closure of the railways siding and related activities	Poor management of siding activities that result in economic displacement.	Minimise impacts on socio-economic environment.	Early detection and prevention of possible impacts.
Construction, operation and closure of the railways siding and related activities	Resettlement/ relocations may manifest as a result of economic displacement (loss of access to livelihoods) and impacts on the sense of place.	Minimise impacts on socio-economic environment.	Prevent impacts on farmers labourers and surrounding landowners at all stages of the development.
Construction, operation and closure of the railways siding and related activities	Devaluation as a result of combined impacts that could include potential impacts on water resources; intrusion impacts; crime; establishment of new informal settlements; trespassing; fragmentation of farmland.	Minimise impacts on socio-economic environment.	Avoid through preventative measures (e.g. communication with landowners, timing of activities). Control through implementation of EMPR mitigation measures.
Construction, operation and closure of the railways siding and related activities	Change in sense of place as a result of visual and land use impacts	Minimise visual impact of sensitive receptors	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 visual impacts to outside boundaries.
Construction, operation and closure of the railways siding and related activities	Security impact may be Indirect impact as a result of activities/influx of people to and from siding.	Minimise impacts on socio-economic environment.	Early detection and prevention of possible impacts.

15.7 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.

Refer to Table 66 for conditions which should be included in the Environmental Authorisation. The mitigation measures as specified within the Table 65 and within Part B: EMPR are to be included in the Environmental Authorisation.

To ensure compliance with, and implementation of the EMPr by:

Appointing of a suitably qualified individual to oversee implementation of the EMPr during all phases of the project; and

Appointing a suitably qualified Environmental Control Officer or Environmental Manager to undertake audits on a regular basis throughout the construction phase

To ensure that all staff, contractors and sub-contractors are aware of and understand the requirements of the EMPr and environmental issues in relation to their individual areas of work by:

- Developing an induction and training program covering the EMPr, environmental awareness, dealing with environmental incidents and waste management; and
- Advising staff commissioned during pre-construction and construction, including sub-contractors, of EMPr requirements through the induction program as well as on notice boards at the contractor’s camps during construction and notice boards during operation. These notice boards should cover the EMPr, environmental awareness, dealing with emergencies and waste management.

Submission of a Water Use License Application and the undertaking of all relevant specialist studies for that purpose (WUL in process). A detailed water balance will need to be produced before commencement and needs to include all water uses, volumes and rates.

All specialist recommentations included in Table 66 should be included in the authorization.

Any negative environmental impacts resulting from the proposed Welgedacht Balloon Siding on the local community will have to be addressed by Canyon. The proposed Welgedacht Balloon Siding has to be held accountable for any environmental damage caused as a result of the operation of the siding.

All monitoring programmes as described in Section 8 Part B: EMPR need to be implemented on site, including:

- An Environmental Noise Measurement Programme (Monitoring Programme) needs to be implemented. 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.

- An Air Quality Monitoring Programme needs to be implemented to get a baseline condition prior to the onset of the operations and in order to establish the level at which the proposed operations are noted to impact on the ambient air quality. If it is found that dust and PM10 levels are measured to be exceeding limits, it is highly recommended to establish a Real-Time indicative monitoring network to quantitatively help identify the sources and to assist in the management of the mitigation of these sources.
- Both SASS and Surface Water Monitoring Programme need to be implemented at the proposed siding as indicated in the EMPR; and
- Implementation of a groundwater monitoring plan as indicated in the EMPR.

Getting approval from Gautrans for the conveyor crossing of any existing /or future roads, as well as for the crossings of both the Balloon Siding and the main siding of K118 (in terms of the Gauteng Transport Infrastructure Act).

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 statement. 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. The proposed Welgedacht Balloon Siding Project can therefore go ahead.

18.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORIZATION

Please refer to Section 16, which states the conditions which should be included in the authorisation.

18.2.1 REHABILITATION REQUIREMENTS: CLOSURE OBJECTIVES

Should the proposed Welgedacht Balloon Siding be decommissioned, the closure objectives which will drive the closure criteria are:

- Return land as far as possible to a land capability to that which existed prior to the Welgedacht Balloon

Siding and that the management level required to utilise the rehabilitated land is within the means of the farmer who uses it;

- Remove all infrastructures that cannot be used by a subsequent landowner or a third party. Where buildings can be used by a third party, arrangements will be made to ensure their long-term sustainable use;
- Clean up all coal stockpiles - rehabilitate these as far as possible to a land capability to that which existed prior to siding activities.
- Follow a process of closure that is progressive
- Implement progressive rehabilitation measures, beginning during the construction phase wherever possible; Leave a safe and stable environment for both humans and animals and make their condition sustainable;
- To prevent any soil and surface/groundwater contamination by managing all water on site;
- Comply with local and national regulatory requirements;
- Form active partnerships with local communities to take of management of the land, where possible; and
- To maintain and monitor all rehabilitated areas following re-vegetation or capping and, if monitoring shows that the objectives have been met, making an application for closure.

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

As the proposed Welgedacht Balloon Siding project is a railway siding and can continue operating without the proposed Palmietkuilen Colliery, financial provision is not required for the proposed Welgedacht Balloon Siding project.

19.2 DESCRIBE THE CLOSURE OBJECTIVES AND THE EXTENT TO WHICH THEY HAVE BEEN ALIGNED TO THE BASELINE ENVIRONMENT DESCRIBED UNDER REGULATION 22 (2) (D) AS DESCRIBED IN 2.4 HEREIN

The precise date on which the proposed facility will be decommissioned has not been determined. A closure plan will be generated timeously once a closure date has been established and adequate resources will be allocated for effective closure and rehabilitation of the facility.

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

The environmental objectives in relation to closure will need to be made available to all registered I&APs for comment should Canyon apply for closure of the proposed Welgedacht Balloon Siding. All comments received and the relevant meeting minutes will be appended to the relevant report at that time.

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

The proposed project is for a railway siding which can operate separatly from the proposed mining at the Palmietkuilen Colliery. Therefore, should Canyon apply for closure of the proposed Welgedacht Balloon Siding, a closure plan will be generated. Also refer to Section 19.1 above.

19.5 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES

Refer to Section 19.1 above.

19.6 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT IN ACCORDANCE WITH THE APPLICABLE GUIDELINE

Refer to Section 19.1.

19.7 CONFIRM THAT THE FINANCIAL PROVISION WILL BE PROVIDED AS DETERMINED

Refer to Section 19.1.

20 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

A Socio-Economic Impact Assessment was added to the Agricultural Impact Assessment study, following comments from the I&APs during the scoping phase in order to determine the possible of the proposed Welgedacht Balloon Siding project on agricultural sector. Furthermore, an Alien Invasive Management Plan was compiled as per the comments received from GDARD.

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).

No deviations in terms of determining the significance of potential environmental impacts and risks have been made.

A Climate Change Assessment was added during the EIA phase and a socio-economic impact assessment was included in the Agricultural Impact Assessment following the public consultation during the scoping phase of the project.

20.2 MOTIVATION FOR THE DEVIATION

The additional studies were undertaken following requests from various interested and affected parties during the scoping phase of the project.

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 study was undertaken for the proposed project as part of the Agricultural Impact Assessment. Socio-Economic aspects have been adequetly assessed and addressed within this document. Various farming activities are situated on the surface where the proposed siding and related infrasrtucture of the siding is to be located.

21.1.1.1 LOSS OF ACCESS TO LIVELIHOODS (INCOMES)

Within the 500m buffer agricultural land uses mainly pertain to crops and grazing. The following pre-mitigation impacts associated with the siding could indirectly impact these land uses:

- Surface water pollution as a result of coal dust affecting crops and livestock;
- Groundwater pollution due to seepage of poor quality leachate from the PCD's and coal stockpile area;
- Coal dust and dust generated by traffic on access/service roads that settle on crops;
- Mismanagement of waste, coal spills and insufficient hazardous substance storage that results in surface and groundwater pollution, which impact livestock and human health;
- Livestock being killed due to speeding and negligent drivers.

These activities and the potential devaluation of agricultural land could result in economic displacement (loss of income, farming assets/fields, business infrastructure, etc.) on affected land portions. The nearest poultry houses are situated more than 1.6 km from the siding infrastructure and noise impacts, which could potentially impact poultry production, are unlikely.

21.1.1.2 SECURITY IMPACTS

Crime and security issues and the rise in stock theft numbers are often associated with the influx of workers, jobseekers and an increase in jobless people. An increase in human activities, roads that become more accessible to the wider public, and materials and equipment that are brought to site could further attract criminals. Indirectly an increase in crime has the potential to result in the economic displacement (loss of income and farming resources) and physical displacement of current farming ventures and workers.

The Delmas SAPS precinct reported an 18% increase in total contact crimes between the period January 2017 to March 2021. These crimes specifically include attempted murder, assault with the intent to inflict grievous bodily harm, common assault and robbery with aggravated circumstances. Carjacking and robberies at non-residential premises increased significantly during the same period (50 and 160% respectively) (www.saps.gov.za).

However, during this same period the Springs SAPS precinct reported a reduction in crime. Total contact crimes reduced with 13% and carjackings and robberies at non-residential premises decreased (-38 and -30% respectively) (www.saps.gov.za).

The following observations are made:

- Even though Springs SAPS reported a reduction in certain crime categories, existing crime levels in the study area remain high;
- Crime often increases during construction and appropriate mitigation measures are required;
- During the operational phase, no additional employment will be created at the siding and an influx of jobseekers as a result of this Project is unlikely;
- The purpose of the conveyor belt and railway line is to reduce road transport and additional movement into the area;
- Existing land uses include agriculture, residential, mining, electricity (substation) and railway infrastructure and the Project activities and associated infrastructure are not in contradiction with these;
- An increase in security issues as a direct result of this Project over the long-term is not likely.

Indirect impacts associated with the proposed Welgedacht Balloon siding is not likely to have a significant impact on surrounding landowners and land users (medium to low significance). Impacts on sense of place is, however, anticipated to be the greatest and is rated with medium significance.

21.1.1.3 RESETTLEMENT OF FARM WORKERS / RELOCATION OF HOUSEHOLDS

Economic displacement in the agricultural sector (loss in livelihoods) and impacts on the sense of place could result in the physical displacement of farming ventures/households/farm workers. Since indirect impacts cannot easily be measured, affected parties are usually not compensated and have to carry the financial burden to impacts and a change in current land uses might be the trigger and/or cause for any impacts on sense of place. The proposed project area is situated in an area characterised by agricultural land uses, wetlands, road and rail infrastructure, Eskom infrastructure, residential farms, Aston Lake sports and recreation facilities and various residential smallholdings and communities.

21.1.1.4 NOISE

The impact of noise from various aspects and the operation of the siding will be of high to medium negative significance. Recommendations have been made for mitigation measures to ensure that impacts will be low, when managed and monitored (T**able 65**).

21.1.1.5 VISUAL

The Visual Impact Assessment determined that specifically the infrastructure in the eastern region of the proposed Welgedacht Balloon siding may potentially have a significant effect and noticeable change on the agricultural quality and scenic appearance of the immediate environment. The siding will establish a new precedent for development in a largely agricultural area and a noticeable change in the visual character of the area is expected. Mitigation is, however, possible and would reduce visual impacts on scenic resources and surrounding land users.

It is thus likely that impacts on sense of place will occur and can be mitigated to a certain extent by implementing the recommendations and mitigations as proposed by the Visual Specialist.

21.1.1.6 AIR POLLUTION

The impact is considered low to insignificant negative significance. The dust generated during associated activities and operational phase may reduce the air quality of the localised air. Occupational Health monitoring as part of the management should be initiated, as well as monthly dust monitoring. Monitoring is to be performed in accordance with the requirements as set out in GNR 827, ASTM D1739 and SANS 1929.

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).

The heritage assessment for the proposed Welgedacht Balloon Siding was undertaken by Mr. Tobias Coetzee. Mitigation measures have been included in this EIAR and the specialist HIA assessment is included in the impact management tables and EMPr. It is unlikely that the proposed Welgedacht Balloon Siding and related infrastructure will impact on heritage features.

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 (TO BE INCLUDED IN FINAL EIAR)

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 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 Canyon Resources (Pty) Ltd: Welgedacht Balloon Siding 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-

23 REFERENCES

Alicanto Groundwater Solutions. 2020. Welgedacht Balloon Coal Siding Groundwater Study.

Bamford, M. 2022. Palaeontological Impact Assessment for the proposed Welgedacht Balloon Siding between Springs and Delmas, Gauteng Province.

Coetzee, T. 2022. A Phase 1 Archaeological Impact Assessment for the Proposed Welgedacht Balloon Siding near Springs, Gauteng.

Corli Havenga Transportation Engineers. 2021. Traffic Impact Statement Welgedacht Balloon Siding.

Crop Estimates Consortium, 2019. *Field crop boundary data layer (MP province)*, 2019. Pretoria. Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2017. *National land capability evaluation raster data: Land capability data layer*, 2017. Pretoria.

Eco Elemental Engineering. 2022. Welgedacht Balloon Siding - Air Assessment.

Elemental Sustainability (Pty) Ltd. 2022. 2022. Visual Impact Assessment – Proposed Welgedacht Balloon Siding

Elemental Sustainability (Pty) Ltd. 2022. Wetland Delineation and Functionality Assessment for the Proposed Welgedacht Balloon Siding, Gauteng Province

Envirdi Environmental Consultants (Pty) Ltd. 2022. Canyon Resources (Pty) Ltd – Welgedacht Balloon Siding, Terrestrial Biodiversity Impact Assessment.

Envirdi Environmental Consultants (Pty) Ltd. 2022. Canyon Resources (Pty) Ltd – Welgedacht Balloon Siding Aquatic Ecology Impact Assessment and Management Plan.

Geo Pollution Technologies (Pty) Ltd. 2022. Wetland flow driver assessment - Proposed Welgedacht Balloon Siding.

Index (Pty) Ltd. 2022. Land Capabilty and agricultural Impact Assessment Welgedacht Balloon Siding.

Kijani Green Energy. 2022. Climate Change Impact Report – Welgedacht Quality Balloon Siding Project.

Kruseman, G.P. and N.A. de Ridder, 1994. *Analysis and Evaluation of Pumping Test Data (2nd ed.)*, Publication 47, Intern. Inst. for Land Reclamation and Improvement, Wageningen, The Netherlands, 370p

Land Type Survey Staff (1972 – 2006). *Land Types of South Africa data set*. ARC – Institute for Soil, Climate and Water. Pretoria.

Mucina, L. & Rutherford, M. C. (2006). The vegetation of South Africa, Lesotho and Swaziland. (Strelitzia 19). South African National Biodiversity Institute. Pretoria.

Nel, J.L., Murray, K.M., Maherry, A. M., Petersen, C.P., Roux, D. J., Driver, A., Hill, L. van Deventer, H., Funke, N., Swartz, E. R., Smith-A Dao, L. B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). *Technical Report for the National Freshwater Ecosystem Priority Areas*. (Report No. 1801/2/11). Water Research Commission.

Redkite Environmental Solutions (Pty). Ltd. 2022. Canyon Resources (Pty) Ltd: Welgedacht Balloon Siding Project Alien Invasive Plant Management Plan.

SANS 10103: 2008.

South Africa (Republic) 2018. *Long-term grazing capacity for South Africa*: Data layer. Government Gazette Vol. 638, No. 41870. 31 August 2018. Regulation 10 of the Conservation of Agricultural Resources Act (CARA): Act 43 of 1983. Pretoria. Government Printing Works.

The Soil Classification Working Group (2018). *Soil Classification – Taxonomic System for South Africa.* Dept. of Agric., Pretoria.

Western Cape Department of Environmental Affairs & Development Planning (WC DEADP) Guideline on alternatives: EIA Guideline and Information Document Series (2011).

Western Cape Department of Environmental Affairs and Development Planning's (WC DEADP). *Guideline on Need and Desirability: EIA Guideline and Information Document Series* (2011).

WRW Consulting Engineering. 2022. Canyon Resources (Pty) Ltd. Proposed New Coal Handling and Loading facility at Palmietkuilen Siding outside Welgedacht Station near Springs in Gauteng -Contaminated Water Management Design Report.

24 APPENDICES

Appendix 1: EAP Declaration

Appendix 2: EAP CV

Appendix 3: Layout

Appendix 4: Composite Layouts

Appendix 5: Water Balance Report

Appendix 6: Scoping Phase Public Participation

Appendix 7: EIA Phase Public Participation

Appendix 8: Hydrogeological Assessment

Appendix 9: Hydropedological Assessment

Appendix 10: Surface Water Assessment

Appendix 11: Wetland Assessment

Appendix 12A: Ecological Assessment

Appendix 12B: Alien Invasive Managent Plan

Appendix 13: Agricultural and Socio-economic Assessment

Appendix 14: Visual Assessment

Appendix 15: Heritage Impact Assessment

Appendix 16: Paleontological Assessment

Appendix 17: Traffic Assessment

Appendix 18: Noise Assessment

Appendix 19A: Air Quality Assessment

Appendix 19B: Climate Change Assessment

Appendix 20: Scoping Report Acceptance

Appendix 21: EIA Impact Assessment