June 2015

KHONGONI HAASKRAAL COAL

Environmental, Social and Health Impact Assessment - Final Scoping Report

Submitted to:
Department of Mineral Resources
Reference No LP30/5/1/2/2/10105MR

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SCOPING REPORT

Golder Associates

Purpose of this Document

Khongoni Haaskraal Coal (KHC) is considering the establishment of an opencast coal mine and associated infrastructure on the farms Haaskraal 221 LQ and Eigendomsbult 222 LQ respectively in the Magisterial District of Lephalale in the Limpopo Province. KHC has applied for a mining right on Haaskraal 221 LQ and for environmental authorisation for listed activities in terms of the 2014 Environmental Impact Assessment (EIA) Regulations (GN R.982, GN R.983, GN R.984 and GN R.985) on both farms.

In terms of the Mineral and Petroleum Resources Development Act (No 28 of 2002, hereafter MPRDA) and the EIA Regulations, KHC is required to undertake an EIA process and submit a Scoping Report, an EIA Report and an Environmental Management Programme (EMPr), which describes the environmental impacts of the proposed development and how they will be managed and mitigated.

Golder Associates Africa (Pty) Ltd, an independent environmental and engineering company, is conducting the EIA and associated licensing processes for KHC.

In line with international standards, such as the Equator Principles (EP) and the requirements of the International Finance Corporation (IFC), this EIA is subject to a process of environmental, social and health impact assessment (ESHIA). This process is being carried out in a number of phases, namely:

a) Project Screening – Involving an evaluation of the Project and Environmental Impact Assessment (EIA) against international standards to identify gaps in information and the requirements to update the study;
b) Project Definition – carrying out studies to evaluate the most viable project configuration;
c) ESHIA Scoping - development of the methodology (Plan of Study) to carry out the impact assessment;
d) Baseline Studies – to provide an evaluation of the environment that may be affected by the Project;
e) ESHIA Impact Assessment and Management System Development – carrying out an evaluation of impacts and benefits of the Project and proposing measures to mitigate impacts and enhance positive benefits; and
f) Decision Making – the ESHIA will be provided to the South African government departments dealing with environmental and mining authorisations for a decision on whether the Project may go ahead and, if so, under what conditions.

During this process the public is consulted on an on-going basis, with issues and concerns being recorded and incorporated into the process for evaluation. Feedback will be provided when a decision on the Project has been made. The public is also given the opportunity to comment on the Project, the proposed activities and the proposed scope of the ESHIA specialist studies. The comments received thus far have been recorded in this Scoping Report.

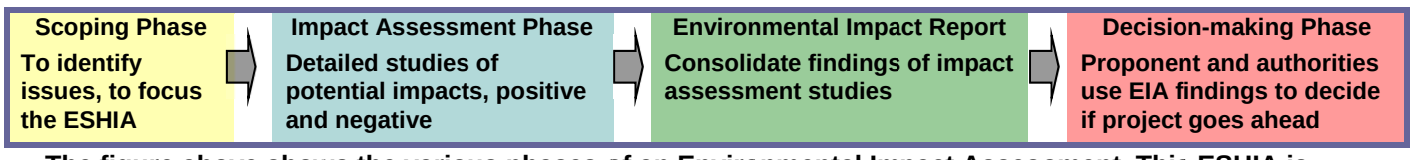
This Scoping Report is being presented to stakeholders so that they may confirm that their comments have been received and to provide them with more information and an additional opportunity to provide comment and/or raise issues of concern.

The due date for comment on this Scoping Report is **Friday, 17 July 2015**. Comments received during the public review period will be acknowledged and recorded in the final version of the ESHIA Report/EMPr, which will be presented for public comment during November 2015.

Summary of what the Scoping Report contains

This report contains:

- A description of the proposed mining activities;
- An overview of the ESHIA process, including public participation;
- A description of the existing environment in the proposed project area;
- The anticipated environmental issues and impacts which have been identified;
- The proposed scope of specialist studies planned for the Impact Assessment phase; and
- A list of interested and affected parties and their comments.



The figure above shows the various phases of an Environmental Impact Assessment. This ESHIA is in the Scoping Phase, during which interested and affected parties comment on the proposed project.

PUBLIC REVIEW OF THE SCOPING REPORT

The Scoping Report is available for comment from **Wednesday, 17 June 2015** until **Friday, 17 July 2015** on the Golder Associates Africa website www.golder.com/public, from the Public Participation Office upon request and at the following public places:

PUBLIC PLACE	CONTACT PERSON	TELEPHONE NUMBER
Lephalale Post Office	Ms Sonja Smalberger	014 763 2642
Marapong Community Library	Ms Sophonia Petja	014 748 3927
Lephalale Public Library	Ms Hazel Mashaba	014 762 1453
Golder Associates	Ms Estrellita Crause	011 254 4800

OPPORTUNITIES FOR PUBLIC REVIEW

Stakeholders wishing to comment on the Scoping Report, may do so in any of the following ways:

- Written submissions directly to the DMR, copies to Golder; and
- Comment by e-mail or telephone.

Comments may be made directly to Mr Aaron Kharivhe, Regional Director of the Department of Mineral Resources, 101 Dorp Street, Polokwane, 0699, copied to the public participation office as indicated below.

DUE DATE FOR COMMENT ON SCOPING REPORT
Friday, 17 July 2015

Please submit comments to the Public Participation Office:

Erika du Plessis or Estrellita Crause

Golder Associates

P O Box 6001

HALFWAY HOUSE, 1685

Tel: (011) 313 1072

Fax: (011) 315 0317

Email: Eduplessis@golder.co.za

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Glossary of terms and list of acronyms

Acronym	Description
ABA	ABA
AIA	Archaeological Impact Assessment
AMD	Acid mine drainage
ARD	Acid rock drainage
BID	Background Information Document
CBO	Community Based Organisation
CBM	Coal bed methane
CD	Compact Disk
DEA	Department of Environmental Affairs
DHSD	Department of Health and Social Development
dBA	A-weighted decibels a unit in which sound levels are measured
DMR	Department of Mineral Resources
DPW	Department of Public Works
DRT	Department of Roads and Transport
DTM	Digital Terrain Model
DWS	Department of Water and Sanitation
LDA	Limpopo Department of Agriculture
EAP	Environmental Assessment Practitioner
ESHIA	Environmental, Social and Health Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
FET	Further Education and Training
GG	Government Gazette
GN	Government Notice
GIS	Geographic Information System
g/t	grams per tonne
ha	Hectare
HIA	Health Impact Assessment
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
KHC	Khongoni Haaskraal Coal
Km	Kilometre
ktpm	kilotonnes per month
kV	Kilovolts

Acronym	Description
l/s	Litres per second
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LoM	Life of Mine
m^3/d	Cubic metres per day
mamsl	metres above mean sea level
MAP	Mean Annual Precipitation
mbgl	Metres below ground level
Ml	Megalitres
MPRDA	Mineral and Petroleum Resources Development Act, No. 28 of 2002
MRA	Mining Right Application
mS/m	Milli Siemens per metre
Mt	Megatonnes
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act, No.107 of 1998
NEMAA	National Environmental Management Amendment Act. Act No. 62 of 2008
NEMBA	National Environmental Management Biodiversity Act, No. 10 of 2004
NEM:WA	National Environmental Management Waste Act, No. 59 of 2008
NGOs	Non-Governmental organisations
NHRA	National Heritage Resources Act, No. 25 of 1999
PPP	Public Participation Process
PRECIS	Pretoria Computerised Information System
RO	Reverse osmosis
RoM	Run of mine
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SLP	Social and Labour Plan
SMS	Short Message System
SDF	Spatial Development Framework
ToR	Terms of Reference
WTP	Water treatment plant

1.0 INTRODUCTION AND OVERVIEW

1.1 Background

Khongoni Haaskraal Coal (KHC) obtained a prospecting right (No: 659 PR) in terms of section 16 and section 17 of the Mineral and Petroleum Resources Development Act (No 28 of 2002, MPRDA) in 2006 and undertook a prospecting programme on the farm Haaskraal 221 LQ in in the Magisterial District of Lephalale in the Limpopo Province over a period of six years, from 2009 to 2014.

Sufficient reserves were demonstrated to sustain an opencast mining rate of 7 million tons per annum, about half of which will be product and the rest discard coal, for a period of 45 years, excluding a year of build-up to full production rate and two years of declining production towards the end of the life of the opencast mining operations.

Additional coal reserves were indicated at greater depths that could sustain underground mining operations at rates of 2 to 3 million tons per annum for more than 20 years.

KHC applied for a mining right in terms of section 22 of the MPRDA at the end of April 2015 with the intention of establishing an opencast coal mine on about 800 ha of Haaskraal and supporting infrastructure on about 300 ha of the adjacent farm Eigendomsbult 222 LQ.

The proposed mining area is about 15 km north-west of Exxaro's Grootegeluk coal mine and 35 km north-west of Lephalale, which is the nearest town See Figure 2-1.

KHC submitted a mining right application for the entire farm of Haaskraal 221 LQ to the DMR on 12 June 2015. KHC appointed Golder Associates Africa (Pty) to develop the required social and labour plan (SLP) and to undertake the scoping phase of the environmental impact assessment (EIA). The mining work programme (MWP) was developed by KHC.

1.2 Contents of the Report

The purpose of a Scoping Report is to present the proposed scope of work to develop an ESHIA for the project. This document has been structured as follows to meet the requirements of the IFC, the Equator Principles and the South African environmental legislation:

1) **Introduction and overview** – Introduces the Project and the Project proponent, gives an overview of the Project, provides the details of the environmental practitioner, and explains the ESHIA/EIA process.

2) **Project Motivation** – provides an indication of the need for and desirability of the Project.

3) **ESHIA Process –** summarises the process being undertaken with respect to Environmental, Social and Health Impact Assessment for the Project, inclusive of the methodology utilised for Scoping**.**

4) **Description of the Proposed Project** - Provides a summary of the key Project components, the Project location, scale, nature and design, production process, main inputs and outputs, schedule and activities during different phases of the Project, inclusive of a description of the Project location and the properties on which the Project will take place.

5) **Project Alternatives –** summarises alternatives considered by the Project proponent.

6) **Policy, Legal and Administrative Framework** – Discusses the environmental policy, legal, and administrative framework applicable to the Project. This includes a summary of relevant South African regulations, the applicable administrative framework, and the environmental permitting process.

7) **Description of the Environment that may be Affected** – Describes the current pre-project biophysical, socio-economic, and cultural status of the area, key characteristics (sensitive or vulnerable areas), important heritage resources, current land use and livelihoods.

8) **Environmental Issues and Potential Impacts of the Project -** Summarises the identified impacts and issues and potential mitigation measures that will be assessed further in the ESHIA. This section also includes the Plan of Study for the Impact Assessment.

9) **Public Consultation –** This section provides a summary of the public consultation activities proposed and carried out as part of the ESHIA / EIA processes.

10) **Next Steps in the Process –** Indicates what the next steps in the process are.

11) **References –** references to literature consulted.

12) **Appendices** – technical material supporting the Scoping Report, including the Curricula Vitae (CV) of the ESHIA / EIA team, stakeholder engagement plan and supporting information, and comments and response report, and document limitations.

2.0 PROPONENT AND PRACTITIONER DETAILS

2.1 Details of the proponent and environmental assessment practitioner

For purposes of this ESHIA, the following person may be contacted at Khongoni Haaskraal Coal:

Table 2-1: Proponent's contact details

Contact Person	Khakhathi Peter Munyai
Address	Unit 19, Oxford Office Park, 3 Bauhinia Street, Highveld Technopark, Centurion
Telephone	011 804 6448
Fax	086 691 0572
Cell phone	083 442 6477
E-mail	Khakhathi@khongoni.co.za

2.1.1 Details of environmental assessment practitioner

KHC has appointed Golder Associates Africa (Pty) Ltd (GAA) as an independent Environmental Assessment Practitioner (EAP) to undertake the scoping phase of the Environmental, Social and Health Impact Assessment (ESHIA) that is required to support the application for a mining right and funding from the IFC or a bank that is a signatory to the Equator Principles.

Golder Associates Africa is a member of the world-wide Golder Associates group of companies, offering a variety of specialised engineering and environmental services. Employee owned since its formation in 1960, the Golder Associates group employs more than 8 000 people who operate from more than 180 offices located throughout Africa, Asia, Australasia, Europe, North America and South America. Golder Associates Africa (GAA) has offices in Midrand, Pretoria, Florida, Durban, Rustenburg, Cape Town, Maputo and Accra. GAA has more than 300 skilled employees and is able to source additional professional skills and inputs from other Golder offices around the world.

GAA has no vested interest in the proposed project and hereby declares its independence as required by the South African EIA Regulations.

For purposes of this ESHIA, the following persons may be contacted at GAA:

Table 2-2: Contact details of environmental assessment practitioner

Contact Persons	Etienne Roux	Erika du Plessis
Purpose	Technical	Public Participation
Address	P O Box 6001 Halfway House 1685	P O Box 6001 Halfway House 1685
Telephone	011 254 4970	011 254 4894
Fax	011 315 0317	011 315 0317
Cell phone	082 774 2045	082 677 6417
E-mail	Eroux@golder.co.za	Eduplessis@golder.co.za

2.1.2 Expertise of environmental assessment practitioner

2.1.2.1 Qualifications

The EAP holds an MSc degree in physical chemistry from the University of Pretoria (1966) and an MBL degree from the University of South Africa (1974). He also completed a Development Programme in Labour Relations at the University of South Africa (1984).

2.1.2.2 Summary of past experience

1962-1966: African Explosives and Chemical Industries Ltd, Modderfontein – research and development work on industrial electrochemical processes;

1967-1993: Foskor Ltd, Phalaborwa – analytical chemistry, systems analysis, research and development, geological exploration, mining, production, tailings storage, environmental management, strategic corporate planning;

1993-2005: Industrial Development Corporation: Responsible for developing corporate environmental, health and safety policy and capability, managing environmental aspects of IDC's larger industrial, mining and agricultural projects, managing remediation programs on polluted sites, designing and implementing an EHS risk assessment methodology specifically for a financial institution and overseeing its application. Participated in more than 50 EIAs within South Africa and seven other African countries, several with involvement from World Bank, IFC, European Investment Bank, African Development Bank, Kreditanstalt für Wiederaufbau, provided environmental guidance on IDC's investment decisions and served as director on boards of two IDC subsidiaries.

2006 – Present: Golder Associates Africa (Pty) Ltd – Undertook more than 20 complete EIAs, 5 environmental audits and several environmental due diligence investigations.

2.2 Description of the property

Table 2-3: Details of area applied for

Aspect	Description
Farm Names	Haaskraal 221 LQ and Eigendomsbult 222 LQ
Application area	Haaskraal: 948 ha – mining right Eigendomsbult: 350 ha – development of supporting infrastructure
Magisterial District	Lephalale
Distance and direction from nearest town	About 35 km north-west of Lephalale
SG Codes	Haaskraal: T0LQ00000000022100000 Eigendomsbult: T0LQ00000000022200000

2.3 Locality map

See Figure 2-1, which shows the locations of the two farms Haaskraal 221 LQ and Eigendomsbult 222 LQ in relation to Lephalale (the nearest town), the border with Botswana, the R510 and the border post at Stockpoort.

The project area is located about 35 km north-west of Lephalale. The R510 regional road passes about 10 km to the north of the project area and a regional gravel road to Lephalale borders Haaskraal 221 LQ along the south-western boundary. Exxaro's Grootegeluk Coal mining complex is situated about 20 km to the south-east of the site along this regional gravel road, and the Stockpoort Border Post is roughly 13 km to the north of the area.

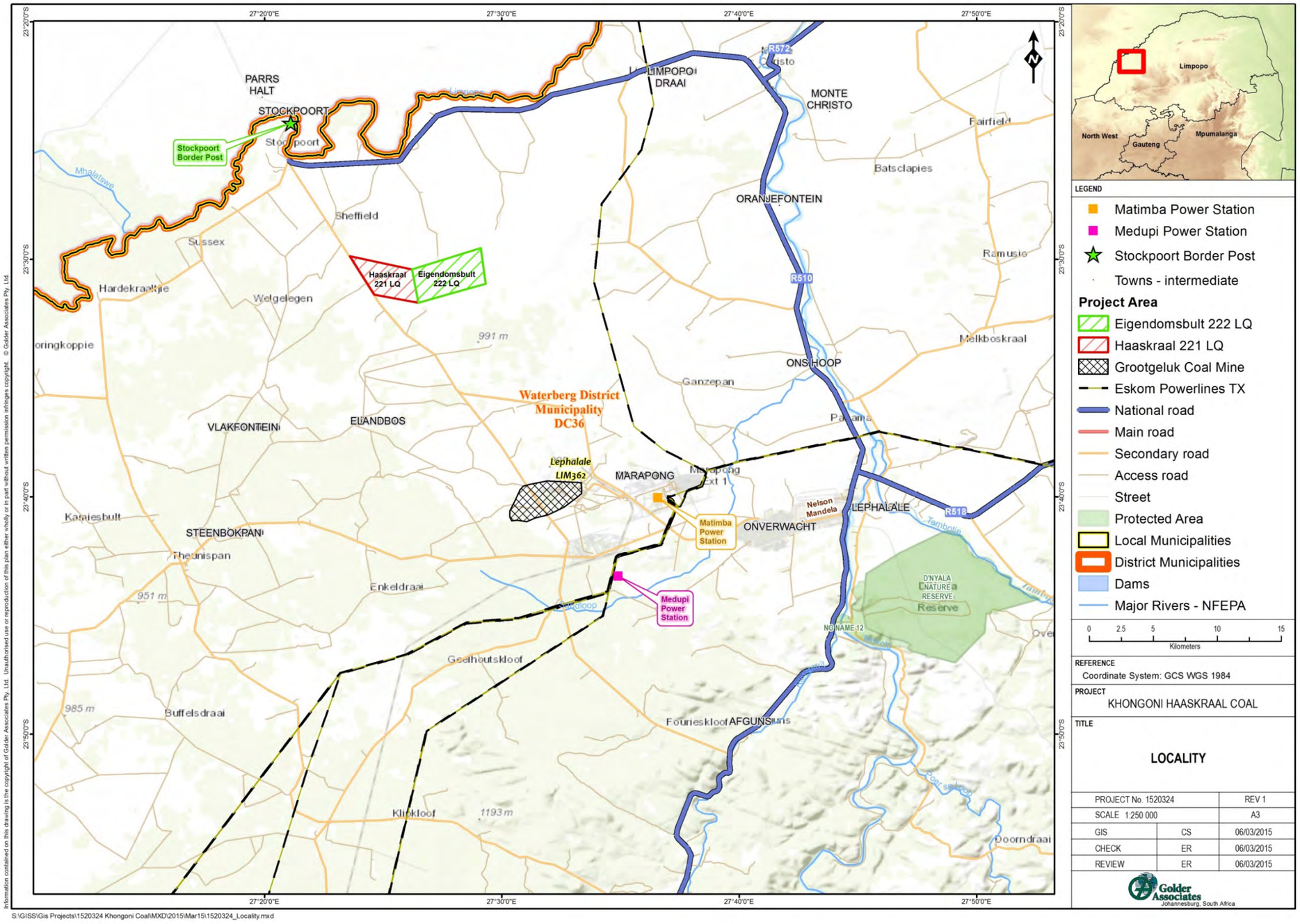


Figure 2-1: Locality Map

2.4 Description and Scope of the Proposed Overall Activity

2.4.1 Mining operations

Sufficient reserves have been proven on the farm Haaskraal 221 LQ to support a coal mining rate of about 7 million tons per annum for 47 years. The average thickness of the overburden is about 75 metres, increasing from about 30 metres in the north-western part of the farm Haaskraal to more than 200 metres in the south-eastern part – see section 2.9.1 of this report for a description of the geology.

The coal occurs in layers of varying thickness which are interspersed with interburden layers of shale, sandstone and gritty sandstone, as illustrated in Figure 2-2. KHC intends to mine zones 7 to 11 by truck and shovel opencast methods. The coal will be transported by haul trucks to a coal processing plant and other supporting infrastructure that will be established on the adjacent farm Eigendomsbult 222 LQ.

Zone 4 contains low grade coal with a raw calorific value of only about 11MJ/Kg, which can almost be qualified as waste material and there is a thick interburden layer between zones 4 and 3. Opencast mining of the seams below zone 7 is not viable. Zones 3 and 2 will be accessed *via* a separate multi seam underground mining operation. Zone 1 is very thin and will be left *in situ*.

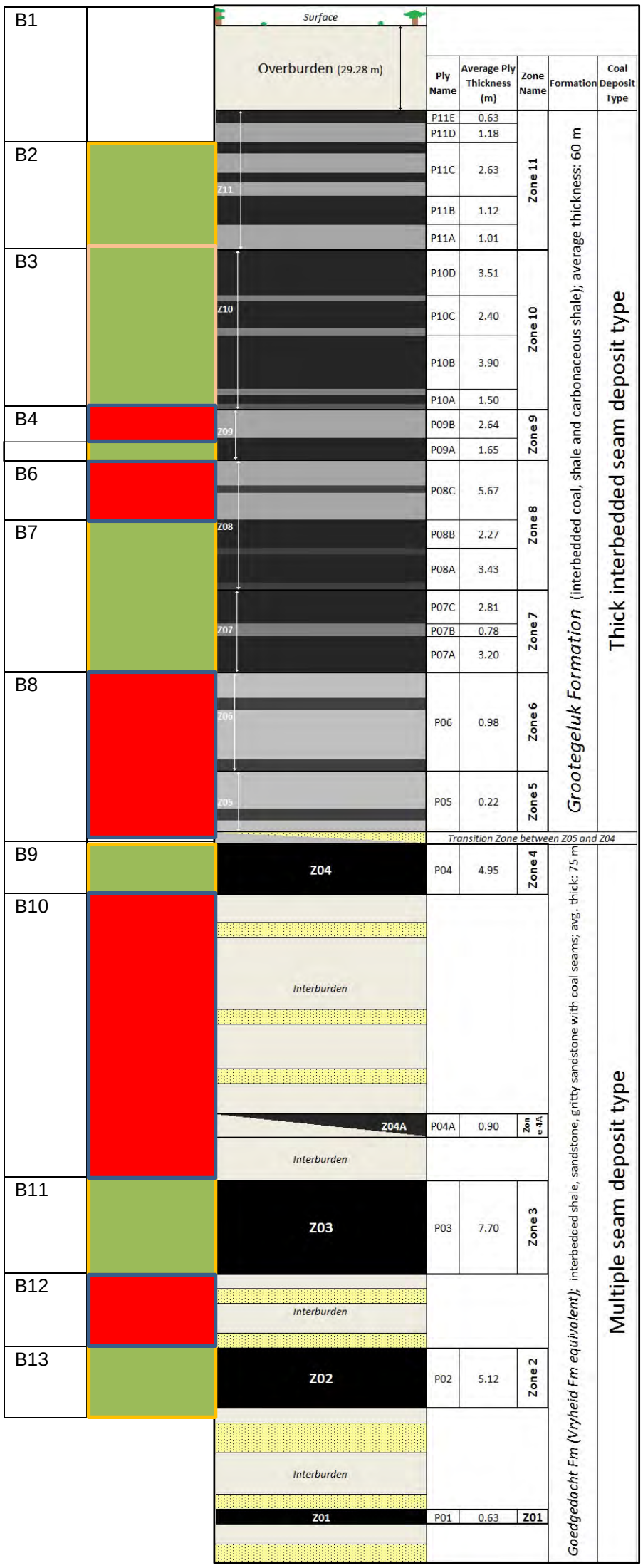


Figure 2-2: Minable coal seams interspersed with interburden layers

The rollover mining method (see Figure 2-3 for a schematic illustration) will be practised, whereby the topsoil and overburden from the first cut of the opencast mine are stockpiled at the position of the last cut. As the opencast mine progresses, the overburden and topsoil from each successive cut are backfilled into the void from the previous cut, the surface is shaped to be free draining, the topsoil is analysed and treated appropriately and the surface is re-vegetated. At the end of the life of the opencast mine the final void is backfilled with the overburden from the final cut of the last remaining pit.

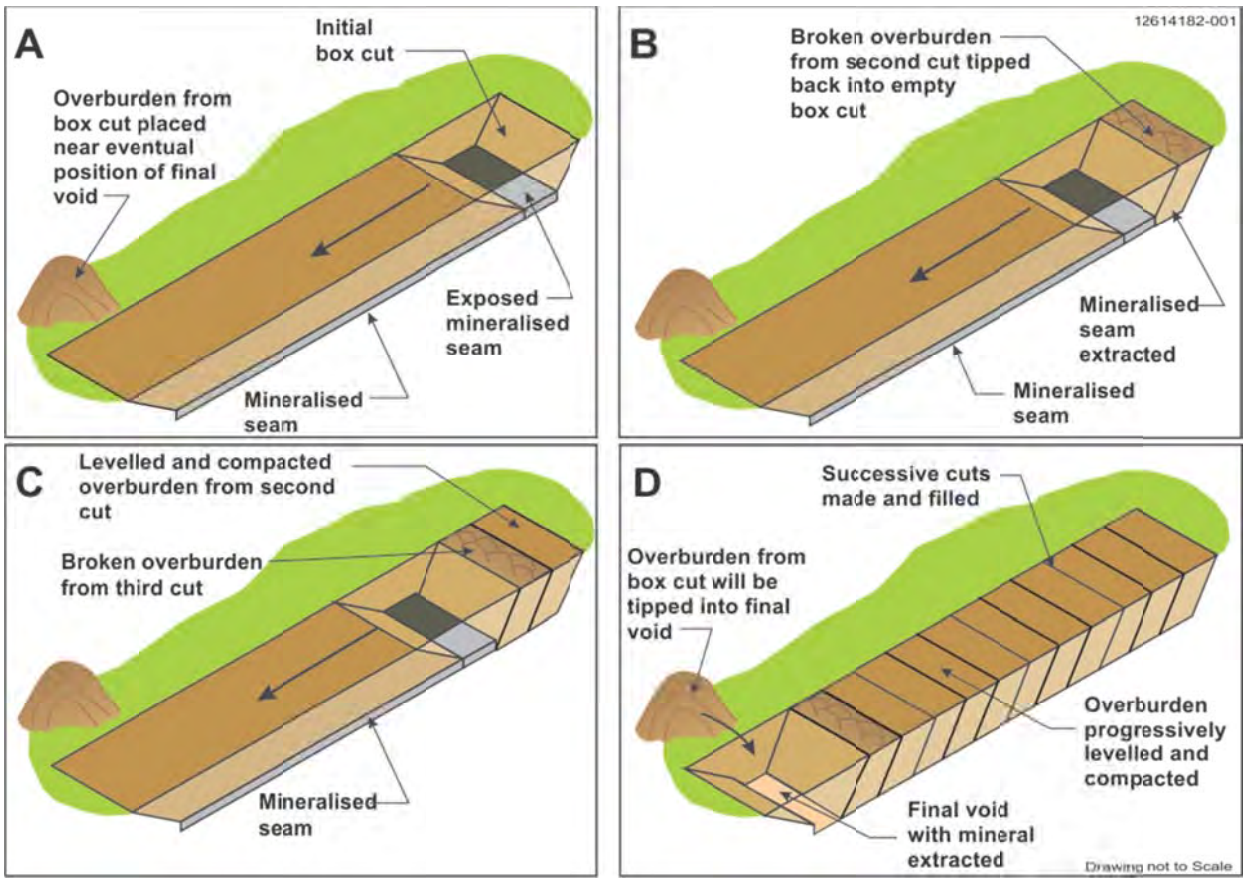


Figure 2-3: Schematic illustration of rollover mining method

2.4.2 Other operations

As indicated on Figure 2-4 and Figure 2-47, KHC proposes to establish supporting infrastructure comprising coal handling, processing, storage and dispatch to market on the adjacent farm of Eigendomsbult 222 LQ.

Selective mining will be practised to mine the coal and shale layers separately, but the run of mine (RoM) coal will contain some shale material. The RoM coal will be de-stoned by dry washing to separate shale material from coal. Dry washing involves crushing and screening the RoM into various size fractions and passing the different size fractions over air-flow tables. Air is blown through the perforated base of the table and the lighter coal is separated from the heavier, stony shale material.

About 50% of the run-of-mine coal is expected to report as good quality thermal coal suitable for transport to Eskom's Majuba and Kusile power stations in Mpumalanga, while the remainder will be a low quality coal. Such coal would normally be stockpiled as "discard coal" at many mines, but there is a possibility that an independent power producer (Royal Haaskoning dhv, a Dutch company) may erect a local power plant utilising fluidised bed combustion technology, which is capable of utilising very poor quality coal.

KHC envisages backfillng low grade coal, for which no beneficial use can be found, into the mining void and covering it with compacted overburden followed by topsoil and a vegetation cover of locally indigenous plants. In terms of current preliminary mine planning, backfilling operations will commence in the ninth year of operation.

Water will abstracted from dewatering boreholes along the perimeter of the mine and pumped out of the opencast mine and, at a later stage, from the underground mine, to create safe and workable conditions in the mine. This water will be used for dust suppression in the mine, on the haul roads and on other unpaved areas. Water for domestic use by the mine personnel will also have to be sourced from boreholes. As shown in Table 2-20, the groundwater in the KHC project area is generally not of potable quality and KHC intends constructing a reverse osmosis (RO) water treatment plant (WTP) to produce potable water. Due to the low permeability of the geological structures within the project area, it is uncertain whether mine dewatering alone will be able to supply KHC's entire water needs.

KHC has had discussions with Anglo American about their coal bed methane (CBM) project in the Waterberg coal field. Groundwater has to be abstracted from the coal seams to release the methane gas. The so-called 37-spot wellfield, consisting of 37 abstraction boreholes located on the Farm Nooitgedacht 403 LQ, about 11 km from KHC's proposed infrastructure site on Eigendomsbult 222 LQ, will be able to supply KHC with an estimated 1.3 million m^3 of brackish coal seam water per annum, which would enable KHC to meet its own needs and to supply water of potable quality to current groundwater users in the vicinity of the KHC project area.

2.4.3 Listed and Specific Activities

KHC has applied for a mining right on Haaskraal 221 LQ and environmental authorisation for the development of supporting infrastructure on the adjacent Eigendomsbult 222 LQ (see Figure 2-4). The listed activities that require environmental authorisation in terms of the EIA Regulations (2014) are indicated in Table 2-4.

Table 2-4: Listed activities requiring environmental authorisation

Regulation	Activity Number	Description
GN R.983	11	The mine will need to establish a 33 KV power line from Eskom's Matimba power station over a distance of about 33 km to the mine and plant areas
	12	The stormwater management system will require the development of- (ii) runoff collection channels exceeding 100 square metres in size; (iv) pollution control dams, where the dams, including infrastructure and water surface area, exceed 100 square metres in size; (vi) bulk stormwater outlet structures exceeding 100 square metres in size;
	14	Development of facilities and infrastructure for the storage and handling of 450 cubic metres of diesel fuel
	19	An estimated 146 000 cubic metres of soil and sand will be removed from two drainage lines within the footprint of the opencast mine on Haaskraal 221 LQ during the course of the mining operations.
GN R.984	6	KHC will need a water use licence for mine dewatering, the pollution control dam, the process water storage dam and for the storage of discard coal
	15	The footprint of the opencast mine will have a surface area of about 658 ha. The haul roads and stockpiles of topsoil and overburden will occupy another 142 ha on Haaskraal 221 LQ. Indigenous vegetation will be cleared ahead of the mining front on Haaskraal and from about 447 ha of land on Eigendomsbult 222 LQ, where the coal processing and handling infrastructure will be established.
	17	A mining right will be required for activities such as blasting, excavating, loading, hauling and transporting of overburden and coal, stockpiling of overburden, discard coal and product coal, constructing and operating a storm water control system, pollution control dams, water supply dams and boreholes, a coal processing plant, workshops, ablution facilities, offices, stores, berms, roads, pipelines, power lines, conveyors, and fencing.
	21	There will be a coal beneficiation plant to produce various commercial grades of coal by crushing, screening and washing

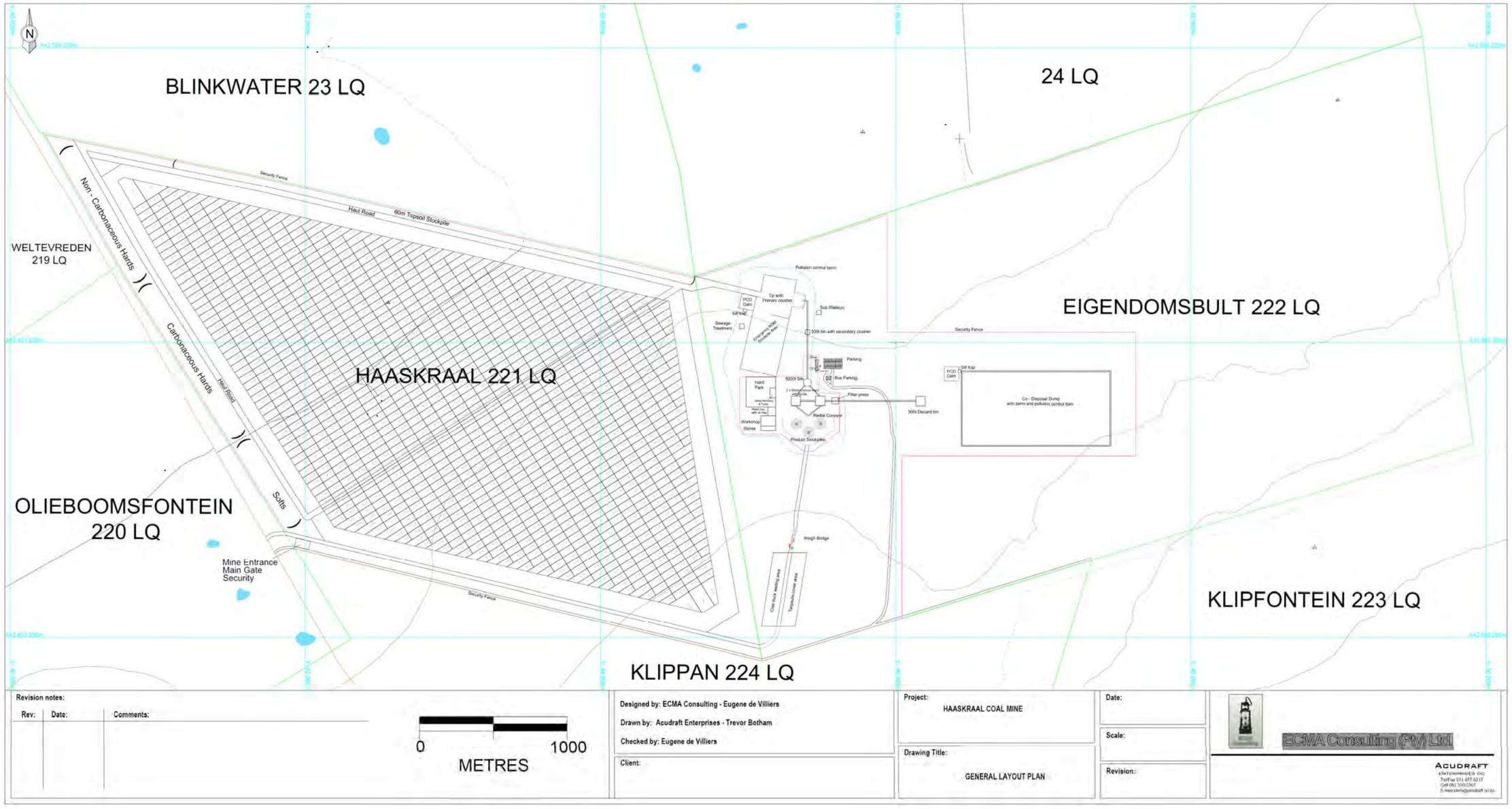


Figure 2-4: Initial site layout plan

2.4.4 Activities to be undertaken

The specific activities will be:

- Drilling of infill boreholes for detailed mine planning. This is expected to commence in the fourth year of operation;
- Stripping and stockpiling of topsoil in front of the advancing mining front, with bulldozers and front end loaders;
- Drilling and charging of blast holes, followed by blasting, where necessary. Vibration levels and fly rock occurrence will be recorded during each blast and used to plan subsequent blasts.
- Excavation, loading, hauling and transport of overburden and coal. Maximum bench heights will be between 10 and 15 metres. The opencast mine will have seven main benches of which four will be coal benches. The coal will be transported to the processing plant on Eigendomsbult by haul trucks;
- Stockpiling of overburden, discard coal and product coal. The overburden will be stockpiled separately from the topsoil and the discard coal;
- Continuously backfilling the void with discard coal, overburden and topsoil, in that order, followed by fertilisation and re-vegetation with locally indigenous species of grass, shrubs and trees. See section 1.1 for a description and illustration of the rollover mining method that will be applied;
- When underground mining of the deeper coal seams commences after about 10 years:
  - Constructing one or more decline shafts from the hanging wall of the open pit;
  - Equipping the shaft(s) with a chairlift system for personnel transport and a conveyor system for the removal of mined material from the underground mining areas;
  - Mining the underground seams by the bord and pillar or longwall method.
- Constructing and operating a storm water control system comprising diversion berms, collection channels, and pollution control dams;
- Constructing and operating water supply dams and boreholes for monitoring, mine dewatering and water supply purposes;
- Constructing and operating a coal processing plant, conveyors, weighbridges, workshops, ablution facilities, offices, stores, roads, pipelines, power lines and fencing. See Figure 2-4 for a layout plan for the supporting infrastructure on Eigendomsbult 222 LQ; and
- Delivering coal to the railhead at Steenbokpan siding (which is currently under construction), or to Eskom's rail siding at Matimba by road in 35 ton trucks, followed by rail transport to power stations in Mpumalanga.

2.5 Policy and Legislative Context

This section provides a brief overview of both the national and international requirements that must be met by this project. It includes international conventions and agreements, as well as the IFC Standards and the EPs.

2.5.1 South African legislation

2.5.1.1 Mineral and Petroleum Resources Development Act

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) the MPRDA Regulations R. 527 and the EIA Regulations GN R.982 of 8 December 2014, an application for a mining right must be supported by an EIA process, consultation must take place with interested and affected

parties (I&APs), a scoping report conforming to Appendix 2 of GN R.982 must be submitted to the DMR, followed by an environmental impact assessment report conforming to Appendix 3 of GN R.982 and an environmental management programme conforming to Appendix 4 of GN R.982. These documents must also conform to the templates prescribed by the DMR.

The EIA process has been designed to be compliant with the MPRD Regulations and the EIA Regulations.

2.5.1.2 National Environmental Management Act

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended and the EIA Regulations, an application for environmental authorisation for certain listed activities must be submitted to the provincial environmental authority, the national authority (Department of Environmental Affairs, DEA), depending on the types of activities being applied for or, when mining and mineral processing activities are involved, the Department of Mineral Resources (DMR) - see section 2.5.1.1 above.

The current EIA regulations, GN R.982, GN R.983, GN R.984 and GN R.985, promulgated in terms of Sections 24(5), 24M and 44 of the NEMA and subsequent amendments, commenced on 8 December 2014. GN R.983 lists those activities for which a Basic Assessment is required, GN R.984 lists the activities requiring a full EIA (Scoping and Impact Assessment phases) and GN R.985 lists certain activities and competent authorities in specific identified geographical areas. GN R.982 defines the EIA processes that must be undertaken to apply for Environmental Authorisation.

The activities described in section 2.4.4 require a mining right and therefore fall within the ambit of listed activity 17 of GN R.984.

2.5.1.3 National Water Act

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) is the primary legislation regulating both the use of water and the pollution of water resources. It is applied and enforced by the Department of Water and Sanitation (DWS).

Section 19 of the National Water Act regulates pollution, which is defined as “the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it:

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to -
  - the welfare, health or safety of human beings;
  - any aquatic or non-aquatic organisms;
  - the resource quality; or
  - property.

The persons held responsible for taking measures to prevent pollution from occurring, recurring or continuing include persons who own, control, occupy or use the land. This obligation or duty of care is initiated where there is any activity or process performed on the land (either presently or in the past) or any other situation which could lead or has led to the pollution of water.

The following measures are prescribed in the section 19(2) of the NWA to prevent pollution:

- cease, modify or control any act or process causing the pollution;
- comply with any prescribed standard or management practice;
- contain or prevent the movement of pollutants;
- eliminate any source of the pollution;
- remedy the effects of pollution; and

- remedy the effects of any disturbance to the bed or banks of a watercourse.

Section 21 of the NWA lists the water uses for which a water use licence (WUL) is required. KHC's intention to dewater the opencast and underground mining areas and to impound contaminated stormwater in pollution control dams constitutes the following water uses:

a) taking water from a water resource;

b) storing water;

j) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process; and

k) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

The Water Use Licence Application (WULA) and the Integrated Water and Waste Management Plan (IWWMP) will have to be approved by the DWS.

2.5.1.4 National Environmental Management: Waste Act

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008)(NEMWA) commenced on 1 July 2009. In terms of this Act, all listed waste management activities must be licensed and in terms of Section 44 of the Act, the licensing procedure must be integrated with the environmental impact assessment process.

Government Notice 921, which commenced on 29 November 2013, lists the waste management activities that require licensing in terms of the NEMWA. Licence applications for activities involving hazardous waste must be submitted to the national authority, the Department of Environmental Affairs (DEA) and those for general waste to the provincial authority, in this case the LDEDET.

One of the major amendments effected by the National Environmental Management Amendment Act 2014 is the insertion of section 24S, as a result of which the NEMWA is now also applicable to mining residue deposits and residue stockpiles, as follows:

''Management of residue stockpiles and residue deposits

24S. *Residue stockpiles and residue deposits must be deposited and managed in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), on any site demarcated for that purpose in the environmental management plan or environmental management programme in question."*

In terms section 18, Schedule 3 of the National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014) (NEMWAA), which commenced on 2 June 2014, mining residues are classified as hazardous wastes by default. Draft regulations to enable the practical implementation of the NEMWAA have been published, but no date has been set for their finalisation.

2.5.1.5 National Environmental Management: Air Quality Act

The main objectives of the National Environmental Management: Air Quality Act 2004 (Act no. 39 of 2004) (NEM: AQA) are to protect the environment by providing reasonable legislative and other measures to:

- Prevent air pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development in alignment with Sections 24a and 24b of the Constitution of the Republic of South Africa.

The Act has devolved the responsibility for air quality management from the national sphere of government to local spheres of government (district and local municipal authorities), who are tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and development of emissions reduction strategies.

National Ambient Air Quality Standards (NAAQS) for common pollutants, as set in terms of the NEM:AQA, are reproduced in Table 2-5.

Table 2-5: South African Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Averaging Period	Limit Value (µg/m^3)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date
Sulphur dioxide (SO_2)[(a)]	10 minute	500	191	526	Immediate
	1 hour	350	134	88	Immediate
	24 hours	125	48	4	Immediate
	1 year	50	19	0	Immediate
Nitrogen dioxide (NO_2)[(b)]	1 hour	200	106	88	Immediate
	1 year	40	21	0	Immediate
Particulate matter <10 micrograms in diameter (PM_{10})[(c)]	24 hour	75	-	4	Immediate
	1 year	40	-	0	Immediate
Particulate matter <2.5 micrograms in diameter ($PM_{2.5}$)[(d)]	24 hours	65	-	4	Immediate
	24 hours	40	-	4	01/01/2016 – 31/12/2029
	24 hours	25	-	4	01/01/2030
	1 year	25	-	0	Immediate
	1 year	20	-	0	01/01/2016 – 31/12/2029
	1 year	15	-	0	01/01/2030
Ozone (O_3)[(e)]	8 hours	120	61	11	Immediate
Lead (Pb) [(f)]	1 year	0.5	-	0	Immediate
Carbon monoxide (CO)[(g)]	1 hour	30,000	26,000	88	Immediate
	8 hour (1 hour averages)	10,000	8,700	11	Immediate
Benzene (C_6H_6) [(h)]	1 year	5	1.6	0	01/01/2015

a. *The reference method for the analysis of SO_2 shall be ISO 6767*
b. *The reference method for the analysis of NO_2 shall be ISO 7996*
c. *The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN 12341*
d. *The reference method for the analysis of $PM_{2.5}$ shall be EN14907*
e. *The reference method for the analysis of ozone shall be the UV photometric method as described in ISO 13964*
f. *The reference method for the analysis of lead shall be ISO 9855*
g. *The reference method for analysis of CO shall be ISO 4224*
h. *The reference methods for benzene sampling and analysis shall be either EPA compendium method TO-14 A or method TO-17*

The National Dust Control Regulations (GN R.827), which were promulgated on 1 November 2013, define acceptable dust fall rates for residential and non-residential areas as listed in Table 2-6.

Table 2-6: Acceptable dust fall rates

Defined areas	Dust fall rate (mg/m^2/day over a 30 day average)	Permitted frequency of exceedance
Residential areas	Dust fall < 600	Two per annum (not in sequential months)
Non-residential areas	600 < Dust fall < 1200	Two per annum (not in sequential months)

Although KHC will not require an atmospheric emission licence for its proposed operations on Haaskraal and Eigendomsbult, it will have to operate within the NAAQS and the National Dust Control Regulations.

2.5.2 International

To provide for the eventuality that KHC will require funding from an institution that subscribes to the Equator Principles, Golder was instructed to incorporate the International Finance Corporation (IFC) Performance Standards (PS) on environmental and social sustainability, as well as the Equator Principles (EP) into the EIA.

The project parameters are such that it would, in terms of the IFC classification system, conform to a Category A project, which requires an Environmental, Social and Health Impact Assessment (ESHIA) for the Project comprising a scoping phase and an impact assessment phase. Two parallel impact assessment processes, with one report (i.e. the ESHIA) will be undertaken for the project:

- South African regulatory process (EIA and EMPr) – which comprises of the following summarised steps:
  - Comprehensive public participation process running throughout the duration of the EIA process;
  - Scoping Report and Plan of Study for the EIA; and
  - EIA Report and EMPr.
- IFC process (ESHIA) – comprising of:
  - (i) Initial screening of the project and Project Definition;
  - (ii) Scoping of the assessment process and examination of alternatives;
  - (iii) Stakeholder identification (focusing on those directly affected) and gathering of environmental and social baseline data;
  - (iv) Impact identification, prediction, and analysis;
  - (v) Generation of mitigation or management measures and actions;
  - (vi) Significance of impacts and evaluation of residual impacts; and
  - (vii) Documentation of the assessment process (i.e. Project Definition, Scoping Report, Baseline Studies, Impact Assessment and Management Plans).

As the IFC ESHIA process is more extensive than the South African regulatory process, the information generated by the ESHIA will be used to inform the South African regulatory process. The EIA documentation produced will be suitable for submission to the South African authorities and, if required for funding purposes, submission to a financing institution that subscribes to the Equator Principles.

The ESHIA process is illustrated in Figure 2-5.

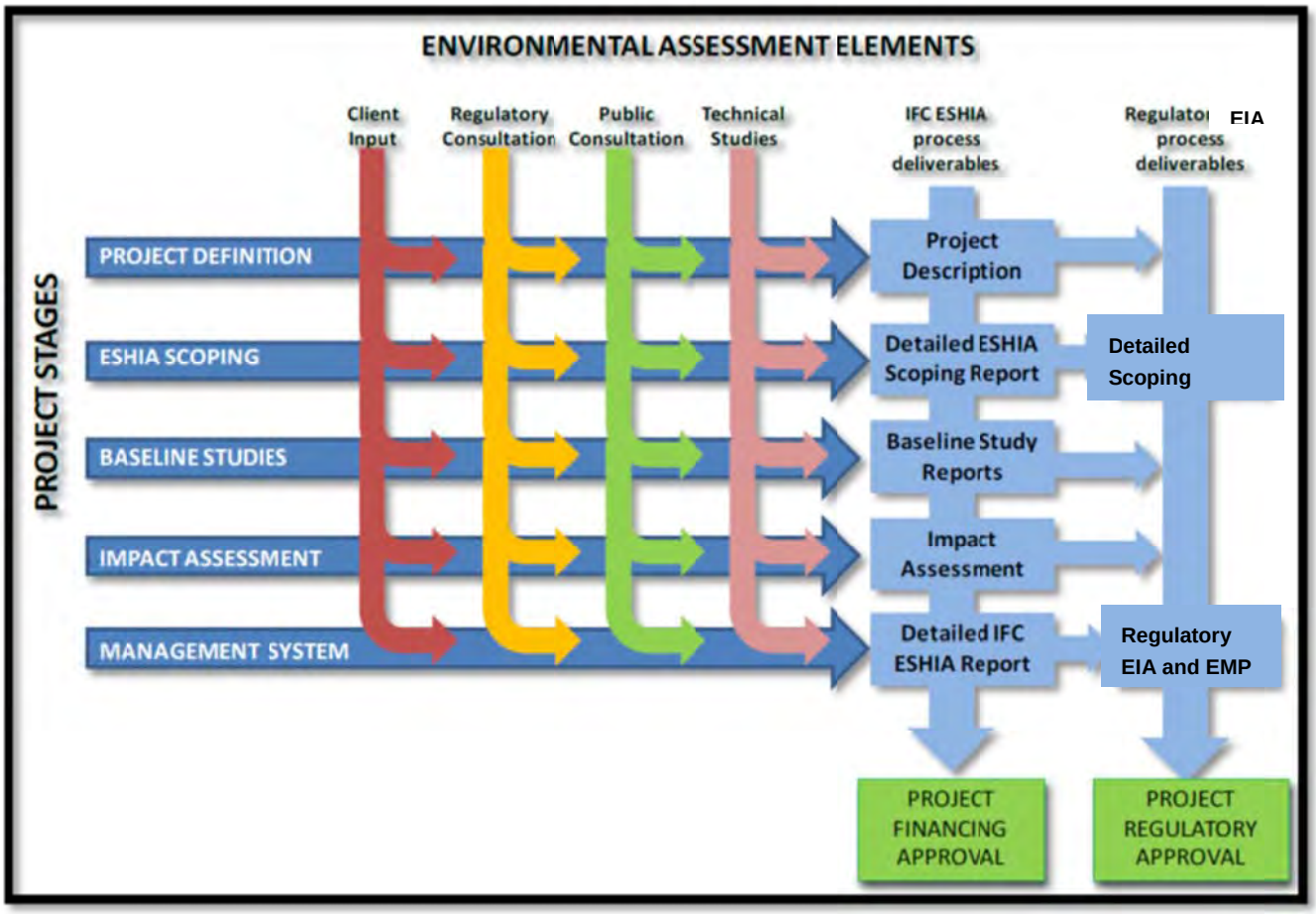


Figure 2-5: ESHIA process

2.6 Need and Desirability of proposed activities

South Africa is endowed with very large coal reserves. The Department of Minerals and Energy, in its *South Africa's Mineral Industry 2001/2 Report*, estimated economically recoverable coal reserves at 55.3 billion tonnes. The largest coal deposits occur in the Ecca Group a stratum of the Karoo Supegroup, dating back between 280 and 250 million years. The Ecca Group is extensive, covering around two thirds of South Africa and contains more than a third of all coal reserves in the Southern Hemisphere.

South Africa is one of the seven largest coal producing and one of the top five coal exporting countries in the world. In 2004, the coal and lignite mining industry generated a gross income of R39 billion and directly employed 50,000 people (Coal in South Africa, 2014).

Coal plays a vital role in South Africa's energy economy. It accounts for 70% of primary energy consumption, 93% of electricity generation and 30% of petroleum liquid fuels. In terms of sales value, coal is currently the most valuable mineral in South Africa and it is essential not only for electricity generation and poverty alleviation but also in the production of steel, cement, liquid fuels and chemicals (Eberhard, A;, 2011).

At least five large Eskom power stations will still be in operation after 2040. Coal is expected to be the second largest source of primary energy and the largest source for electricity generation in the next 30 years, during which time Eskom will need about four billion tons of coal. Coal exports are also important to the South African economy particularly at this time of a precarious current account deficit.

New coal mines will have to be developed in the Waterberg coalfield as existing mines in the Witbank area exhaust their reserves, and as Eskom and independent power producers (IPPs) and possibly Sasol increase their demand for coal. Coal is South Africa's third largest source of foreign exchange, platinum being the largest and gold second. (Hall, I;, 2014)

The Waterberg Coalfield stretches about 85 km from east to west and about 40 km from north to south and it has been estimated to hold about 50 billion tons of coal, of which about a quarter could be extracted by opencast mining (Coal in South Africa, 2014). The KHC project is aimed at augmenting coal supplies to Eskom's Mpumalanga power stations against the backdrop of the dwindling reserves in the Witbank coalfield.

Other benefits of the project include employment and income generation in the area as well as the development of BEE opportunities during construction, operation and eventual closure and rehabilitation.

2.7 Period for which environmental authorisation is required

The planned life of the mine, based on the proven coal reserves is estimated to be 47 years. To accommodate the time needed for construction, mine development, production ramp up, closure and rehabilitation, the authorisation is required for a period of 55 years.

2.8 Process followed to reach preferred site

Mining can take place only within the area for which a mining right is obtained and no alternative site for mining is possible. Several alternative sites and layouts for the supporting infrastructure are possible and were explored, taking into consideration economic viability, practicality and environmental characteristics.

2.8.1 Project Alternatives

In terms of Regulation 50 (d) of the MPRDA Regulations R. 527 under the Mineral and Petroleum Resources Development Act, Act 28 of 2002, an environmental impact assessment report must include *inter alia* the following:

> *"(d) A comparative assessment of the identified land use and development alternatives and their potential environmental, social and cultural impacts."*

IFC Performance Standard 1 requires that an analysis of alternatives be conducted as part of the ESHIA.

Alternatives considered for the proposed project are as follows:

2.8.1.1 Opencast mining

The drilling programme undertaken during the prospecting phase established sufficient reserves at depths of up to 200 metres below ground level to sustain an opencast mining operation producing 7 million tons of coal per annum for 48 years (including one year build-up to full production and two years of declining production at the end of the life of the open pit.

2.8.1.2 Use of low grade coal

About 50% of the coal produced by the opencast mine would be of suitable quality to supply Eskom's Majuba and Kusile power stations in Mpumalanga. There is a possibility of a local power station utilising fluidised bed combustion technology, which is capable of operating on very poor quality coal, being established by an independent power producer. Low grade coal in excess of that for which a beneficial use is found, could be back-filled into the opencast void (preferred option) or stockpiled on the surface as discard coal. The latter option would require the implementation of management measures against spontaneous combustion of the low grade coal and is not the preferred long term solution.

2.8.1.3 Underground mining

The prospecting drilling programme also indicated deeper reserves that could sustain an underground mining operation producing 2 to 3 million tons per annum with a lower percentage of low grade coal.

In theory, the underground mining operation could commence at any time during the life of the opencast mine. In practice it will not commence before a sufficiently large space has been created at a convenient location in the opencast mine where the necessary infrastructure for underground mining can be established and from which the underground mining operations can be launched. This is unlikely to happen during the first ten years of the opencast operation. Thereafter the underground mine can be operated concurrently with the opencast mine.

The flexibility in the timing of the underground mining operation results in a potentially large number of alternatives, which will be determined by reigning market demand for and price of coal over the years.

2.8.1.4 Location of infrastructure

The preferred location and layout of the supporting infrastructure on Eigendomsbult 222 LQ, as shown in Figure 2-52, was chosen with practical, economic, environmental and logistics considerations in mind, as set out in section 2.14 of this report.

2.8.1.5 Postponement of mining project

The coal reserves on Haaskraal 221 LQ could be left in the ground to be mined at a much later date, but if KHC, who has applied for a mining right, does not pursue this project, KHC's rights will lapse and other parties would be free to pursue the right to mine these coal reserves. Considering the large reserves in the Waterberg coalfield and the growing need for the development of new mines to supply Eskom's Mpumalanga power stations, such postponement would result in KHC losing a business opportunity while other parties pursue the development of new coal mines to meet the demand.

2.8.1.6 No-Project Option

If the coal reserves on Haaskraal 221 LQ are not mined by KHC, some other company will almost certainly seek to mine them, as the need to develop the Waterberg coalfield is set to increase in the foreseeable future.

2.8.2 Public participation process

This section provides an overview of the public participation process undertaken during the scoping phase of the ESHIA.

2.8.2.1 Objectives of public participation

The public consultation process was designed to provide information to and receive feedback from interested and affected parties (I&AP) for use throughout the ESHIA and EIA process, thus providing organisations and individuals with an opportunity to raise concerns and make comments and suggestions regarding the proposed Project. By being part of the assessment process, stakeholders had the opportunity to influence the plan of study of the ESHIA and EIA.

Opportunities for Comment

Documents were made available at various stages during the ESHIA and EIA process to provide stakeholders with information, further opportunities to identify issues of concern and suggestions for enhanced benefits and to verify that the issues raised have been considered.

The principles that determine communication with society at large are included in the principles of the National Environmental Management Act (NEMA) (Act 107of 1998, as amended) and are elaborated upon in General Notice 657, titled *"Guideline 4: Public Participation"* (Department of Environmental Affairs and Tourism, 19 May, 2006), which states that: *"Public participation process means a process in which potential interested*

and affected parties (I&APs) are given an opportunity to comment on, or raise issues relevant to, specific matters."

Public participation is an essential and regulatory requirement for an environmental authorisation process, and was undertaken in terms of Regulations 39 to 44 of the Environmental Impact Assessment (EIA) Regulations GN R.982 (8 December 2014). Public participation is a process that is intended to lead to a joint effort by stakeholders, technical specialists, the authorities and the proponent/developer who work together to produce better decisions than if they had acted independently.

Internationally, the public consultation process complied with the Equator Principles (in particular Principles 5 and 6) and the IFC Performance Standards (PS) (specifically PSs 1, 2, 4, 5, 7 and 8). The Stakeholder Engagement Plan (SEP), attached to this document as APPENDIX D, provides a more comprehensive summary of the local regulatory requirements and international standards that were considered in the design of the public consultation process.

The public participation process was designed to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner and:

During the Scoping Phase to enable them to:

- Understand the context of the ESHIA/EIA;
- Become informed and educated about the proposed project and its potential impacts;
- raise issues of concern and suggestions for enhanced benefits;
- verify that their comments, issues of concern and suggestions have been recorded;
- assist in identifying reasonable alternatives; and
- contribute relevant local information and traditional knowledge to the environmental assessment.

During the impact assessment phase to assist them to:

- contribute relevant information and local and traditional knowledge to the environmental assessment;
- verify that their issues and suggestions have been evaluated and considered in the environmental investigations and feedback has been provided;
- comment on the findings of the ESHIA / EIA; and
- Identify further issues of concern from the findings of the ESHIA / EIA.

During the decision-making phase:

- to advise I&APs of the outcome, i.e. the authority decision, and how the decision can be appealed.

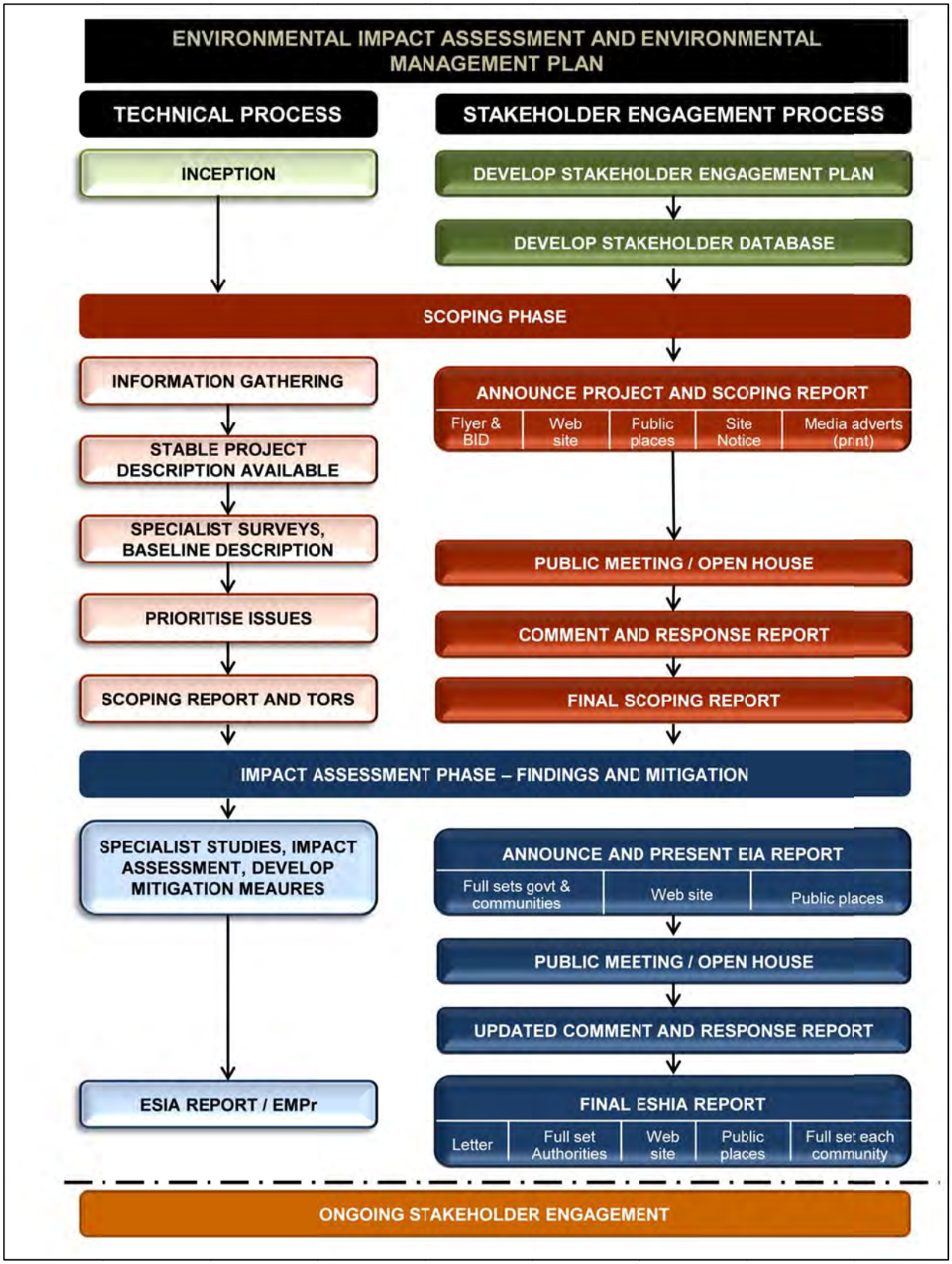


Figure 2-6: The flow diagram shows the typical structure of the ESHIA process

2.8.2.2 Pre-Scoping Phase: Capacity Building

IFC PS 1 stipulates that stakeholder consultation should include *elements of capacity building* to ensure the process is considered "*free, prior and informed*".

The Grootegeluk coal mine, which is located about 15 km to the south-east of the project area, was established in 1980. Two new coal mines are being planned in the region by the Waterberg Coal Company and Resource Generation (Boikarabelo Coal Mine). Eskom's Matimba power station came into full operation in 1993 and the first unit of the Medupi power station has started producing power. Landowners and other residents in the area are used to these mining and industrial developments and they are not in need of the type of basic capacity building that would have been appropriate if Khongoni project were the first major project to be developed in this area.

The local residents were made aware of the Khongoni project during the prospecting phase, which took place from 2009 to 2014 by:

- Engaging with the current landowners and occupants of the farms Haaskraal 221 LQ and Eigendomsbult 222 LQ as well as the adjacent farms and keeping them informed of the progress towards the next phase, i.e. the establishment of the proposed coal mine; and
- Interacting regularly with the Lephalale Development Forum and the Lephalale Local Municipality and keeping them informed.

2.8.2.3 Stakeholder Engagement Plan

The Stakeholder Engagement Plan (SEP) follows the framework provided by the International Finance Corporation (IFC , 2012).The purpose of stakeholder engagement is to establish, maintain and preserve a beneficial relationship with various stakeholders over a certain period of time. The SEP deals with both public consultation for an ESHIA and EIA which started in March 2013, and following the ESHIA and EIA, on-going engagement with stakeholders. The SEP is attached to this report as APPENDIX D**.**

2.8.2.4 Identification of I&APs

I&APs were initially identified through a process of networking and referral, obtaining information from Golder's existing stakeholder database, liaison with potentially affected parties in the vicinity of the project area, newspaper advertisements and a registration process involving completion of a registration and comment sheet. The registration sheet encouraged I&APs to indicate the names of their colleagues and friends who may also be interested in participating.

The initial stakeholder database used to announce KHC's proposed project on the farm Haaskraal 221 LQ comprised a total of 385 I&APs representing various sectors of society listed below. See APPENDIX A**.**

- Landowners within and near the project area;
- Government (national, provincial and local);
- Environmental NGOs;
- Conservation Agencies;
- Community Representatives and CBOs;
- Directly affected communities;
- Business and Commerce; and
- Other.

2.8.2.5 Register of I&APs

The NEMA Regulations distinguish between I&APs and registered I&APs.

I&APs, as contemplated in Section 24(4)(d) of the NEMA include: "*(a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity".*

In terms of the Regulations:

"An EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

(a) All persons who; have submitted written comments or attended meetings with the applicant or EAP;
(b) All persons who; have requested the applicant or EAP managing the application, 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.

A Register for I&APs was opened after announcement of the project.

All stakeholders on the initial database received a Background Information Document on 12 June 2015 inviting them to register as I&APs.

Registering as an I&AP

Stakeholders could register as I&APs at any time during the EIA process by contacting the public participation office as indicated on page ii of this report.

Stakeholders who were involved in the initial consultation and who attended any of the public meetings during the Scoping Phase were added to the register. The I&AP register was updated throughout the EIA process.

As per the EIA Regulations, subsequent notifications about the EIA process and availability of EIA documents were sent to registered I&APs only.

2.8.2.6 Public participation during Scoping

This section provides a summary of the public participation process followed during the Scoping Phase of the EIA.

2.8.2.7 Scoping Report

The Scoping Report was made available for public review for 30 days from **17 June 2015 until 17 July 2015.** Stakeholders were invited to participate in the ESHIA / EIA and public participation process, to pass on the information to friends/colleagues/neighbours who may be interested and to register as I&APs.

The proposed project was announced as follows:

- Distribution of the Scoping Report and a letter of invitation to participate to all I&APs on the database, accompanied by a registration, comment and reply sheet that was mailed/emailed to the entire stakeholder database. Copies of these documents are attached as APPENDIX B.
- The abovementioned documents were made available at the public places listed on page ii of the Scoping Report and posted to the Golder website www.golder.com/public;
- An advertisement was published in the **Mogol Post** on Friday 12 June 2015 **(APPENDIX C)**.

2.8.2.8 Public Meeting

Stakeholders were invited to attend a Public Meeting on **Thursday, 25 June 2015** at the Grootegeluk Conference Room, Mogol Club, cnr of Nelson Mandela and George Wells Street, Lephalale from 15h00 to 17h00.

2.8.2.9 Final Scoping Report

The Scoping Report will be updated, submitted to the Department of Mineral Resources (DMR), the Department of Water and Sanitation (DWS) and the Limpopo Department of of Economic Development, Environment and Tourism (LEDET) and made available on the Golder website www.golder.com/public.

2.8.2.10 Summary of issues raised by I&APs

A summary of the issues raised during the scoping phase include the following:

- Ownership of surface rights on the area affected by the application for a mining right and the establishment of supporting infrastructure;
- Community development projects;
- The cumulative impacts of air quality;
- Blasting effects on nearby residents and buildings:
  - The farmstead buildings of Mr Frikkie Pistorius on Olieboomsfontein 220 LQ are located about 360 m to the south-west of the perimeter of the opencast mine;
  - The lodge on Eigendomsbult 222 LQ is located about 165 m east of the perimeter of the mine;
  - Existing farmstead buildings on Eigendomsbult 222 LQ are located about 360 m east of the perimeter of the mine.
- Any rare plants and/or animals identified on site;
- Water pollution;
- Management of any finds of cultural and heritage significance; and
- Rehabilitation and closure of the mine.

The detailed issues and comments received to date have been captured in the Comment and Response Report that appears in **Error! Reference source not found.** of this Scoping Report.

2.9 Environmental Attributes and Description of the Baseline Receiving Environment

This section of the report provides a description of the receiving environment and existing conditions on and in the vicinity of the proposed project.

Unfortunately the owners of Haaskraal 221 LQ and Eigendomsbult 222 LQ refused the specialists access to the farms in order to undertake the required field work and the information presented in this chapter of the scoping report reflects such information as the specialists could glean from the literature and from observations and measurements made from public roads along the perimeters of the two farms, augmented by their past work in the area. The mining right applicant, Khongoni Haaskraal Coal, is in the process of negotiating access and additional information will be added to either the scoping report or the impact assessment report after the specialists have been afforded access.

2.9.1 Geology

The Haaskraal Project is situated within the Waterberg Coal Field. The coal-bearing rocks are in the Grootegeluk Formation within the Karoo Supergroup. They were deposited from 260 to 190 million years ago, and are bounded by the Limpopo Mobile Belt to the north and the Eenzaamheid and Ellisras Faults to the south. The more recent Daarby Fault cuts across the coalfield. The recent covering comes from weathering of Limpopo Mobile Belt gneiss and Karoo rock in the north, and from weathering of the Waterberg sandstones in the south.

Thin seams of coal alternate with layers of mudstones. Some of the coal resources are near the surface and readily accessible and some of the seams lie at depths of up to 400 metres. A large portion of the coal resource is low grade bituminous, suitable for local power generation but not for export (Waterberg Coalfield, 2014).

The proposed mining area on Haaskraal is divided into three structurally separate blocks by faulting. The Daarby Fault is located in close proximity to the western border of the project area and several splays of this fault cut across the investigation area and divide Haaskraal into three prominent blocks (West, Central and East – see Figure 2-7).

The Grootegeluk Formation overlies the Goedgedacht Formation (equivalent of the Vryheid Formation of the Main Karoo Basin), within the project area. The Goedgedacht Formation reaches an average thickness of about 75 m within the project area, and is composed of shale, sandstone and gritty sandstone beds with 4 main coal zones present. The coal zones are divided up into Zone 1, Zone 2, Zone 3 and Zone 4 (from the base to the top of the formation, with a Zone 4A present in the sequence between Zones 4 and 3 in some instances). See Figure 2-8. These coal zones are described as a multiple seam deposit type, similar to the coal seams present within the Vryheid Formation of the Main Karoo Basin.

The strata dip gently to the southeast. The depth to the top of the number 11 coal seam increases eastwards, from 48m in the West Block to 124m in the East Block. The coal-bearing sequence is 120m thick and subdivided into 11 zones. Seams 11 - 4 form a continuous package, with substantial partings between seams 4, 3, 2 and 1.

The coal seams/zones correlation between boreholes is good and no faults are currently modelled. The stratigraphy and coal qualities play a very important role in the selection of mining method and resource exploitation.

The Grootegeluk Formation attains an average thickness of around 60 m within the project area and consists of interbedded coal, shale and carbonaceous shale. There are 7 main coal zones present within the Grootegeluk Formation (named Zones 5 to 11, from the base to the top of the formation), and the formation is classified as a thick interbedded seam deposit type (de Villiers, E; Fourie, H;, 4 December 2014).

The farm Haaskraal 221 LQ is underlain by strata of the Karoo Supergroup, comprising from top to bottom: red mudstone of the Lisbon Formation, multicoloured shales of the Eendrachtpan Formation, mudstone, carbonaceous shale and coal of the Grootegeluk Formation and sandstone, mudstone, conglomerate and coal of the Goedgedacht Formation. The central portion of the farm is covered with surficial sand and soil. See also section 2.4.

Table 2-7: Haaskraal Coal Reserves

Resource Class	Gross In Situ Tonnes (GTIS)	Geological Loss	Total In Situ Tonnes (TTIS)
Measured	74 782 778	2%	73 287 122
Indicated	494 728 681	5%	469 992 247
Inferred	155 095 415	10%	139 585 874

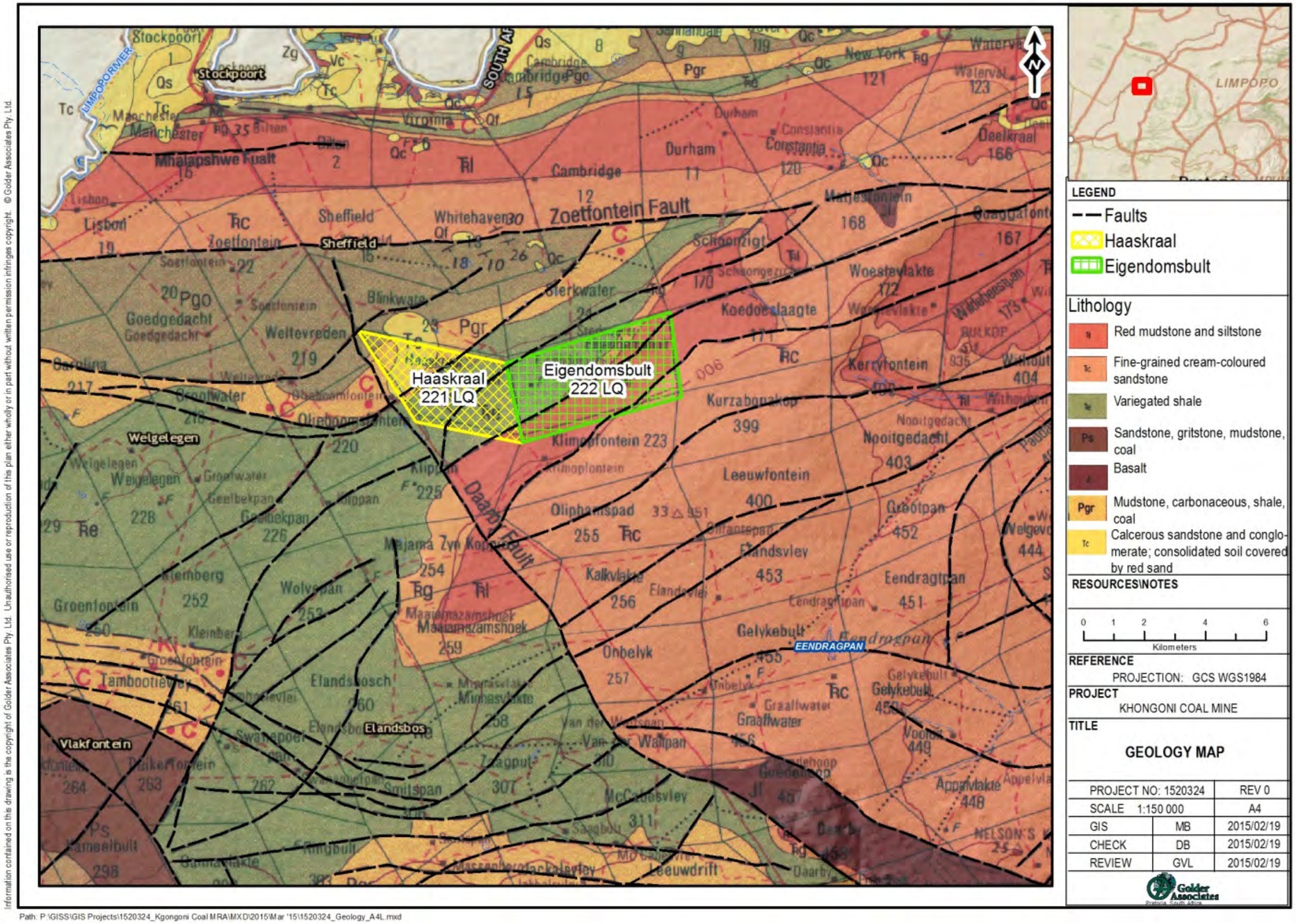


Figure 2-7: Geological map

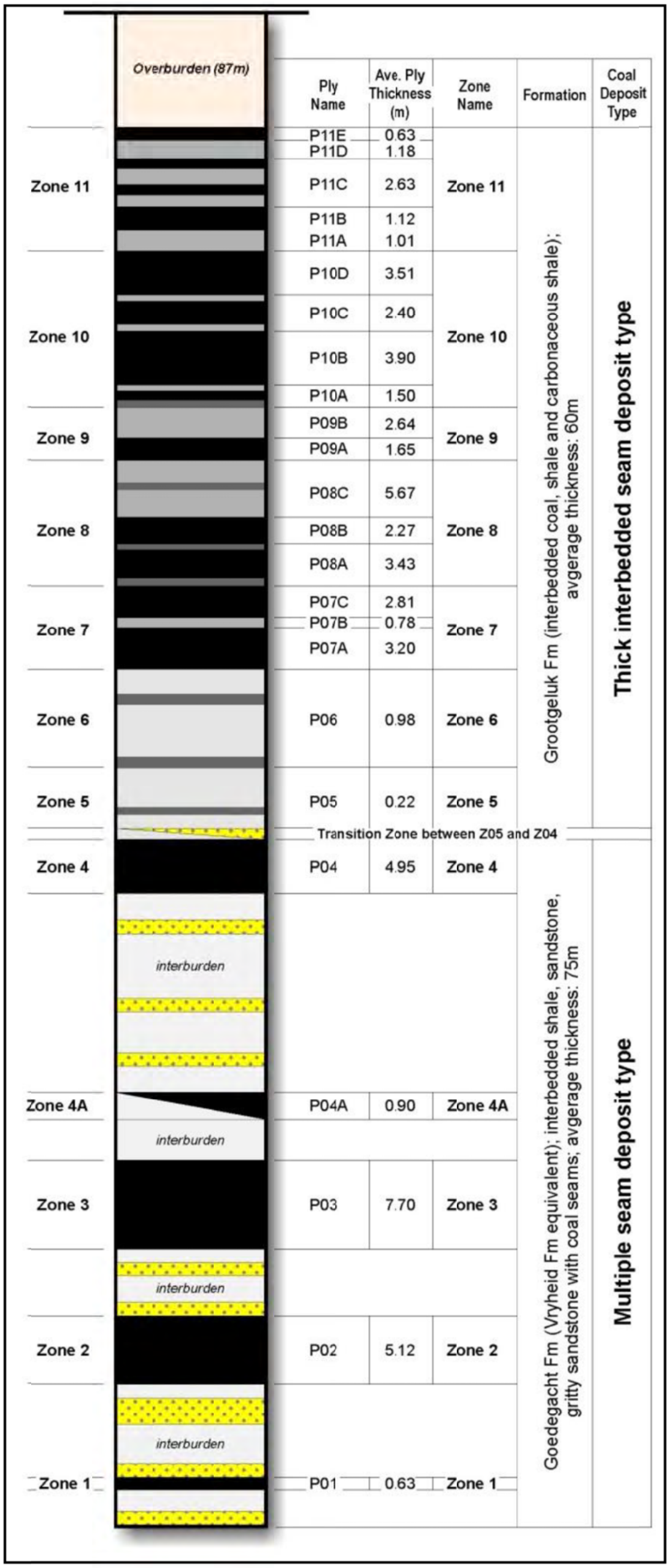


Figure 2-8: Waterberg Coal Field: Stratigraphic Column depicting generalised coal zones

The coal bed on Haaskraal dips from the north-west to the south-east at an angle of about 0.75 degrees or 1:130 and the thickness of the overburden increases from about 30 metres in the north-western portion of the farm to more than 200 metres in the south-eastern part. It will not be technically and economically viable to mine the entire resource by opencast methods.

There is a very thick layer of interburden (waste) between Zones Z04 and Z03 which would result in a significant increase in the stripping ratio, and Z04 poor quality coal with a raw calorific value of only about 11MJ/Kg, which can almost be classified as waste material. As a result of the position of this low quality seam, Zone Z07 is the last coal zone that can be mined by opencast methods.

Zones Z03 and Z02 will be mined as a separate multi seam by underground mining methods with Z03 to be mined first and Z02 thereafter due to the thin parting between the two zones. Zone 1 is too thin and it will be left *in situ*.

2.9.2 Climate

The baseline characteristics of the climate, wind field and air quality in the project area were determined from literature sources (Allan, C; Bennet, A;, March 2015).

The project area is situated in the subtropical high-pressure belt. The mean circulation of the atmosphere over the subcontinent is anticyclonic throughout the year (except for near the surface) (Preston-Whyte and Tyson, 1997). The synoptic patterns affecting the typical weather experienced in the region owe their origins to the subtropical, tropical and temperate features of the general atmospheric circulation over Southern Africa.

The subtropical control is brought via the semi-permanent presence of the South Indian Anticyclone (HP cell), Continental High (HP cell) and the South Atlantic Anticyclone (LP cell) in the high pressure belt located approximately 30°S of the equator (Preston-Whyte and Tyson, 1997). The tropical controls are brought via tropical easterly flows (LP cells) (from the equator to the southern mid-latitudes) and the occurrence of the easterly wave and lows (Preston-Whyte and Tyson, 1997). The temperature control is brought about by perturbations in the westerly wave, leading the development of westerly waves and lows (LP cells) (i.e. cold front from the polar region, moving into the mid-latitudes) (Preston-Whyte and Tyson, 1997).

Seasonal variations in the positioning and intensity of the HP cells determine the extent to which the westerly waves and lows impact the atmosphere over the region. In winter, the high pressure belt intensifies and moves northward while the westerly waves in the form of a succession of cyclones or ridging anticyclones moves eastwards around the South African coast or across the country. The positioning and intensity of these systems are thus able to significantly impact the region. In summer, the anticyclonic HP belt weakens and shifts southwards and the influence of the westerly wave and lows weakens.

Anticyclones (HP cells) are associated with convergence in the upper levels of the troposphere, strong subsidence throughout the troposphere, and divergence near the surface of the earth. Air parcel subsidence, inversions, fine conditions and little to no rainfall occur as a result of such airflow circulation patterns (i.e. relatively stable atmospheric conditions).

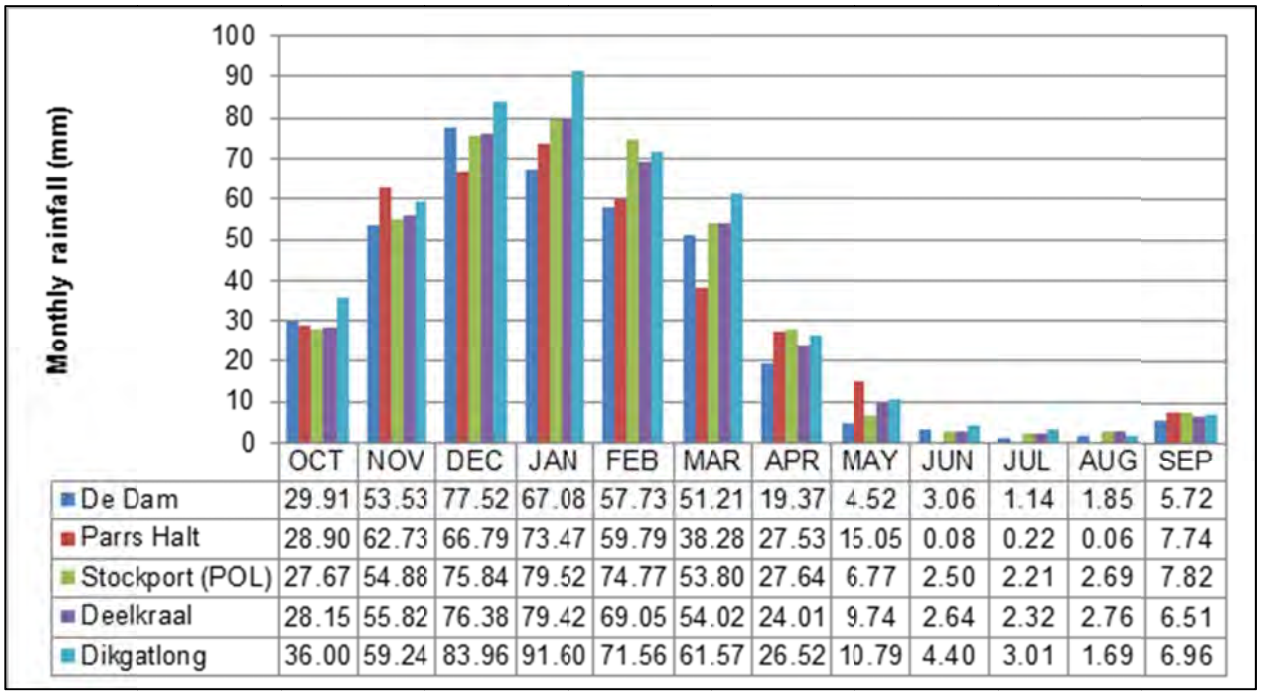
Westerly waves and lows (LP cells) are characterised by surface convergence and upper-level divergence that produce sustained uplift, cloud formation and the potential for precipitation. Cold fronts, which are associated with the westerly waves, occur predominantly during winter. The passage of a cold front is characterised by pronounced variations in wind direction and speed, temperature, humidity, pressure and distinctive cloud bands (i.e. unstable atmospheric conditions).

The tropical easterlies and the occurrence of easterly waves and lows affect Southern Africa mainly during the summer months. These systems are largely responsible for the summer rainfall pattern and the north easterly wind component that occurs over the region (Schulze, 1986; Preston-Whyte and Tyson, 1988).

2.9.2.1 Rainfall

The region experiences strongly seasonal precipitation. Rainfall data for the project area was sourced from the Daily Rainfall extraction utility (Kunz, 2004).

Figure 2-9 shows the monthly rainfall distribution for the five rainfall stations in the Lephalale area. The Stockpoort (POL) Rainfall Station (0717595 W) provided the most reliable data and Figure 2-10 shows the annual rainfall measured at the Stockpoort station from 1903 to 1999.



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
De Dam	29.91	53.53	77.52	67.08	57.73	51.21	19.37	4.52	3.06	1.14	1.85	5.72
Parrs Halt	28.90	62.73	66.79	73.47	59.79	38.28	27.53	15.05	0.08	0.22	0.06	7.74
Stockport (POL)	27.67	54.88	75.84	79.52	74.77	53.80	27.64	6.77	2.50	2.21	2.69	7.82
Deelkraal	28.15	55.82	76.38	79.42	69.05	54.02	24.01	9.74	2.64	2.32	2.76	6.51
Dikgatlong	36.00	59.24	83.96	91.60	71.56	61.57	26.52	10.79	4.40	3.01	1.69	6.96

Figure 2-9: Monthly rainfall distribution for rainfall stations in the Lephalale area

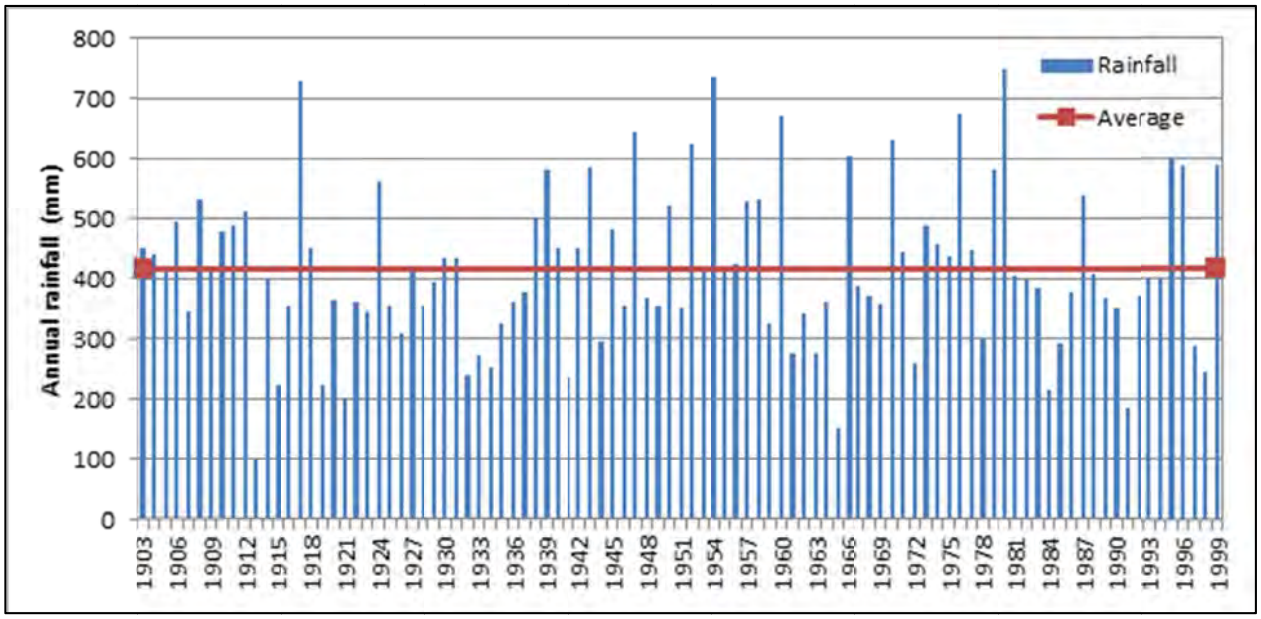


Figure 2-10: Annual rainfall measured at Stockport (POL) Rainfall Station (0717595 W)

The mean annual rainfall at the Stockpoort station is 416.09 mm. The lowest rainfall year was 1913 with 98.6 mm and the highest rainfall year was 1980 with 747.9 mm.

The 5, 50 and 95 percentile of the annual rainfall totals for this rainfall station are listed in Table 2-8.

Table 2-8: 5, 50 and 95 percentile of the annual rainfall totals at Stockpoort (POL) Rainfall Station

Station number	Station name	5th percentile	50th percentile	95th percentile
0717595 W	Stockport (POL)	209.21	421.70	636.55

The Stockpoort station recorded 75 events measuring more than 50 mm/day and 9 events measuring more than 100 mm/day during the data period.

The 24-hour rainfall depths for the 1 in 2, 1 in 5, 1 in 10, 1 in 20, 1 in 50, 1 in 100 and 1 in 200 recurrence intervals at the Stockpoort station were abstracted from the Design Rainfall Estimation Program (Smithers & Schulze, 2002) and are listed in **Table 2-9**.

Table 2-9: 24 hour rainfall depths for different recurrence intervals in mm/day

Recurrence interval (years)	1 in 2	1 in 5	1 in 10	1 in 20	1 in 50	1 in 100	1 in 200
24 hour rainfall depth (mm)	61.7	87.1	105.3	123.9	149.7	170.3	192.0

2.9.2.2 Temperature

Average temperatures range from a minimum of about 5 °C in June and July, to a maximum of about 32 °C January and December (Figure 2-11).

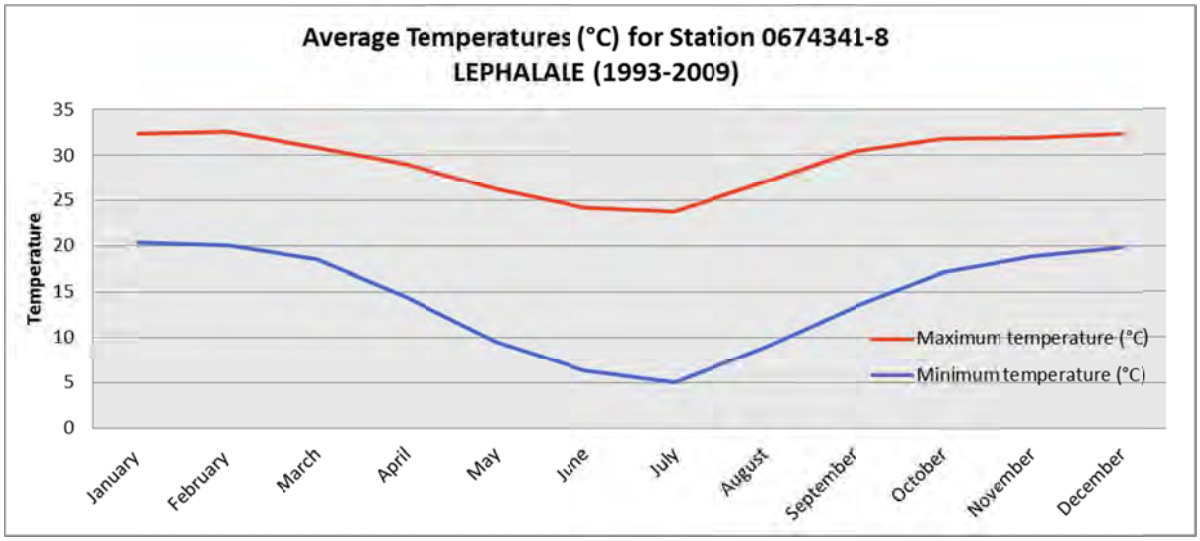


Figure 2-11: Average maximum and minimum temperatures for the period 1993 – 2009 for the South African Weather Service Lephalale meteorological station, approximately 30 km south east of the proposed KHC mine

2.9.2.3 Evaporation

Monthly evaporation data was available for two DWS stations namely, A4E003 Zandpan and A4E007 Mokolo Nature Reserve @ Mokolo Dam and is shown in Figure 2-12. The mean annual evaporation rates are 2 572 mm and 2 014 mm for stations A4E003 and A4E007 respectively.

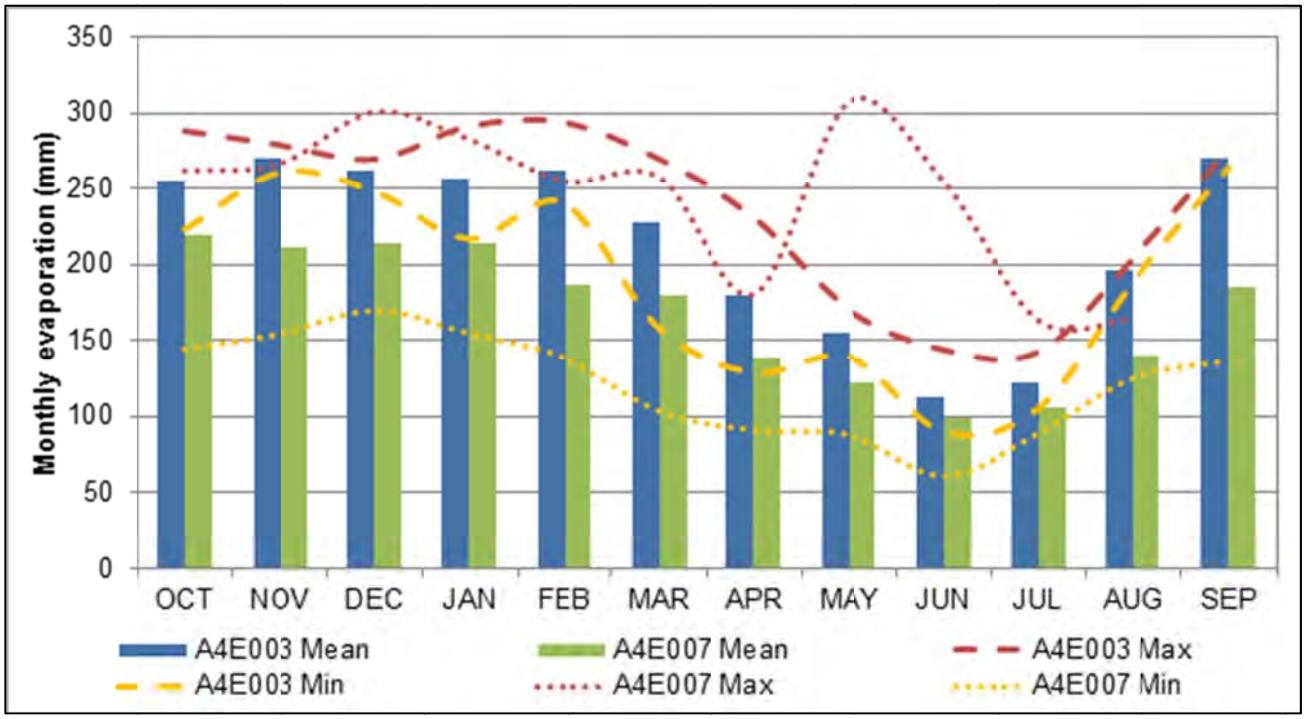


Figure 2-12: Monthly mean, minimum and maximum evaporation for stations A4E003 and A4E007

2.9.3 Wind Field

The meteorological overview for the proposed KHC mine was based on the analysis of MM5[1] modelled meteorological data for 2012 - 2014[2], which was checked against the South African Weather Services (SAWS) data from the weather station in Lephalale, located approximately 30 km south-east of the proposed KHC mine.

Meteorology and ambient air quality data are considered to be valid if the station is located less than 20 km from a specific project site, if there are no major topographical features which could cause significant variances. Since the Lephalale Station is the closest station to the proposed KHC mine and there are no significant topographical features between the two, the Lephalale Station data is assumed to be a valid comparison[3].

The Lephalale Station data was used to develop the wind roses shown in Figure 2-13 to Figure 2-15. Wind roses summarize the characteristics of the wind field at a specified location by representing their strength, direction and frequency. Calm conditions (wind speeds of less than 1 m/s) are represented as a percentage of the total winds in the central circle. Each directional branch on a wind rose represents wind originating from that specific cardinal direction (there are 16 cardinal directions). Each directional branch is divided into

[1] The MM5 (short for Fifth-Generation Penn State/NCAR Meso-scale Model) is a regional meso-scale model used for creating weather forecasts and climate projections. It is a community model maintained by Penn State University and the National Centre for Atmospheric Research

[2] The analysis of the data is assumed and expected to be representative of the actual experienced meteorological conditions on site.

[3] The data recovery statistic was not provided and thus the accuracy of the data could not be verified.

segments of different colours which represent different wind speed classes. Each circle in the wind rose represents a percentage frequency of occurrence.

North-north-easterly to easterly winds are expected to be dominant at the proposed KHC mine, with wind speeds being low to moderate, averaging 3 m/s with 14 % calm conditions (<1 m/s).

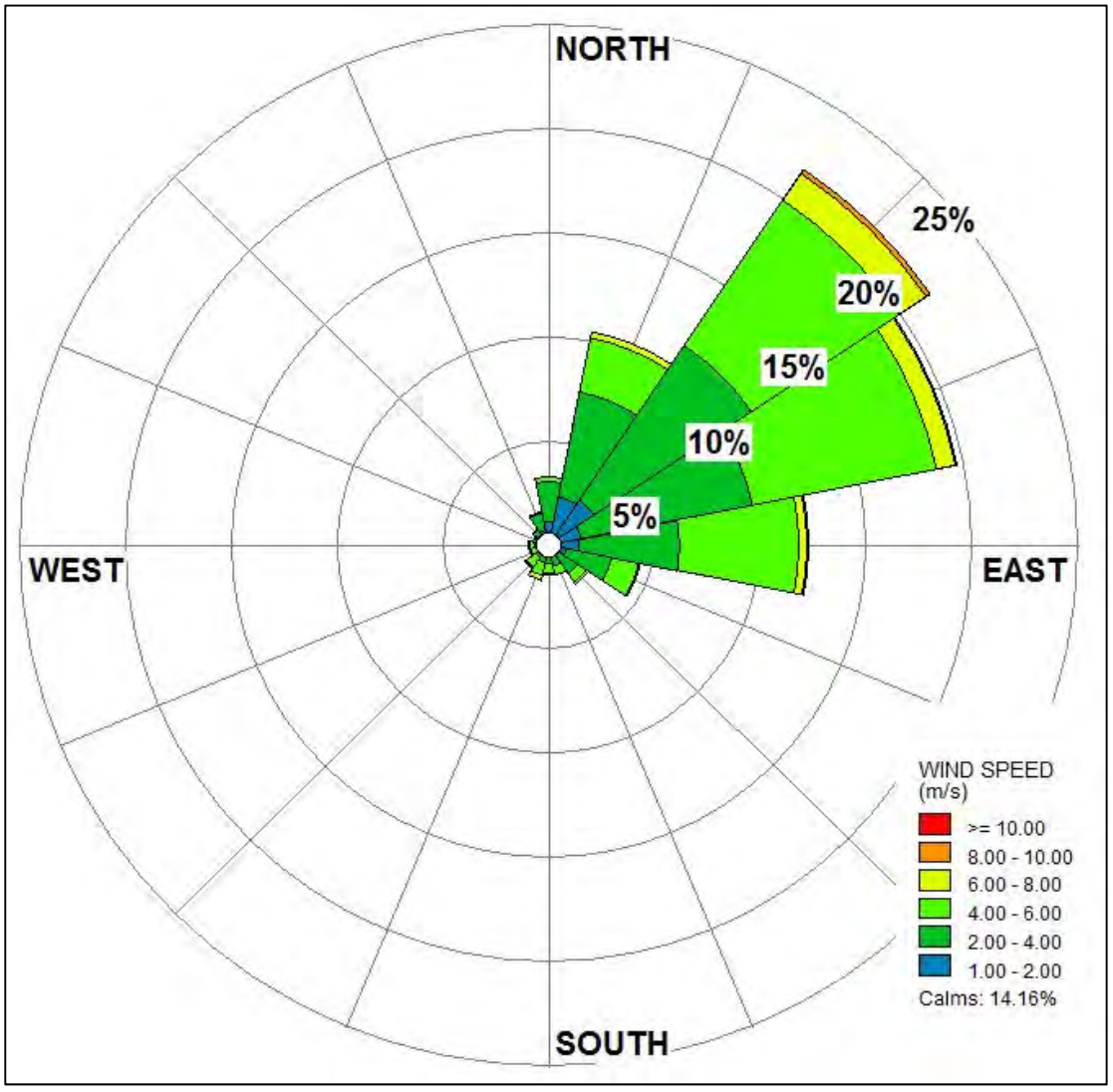
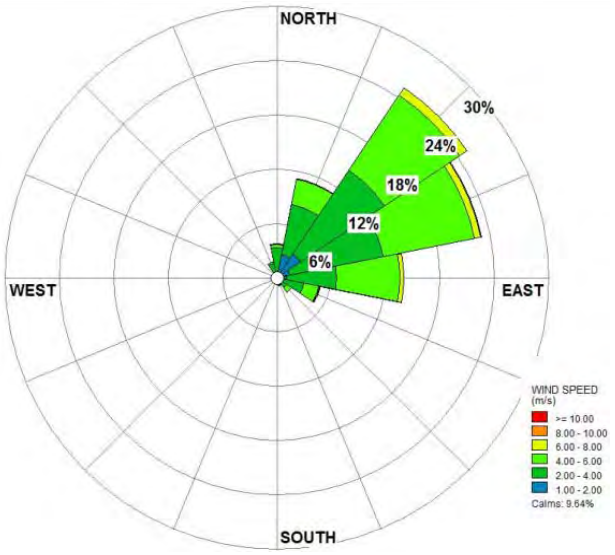


Figure 2-13: Modelled period wind rose for 2012 – 2014

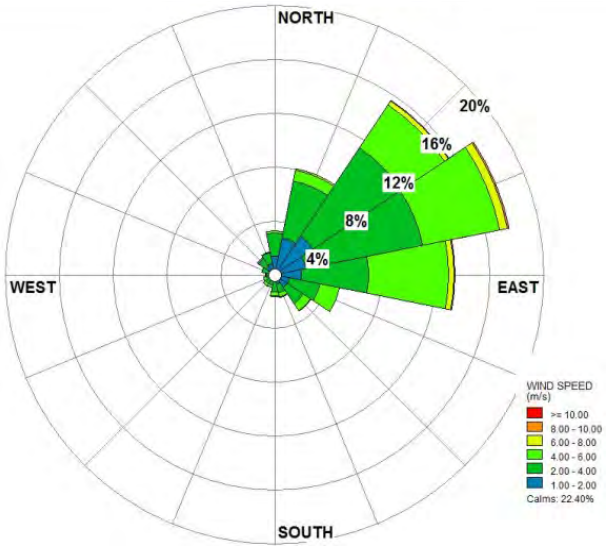
North-north-easterly to easterly winds are expected to be dominant throughout the year, with no significant seasonal variations in wind speed or direction (Figure 2-14).

North-north-easterly to easterly winds are also expected to be dominant throughout the day, with no significant diurnal variations in wind speed or direction (Figure 2-15).



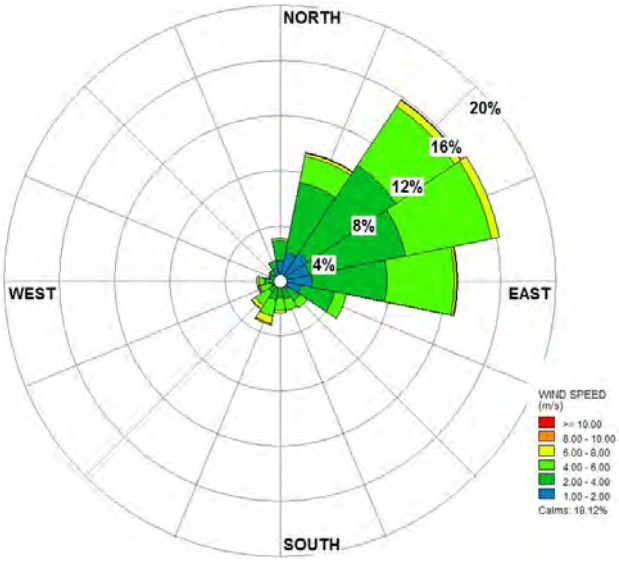
Summer (Dec, Jan, Feb)

NNE to E 81 % of the time



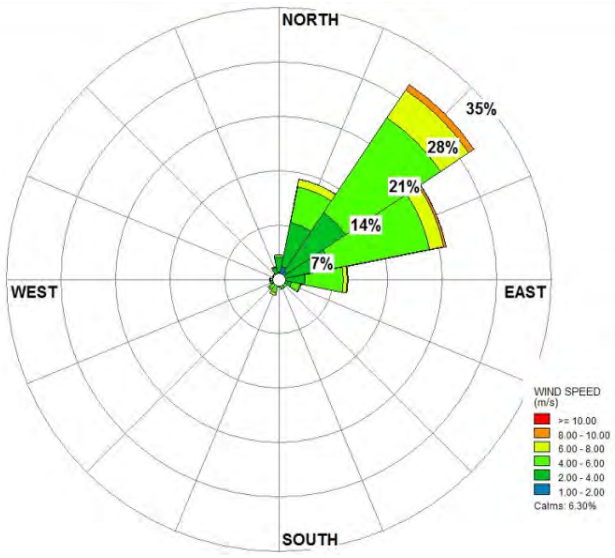
Autumn (Mar, Apr, May)

NNE to ESE 77 % of the time



Winter (Jun, Jul, Aug)

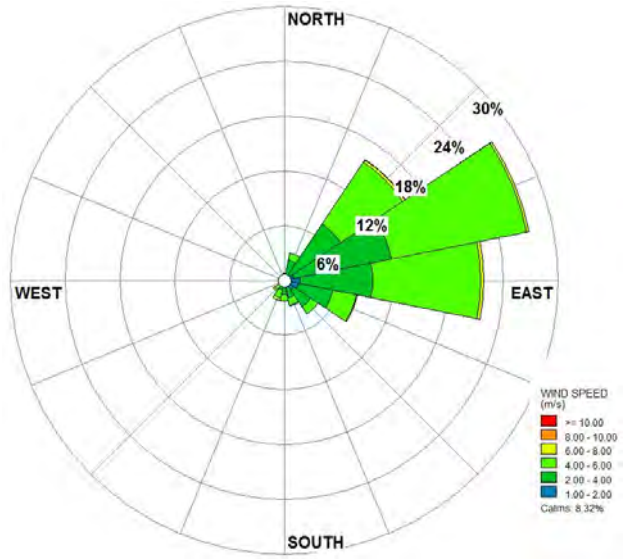
NNE to E 66% of the time



Spring (Sep, Oct, Nov)

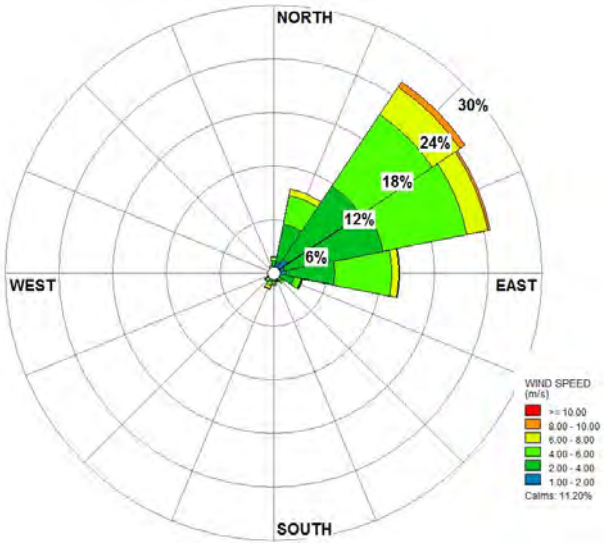
NNE to E 90% of the time

Figure 2-14: Modelled seasonal wind roses for the proposed KHC mine site (2012 - 2014)



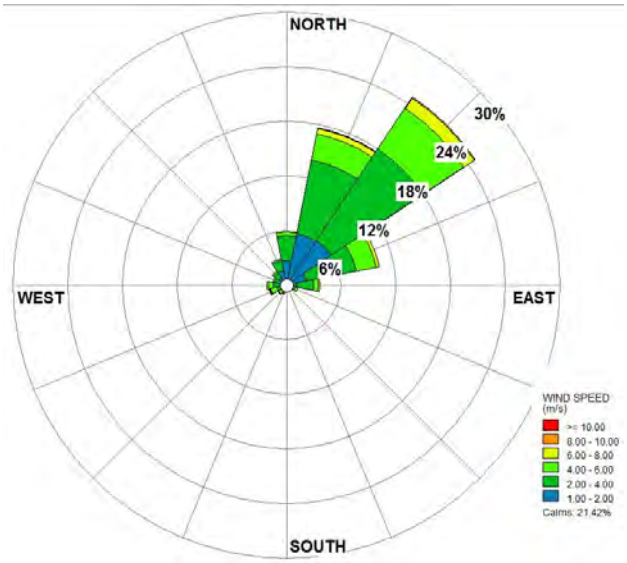
Early morning (00:00 – 06:00)

NE to ESE 89 % of the time



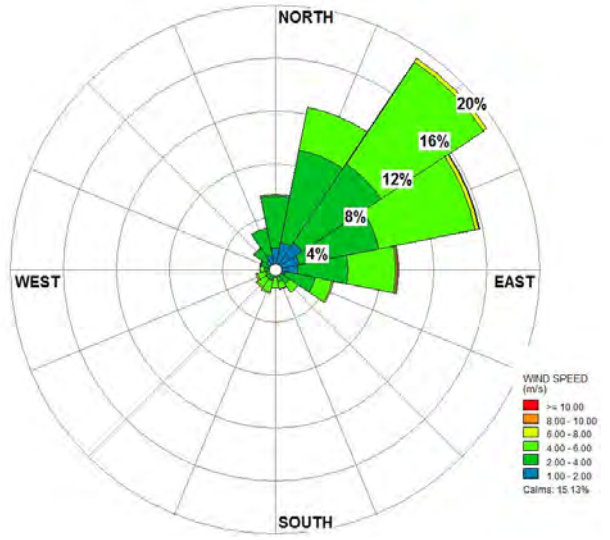
Morning (06:00 – 12:00)

NNE to E 83 % of the time



Afternoon (12:00 – 18:00)

N to ENE 75 % of the time



Evening (18:00 – 00:00)

N to E 74% of the time

Figure 2-15: Modelled diurnal wind roses for the proposed KHC mine site (2012 - 2014)

2.9.4 Air Quality

Sections 18 to 20 of NEM: AQA deal with the establishment of Priority Areas in so-called “hot-spot” areas of South Africa where ambient air quality standards are often exceeded or may often be exceeded. The establishment of a Priority Area is intended to achieve the following:

- It effectively allows for the concentration of limited air quality management capacity (human, technical and financial) for dealing with acknowledged problem areas in order to obtain measurable air quality improvements in the short, medium and long term;
- It prescribes a cooperative governance regime by effectively handing-up air quality management authority to the tier of government that can provide leadership and coordination; and
- It allows for “cutting edge” air quality management methodologies that take into account all contributors to the air pollution problem, i.e. air-shed air quality management.

The proposed KHC mine site is located within the Waterberg-Bojanala Priority Area (WBPA) (Figure 2-16). The WBPA was declared a Priority Area by the Minister of Water and Environmental Affairs on 15 June 2012 (Government Gazette No. 35435). The declaration was in response to the predicted NAAQS exceedances in the area and trans-boundary emission sources and air pollution impacts spanning the Waterberg District Municipality and Bojanala Platinum District Municipality.

Regional atmospheric emission sources include:

- Coal mining operations, the most relevant being those at the Grootegeluk opencast mine, located about 16 km south-south-east of the proposed KHC mine at closest approach. These operations result mainly in fugitive dust releases and small amounts of NO_x, CO, SO_2, methane and CO_2 gases;
- Coal-fired power stations that emit include particulates (PM_{10} and $PM_{2.5}$), SO_2, NO_x, nitric oxide (NO), NO_2, CO, CO_2, nitrous oxide (N_2O), and trace amounts of mercury. The following power stations are located in the region:
  - Matimba, located approximately 24 km south-east of the proposed KHC mine;
  - Medupi, due to come online during the course of 2015[4], located 25 km south-south-east of the proposed KHC mine; and
  - Power stations in Botswana, located approximately 100 km from Lephalale.
- Vehicle exhaust emissions. These include CO_2, CO, SO_2, NO_x and hydrocarbon gases as well as particulate material and lead;
- Household fuel combustion (particularly coal, wood and paraffin used by smaller communities/settlements). Combustion of coal produces emissions that include sulphur dioxide, heavy metals, total and respirable particulates, inorganic ash, carbon monoxide, polycyclic aromatic hydrocarbons (PAHs), and benzo(a)pyrene. Pollutants arising from the combustion of wood include respirable particulates, NO_2, CO, PAHs, benzo(a)pyrene and formaldehyde. The main pollutants emitted from the combustion of paraffin are NO_2, particulates, CO and PAHs; and
- Biomass burning (veld fires and fires in agricultural areas within the region).

[4] Medupi has achieved a significant stage in its construction by the synchronisation of its 1st unit (Unit 6) on 2 March 2015 to the National grid. Within three to six months, South Africa hope to see Medupi unit 6’s full potential of 794MW being fed into the South African national grid. While Unit 6 is the first of Medupi’s six units, it should be noted that all required auxiliary services for the entire power station are ready to ensure that Medupi’s total output of 4 764MW is fully synchronised to the South African power grid upon completion and full comissioning.

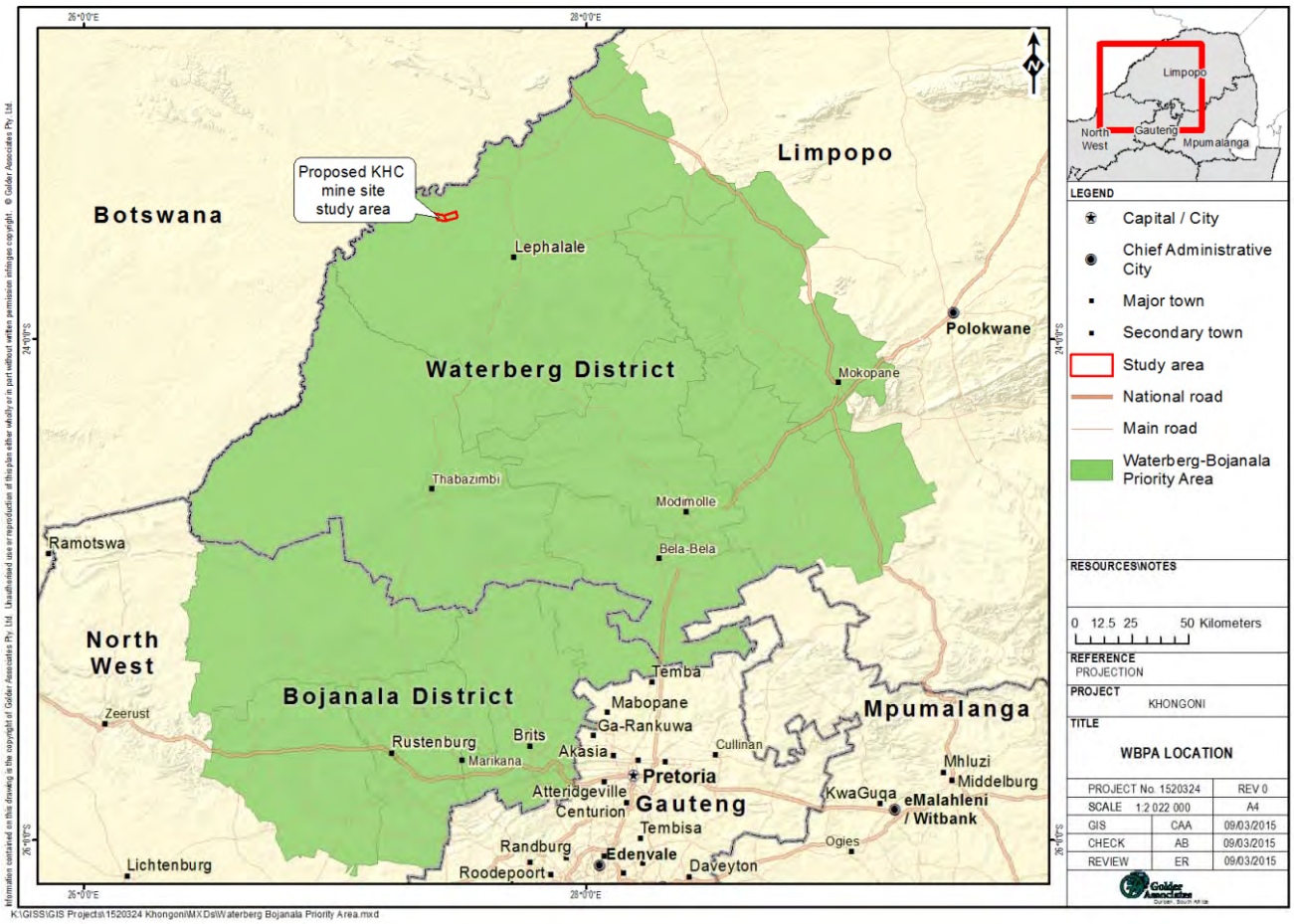


Figure 2-16: Location of the proposed KHC mine within the WBPA

The South African Ambient Air Quality Information System (SAAQIS)[5] was used to access ambient air quality monitoring data for the Lephalale Monitoring Station for the period 01 January 2014 to 31 December 2014. This station was established to monitor urban vehicle emissions and background emissions from the Grootegeluk mine and Matimba Power Station. Considering the comparatively rural nature of the KHC site, its distance from Lephalale and the prevalence of the north-easterly winds, the current pollutant concentrations at the KHC site are likely to be significantly lower than those recorded at the Lephalale station.

Figure 2-17 to Figure 2-19 show that the 10-minute average, hourly average and daily average SO_2 concentrations recorded at Lephalale generally remained below the NAAQS in 2014, but there were a few exceedances in April/May 2014.

[5] SAAQIS is housed and maintained by the South African Weather Service (SAWS).

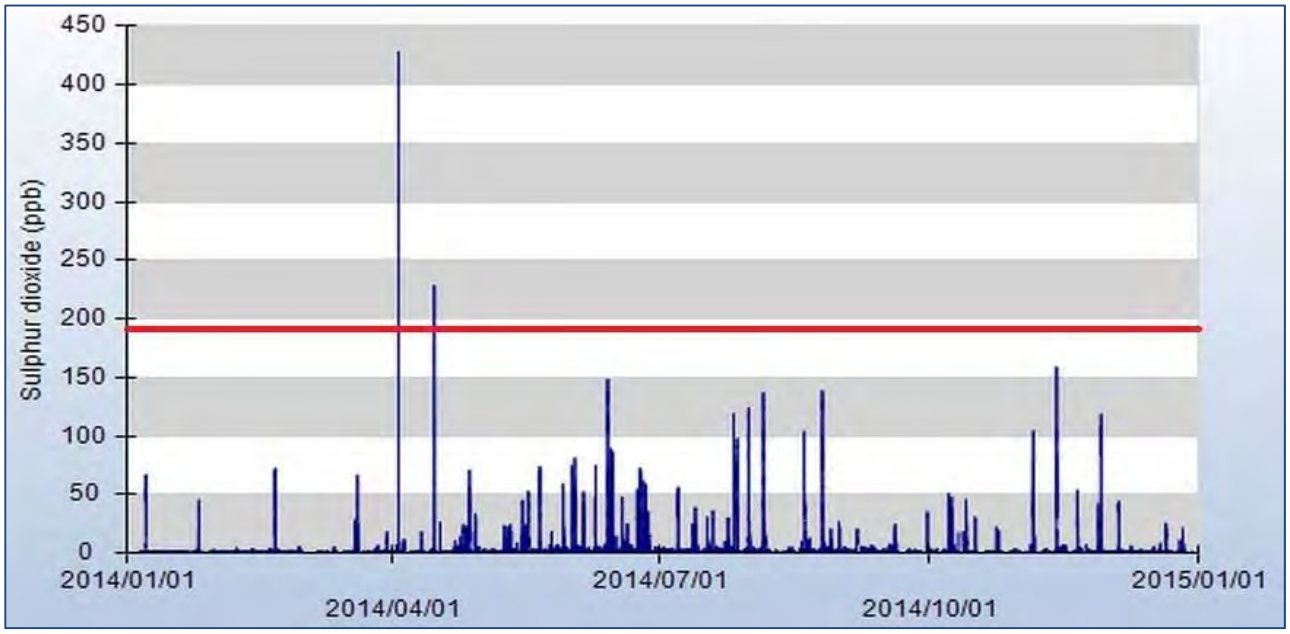


Figure 2-17: 10 minute average SO2 concentrations for the period 01/01/2014 – 31/12/2014 (www.saaqis.org.za/)

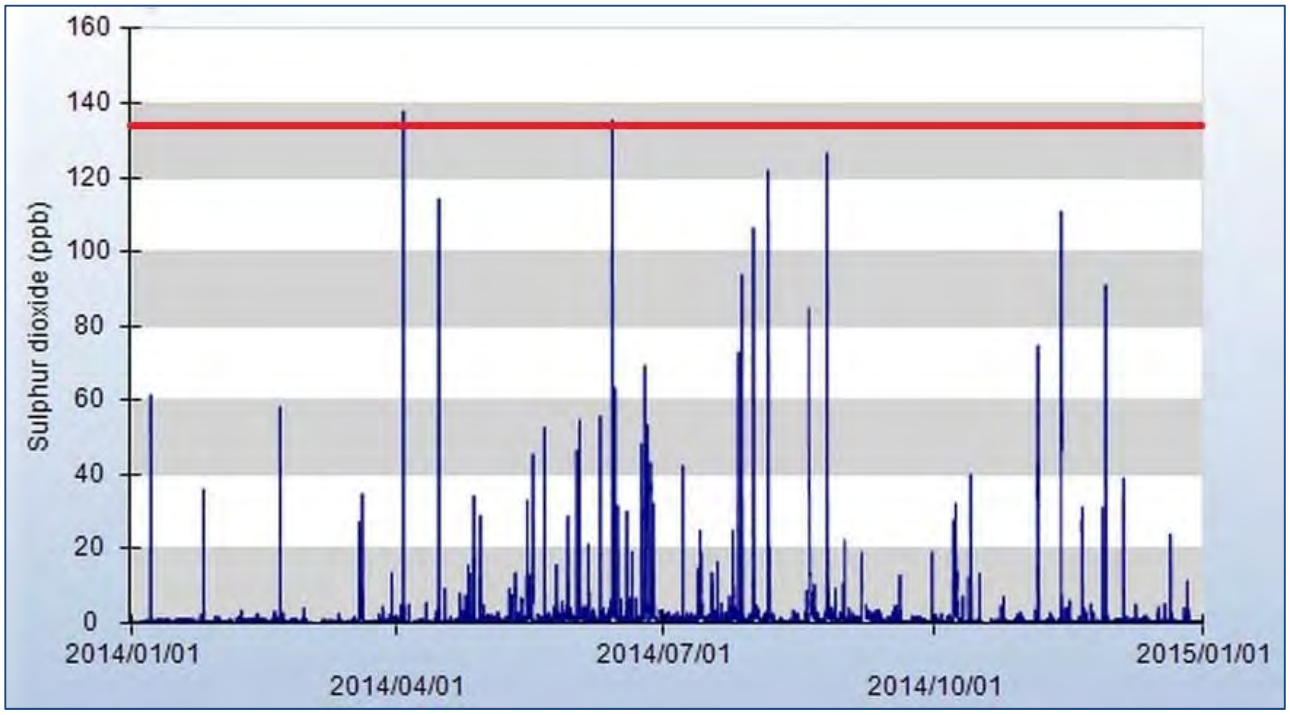


Figure 2-18: Hourly average SO_2 concentrations for the period 01/01/2014 – 31/12/2014 (www.saaqis.org.za/)

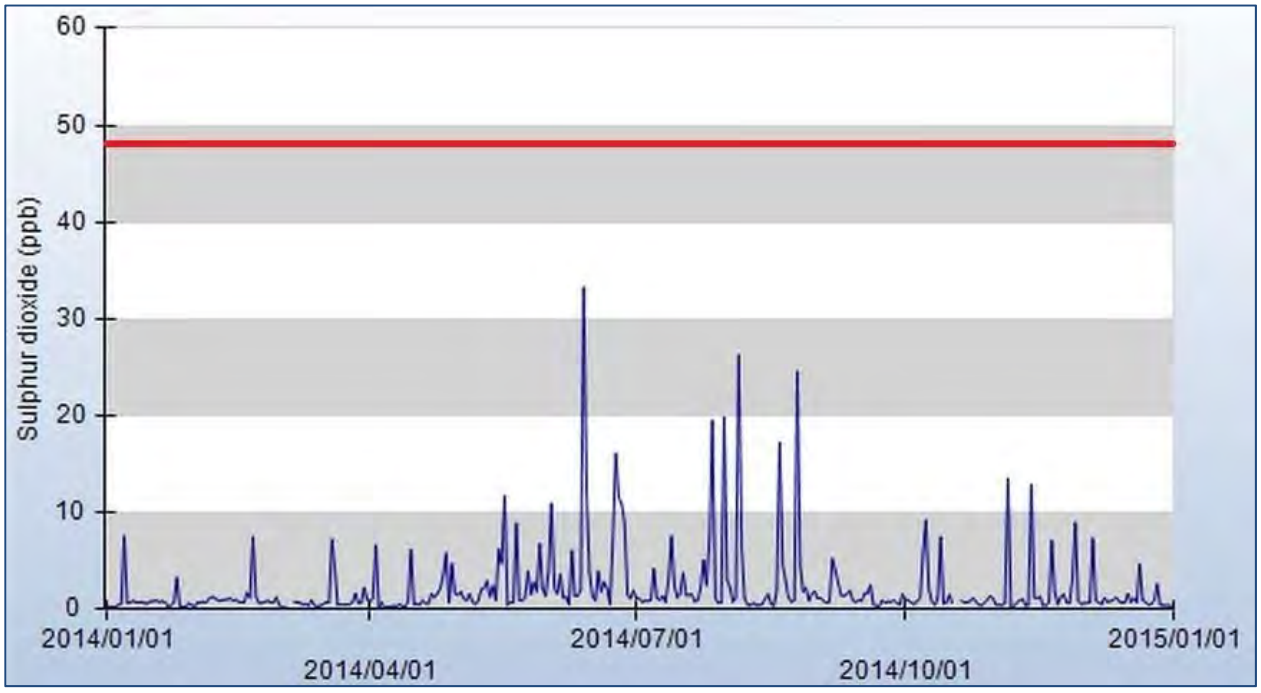


Figure 2-19: Daily average SO_2 concentrations for the period 01/01/2014 – 31/12/2014 (www.saaqis.org.za/)

With the exception of a few exceedances in April/May 2014, the hourly average NO_2 concentrations remained below the NAAQS (Figure 2-20).

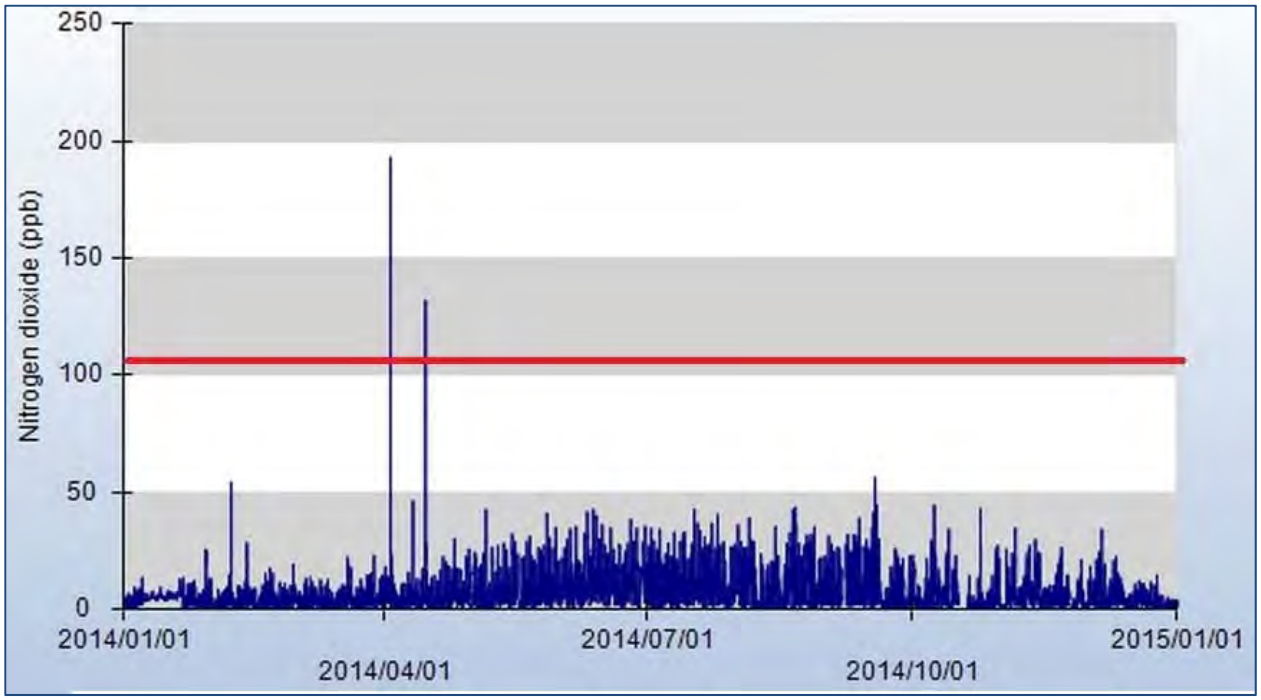


Figure 2-20: Hourly average NO_2 concentrations for the period 01/01/2014 – 31/12/2014 (www.saaqis.org.za/)

Recorded hourly average PM_{10} concentrations remained well below both of the NAAQS limits (120 µg/m^3 pre 01/01/2015 and 75 µg/m^3 post 01/01/2015) (Figure 2-21).

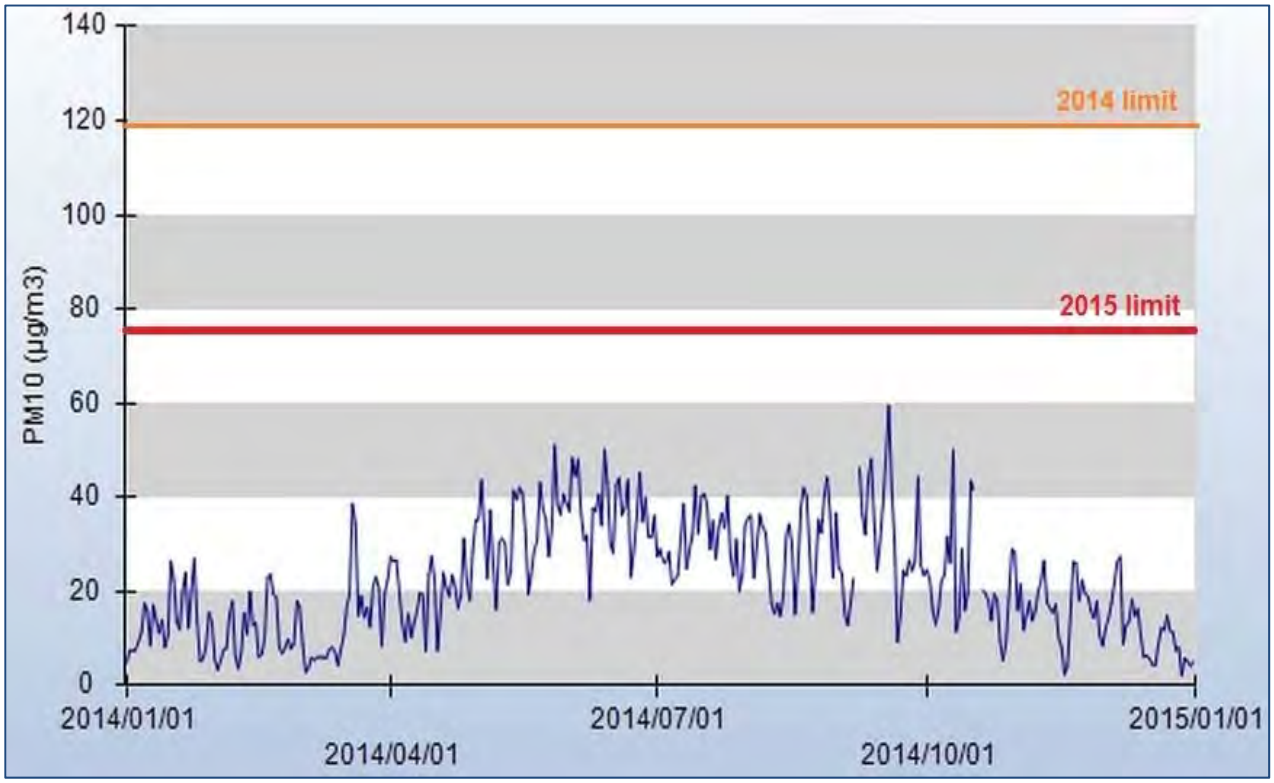


Figure 2-21: Hourly average PM_{10} concentrations for the period 01/01/2014 – 31/12/2014

The recorded hourly average $PM_{2.5}$ concentrations during 2014 remained well below the 2015 NAAQS (65 µg/m^3) (Figure 2-22).

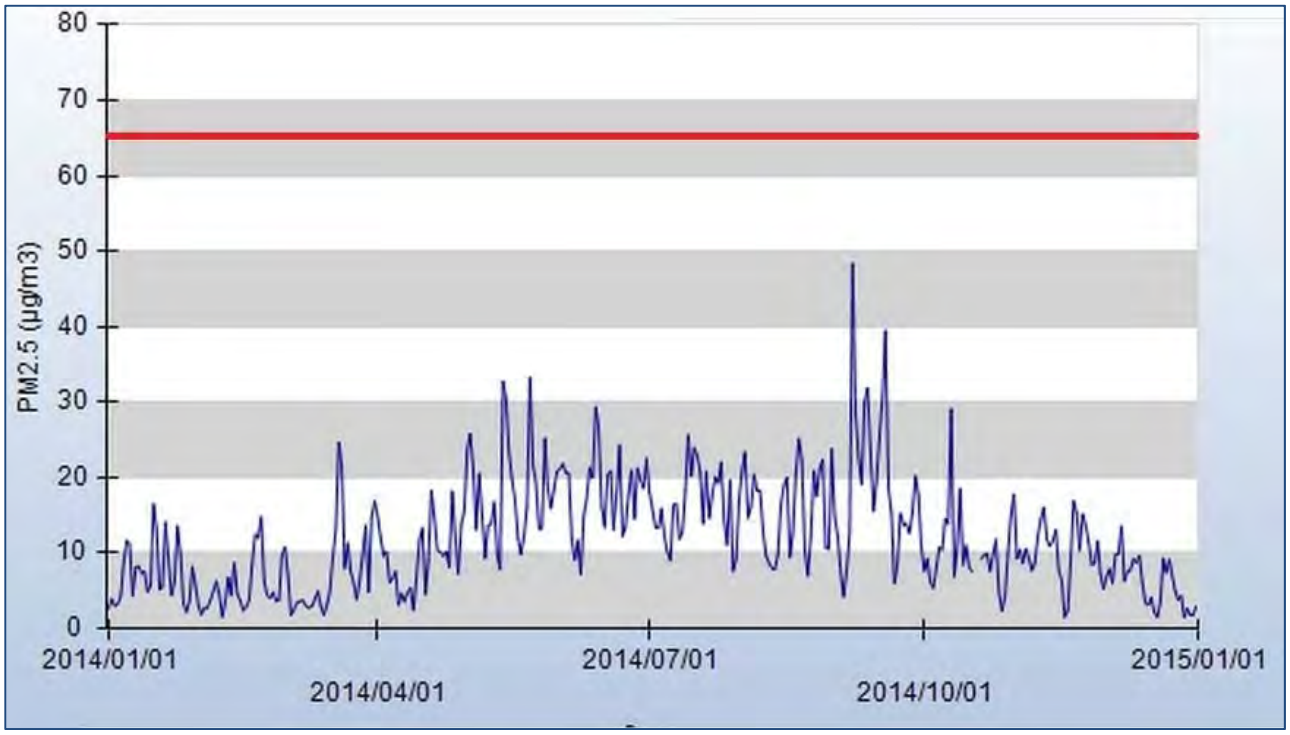


Figure 2-22: Hourly average $PM_{2.5}$ concentrations for the period 01/01/2014 – 31/12/2014

2.9.5 Topography

The terrain on Haaskraal is relatively flat, sloping from 849 mamsl in the north-western corner to 891 mamsl in the south-eastern corner over a distance of 5 935 metres and from 851 mamsl on the northern perimeter to 867 mamsl on the southern perimeter over a distance of 2 620 metres.

The larger surrounding area is characterised by undulating to flat topography at an average elevation of *ca.* 850 metres above mean sea level (mamsl). The land slopes gently towards the Limpopo River (elevation 815 mamsl) to the north of the project area over a distance of about 8.6 km. The non-perennial Mokolo River some 28 km to the east of the project area flows from south to north, towards the Limpopo River.

2.9.6 Soil, Land Capability and Land Use

The soil investigation included a soil survey, mapping of the project area, measurement of the effective depth of the soil(s), assessment of agriculture potential, erodibility and misuse of soils, mapping of land use and land capability, the suitability of soils for rehabilitation and the impact of soil stripping. The investigation was undertaken during April 2015 (Viljoen, C;, April 2015).

Soils vary from place to place due to varying conditions such as climate, rock types, topography and the local soil-forming processes. Over time soils develop characteristics specific to their location, which relate closely to the climate and vegetation of the area. The major world biomes reflect a clear association between vegetation and soil that has developed in response to the prevailing climate. Each soil type has a distinct combination of soil horizons and associated soil properties. Figure 2-23 illustrates the different stages of soil formation.

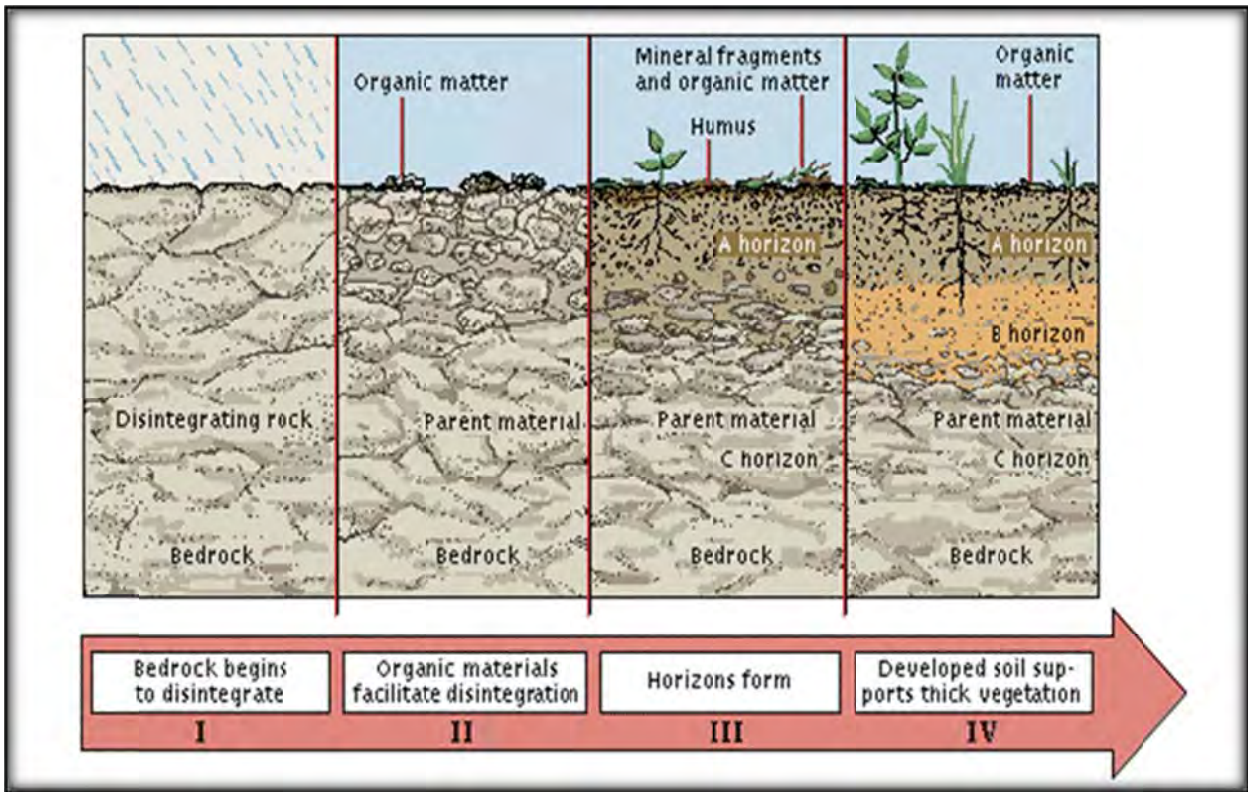


Figure 2-23: Stages of soil formation

Figure 2-24 shows the distribution of the different soil types identified within the project area and classified according to the latest version of the *South African Taxonomical Soil Classification System* into different soil types within the proposed Khongoni Coal project area.

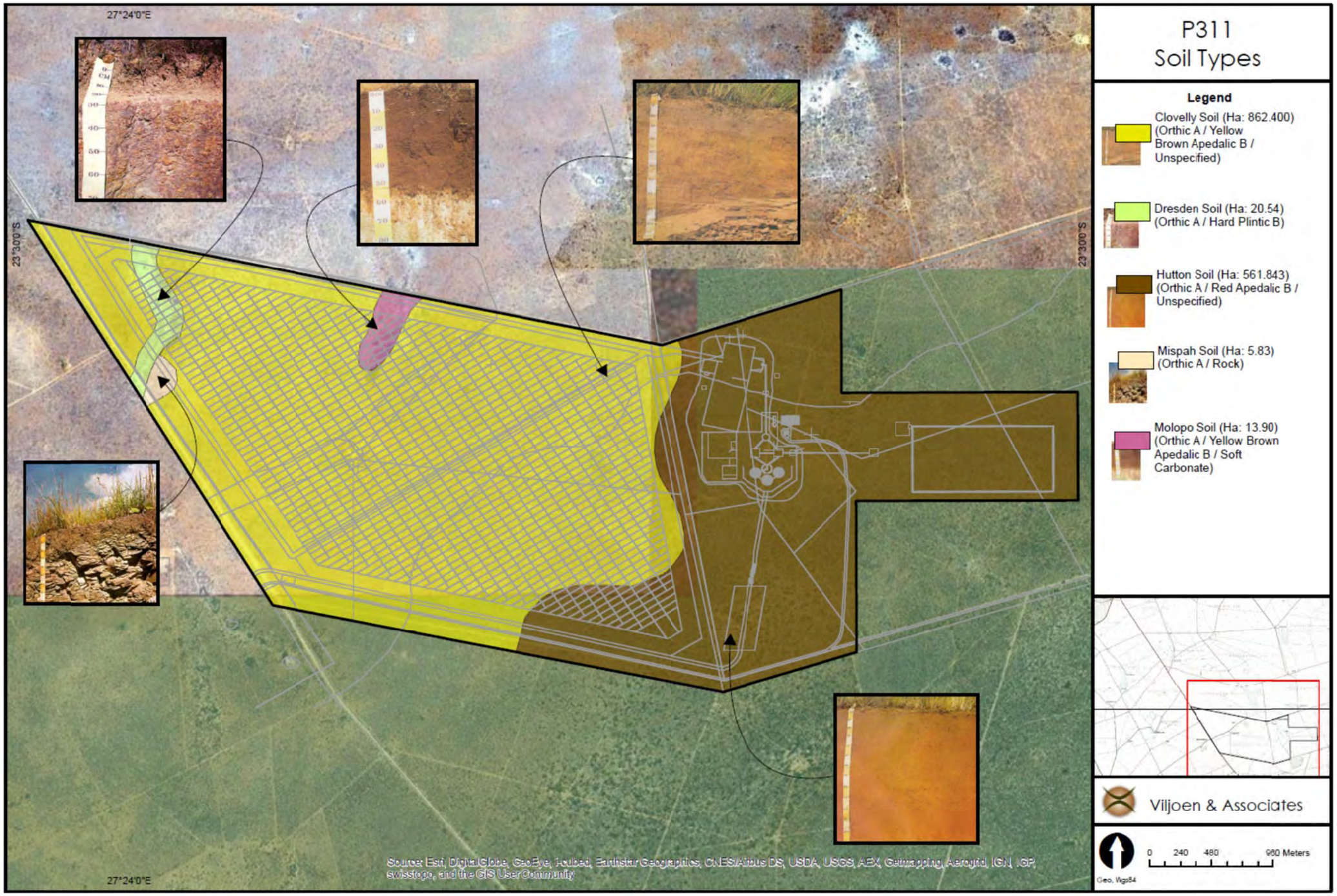


Figure 2-24: Soil types in the project area

2.9.6.1 Agricultural Potential

The Hutton, Clovelly and Molopo soils have high agricultural potential under dryland and irrigation conditions, but the availability of water for irrigation is a main constraint for optimal production. With average rainfall of 450mm/year, production of 30,000 maize plants/ha under dryland conditions will not be sustainable, especially during the very hot summer period. Production under irrigation conditions would require 6,100m^3/ha/year of water for 100,000 plants/ha, which is the equivalent of 30,000l/ha for 24 hours, 7 days per week. The relatively small areas of Dresden and Mispah soils within the project area are not suitable for agricultural purposes.

With an exchangeable sodium percentage of the soils of less than 15% of the cation exchange capacity, the soils in the project area are free of dispersion anomalies caused by the hydration of sodium and consequently a low potential for soil erosion. No evidence of soil contamination or misuse, e.g. salinization or heavy metal precipitation was observed during the investigation

2.9.6.2 Land Use and Land Capability

The project area is utilised mainly for commercial game farming and hunting. Cattle farming is practised to the west of the project area.

2.9.7 Ecology

A literature-based baseline ecological survey was undertaken during March 2015 (Zinn, A; Roux, E, March 2015), which was followed by field investigations from 20 to 24 April 2015 (Zinn, A; Roux, E;, May 2015). A wet season survey will be undertaken during the latter half of 2015.

2.9.7.1 Flora

The project area is located in the Limpopo Sweet Bushveld vegetation type of the savanna biome (Mucina & Rutherford, 2006). Land Cover data designates much of the land in the region as Dense/Open Bush and Low shrubland – see Figure 2-25.

Vegetation surveys comprised belt transects of representative vegetation communities, as identified on aerial imagery during the desktop component, to determine general vegetation composition. Unusual or unrecorded plant species were photographed, sampled and submitted to relevant experts for identification.

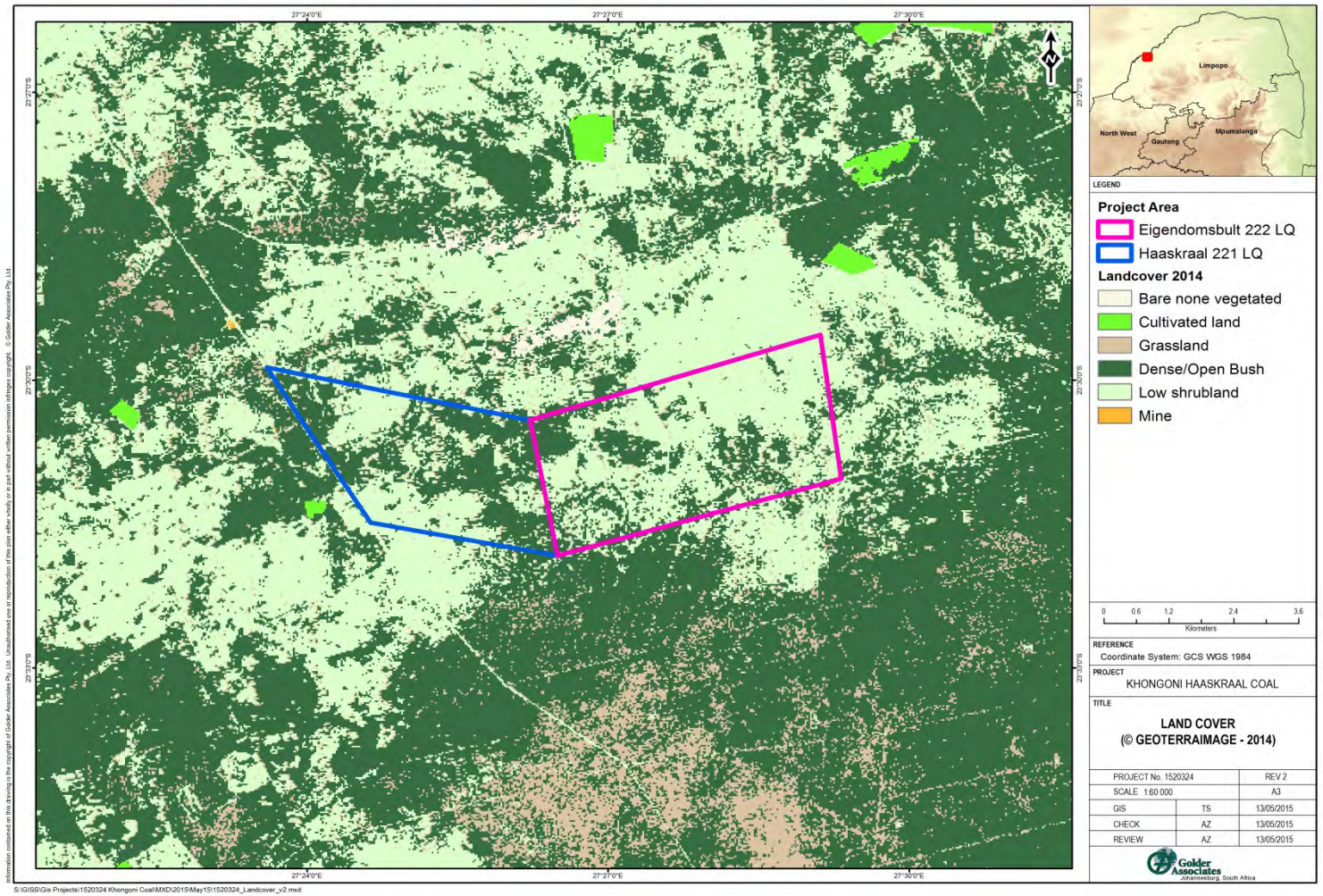


Figure 2-25: Land cover classes characterising the project area and surrounding landscape.

The following four broad vegetation communities and two sub-communities were identified in the project area:

- *Combretum apiculatum* - Mixed Thicket and Bushland;
  - *Combretum apiculatum – Acacia nigrescens* Bushland;
  - *Combretum apiculatum – Sclerocarya birrea* Bushland;

  The *Combretum apiculatum* – Mixed Thicket and Bushland is the largest vegetation community in the project area, occurring on the red sandy soils that dominate much of the mid-slope and a narrow, slightly elevated rocky band in the north-western corner of the project area.

  The broad-leaf *Combretum apiculatum* is characteristic of this community, occurring at both high and low densities. Other common woody species include *Commiphora pyracanthoides, Dichrostachys cinerea,* various *Grewia* spp. (*G. flava, G. bicolor* & *G. flavescens*) and *Solanum tettense* var. *renschii.* These typically grow as small shrubs/trees.

  Two prominent variations of this vegetation community were noted.

  The first, termed *Combretum apiculatum – Acacia nigrescens* Bushland, characterises a diagonal band immediately north of the *Terminalia Sericea – Ochna pulchra* Open Bushland vegetation community. Although the species composition of this sub-community is generally consistent with the broader *Combretum apiculatum* – Mixed Thicket and Bushland vegetation community, it is characterised by a prevalence of tall *Acacia nigrescens* trees, which impart a woodland form to the community.

  The second variation, termed *Combretum apiculatum – Sclerocarya birrea* Bushland, similarly has a composition consistent with the broader community, but is characterised by an abundance of large *Sclerocarya birrea* trees. A patch of this community straddles the Haaskraal - Eigendomsbult farm boundary in the south of the project area (see Figure 2-26).

  Other occasionally or rarely observed broad-leaf woody species include *Bauhinia petersiana, Boscia albitrunca, Boscia foetida* subsp. *rehmanniana, Combretum hereroense, Combretum imberbe, Euclea undulata, Flueggea virosa, Grewia occidentalis, Grewia retinervis, Gymnosporia senegalensis, Gymnosporia tenuispina, Lantana rugosa, Lycium schizocalyx, Opuntia* sp. (an exotic species)*, Rhigozum brevispinosum, Rhus tenuinervis, Solanum lichtensteinii, Terminalia sericea* and *Ziziphus mucronata*. Several fine-leaf species were also occasionally encountered in this community, such as *Acacia erioloba, Acacia erubescens, Acacia fleckii, Acacia grandicornuta, Acacia mellifera, Acacia nilotica, Acacia senegal* var. *rostrata, Acacia tortilis, Albizia harveyi*, *Asparagus cooperi*, *Asparagus suaveolens, Elephantorrhiza burkei* and *Peltophorum Africana.*

  The herbaceous layer comprises a mixture of grasses and forbs/herbs. The annual grass *Megaloprotachne albescens* appears to be particularly common, as are the forbs *Melhania acuminata* and *Waltheria indica*. A full appreciation of relative abundances of species in the herbaceous layer will only be possible after the wet season field survey.

  Four protected tree species were recorded in the *Combretum apiculatum* – Mixed Thicket and Bushland vegetation community, namely *Acacia erioloba, Boscia albitrunca, Combretum imberbe* and *Sclerocarya birrea. Sclerocarya birrea* is particularly abundant in the *Combretum apiculatum – Sclerocarya birrea* Bushland sub-community.

- Mixed Shrubland and Thornveld;

  Common woody species in the lower shrub layer are *Commiphora pyracanthoides, Grewia flava, Gymnosporia tenuispina* and *Rhigozum brevispinosum. Gymnosporia tenuispina* typically has a patchy distribution. The upper layer is characterised by various *Acacias* and species such as *Albizia anthelmintica* and *Boscia albitrunca,* which give this vegetation community the appearance of being fine-leaf dominated.

  Occasionally or rarely encountered broad-leaf woody species recorded include *Acacia erioloba, Acacia erubescens, Acacia fleckii, Acacia grandicornuta, Acacia mellifera, Acacia senegal var. rostrata, Acacia tortilis, Asparagus* sp*., Boscia albitrunca, Boscia foetida* subsp. *rehmanniana, Combretum apiculatum, Combretum imberbe, Dichrostachys cinerea, Ehretia rigida, Elephantorrhiza burkei, Grewia bicolor, Grewia flavescens, Grewia retinervis, Gymnosporia tenuispina, Lantana rugosa, Lycium schizocalyx, Mundulea sericea, Peltophorum africana, Rhus tenuinervis, Solanum tettense var. renschii, Sclerocarya birrea* and *Terminalia sericea.*

  The herbaceous layer is generally herb/forb dominated, with *Melhania acuminata* and *Waltheria indica* being the most abundant. *Megaloprotachne albescens* is the most common grass. Other occasionally or rarely encountered grasses recorded include *Aristida congesta* subsp*. barbicollis, Aristida congesta* subsp. *congesta, Aristida diffusa, Digitaria eriantha, Eragrostis lehmanniana, Eragrostis pallens, Panicum coloratum, Panicum maximum, Perotis patens, Schmidtia pappophoroides* and *Stipagrostis uniplumis.*

  Recorded forbs and herbs in this community include *Acrotome inflata, Barleria holubii, Blepharis subvolubilis* subsp. *subvolubilis, Chamaecrista comosa, Cleome hirta, Commelina* sp.*, Crinum crassicaule, Gossypium herbaceum, Hermannia boraginiflora, Indigofera ingrata, Kalanchoe brachyloba, Kyphocarpa angustifolia, Neorautanenia amboensis, Ocimum americanum* var. *americanum, Pergularia daemia, Sansevieria aethiopica*, *Sarcostemma viminale, Tephrosia purpurea, Rhynchosia totta* var. *totta, Vernonia fastigiata* and *Xenostegia tridentata* subsp. *angustifolia.*

  Two flora species of conservation importance were recorded, namely *Boscia albitrunca* and *Sclerocarya birrea.*

- Open and Closed *Acacia* Thicket;

  These thickets are mainly, although not exclusively, associated with pans and depressions in the project area. Patches of this vegetation type that are not associated with pans are possibly located on sites of historic human habitation or cattle kraals. The accumulation of silt and clay particles in these areas results in locally elevated soil nutrients, which favours a fine-leafed woody community typically dominated by *Acacia* species.

  Areas of Open and Closed *Acacia* Thicket thus comprise important foraging habitat for fauna in the broader landscape. In the project area, the year-round provisioning of water to pans has increased herbivore utilisation of surrounding vegetation, which has resulted in areas of this community being overgrazed.

- *Terminalia Sericea – Ochna pulchra* Open Bushland.

  This small vegetation community is located on the deep white sands of the south-eastern corner of the project area – an upland area. It is characterised by open, park-like savanna with a well-developed grass layer overtopped by medium-sized to tall trees. The whiteness of the soil indicates a high degree of leaching and a low nutrient status, and this is reflected in vegetation composition, which is dominated by broad-leaf woody species.

In terms of composition *Terminalia sericea* and *Ochna pulchra* are particularly abundant, with *Combretum apiculatum* and *Dichrostachys cinerea* also frequently recorded. Although not abundant, *Burkea africana* and *Sclerocarya birrea* are conspicuous in this vegetation community on account of their size relative to surrounding woody vegetation. Other occasionally or rarely encountered woody species recorded include *Acacia erioloba, Acacia fleckii, Bauhinia petersiana, Combretum zeyheri, Commiphora angolensis, Commiphora pyracanthoides, Dichrostachys cinerea, Euclea natalensis, Gardenia volkensii, Grewia bicolor*, *Grewia flavescens* and *Solanum tettense* var. *renschii*.

Two protected trees (*Acacia erioloba* and *Sclerocarya birrea*) were recorded.

Unlike other communities in the project area the herbaceous layer of the *Terminalia sericea – Ochna pulchra* Open Bushland vegetation community is grass dominated, with *Megaloprotachne albescens* being particularly common. *Eragrostis pallens* was occasionally recorded. Forbs and herbs recorded include *Achyranthes aspera* var. *sicula, Acrotome inflata*, *Asparagus* sp., *Chamaecrista mimosoides, Dicerocaryum eriocarpum, Heliotropium lineare, Hermannia boraginiflora, Hibiscus engleri, Indigofera ingrata, Ipomoea* sp*., Melhania acuminata, Neorautanenia amboensis* and *Xenostegia tridentata* subsp*. angustifolia.*

In general, the transition from one vegetation community to the next is gradual. Community delineations as presented in Figure 2-26 are thus indicative and will be further refined upon completion of the wet season survey.

All four vegetation communities are in good condition and exhibit high ecological integrity. They provide important habitat for flora and fauna species, several of which are species of conservation importance, but none of them are Red List species.

Seven species of conservation importance, in addition to the already mentioned *Acacia erioloba, Boscia albitrunca, Combretum imberbe* and *Sclerocarya birrea,* may potentially occur in the area. They are listed in Table 2-10.

Table 2-10: Flora species of conservation importance potentially occurring in the study area

Species	IUCN (2009) – Regional Status	Protected Tree Species (National Forest Act No. 84 of 1998)	Limpopo Province - Protected Species (2003)
Acacia erioloba	Declining	Protected	-
Acalypha caperonioides var. *caperonioides*	Data Deficient – Taxonomic Problems	-	-
Adansonia digitata	-	Protected	Protected
Boscia albitrunca	-	Protected	-
Combretum imberbe	-	Protected	-
Corchorus psammophilus	Vulnerable	-	-
Eulalia aurea	Near Threatened	-	-
Euphorbia waterbergensis	Rare	-	-
Sclerocarya birrea	-	Protected	-
Securidaca longepedunculata	-	Protected	-
Spirostachys africana	-	Protected	Protected

A number of flora species recorded in the project area are also used in traditional medicine – see Table 2-1. These are *Dichrostachys cinerea, Elephantorrhiza elephantina, Euclea undulata, Sclerocarya birrea, Terminalia sericea* and *Ziziphus mucronata.*

Table 2-11: Plants of traditional medicinal use occurring and potentially occurring in the project area

Flora Species	Traditional Uses
Asparagus nelsii	Rhizomes and fleshy roots are used for a variety of ailments including tuberculosis, kidney complaints and rheumatism.
Asparagus cooperi	
Croton gratissimus	Bark is used as a remedy for fever and an assortment of other ailments, while a leaf infusion is used for coughs.
Dichrostachys cinerea	Various parts of this plant are used to treat body pain, elephantiasis, syphilis and leprosy, amongst others.
Elephantorrhiza burkei	Underground rhizomes used to treat diarrhoea, dysentery other stomach disorders and haemorrhoids.
Euclea undulata	Root infusions used as a remedy for heart diseases and headache and toothache.
Tarchonanthus camphoratus	Leaves and twigs are used to brew infusions to treat stomach trouble, headaches, toothache, asthma, bronchitis and inflammation.
Terminalia sericea	Root decoctions are used as a remedy for stomach complaints, diarrhoea and pneumonia, as well as applied as an eye lotion.
Sclerocarya birrea	Various stomach and digestive ailments are treated with bark. The fruit of this tree is also widely eaten and used to produce beverages.
Ziziphus mucronata	Bark and leaves are used as an expectorant in coughs and chest ailments, while root extracts are used to treat diarrhoea and dysentery.

Source: Uses as described by Van Wyk, *et al.* (2009).

An *Opuntia* species (possibly *O. humifusa*) was the only listed alien invasive species that was recorded in the project area. *Opuntia* taxa are generally listed as Category 1 species under the Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) and Category 1b species under the National Environmental Management: Biodiversity Act (2004) (Act No. 10 of 2004).

Figure 2-26: Vegetation communities identified in the project area

2.9.7.2 Fauna

2.9.7.2.1 Mammals

Mammal sampling was undertaken using both active and passive methods. Active sampling included the use of baited Sherman traps and camera traps placed at selected sites. Passive methods included opportunistic observations of / encounters with mammals, the identification of mammal tracks, faeces, burrows and feeding signs, as well as anecdotal evidence provided by local land users.

The area has a rich mammalian community. Thirty eight mammals were recorded during the field survey, comprising 28 naturally occurring or free range species and ten actively managed species.

Actively managed species refers to wildlife species that are bred for commercial purposes. Typically, these are medium- to large ungulates. Sable Antelope (*Hippotragus niger*) and Buffalo (*Syncerus caffer*) are intensively bred in enclosed breeding camps in the project area. Other managed species are extensively bred in the remainder of the project area and include Impala (*Aepyceros melampus*), Eland (*Tragelaphus oryx*), Red Hartebeest (*Alcelaphus buselaphus*), Blue Wildebeest (*Connochaetes taurinus*), Gemsbok (*Oryx gazelle*), Waterbuck (*Kobus ellipsiprymnus*), Giraffe (*Giraffa camelopardalis*) and Burchell's Zebra (*Equus quagga*).

Naturally occurring free range mammals recorded in the project area include ungulates such as Kudu (*Tragelaphus strepsiceros*), Common Duiker (*Sylvicapra grimmia*), Steenbok (*Raphicerus campestris*) and Warthog (*Phacochoerus africanus*).

Carnivores recorded include African Wild Cat (*Felis silvestris lybica*), African Civet (*Civettictis civetta*), Small-spotted Genet (*Genetta genetta*), Slender Mongoose (*Galerella sanguinea*), Honey Badger (*Mellivora capensis*), Black-backed Jackal (*Canis mesomelas*), Brown Hyaena (*Parahyaena brunnea*) and Bat-eared Fox (*Otocyon megalotis*). Although not observed during the field survey, anecdotal evidence from the land owner indicates that Leopard (*Panther pardus*), Cheetah (*Acinonyx jubatus*), Caracal (Caracal caracal) and Aardwolf (*Proteles cristatus*) are also present.

Several smaller species were also recorded, including Aardvark (*Orycteropus afer*), Tree Squirrel (*Paraxerus capapi*), Scrub Hare (*Lepus saxatilis*), Vervet Monkey (*Ceropithecus pygerythrus*) and numerous rodents such as Porcupine (*Hystrix africaeaustralis*), Grey Climbing Mouse (*Dendromus melanotis*), Pouched Mouse (*Saccostomus campestris*), Woodland Dormouse (*Graphiurus murinus*), Lesser Red Musk Shrew (*Crocidura hirta*), Red Veld Rat (*Aethomys chrysophilus*), Spiny Mouse (*Acomys spinosissumus*) and Multimammate Mouse (*Mastomys* sp.).

A total of 50 mammal species possibly occurring in the region, as per the distribution maps presented in Stuart & Stuart (2007). Of mammals recorded in the project area, nine are of conservation importance. An additional 14 Red List/protected species potentially occur in the area. Please refer to the complete ecological report in APPENDIX E.

2.9.7.2.2 Avifauna (Birds)

The bird survey was based on chance encounters, visual identification and bird call identification. Particular attention was paid to suitable roosting, foraging and nesting habitats for Red Data and protected species.

Birds recorded in the project area are typical bushveld species, most of which are common and not restricted in terms of range or habitat, but three species of conservation importance were recorded, namely the Tawny Eagle (*Aquila rapax*), White-backed Vulture (*Gyps africanus*) and Lappet-faced Vulture (*Torgos tracheliotus*). All are listed as Endangered on the IUCN regional list (2014). The Tawny Eagle and Lappet-faced Vulture are further listed as Vulnerable on the NEMBA ToPS List (2013), while the White-backed Vulture is listed as Protected.

The presence of large numbers of vultures on a carcass in the project area highlights the fact that game farming operations throughout the region play an important role in maintaining threatened vulture populations and other birds of conservation importance. Indeed, the Waterberg System Important Bird Area (IBA) (No. SA007) is located approximately 30 km to the south of the project area. This IBA incorporates the entire Waterberg range and plateau and is home to many raptor species (Birdlife South Africa, 2015). Of particular

importance is the Kransberg massif which supports a large and highly significant colony of Cape Vulture (*Gyps coprotheres*) (Birdlife South Africa, 2015).

SABAP2 records indicate that an additional five birds of conservation importance potentially occur in the project area (Table 2-12). Apart from the Black-winged Pratincole (*Glareola nordmanni*) which favours fallow lands and wetlands or marshes overgrown with dense grass, these birds all potentially use resources in the project area.

Table 2-12: Red List and protected bird species potentially occurring in the project area

Scientific Name	Common Name	IUCN (2009) – Regional Status	NEMBA TOPS List (2013)	Limpopo Protected Species (2003)	Probability of Occurrence
Aquila rapax	Tawny Eagle	Endangered	Vulnerable	Protected	Recorded
Ardeotis kori	Kori Bustard	Near Threatened	Protected	Specially protected	Probable
Glareola nordmanni	Black-winged Pratincole	Near Threatened	-	Protected	Unlikely
Gyps africanus	White-backed Vulture	Endangered	Protected	Protected	Recorded
Gyps coprotheres	Cape Vulture	Endangered	Vulnerable	Specially protected	Probable
Sagittarius serpentarius	Secretarybird	Vulnerable	-	Protected	Probable
Terathopius ecaudatus	Bataleur	Endangered	Vulnerable	Specially Protected	Probable
Torgos tracheliotus	Lappet-faced Vulture	Endangered	Vulnerable	Protected	Recorded

2.9.7.2.3 Herpetofauna (amphibians and reptiles)

Herpetofauna surveys comprised active sampling involving the placement of pitfall traps and funnel traps, and drift fences at the fauna survey sites. Species encountered during opportunistic observations were also noted.

Reptiles recorded in the project area include Bushveld Lizard (*Heliobolus lugubris*), Holub's Sandveld Lizard (*Nucras holubi*), Skink species (*Mabuya* sp.), Leopard Tortoise (*Stigmochelys pardalis*), Black Mamba (*Dendroaspis polylepis*) and the Southern African Python (*Python natalensis*). Amphibians recorded include Eastern Olive Toad (*Amietophrynus garmani*), Tandy's Sand Frog (*Tomopterna tandyi*) and Bushveld Rain Frog (*Breviceps adspersus adspersus*)

The Southern African Python (*Python natalensis*), which was recorded in the project area, is listed as protected in the NEMBA TOPS List (2013).

Twenty five amphibian species potentially occur in the region, of which only the Giant Bullfrog (*Pyxicephalus adspersus*) is of conservation importance. The IUCN regional status of this is Near Threatened and it is listed as Protected according to the Limpopo Environmental Management Act (Act No. 7 of 2003). The Giant Bullfrog remains buried for much of the year in grassland and savanna areas, emerging after rain to breed in shallow, temporary streams and pans (Carruthers 2001). As the survey was undertaken during the dry season, it is quite possible that this species is present in the project area.

For a list of all reptile and amphibia species potentially occurring in the project area please refer to the complete ecological report in APPENDIX E.

Table 2-13: Reptiles of conservation importance potentially occurring in the region

Scientific Name	Common Name	IUCN (2009) – Regional Status	NEMBA TOPS List (2013)	Endemic Status	Probability of Occurrence
Afrotyphlops bibronii	Bibron's Blind Snake	-	-	Near Endemic	Possible
Pachydactylus affinis	Transvaal Gecko	-	-	Endemic	Probable
Platysaurus guttatus	Dwarf Flat Lizard	-	-	Endemic	Possible
Platysaurus intermedius	Unexpected Flat Lizard	Endangered	-	Endemic	Possible
Platysaurus minor	Waterberg Flat Lizard	-	-	Endemic	Possible
Platysaurus monotropis	Orange-throated Flat Lizard	Endangered	-	Endemic	Possible
Python natalensis	Southern African Python	-	Protected	-	Recorded
Scelotes limpopoensis limpopoensis	White-bellied Dwarf Burrowing Skink	Near Threatened	-	-	Probable
Smaug breyeri	Waterberg Dragon Lizard	-	-	Endemic	Possible
Smaug vandami	Van Dam's Dragon Lizard	-	-	Endemic	Possible

2.9.7.2.4 Arthropoda (insects)

The arthropod taxa recorded in the project area during the field survey are listed in Table 2-14. Although no formally listed species are likely to occur in the project area, the taxa listed in Table 2-15 may be present and are considered to be of conservation value.

No evidence of burrow dwelling spiders (Infra order MYGALOMORPHAE) was noted in the project area. However, populations of various baboon spiders (Family THERAPHOSIDAE) have been recorded near Lephalale to the south of the project area (see Exxaro, 2014). It is thus probable that these taxa are present on site.

The characteristic flat burrows of burrowing scorpions (Genus *Opistophthalmus*) were recorded on site during the field programme. Like members of the MYGALOMORPHAE, these taxa are also considered of conservation value.

Table 2-14: Arthropod taxa recorded in the project area

Family	Genus/Species
MITURGIDAE	*Cheiracanthium*
NEPHILIDAE	*Nephila senegalensis*
ARANEIDAE	*Agiope australis*
	Gasteracantha versicolor
SCARABAEIDAE	Sp. 1
GRYLLIDAE	*Cophogryllus*
FORMICIDAE	*Tetraponera*
	Polyrhachis gagates
	Dorylus helvolus
TROGIDAE	*Trox sulcatus*
TETTIGONIIDAE	*Zabalius aridus*
BACILLIDAE	*Maransis rufolineatus*

Family	Genus/Species
CARABIDAE	Sp. 1
DANAINAE	*Danaus chrysippus aegyptius*
NYMPHALINAE	*Junonia hierta cebrene*
	Vanessa cardui
PIERIDAE	*Pinacopteryx eriphia eriphia*
APIDAE	*Apis mellifera*
MUSCIDAE	Sp. 1
SOLIFUGE	*Solifuge* sp. 1
SCORPIONIDAE	*Opistophthalmus* Sp.

Table 2-15: Arthropods of conservation value potentially occurring in the project area

Class: Arachnida	Genus
Infra Order: MYGALOMORPHAE	*Augacephalus*
	Brachionopus
	Ceratogyrus
	Idiothele
Order: SCORPIONIDAE	*Opistophthalmus* (Burrowing scorpions)
Source: Leeming (2003), Dippenaar-Schoeman (2014)	

2.9.7.3 Key conclusions

The project area and surrounding landscape comprise mainly natural habitat, used mostly for game farming. Although numerous fences and gravel roads have caused fragmentation, the movement and dispersal of unmanaged wildlife populations across the landscape is probably only moderately restricted and the overall habitat connectivity for free range species is relatively high.

Despite the natural condition of the project area and surrounding landscape, there is a significant anthropological influence on its ecological functioning. This influence is mostly directed at enhancing game productivity by managing stocking rates and manipulating the temporal and spatial distribution of herbivores. The management tools employed to this end include provision of supplementary water and feed, boundary and internal fences, controlled burning and control of game mixes and stocking rates.

These factors affect the frequency and intensity of herbivore resource use across the study area. In the case of large herbivores, this can drive changes in vegetation composition and structure, which if not monitored and adequately managed, can ultimately cause localised as well as wider scale habitat degradation. In rangeland ecosystems, habitat degradation typically manifests as a combination of syndromes including *inter alia* a loss of vegetation cover, increased bush encroachment, loss of productive flora species or functional types, soil erosion and nutrient depletion.

Despite some evidence of localised disturbances, such as overgrazing around water points, potential drivers of change in the study area are currently unlikely to cause significant changes in ecosystem dynamics that would affect overall integrity and functioning. The terrestrial ecology of the project area is therefore considered to be stable.

2.9.8 Surface Water

A scoping level surface water study was undertaken between 13 and 23 April 2015, when the owners of Haaskraal and Eigendomsbult granted limited access to the project area (Cassa, A; Coleman, T;, May 2015).

2.9.8.1 Regional surface water

The Khongoni Haaskraal Coal project is located in the Matlabas catchment which is a predominantly flat area within the Limpopo Water Management Area (WMA). The Matlabas River, which joins the Limpopo River about 47 km to the south-west of the farm Haaskraal 221LQ at an altitude of 840 m, originates in the Waterberg mountain range at an altitude of about 1 400 m. The natural surface drainage in the area is north towards the Limpopo River and east towards the Mokolo River.

The catchment is largely undeveloped with limited water resources and limited water use. The KHC site is situated in the Steenbokpan area, which lies in the A41E quaternary catchment. This area is part of the Lephalale coalfield and numerous mining developments are foreseen for this region. It is a semi-arid region, with non-perennial flow and limited sustainable yield from surface water.

2.9.8.2 Surface water in project area

There are seven surface water features within the project area – see Figure 2-27.

The most prominent one consists of a drainage line that traverses the north-western corner of the farm Haaskraal 221 LQ and culminates in a ca. 300m x 125 m oblong depression about 145 metres from the northern perimeter of the farm. Another drainage line runs from south to north about 1550 metres to the east, starting about 730 metres south of the northern perimeter of the farm and culminating in a depression about 360 metres north of the farm perimeter, on the farm Blinkwater 23 LQ.

There are four natural depressions (pans) across the project area that collect rainwater. Four of these can be supplied with abstracted groundwater when necessary. Only these four were sampled, as Kh_SW03 was dry and muddy and is the only pan that cannot receive groundwater.

In terms of water quality at the pans, the only two constituents that are above ideal limits are the TDS and fluoride. The TDS, while above the ideal limit, was within the acceptable limits for livestock watering. Two pans had fluoride levels above the ideal limits but within acceptable limits. One pan, Kh_SW01 had a fluoride level of 4.35, which is within the tolerable range, but it should be monitored further. The water quality is subject to the water quality of the groundwater boreholes that feed these pans and thus should be compared against the borehole data to identify the source of the high fluoride levels.

There are also man-made troughs and pans for the supply of drinking water to wildlife – see Figure 2-28 and Figure 2-29.

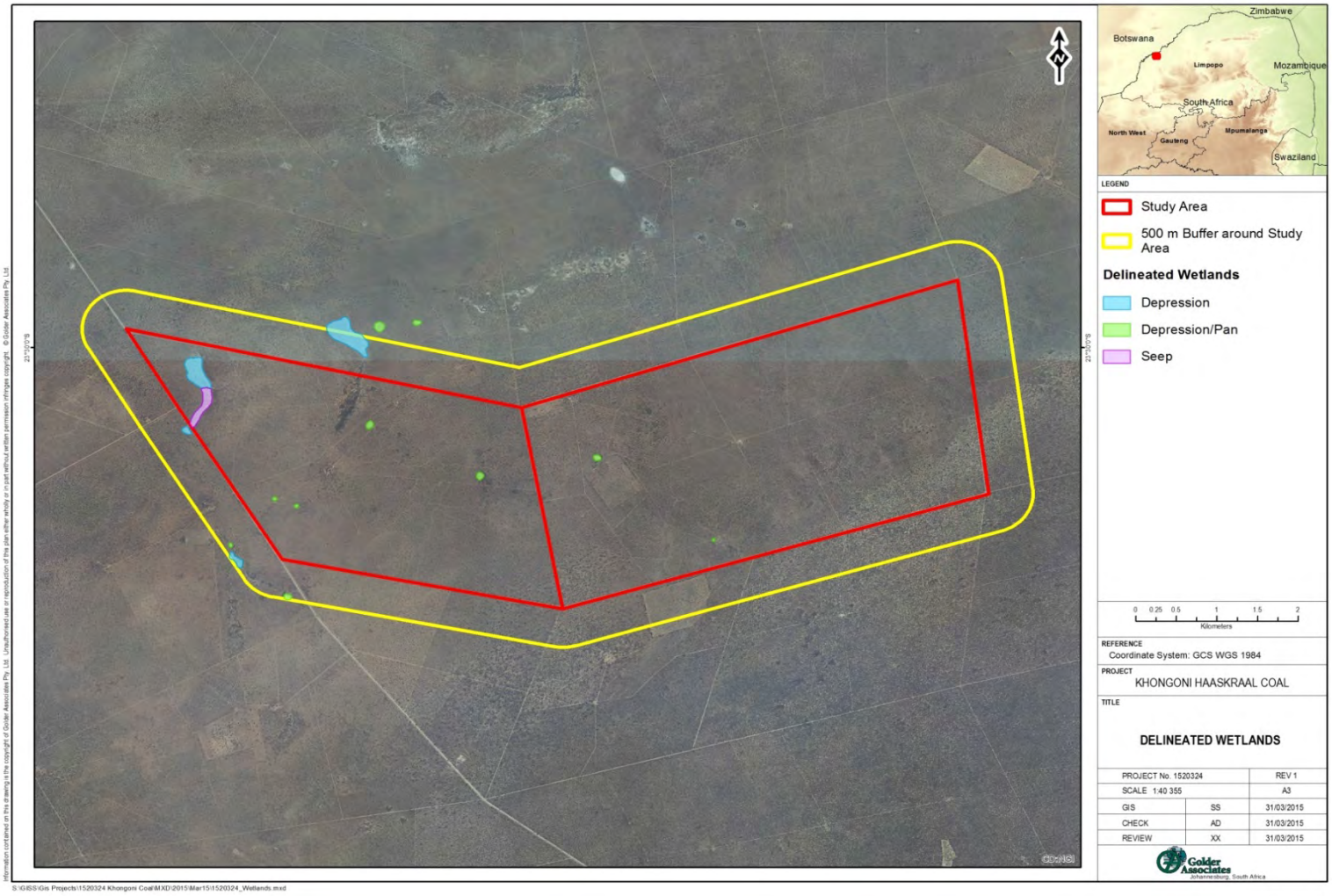


Figure 2-27: Natural surface water features within and adjacent to the project area

Figure 2-28: Man-made watering point (Kh_SW01) in north-western corner of Haaskraal 221LQ

Figure 2-29: One of the man-made water features within the project area.

2.9.8.3 Monitoring of flow and water quality

The Department of Water and Sanitation (DWS) maintains some flow stations in the area (Department of Water Affairs, 2008). Four flow stations had data that were downstream of the site - see Figure 2-30. The river systems in this region have large sand banks and sediment and often run dry. They flow mainly during the months of January to March with low flows being recorded during December, April and May. The rest of the year has little or no flow and the river runs dry during the winter and early spring. These flows correlate with the rainfall pattern of the area in that the rains peak from December through to March, allowing the rivers to flow freely.

The DWS also maintains 6 water quality monitoring stations in the area (also shown on Figure 2-30) and water quality data was obtained from the DWS (Resource Quality Studies) website – see Table 2-16. Golder took surface water samples from the 5 locations within the project area that are shown on Figure 2-31. The water quality results are presented in Table 2-17.

The water qualities presented in Table 2-16 and Table 2-17 are compared against the South African Water Quality Guidelines for Agricultural Use: Livestock Watering (Department of Water Affairs and Forestry, 1996), which is the main water use within the project area.

The water quality in the Limpopo, Mokolo and Lephalale Rivers are well within the limits for livestock watering.

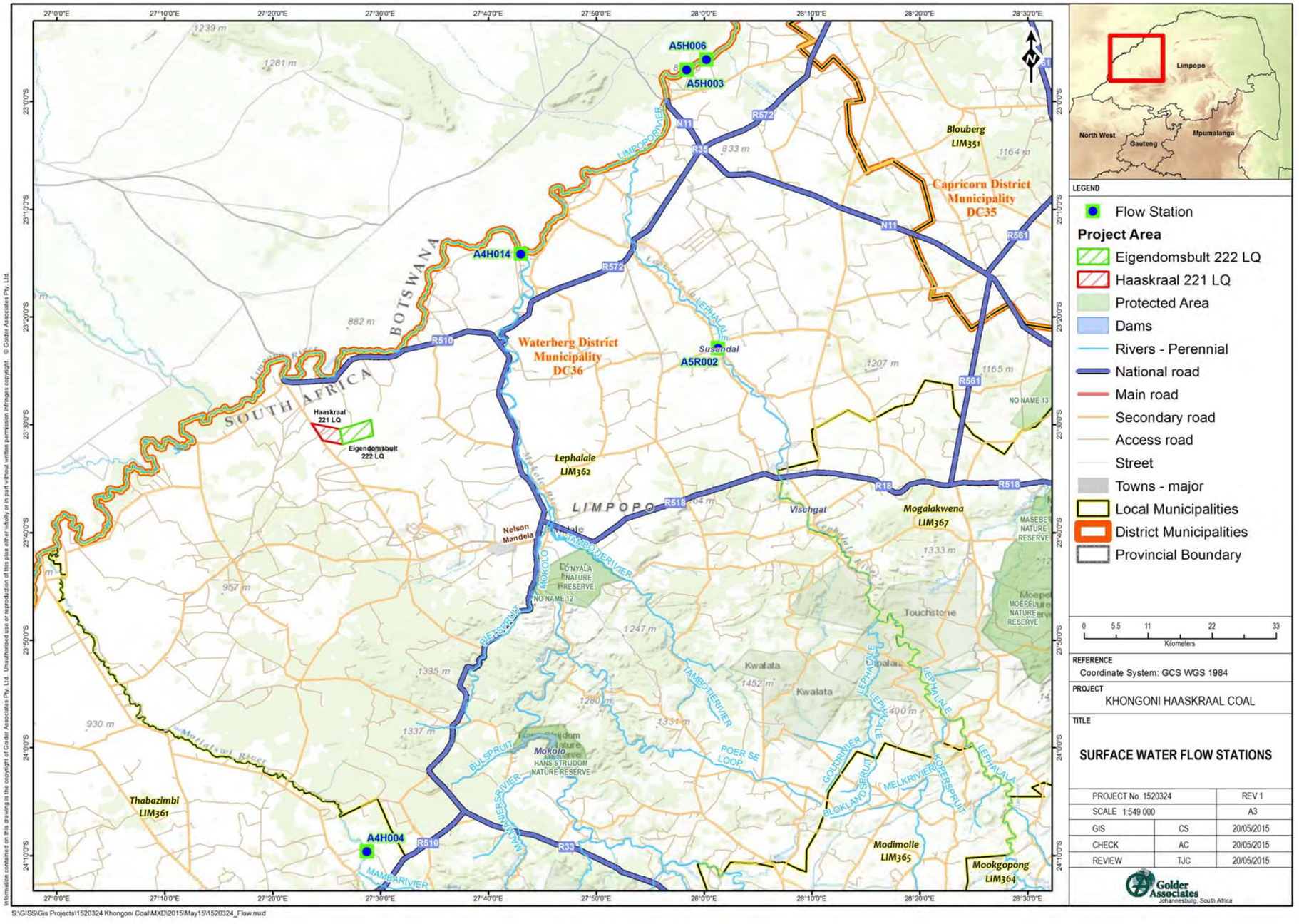


Figure 2-30: Flow measuring stations in the Limpopo water management area

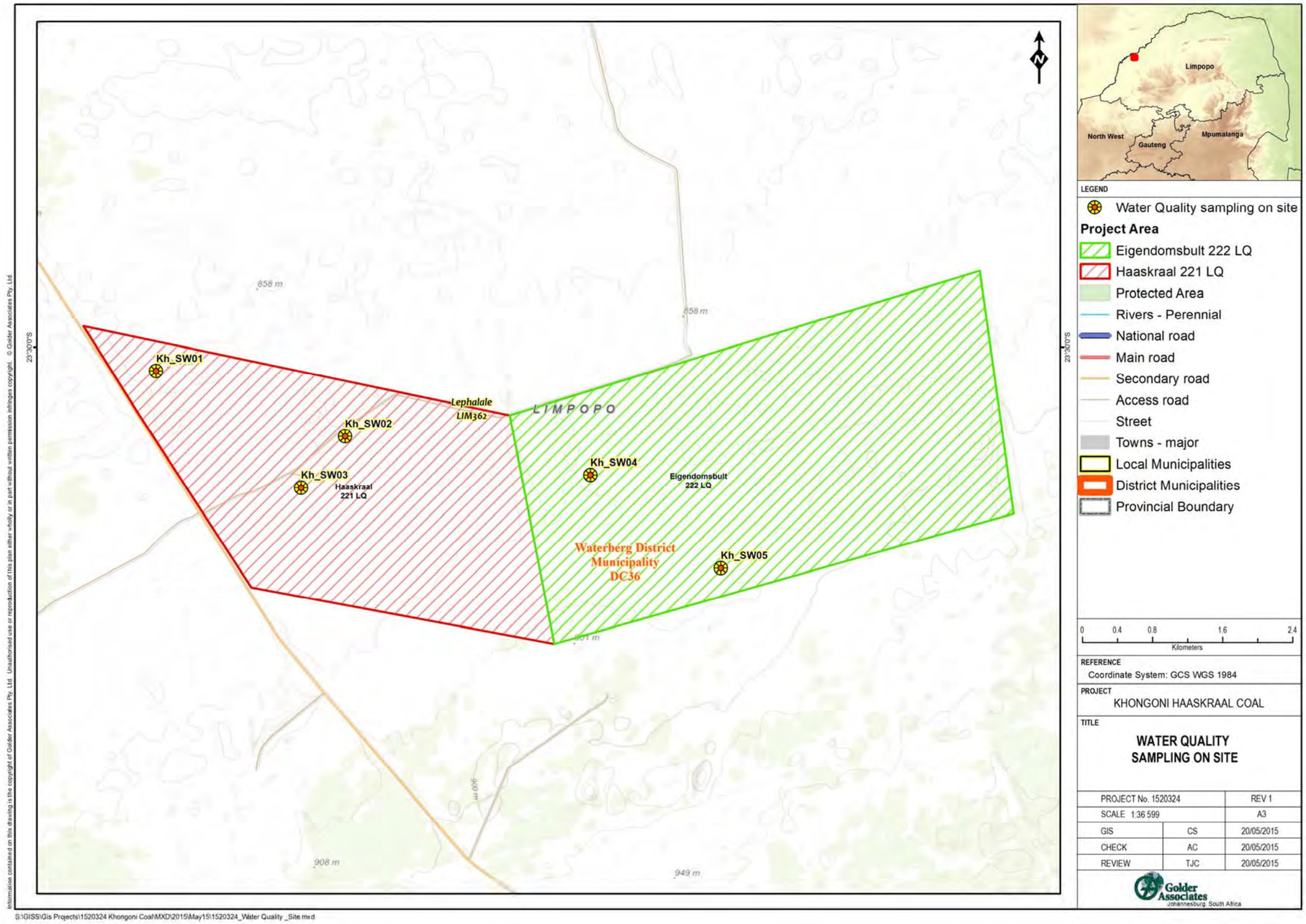


Figure 2-31: Water quality sampling points at pans in project area

Table 2-16: Water quality at DWS sites in Limpopo region

DWS ID			100821	177699	189537			90341			190193			90340		
Station number				A4H012Q01	A4H014Q01			A5H008Q01						A5H006Q01		
No. of samples			1	1	26			236			98			298		
Dates samples were taken			04/05/1983	09/10/200	24/01/2008 - 27/06/2014			31/05/1995 - 04/09/2014			11/02/2005 - 30/10/2014			12/01/1980 - 29/10/2014		
River			Limpopo	Limpopo	Mokolo			Lephalale			Limpopo			Limpopo		
Upstream/Downstream			US	US	DS			DS			DS			DS		
Quaternary			A41D	A41D	A42J			A50H			A50H			A50J		
Percentile	Livestock watering	Unit			5th	50th	95th	5th	50th	95th	5th	50th	95th	5th	50th	95th
pH			7.7	7.9	7.2	7.5	8.0	7.1	7.7	8.5	7.2	8.0	8.6	6.5	7.6	8.5
Total Dissolved Solids, TDS	1000	mg/l	245	590	33	41	50	40	74	245				67	160	424
Electrical Conductivity, EC			32	71	6	7	11	6	12	38	13	39	72	9	25	60
Total Alkalinity as $CaCO^3$			120	271	13	18	24	13	29	85	26	82	162	28	66	143
Ammonia, NH4			0.04	0.02	0.025	0.03	0.0622	0.0168	0.02	0.075	0.05	0.05	1.625	0.02	0.02	0.0694
Calcium, Ca	1000	mg/l	29.3	52.0	2.36	3.38	4.62	3.22	6.63	20.18	4.84	17.50	36.50	6.51	14.55	35.68
Chloride, Cl	1000	mg/l	12.80	39.73	5.61	7.87	12.29	5.00	12.19	52.26	11.25	41.15	85.13	7.56	25.65	68.53
Fluoride, F	2	mg/l	0.680	0.267	0.025	0.137	0.249	0.050	0.153	0.290	0.149	0.200	0.516	0.129	0.270	0.518
Magnesium, Mg	500	mg/l	14.90	39.50	0.75	1.58	2.32	0.75	3.08	11.42	3.37	12.16	24.81	2.71	8.70	24.29
Nitrate and Nitrite as N	100	mg/l	0.420	9.762	0.025	0.025	0.127	0.020	0.205	1.319	0.050	0.200	0.279	0.020	0.080	0.589
Potassium, K		mg/l	5.61	9.61	1.00	1.99	2.49	0.63	1.03	2.61	1.61	3.99	7.16	1.39	2.80	6.57
Sodium, Na	2000	mg/l	17.20	39.47	3.01	5.62	7.16	4.00	8.86	37.21	13.80	29.50	62.94	5.44	19.68	50.18
Sulphate, SO_4	1000	mg/l	16.30	24.98	1.50	1.50	4.78	1.50	6.57	18.42	5.00	24.70	60.35	4.71	15.27	58.95
Nitrogen, N														0.275	0.590	1.094
Phosphorus, P														0.024	0.092	0.166
Orthophosphate as P			0.034	3.218	0.005	0.005	0.058	0.006	0.021	0.200	0.050	0.200	5.245	0.003	0.016	0.060
Silicon, Si			6.93	10.45	2.67	3.89	5.00	2.47	3.80	5.10				1.33	4.38	6.51

Table 2-17: Water Quality at sites sampled on the Haaskraal and Eigendomsbult farms

Laboratory			Aquatico	Aquatico	Aquatico	Aquatico
Sample ID			Kh_SW01	Kh_SW02	Kh_SW04	Kh_SW05
Sampled date and time			21-Apr-2015	21-Apr-2015	21-Apr-2015	21-Apr-2015
Quaternary						
	Unit	Livestock watering				
pH			9.06	8.17	9.18	7.67
Total Dissolved Solids, TDS	mS/m	1000	1212	768	555	1180
Electrical Conductivity, EC	mg/l		232	146	104	218
Total Alkalinity as $CaCO_3$	mg $CaCO_3$/l		228	201	364	106
Total Suspended Solids, TSS	mg/l		1460	585	265	300
Total hardness	mg $CaCO_3$/l		121	70	23	395
Aluminium, Al	mg/l	5	<0.002	<0.002	0.729	<0.002

Laboratory			Aquatico	Aquatico	Aquatico	Aquatico
Ammonia, NH_3 as N	mg/l		0.15	0.044	0.173	0.098
Ammonium, NH_4 as N	mg/l		0.449	0.659	0.428	4.41
Arsenic, As	mg/l	1	<0.01	<0.01	<0.01	<0.01
Cadmium, Cd	mg/l	0.01	<0.002	<0.002	<0.002	<0.002
Calcium, Ca	mg/l	1000	19.8	13.9	4.99	95.3
Chloride, Cl	mg/l	1000	601	346	95.4	620
Total chromium, Cr	mg/l	1	<0.003	<0.003	<0.003	<0.003
Cobalt, Co	mg/l	1	<0.002	<0.002	<0.002	<0.002
Copper, Cu	mg/l	0.5	<0.002	<0.002	<0.002	<0.002
Fluoride, F	mg/l	2	4.35	2.51	2.04	0.329
Iron, Fe	mg/l	10	<0.004	<0.004	0.272	<0.004
Lead, Pb	mg/l	0.1	<0.003	<0.003	<0.003	<0.003
Magnesium, Mg	mg/l	500	17.5	8.68	2.54	38
Manganese, Mn	mg/l	10	<0.002	0.144	<0.002	<0.002
Mercury, Hg	mg/l	1	<0.007	<0.007	<0.007	<0.007
Nickel, Ni	mg/l	1	<0.002	<0.002	<0.002	<0.002
Nitrate, NO_3	mg/l	100	0.325	0.321	0.352	1.11
Nitrite, NO_2	mg/l	100	0.054	0.037	0.039	0.649
Orthophosphate, PO_4 as P	mg/l		0.018	<0.002	0.004	0.021
Total phosphorus	mg/l		6.47	1.03	6	0.46
Potassium, K	mg/l		23.7	10.8	11	26.3
Selenium, Se	mg/l	0.05	<0.005	<0.005	<0.005	<0.005
Silicon, Si	mg/l		1.05	3.74	1.31	2.63
Sodium, Na	mg/l	2000	397	251	211	244
Sulphate, SO_4	mg/l	1000	5.2	0.616	0.43	73.8
Uranium, U	mg/l		<0.001	<0.001	<0.001	<0.001
Zinc, Zn	mg/l	20	<0.002	<0.002	<0.002	<0.002
Chemical oxygen demand, COD	mg/l		117	53	119	55.9
Dissolved organic carbon, DOC	mg/l		11.1	18.4	36	13.5

2.9.9 Groundwater

A scoping level groundwater investigation of the project area on Haaskraal 221 LQ and Eigendomsbult 222 LQ and the surrounding area was undertaken during March 2015 (Brink, D; van der Linde, G;, June 2015).

2.9.9.1 Background information sourced from literature

Existing background information was sourced from:

- The Department of Water and Sanitation (DWS) National Groundwater Database (NGDB). The NGDB was initiated and is driven by DWS. Groundwater information is captured from numerous government and private projects and is available upon request;
- Golder's groundwater database (Aquabase); and
- Other available literature.

The approximate locations of 71 existing boreholes listed in the NGDB in the vicinity of the investigation area are indicated on Figure 2-32. The borehole yields on the database range from 0.01 to 6.0 l/s with an average yield of about 1.0l/s and the groundwater level in the area ranges from 30 to 40 metres below ground level (mbgl) with an average of 33 mbgl. The published hydrogeological maps (DWAF 1996) indicate the water level to range from 20 to 40mbgl and the average to be 27 mbgl.

Groundwater is abstracted mainly for domestic use and for the watering of game and livestock.

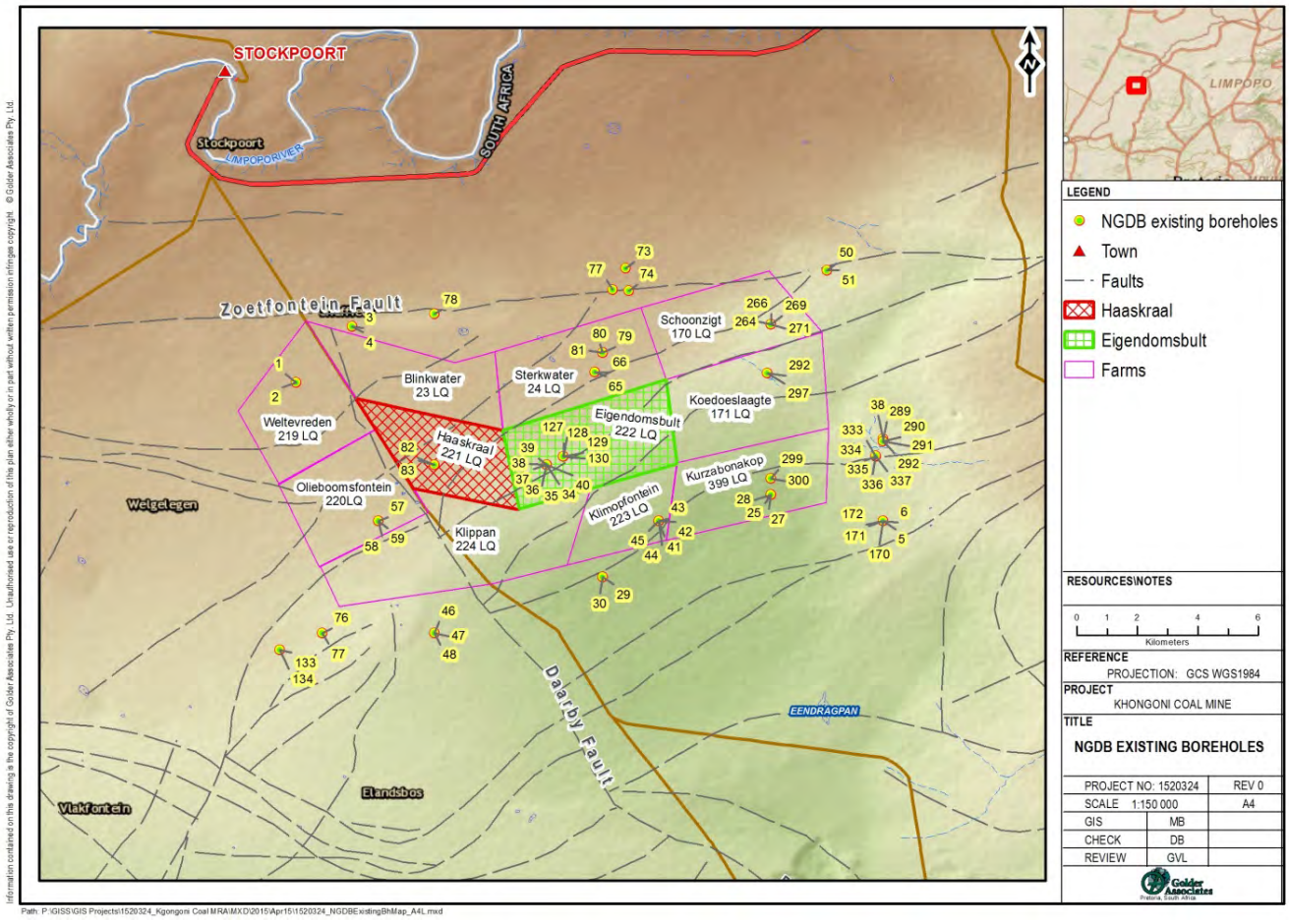


Figure 2-32: Borehole Positions recorded in National Groundwater Database

2.9.9.2 Information from prospecting boreholes

Water levels measured during May 2014 in 18 prospecting boreholes indicated on Figure 2-33 ranged from 1.8 to 53.8 metres below ground level (mbgl), with an average of 25.4 mbgl. The water levels were measured after completion of the boreholes. They are not representative of static water levels and cannot be used to develop piezometric contours.

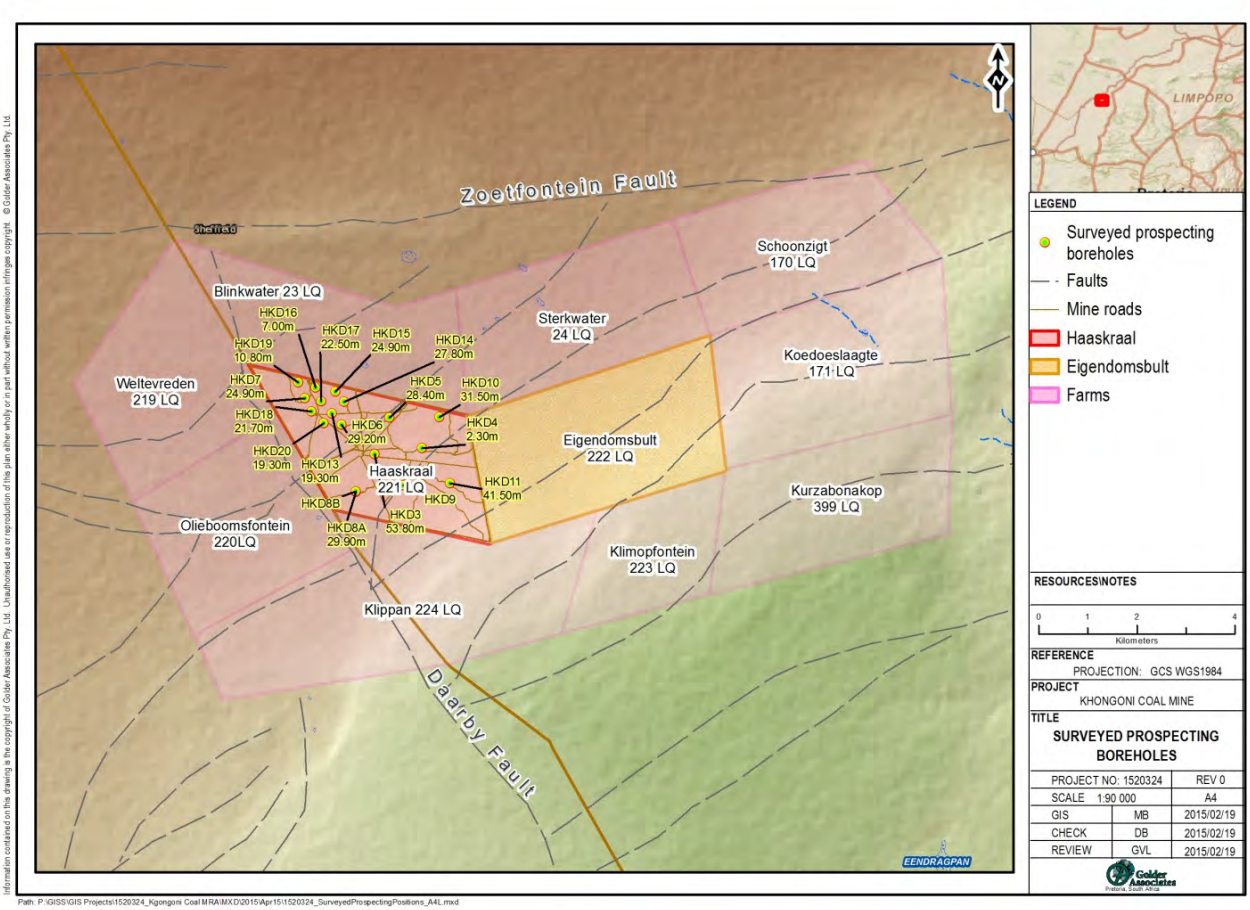


Figure 2-33: Prospecting Boreholes on Haaskraal

2.9.9.3 Hydrocensus

A hydrocensus of the nineteen boreholes indicated on Figure 2-34 and listed in Table 2-18 was undertaken during April 2015 and groundwater samples were collected at nine of these boreholes as indicated on Figure 2-34. The samples were collected as per Golder's standard sampling procedures and submitted to UIS Analytical Services Laboratories in Pretoria, an accredited laboratory.

Water levels were measured in eight boreholes, three of which were being subjected to pumping (Table 2-18). The measured water levels ranged from 26.4 to 65.44 metres below ground level (mbgl), with an average of 44.64 mbgl. The reported borehole yields ranged from 0.01 to 1.26 l/s with an average of 0.53l/s.

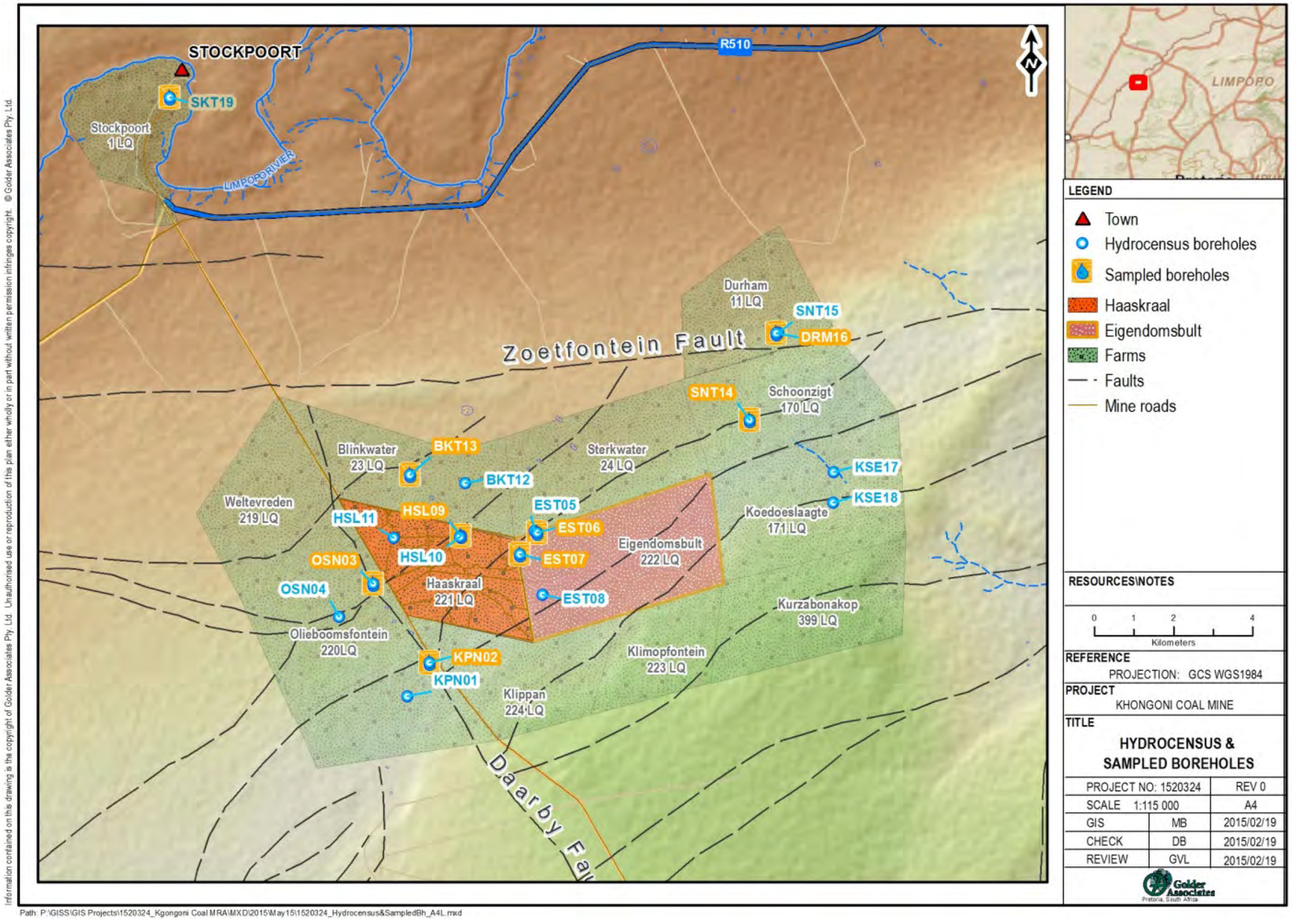


Figure 2-34: Hydrocensus and sampled boreholes

Table 2-18: Hydrocensus Boreholes

Borehole No. on Map	Alternative No.	Latitude	Longitude	Site Name	Owner	Equipment	Depth	SWL (mbgl)	Altitude (mamsl)	SWL (mamsl)	Yield (l/s)
BKT13	HY13	-23.49261	27.41095	BLINKWATER	HARDUS STEENKAMP	Z	200.00	51.79 (pumping)	849	797.21	0.27
BKT12	HY12	-23.49446	27.42449	BLINKWATER	HARDUS STENEKAMP	Windmill	-	-	848	-	-
SNT14	HY14	-23.47981	27.49481	SCHOONZIGT	G ERASMUS	S	60.00	-	862	-	0.42
SKT19	HY19	-23.40671	27.35124	STOCKPOORT LODGE	B. PELSER	S	-	-	821	-	-
SNT15	HY15	-23.45996	27.50182	DURHAM PTN. SCHOONZIGT	G ERASMUS	M	-	-	849	-	-
DRM16	HY16	-23.46008	27.50137	DURHAM	G ERASMUS	S	-	-	848	-	-
KSE17	HY17	-23.49167	27.51558	KOEDOESLAAGTE	G ERASMUS	M	-	-	883	-	-
KSE18	HY18	-23.49857	27.51554	KOEDOESLAAGTE	G ERASMSUS	N	-	38.10	893	854.9	-
KPN01	HY01	-23.54302	27.41036	KLIPPAN	FRIKKIE PISTORIUS	S	180.00	-	870	-	0.38
KPN02	HY02	-23.53530	27.41589	KLIPPAN	FRIKKIE PISTORIUS	S	233.00	-	867	-	1.26
OSN03	HY03	-23.51743	27.40189	OLIEBOOMSFONTEIN	FRIKKIE PISTORIUS	S	-	-	852	-	0.32
OSN04	HY04	-23.52498	27.39343	OLIEBOOMSFONTEIN	FRIKKIE PISTORIUS	S	-	32.4 (pumping)	854	821.6	0.38
EST05	HY05	-23.50535	27.44169	EIGENDOMSBULT	SP GROBLER - STEFGROB@INET.CO.ZA	N	-	38.67	858	819.33	-
EST06	HY06	-23.50569	27.44237	EIGENDOMSBULT	SP GROBLER - STEFGROB@INET.CO.ZA	S	-	52.56 (pumping)	859	806.44	-
EST07	HY07	-23.51057	27.43815	EIGENDOMSBULT	SP GROBLER	S	-	-	862	-	0.69
EST08	HY08	-23.51979	27.44369	EIGENDOMSBULT	SP GROBLER	S	148.00	65.44	876	810.56	0.69
HSL09	HY09	-23.50639	27.42360	HAASKRAAL	SP GROBLER	S	-	-	852	-	0.83
HSL10	HY10	-23.50667	27.42333	HAASKRAAL	SP GROBLER	N	-	26.40	852	825.6	-
HSL11	HY11	-23.50694	27.40695	HAASKRAAL	SP GROBLER	S	37.58	51.79	852	800.21	0.01
Minimum							37.58	26.4	821	797.21	0.01
Maximum							233	65.44	893	854.90	1.26
Average							143.10	44.64	858	816.98	0.53

2.9.9.4 Conceptual groundwater model

The groundwater potential of the geological formations is limited by the low permeability, storage and transmissivity values of the Karoo Supergroup formations. Although fractured fault zones are usually possible locations of increased groundwater potential, no artesian boreholes or substantial groundwater abstraction systems are reported in this area.

The the Eenzaamheid and Daarby Faults are believed to be impermeable and the variation in water levels seen at the drilled boreholes support this view. The splay faults associated with the Daarby fault in the investigation area have varying strikes, throws and throw directions. The most important geohydrological aspect of the faulting is an increase in rock permeability for both the Beaufort and Ecca Groups.

Two distinct aquifer types are prominent in the Karoo Supergroup formations of the Waterberg Coalfields:

- Upper weathered (sandy) aquifer system ; and
- Fractured underlying aquifer system.

The evaporation rate (2365 mm/a) is much higher than the mean annual precipitation (MAP) in the area (350-400 mm/a). The Chloride Ratio Method (CRM) was used to estimate the aquifer recharge rate as 3.1% of the MAP. The CRM calculates the recharge rate from the ratio between the average chloride in rainfall (0.6 mg/l) and the average chloride in the groundwater (19.54 mg/l).

The seasonal variation in rainfall and evaporation rate is reproduced in the borehole yields and the influence is so strong that the rainy season yields can be around 1-3 l/s, but they decrease markedly during the dry season. In some areas the upper aquifer will be completely dry during the winter and early spring.

The water levels of the lower and middle Ecca are higher than in the upper Ecca, which suggests confined aquifer conditions. A sustainable development study of the Waterberg Coalfields in 2010 reported a groundwater flow direction following the topography in a north-north westerly direction. Figure 2-35 shows groundwater contours developed from an EIA undertaken by Golder in the region in 2009 to 2011 (Armitage, N; Baxter, B;, 2011).

In terms of the hydrogeological map series published by DWAF (1996), the aquifer is classified as a fractured aquifer system and the average borehole yield in the area is indicated to be between 0.5l/s and 2.0l/s. The groundwater vulnerability in the area is indicated as low on the national groundwater vulnerability map.

An initial conceptual groundwater model was derived using the 1:250 000 geology map series and available groundwater information (See Figure 2-36). The depth to coal bed was obtained from prospecting borehole logs. The conceptual model excludes any surface or underground mining works and/or linkages to underground mining works.

The conceptual model is needed to gain an understanding of the groundwater occurrence and flow mechanisms in the area of investigation, and will be used as a basis for future numerical groundwater modelling.

Two potential aquifer zones are commonly present in the coal fields of the Karoo Supergroup (needs to be confirmed by drilling on Haaskraal) namely:

- An upper weathered (sandy) aquifer system, comprising of sandstone, shale and mudstone. The average weathering depth of the Karoo sediments is commonly about 5 to 15m below surface. The aquifer conditions in the weathered aquifer zone could be unconfined, but a perched water level could be present in areas underlain by an aquiclude formation; and
- A fractured underlying aquifer system, controlled by geological structures and/or horizontal coal seams. The average depth of the fractured aquifer zone is commonly about 15 to 45m below surface. The aquifer conditions of this aquifer zone can be described as semi-confined and being controlled by fracturing, geological structures (fault zones) and horizontal coal seam contact zones. Geological structures will act as preferred groundwater flow paths.

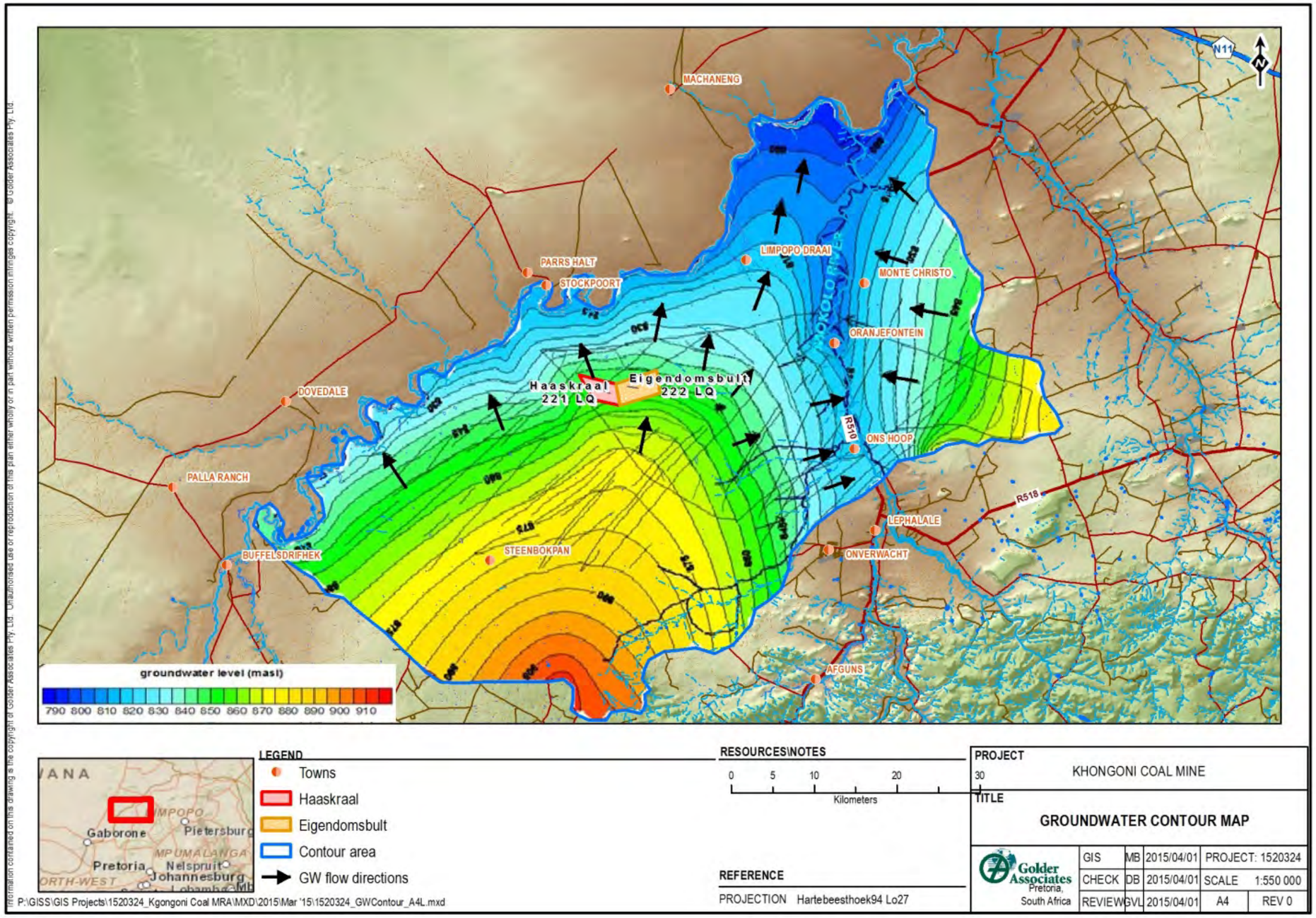


Figure 2-35: Groundwater Contour Map, adapted from previous EIA (Golder, 2011)

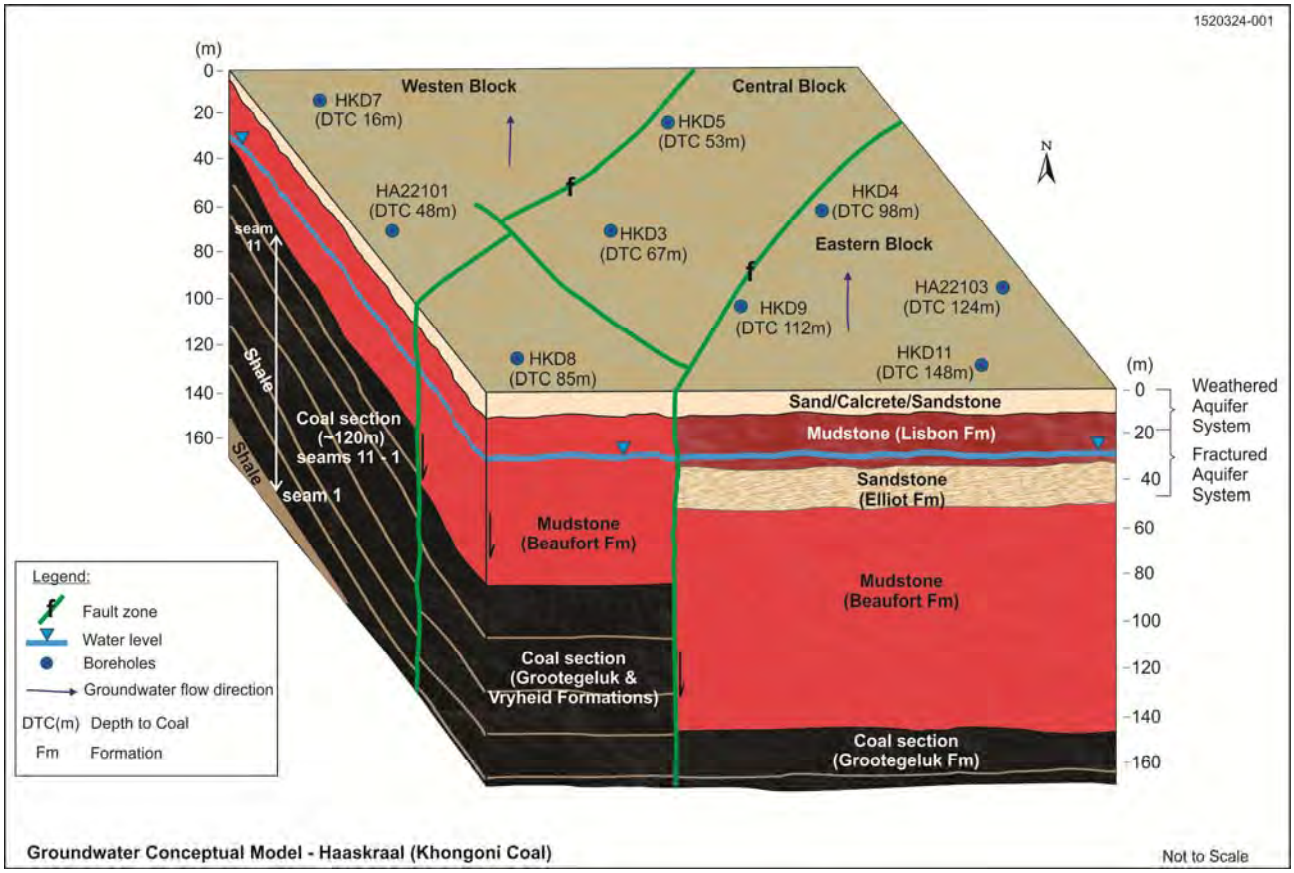


Figure 2-36: Conceptual groundwater model – based on assumed structural geological model

2.9.9.5 Groundwater quality

The published hydrogeological map series (DWAF1996) was used to define the regional groundwater quality in the project area based on Electrical Conductivity (EC) values, which ranged from 70 to 300 mS/m, with the corresponding water quality classes being class I and II.

Twenty two boreholes adjacent to the investigation area were selected as being representative of background groundwater information. Seven of these boreholes were sampled and analysed during 2007 – see Table 2-19. A value in bold red font signifies exceedance of the SANS 241:2011 maximum allowable limit, whereas values in bold black font signify exceedances of Class 0 values in terms of the DWAF (1996) drinking water standards.

For the two boreholes ELDS1 and MTJ, groundwater quality on a Piper diagram indicates a calcium-magnesium bicarbonate type of water (Ca, Mg)$(HCO_3)_2$. This type of water is associated with recent rainfall recharge and unpolluted groundwater.

Based on the published data, the groundwater quality of the project area can be described as being slightly affected by activities such as mining and can be classified as moderate at best. The samples are characterised by elevated EC, sodium, Cl and nitrate values and slightly alkaline pH values.

Table 2-19: Chemical composition of groundwater samples in vicinity of project area – published data

Borehole Number	PH	EC (mS/m)	Total Dissolved Solids	Ca	Mg	Total Hardness as $CaC0_3$	Na	K	Total Alkalinity $CaC0_3$	Bicarbonate HCO_3	Carbonate $C0_3$	Cl	SO_4	NO_3	F	Turbidity NTU	PO_4	Mn	Fe	Co	COD	Alkalinity $CaC0_3$	Water Quality Class
DRH 2	8.8	174	1118	130	43	502	149	6.2	325	343	26	301	7.2	81	0.2	0.65	<0.12	0.002	0.22	0.003	8	22	IV
DRH 3	9	143	912	93	36	380	173	6.5	409	401	48	269	9	11.4	0.3	5.0	<0.12	0.11	0.44	0.008	8	40	II
DRH 4	8.5	166	1912	140	56	580	452	9	321	370	11	712	157	1.8	0.9	7.5	<0.12	0.15	10.4	0.006	17	9	III
DRH6	9.1	166	1284	44	25	213	310	32	785	819	68	164	<0.2	<0.1	0.2	35	5.5	0.33	2.7	0.008	33	57	III
DRH7	8.9	96.7	656	48	28	235	109	4.2	229	236	22	147	7	54	0.3	0.05	<0.12	<0.001	<0.001	0.009	33	18	IV
ELDS 1	7.4	468	31	23	172	70	10.8	21	26	Nil	183	<0.2	21	<0.1	1	<0.12	0.02	0.3	0.005	<5	Nil	<1	III
MTJ 1	8.6	756	89	42	395	169	7.2	330	373	14	203	3.5	34	0.3	6	<0.12	0.1	0.93	0.008	9	12	10	IV
SANS241: 2011	9.7	<170	1200	-	-	-	200	-	-	-	-	300	500	11	1.5	<1.0	-	0.5	0.3	<500	-	-	
Class 0 Max. Allowable Limit	9.5	<70	<450	<25	<70	<200	<100	<25	-	-	-	<100	<200	<6	<0.7	<0.1		<0.1	<0.01	-	-	-	
Class 1 Max. Allowable Limit	10	150	1000	50	100	200-300	200	50	-	-	-	200	400	10	0.7-1.0	0.1-1.0		0.1-0.4	0.01-0.2	-	-	-	
Class 2 Max. Allowable Limit	10.5	370	2400	100	200	300-600	400	100	-	-	-	600	600	20	1.0-1.5	1.0-20		1-4	0.2-2.0	-	-	-	
Class 3 Max. Allowable Limit	11	520	3400	500	400	>600	1000	500	-	-	-	1200	1000	40	1.5-3.5	20-50		4-10	2-10	-	-	-	
Class 4 Max. Allowable Limit	>11	>520	>3400	>500	>400	-	>1000	>500	-	-	-	>1200	>1000	>40	>3.5	>50		>10.0	>10.0	-	-	-	
Minimum	7.4	96.7	31	23	25	70	7.2	4.2	26	14	11	3.5	7	0.3	0.2	0.05	0.02	0.002	0.005	0.003	8	9	
Maximum	9.1	756	1912	140	395	580	452	330	785	819	203	712	157	81	6	35	5.5	0.93	10.4	9	33	57	
Average	8.6	281.4	857	74	108	307	173	58.4	353	364	80	266	39	29.7	1.3	9.64	1.87	0.30	2.30	1.51	18.50	26.00	

The chemical analyses of the nine boreholes sampled during the hydrocensus were used to update the baseline groundwater information and were evaluated against the following standards:

- DWAF, domestic water quality guidelines, volume 1(1996) and Water Research Commission, water quality guidelines, 1998; and
- South African National Standards, drinking water standards, 2011 (SANS 241:2011).

The SANS 241:2011 drinking water standard was used as reference and the DWAF 1996 guidelines were used to classify and discuss the baseline water quality classes (Table 2-20).

From the analytical results obtained during the hydrocensus it is concluded that the groundwater quality has been affected by activities such as stock farming and possibly prospecting. The samples showed elevated EC, TDS, Ca, Na, Cl, F and nitrate values with slightly alkaline pH values. The elevated sodium and chloride values are probably related to deep boreholes intersecting coal layers and the elevated fluoride values are probably related to the shale layers, which formed on the bottom of an ancient waterbody and are likely to contain minerals such as collophane. The elevated nitrate values are probably related to stockades and cattle farming located close to these boreholes.

Based on the majority of the hydrocensus groundwater samples, the background groundwater quality within the project area is representative of a sodium bicarbonate/chloride type of water.

Table 2-20: Water quality in boreholes sampled in May 2015

Borehole Number	PH	EC (mS/m)	Total Dissolved Solids	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Total Alkalinity $CaC0_3$ (mg/l)	Cl (mg/l)	SO_4 (mg/l)	NO_3 (mg/l)	F (mg/l)	PO_4 (mg/l)	Mn (mg/l)	Fe (mg/l)	Zn (mg/l)	Al (mg/l)	Cr (mg/l)	P. Alkalinity $CaC0_3$	Water Quality Class
KPN02	7.39	**106**	**598**	44.8	10.8	**170**	11.3	439	75.6	1.88	<0.3	**5.48**	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	IV
OSN03	7.63	**136**	**768**	42.2	12.9	**232**	10.8	441	**180**	2.8	<0.3	**4.68**	<0.8	<0.05	0.06	0.17	<0.05	<0.05	<0.6	IV
EST06	7.22	**187**	**1100**	21.4	21.8	**315**	18.9	725	**195**	16.1	<0.3	**2.85**	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	III
EST07	7.67	**124**	**754**	31.2	7.99	**232**	9.44	534	**102**	3.46	<0.3	**4.46**	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	IV
HSL09	7.33	**232**	**1320**	28.7	15.8	**378**	14.1	449	**524**	1.86	<0.3	**3.08**	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	III
BKT13	7.27	**383**	**2180**	53	31.7	**652**	**27**	521	**1100**	1.87	<0.3	**2.05**	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	III
SNT14	7.33	**250**	**1620**	**91.7**	67.6	**311**	19.9	421	**607**	37.5	**38.5**	0.27	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	III
DRM16	7.29	**93.2**	**670**	50.5	24.7	**114**	5.25	205	**139**	13.3	**22.4**	0.37	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	III
SKT19	7.63	**514**	**3910**	**146**	**234**	**611**	5.83	582	**1460**	**628**	0.87	**0.94**	<0.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.6	IV
SANS241: 2011	9.7	<170	1200	-	-	200	-	-	300	500	11	1.5	-	0.5	0.3	<0.5	<0.3	<0.05	-	
Class 0 Max. Allowable Limit	9.5	<70	<450	<80	<70	<100	<25	-	<100	<200	<6	<0.7	-	<0.1	<0.01	-	-	-	-	
Class 1 Max. Allowable Limit	10	150	1000	150	100	200	50	-	200	400	10	0.7-1.0	-	0.1-0.4	0.01-0.2	-	-	-	-	
Class 2 Max. Allowable Limit	10.5	370	2400	300	200	400	100	-	600	600	20	1.0-1.5	-	01-Apr	0.2-2.0	-	-	-	-	
Class 3 Max. Allowable Limit	11	520	3400	>300	400	1000	500	-	1200	1000	40	1.5-3.5	-	04-Oct	02-Oct	-	-	-	-	
Class 4 Max. Allowable Limit	>11	>520	>3400	>300	>400	>1000	>500	-	>1200	>1000	>40	>3.5	-	>10.0	>10.0	-	-	-	-	
Minimum	7.22	93.2	598	21.4	7.99	114	5.25	205	75.6	1.86	0.87	0.27	<0.08	<0.05	<0.05	0.17	<0.05	<0.05	<0.6	
Maximum	7.67	514	3910	146	234	652	27	725	1460	628	38.5	5.48	<0.08	<0.05	0.06	0.17	<0.05	<0.05	<0.6	
Average	7.42	225	1435.56	56.61	47.48	335.00	13.61	479.67	486.96	78.53	20.59	2.69	<0.08	<0.05	0.06	0.17	<0.05	<0.05	<0.6	

2.9.10 Noise

A noise survey was undertaken early in April 2015. Noise Monitoring was undertaken in accordance with SANS 10103:2008, which specifies the equipment to be used to undertake measurements, conditions under which noise measurements should be undertaken, measurement parameters and appropriate siting of monitoring equipment.

The noise monitoring instruments were set up next to a gravel road at the location shown in Figure 2-37, the coordinates being 23°30'1.53"S and 27°23'41.53"E. The traffic flow on this road is very low and can be discounted as a significant source of noise, but the wildlife (mammals, birds and insects), can contribute high noise levels at certain times of the day.

Monitoring was undertaken during both the daytime (06:00 to 22:00) and night-time (22:00 to 06:00) periods, as defined in SANS 10328:2008. The monitoring commenced at 12:25hrs on 1 April 2015 and finished at 07:00hrs on 2 April 2015, giving 9.5 hours of monitoring during the daytime and 8 hours during the night-time.

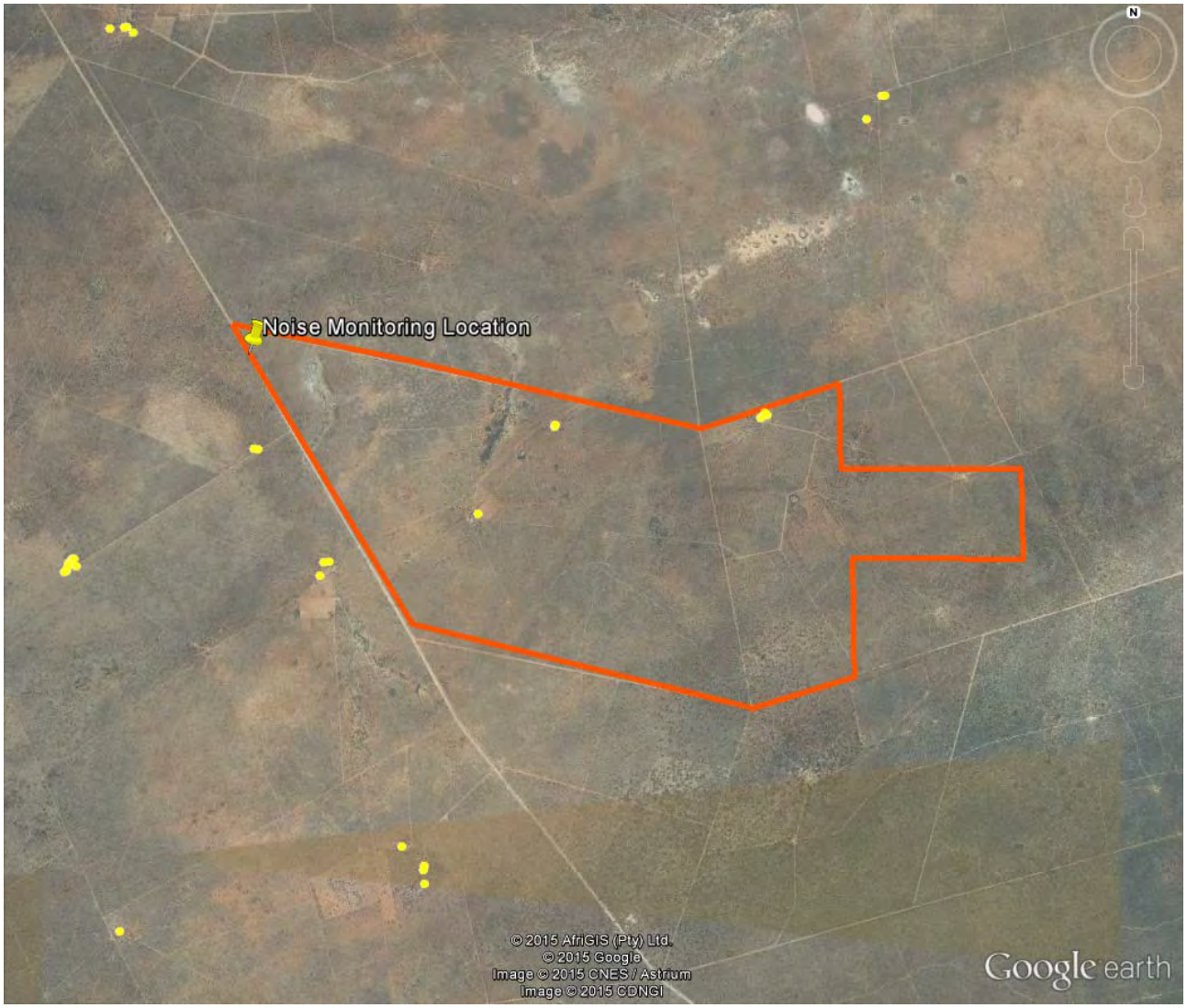


Figure 2-37: Location of noise monitoring sites with dwellings shown as yellow dots

The noise meter used met the accuracy requirements specified for a Class 1 instrument in SANS 656 *Sound level meters*, SANS 658 *Integrating-averaging sound level meters* and SANS 61672-1/IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*.

The weather conditions (dry and low wind speeds) were suitable for monitoring throughout the baseline survey period. The $L_{Aeq,10mins}$ noise levels recorded during the 18 hour monitoring period are shown on Figure 2-38.

The baseline noise climate in the project area can be summarised as follows:

- The $L_{Aeq,10mins}$ daytime levels varied from very quiet around 17h30 (23 dB) up to 62 dB. The noise level started increasing from 18h00 and reached a peak of 52 dB around 19h30, after which it decayed through the night-time period to a very low level of 18 dB around 01h30hrs. This very low level lasted until 05h30.
- The louder periods during the day were caused mainly by nearby animals or occasional cars using the road. The build-up of noise from 18h00 to 19h30 was due mainly to insect activity, nocturnal animals becoming active and birds roosting as dusk falls. The louder peaks during the night time period were due to mainly to animal activity.

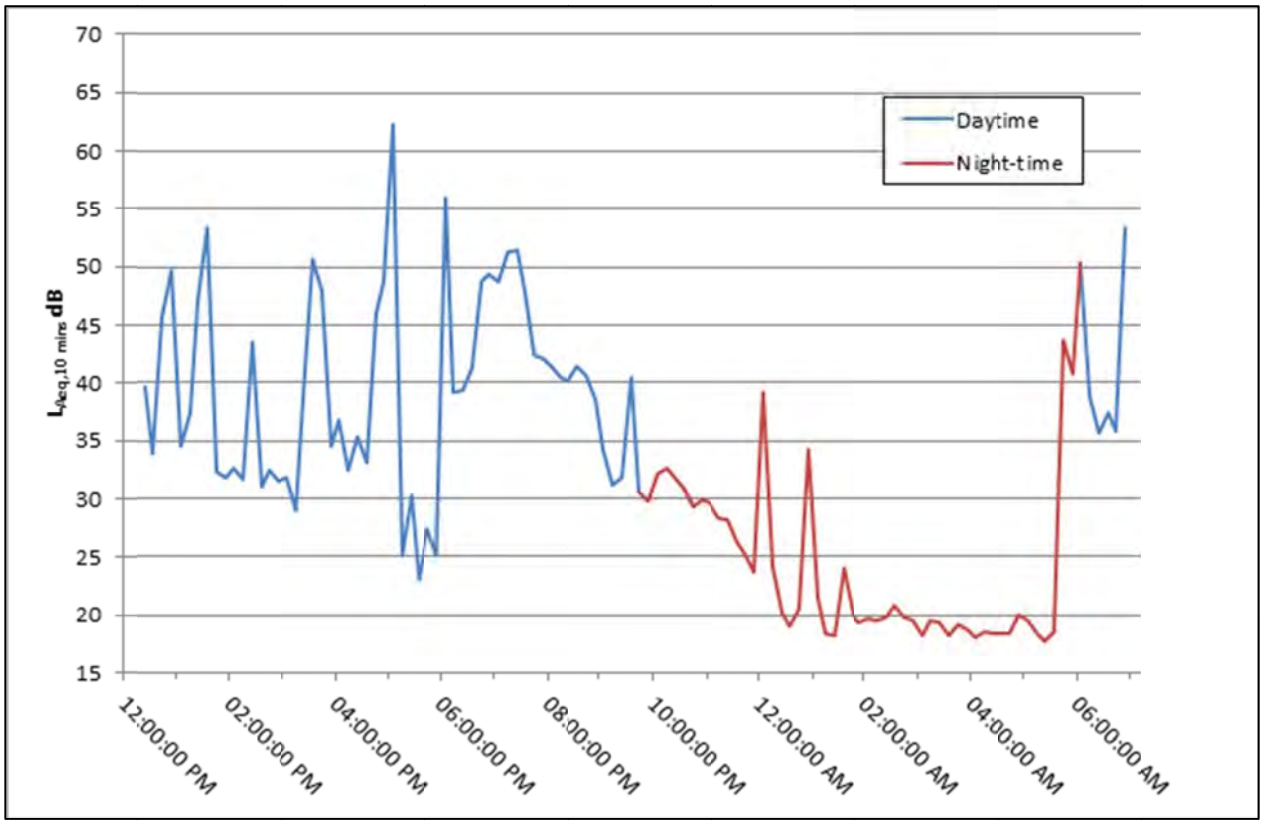


Figure 2-38: Noise levels recorded between 12h00 on 01/04/2015 and 07:h00 on 02/04/2015

The measured baseline noise levels are summarised in Table 2-21.

Table 2-21: Summary of Baseline Noise Conditions, $L_{Aeq, 10 mins}$ dB

Period	$L_{Aeq, period}$ dB	$L_{Aeq, 10 mins}$ dB Typical (Mode Average)	$L_{Aeq, 10 mins}$ dB Mean Average	$L_{Aeq, 10 mins}$ dB Minimum	$L_{Aeq, 10 mins}$ dB Maximum
Daytime	48	32	40	23	62
Night-time	30	20	23	18	44

2.9.11 Visual Aspects

The study area for purposes of the visual impact assessment (VIA) was defined as a 10 km radius around the physical footprint of all surface components of the mine. The human eye cannot distinguish significant detail beyond this range. Although it is possible to see over greater distances from certain elevated locations such as hilltops, details of manmade structures or artificial landforms that are this far away from the viewer are not clearly discernible or are at most inconspicuous, and their visual impact beyond this range is considered to be negligible.

The Grootegeluk coal mining complex, town of Lephalale, township of Marapong and the Eskom power stations Medupi and Matimba are all more than 10 km to the south and south-east and are not visible from the project area.

The topography of the study area is relatively flat with slopes that vary between 0 and 3%. Elevation toward the south of the area varies from 900 to 922 m above sea level and the area is relatively featureless, with no prominent or distinctive landmarks. It is devoid of mining and other large-scale human activity, and there are no significant artificial landforms. Humidity is generally in the medium range and there is usually little cloud cover, allowing for clear visibility in the region.

Drainage lines run northerly and easterly towards the Limpopo and Mokolo Rivers respectively. There are no prominent water bodies or watercourses present within viewing distance of the project area, other than the above mentioned river systems.

Due to the homogenous vegetation cover and flat topography, the study area does not have a high visual absorption capacity (VAC). Existing vegetation cover does, however, offer significant visual screening over greater distances. The vegetation cover is largely undisturbed and is one of the most appealing features of the area – see Figure 2-39.

Figure 2-39: The project area, characterised by grasslands and woody vegetation that is typical of the savannah biome

The project area contains a farm house, accommodation for farm workers, buildings used for storage and chalets for visitors.

The overall visual resource value of the area is considered to be moderate to high, largely due to the lack of human transformation. When one considers the strong sense of place that the overall landscape evokes, the aesthetic value of the study area could possibly attract eco-tourists in addition to the hunters for sport and trophies who are current frequent visitors.

2.9.12 Sites of Archaeological and Cultural Significance

From his own experience with earlier heritage surveys which he undertook in the larger area and a literature study undertaken during March 2015 (Pistorius J. C., March 2015), the cultural and heritage specialist came to the following conclusions about the types and ranges of heritage resources that could possibly occur within the project area:

- Middle Stone Age (dating between 200 000 years to 22 000 years back) and Late Stone Age sites (dating between 22 000 years to 300 years back) may be found in eroded areas and in dongas as well as near streams and tributaries. If stone tools from these periods are present, it is highly likely that they will be limited in numbers and that they will occur in an eroded context;
- It is highly unlikely that significant numbers of Early Iron Age (AD500 to AD900), Middle Iron Age (AD1200 to AD1300) or Late Iron Age (17th century onwards) sites are present, but if they are, the remains will be limited and will probably occur in an eroded context;
- Farm residences and possibly outbuildings that are sixty years old or may be approaching this age, and that might have historical significance in terms of the National Heritage Resources Act (NHRA, Act No 25 of 1999) may possibly exist within the project area;
- Graveyards may exist, but the number will most probably be low;
- Although the Waterberg coal fields were discovered in the 1920s during exploration for water, coal mining in the region is too recent to constitute any mining heritage value;

The literature survey was followed by a Phase I heritage impact assessment that included a field survey undertaken by means of an off-road vehicle and on foot (Pistorius J. , May 2015) – see Figure 2-40.

The field survey recorded a grave on Haaskraal 221LQ and a graveyard on Eigendomsbult 222LQ, which were geo-referenced and mapped. Their description, coordinates and significance are indicated in Table 2-22.

Figure 2-40: Track pathway registered with a mounted GPS outlines the main routes that were followed during the field survey. Pedestrian surveys were undertaken from the main track pathway

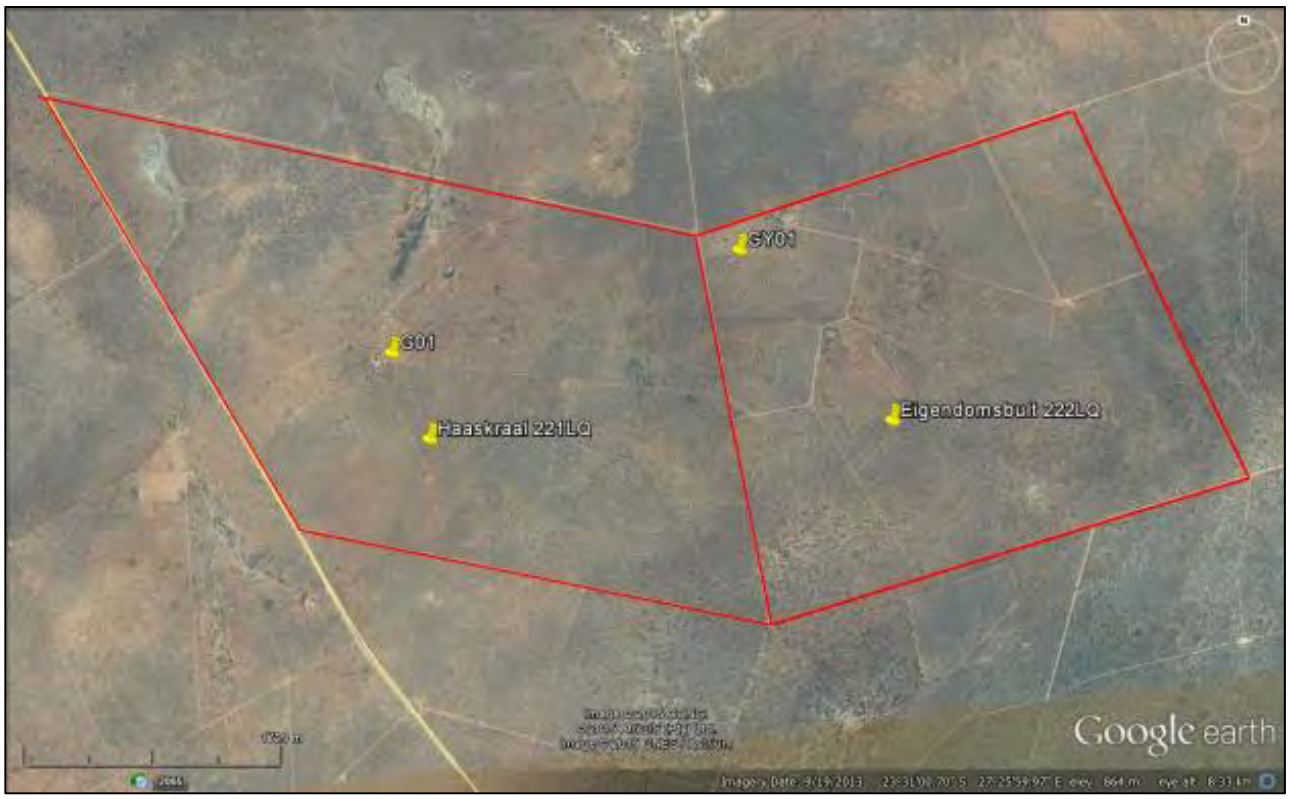


Figure 2-41: Locations of a grave (G01) on Haaskraal 221LQ and a graveyard (GY01) on Eigendomsbult 222LQ

Table 2-22: Coordinates and significance rating for heritage resources in the project area

Heritage Resource	Coordinates	Significance
GY01. Three graves on Eigendomsbult 222LQ fitted with stones and a piece of concrete.	23º 30.513'S 27º 26.353'E	**HIGH**
G01. Single grave on Haaskraal 221LQ which is no longer visible on the ground.	23º 30.887'S 27º 24.977'E	**HIGH**

The grave (G01) used to have a fence consisting of iron poles and strands of wire and. A single remaining iron pole indicates the former presence of the grave. G01 is no longer visible on the surface of the ground. It is possibly older than sixty years.

Graveyard 01 holds three graves, two of which are fitted with stones which serve as headstones whilst the third is decorated with a piece of concrete. No inscriptions are visible on the headstones. GY01 is demarcated with a diamond mesh fence and fitted with a gate. It is highly likely that the three graves are older than sixty years.

All graveyards and graves can be considered to be of high significance and are protected by various laws. Section 36 of the National Heritage Resources Act 1999 (Act No 25 of 1999) (NHRA) prohibits disturbance of graves older than sixty years, and situated outside a formal cemetery administered by a local authority, without a permit. The act also distinguishes various categories of graves and burial grounds. Other legislation with regard to graves includes those which apply when graves are exhumed and relocated, namely the Ordinance on Exhumations (No 12 of 1980) and the Human Tissues Act (No 65 of 1983 as amended).

From the conceptual mine and infrastructure layout plan (Figure 2-4), it is clear that the graveyard and grave will be affected by the proposed Khongoni Coal Mine. It is mostly likely that the impact on the graveyard and grave will commence during the construction phase when the top soil for the proposed Khongoni Coal Mine is being removed.

As illustrated in Figure 2-42, the existing infrastructure on Eigendomsbult 222LQ comprises of residences, sheds and outbuildings of modern construction, which are without any heritage significance.

Figure 2-42: Existing buildings on Eigendomsbult 222 LQ

2.9.13 Traffic

A traffic count and a service level evaluation of intersections on the road between Lephalale and the project area were undertaken during April 2015 (Makala , J; Purchase, P;, April 2015).

Manual traffic counts were undertaken during the weekday morning and afternoon peak hour periods at the key intersections shown in Figure 2-43. A capacity analysis was carried out using ***Sidra Intersection 6***, a traffic engineering software package, to determine which intersections already have capacity problems, if any, and to define geometric upgrades that would be required to restore the intersections to acceptable performance.

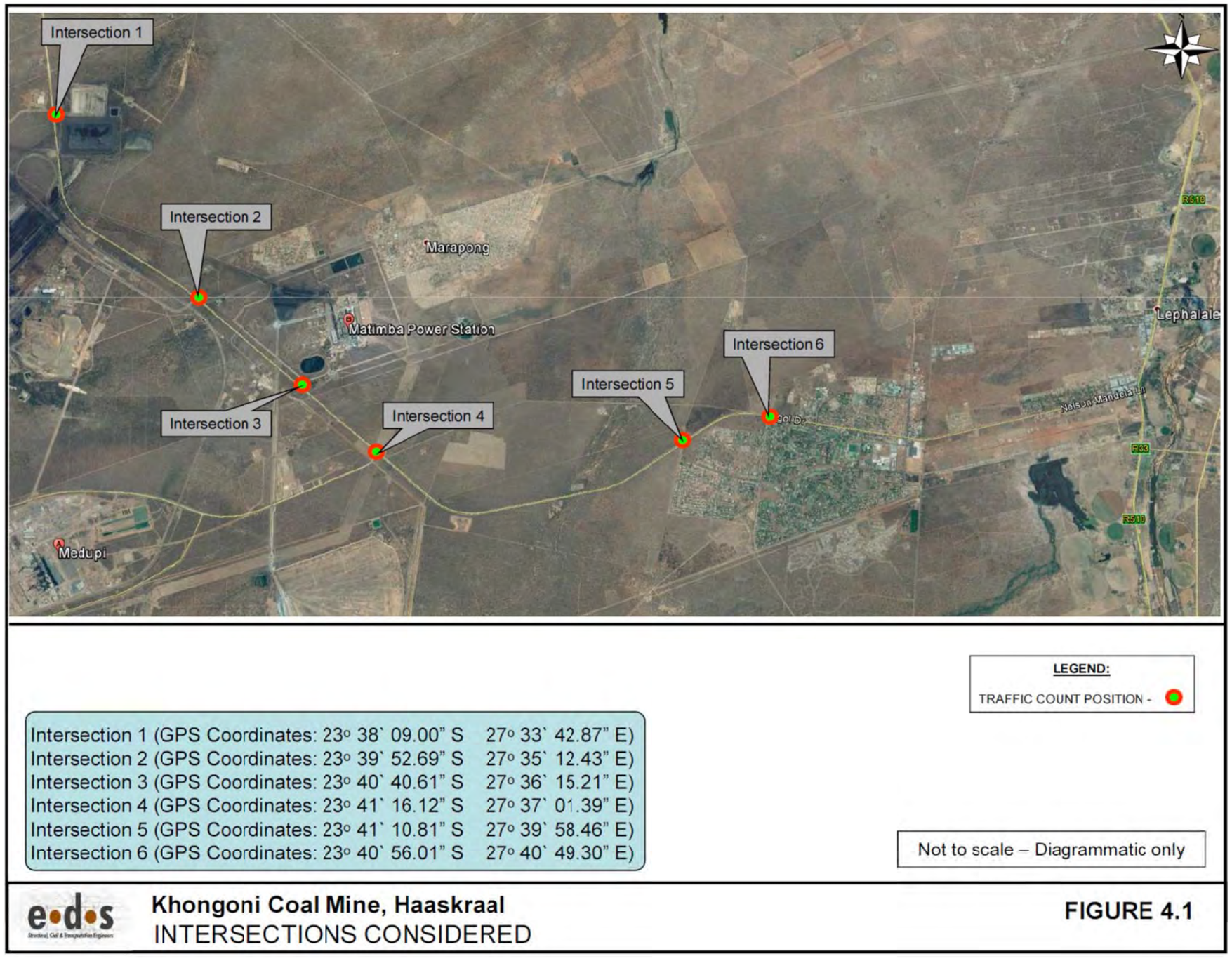


Figure 2-43: Intersections where traffic counts were undertaken

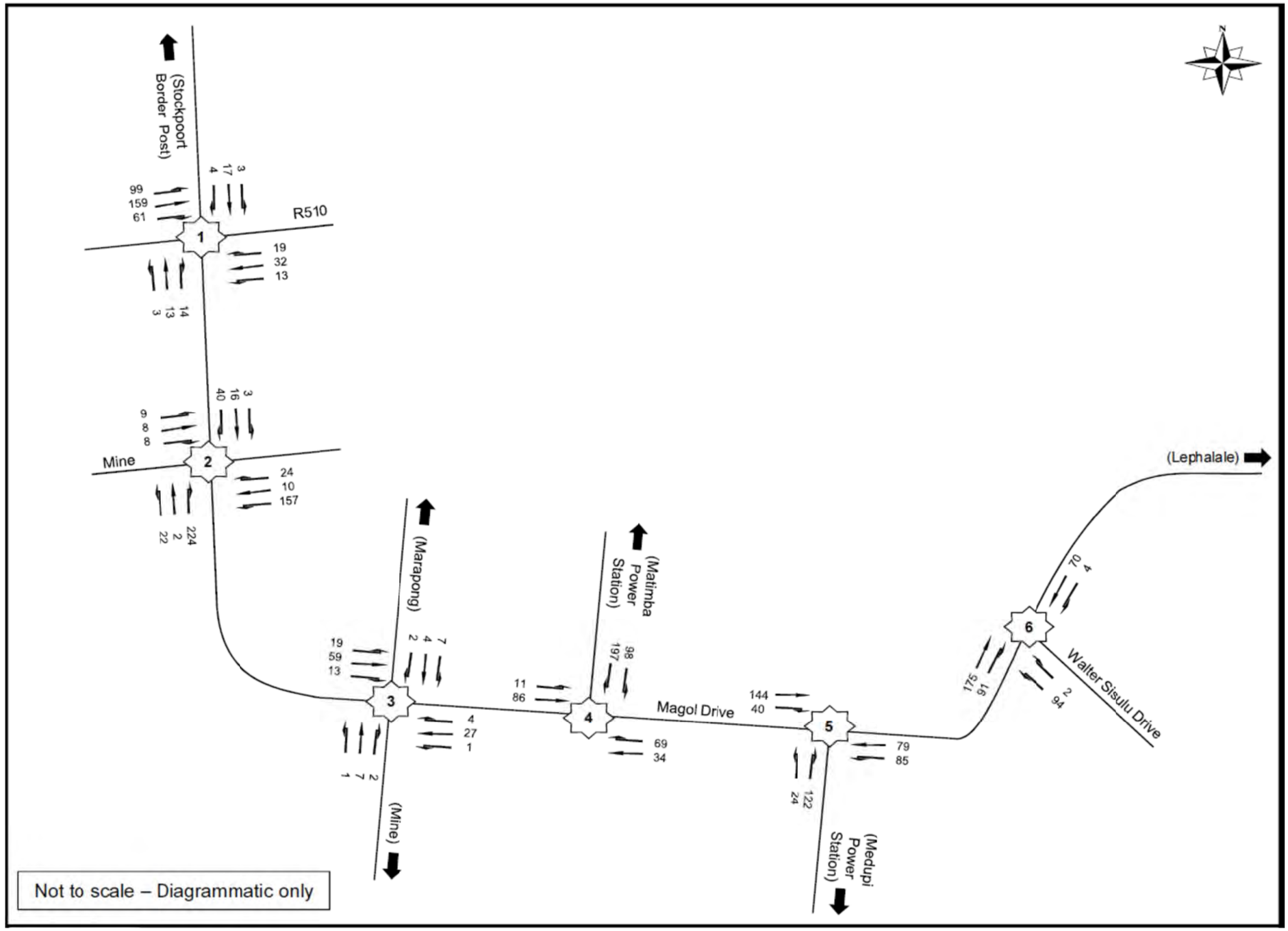


Figure 2-44: Morning peak hour traffic flows (08:45 – 09:45)

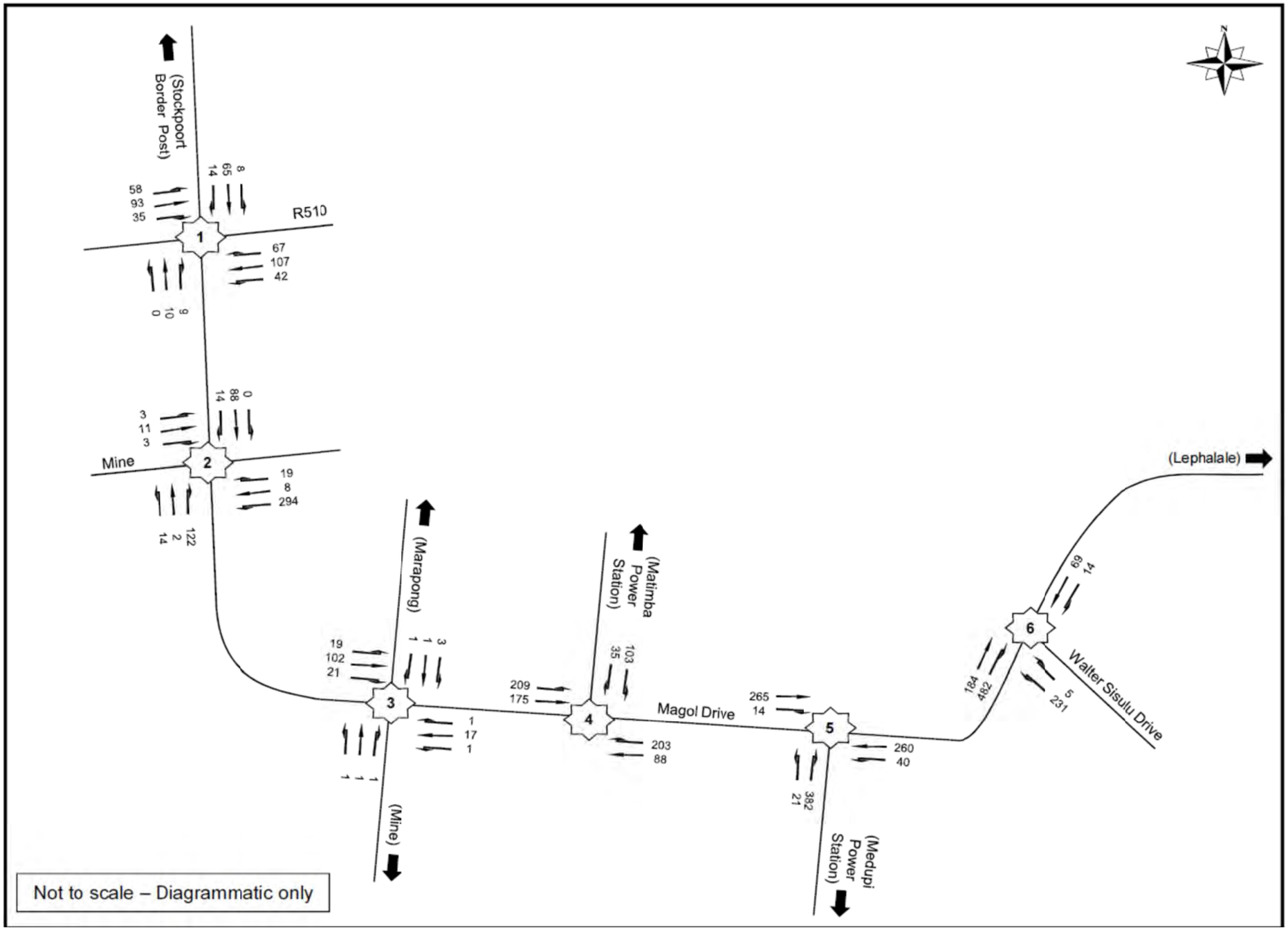


Figure 2-45: Afternoon peak hour traffic flows (16:30 – 17:30)

2.9.13.1 Level of Service

In traffic analysis:

- The capacity of a road (C) is the maximum hourly number of vehicles that can reasonably be expected to traverse the road under prevailing traffic and control conditions;
- The volume (V) is the number of vehicles that arrive at an intersection per hour; and
- The level of service (LOS) is expressed as the average delay (D) in seconds that a driver experiences at an intersection.

The levels of service for signalised and un-signalised intersections as defined in the Highway Capacity Manual (2010) are shown in **Table 2-23**.

Table 2-23: Level of service as a function of volume and capacity

Level of Service for V/C≤1.0	**Rating**	**Average delay per vehicle in seconds (D)**			**Level of Service for for V/C>1.0**
		Signals	SIDRA Roundabout LOS option	Priority Control *(HCM2010 default for roundabouts)*	All Intersection Types
A	Excellent	d ≤ 10	d ≤ 10	d ≤ 10	**F**
B	Very Good	10 < d ≤ 20	10 < d ≤ 20	10 < d ≤ 15	**F**
C	Good	20 < d ≤ 35	20 < d ≤ 35	15 < d ≤ 25	**F**
D	Acceptable	35 < d ≤ **55**	35 < d ≤ **50**	25 < d ≤ **35**	**F**
E	Poor	**55** < d ≤ 80	**50** < d ≤ 70	**35** < d ≤ 50	**F**
F	Very Poor	80 < d	70 < d	50 < d	**F**

Note: V/C (demand volume / capacity) ratio, or degree of saturation: V/C > 1.0 represents oversaturated conditions.

An intersection is deemed to be operating acceptably at levels of service A to D. If an intersection operates at a level of service E or F or has a volume to capacity ratio higher than 0.95 the intersection is considered to be operating at capacity.

The existing levels of service, based on current (April 2015) traffic volumes as per Figure 2-44 and Figure 2-45, are shown in **Table 2-24**.

With reference to the LOS ratings as explained in Table 2-23, only one intersection is currently rated as having poor (E) levels of service during the afternoon peak hour. The rest have LOS ratings of good (C), very good (B) or excellent (A).

Table 2-24: Intersection performance – April 2015

Intersection	Existing control	Peak Period	
		AM	PM
1 – Stockpoort Road/R510	Side Stop (2-way)	A (3.7) {0.190}	A (4.4) {0.141}
2 – Stockpoort Road/Mine Access	Side Stop (2-way)	A (6.7) {0.202}	A (6.5) {0.299}
3 – Stockpoort Road/Marapong Access	Side Stop (4-way)	B (12.2) {0.166}	B (11.6) {0.237}
4 – Stockpoort Road/Matimba Power Station Access	Side Stop (2-way)	A (6.1) {0.181}	A (4.6) {0.180}
5 – Stockpoort Road/ Medupi Power Station Access	Side Stop (4-way)	C (17.8) {0.481}	F (107.0) {1.498}
6 – Stockpoort Road/Walter Sisulu Drive	Side Stop (2-way)	A (2.6) {0.061}	A (4.8) {0.303}
Legend		B – Level of service (LOS)	
		(16.4) – Delay in seconds	
		{0.527} – Volume / Capacity (v/c)	

2.9.14 Socio-economic

2.9.14.1 Administrative setting

The farms Haaskraal 221 LQ and Eigendomsbult 222 LQ are located in Ward 3 of the Lephalale Local Municipality, in the Waterberg Municipal District of the Limpopo Province. Limpopo is the northernmost of South Africa's nine provinces. It was named after the Limpopo River, which flows along South Africa's borders with Botswana, Zimbabwe and Mozambique. The capital of Limpopo is Polokwane.

Limpopo has the highest level of poverty of all the South African provinces with 78.9% of its population living beneath the national poverty line, which is based on the minimum food needs for daily energy requirements, plus essential non-food items.

The Waterberg District Municipality (WDM) covers an area of about 4.95 million ha and consists of the six local municipalities Bela-Bela, Lephalale, Modimolle, Mogalakwena, Mookgophong and Thabazimbi. Geographically, it is the largest District Municipality in the Limpopo province but it has a smaller population than any of the other districts as it consists mainly of commercial farms, game farms, some small rural settlements and a few small towns.

The WDM is a well-known tourist destination, offering attractions such as Makapans valley and the Marekele National Park. The Medupi Power Station, which is located in the Waterberg District, is of significant importance with regard to ensuring sufficient energy capacity for the country over the long term.

Lephalale Local Municipality (LLM) is situated in the north-western part of the Waterberg District Municipality. Its north-western border forms part of the international border between South Africa and Botswana. It is the largest local municipality in the province, with a surface area of about 1.4 million ha.

2.9.14.2 Population Demographics

The population profile is shown in Table 2-25. According to the official census of 2011, the number of households in the Lephalale local municipality increased from 20 277 in 2001 to 29 880 in 2011, and household size increased from 3.5 to 3.9. This census indicated a 35.8% population increase between 2001 and 2011, with 43.2% of the population falling within the 15-34 year age group.

Table 2-25: Population Profile

	Black	Coloured	Indian	White	Other	MALE %	FEMALE %	Total
Limpopo Province	97%	0.2%	0.2%	2.5%	0.1%	50%	50%	5 391 455
Waterberg DM	91.2%	0.5%	0.4%	7.6%	0.3%	52%	48%	679 316
Lephalale LM	91%	0.1%	0.3%	7.9%	0.3%	51%	49%	115 766
Ward 3	86.6%	0.6%	0.1%	12.5%	0.5%	52%	48%	11 138

** Stats SA, 2011*

2.9.14.3 Levels of Education

The education levels in the area, as determined during the 2011 census, are shown in Table 2-26.

Table 2-26: Average Education Levels

	No Schooling	Some Primary	Completed primary	Some secondary	Completed secondary	Higher
Limpopo Province	17%	12%	4%	36%	27%	8%
Waterberg DM	13%	14%	5%	37%	24%	7%
Lephalale LM	10%	13%	5%	40%	24%	8%
Ward 3	14%	19%	9%	38%	14%	6%

** Stats SA, 2011*

In 2013, 82 483 learners in the Waterberg district wrote the Grade 12 exams, with 71.8% or 59 183 passing, an improvement on the 66.9% pass rate of 2012.

Challenges experienced by school going children include poor road conditions, a lack of transport to schools, a lack of water or an inadequate supply thereof, a lack of provision for disabled learners to attend school, mismanagement of funds, overcrowding of classrooms and increased teenage pregnancies.

The Lephalale Local Municipality has 94 educational facilities in total. Generally, there is an educational facility within a 30 minute walking distance from 95% of the population, but primary schools are perceived to be more easily accessible than secondary schools. Secondary schools do not have adequate mathematics and science teachers and the area lacks technical high schools.

2.9.14.4 Economic Activities

The Waterberg District has abundant natural resources with potential for entrepreneurship and economic development. The economy is dominated by mining (platinum, iron ore, coal, diamonds), tourism and agriculture. The Waterberg District Municipality is the largest platinum producing area in the Limpopo Province. The growing energy demand drives the development of coal and petroleum production in the Lephalale area. The coal resource in the Waterberg field is estimated at 76 billion tons, which is more than 40% of the national coal reserve. Mining is the highest GDP contributor in the district at 47.4% (Waterberg DM IDP, 2014/15).

The renowned Biosphere Reserve is found in the District, and the agricultural potential of the sector has not yet been reached.

The contribution of mining to the Lephalale LM's GDP is significant at 59.21%. Tourism and manufacturing contribute to the local economy to a lesser extent, and the Medupi Power Station near Lephalale will have an influence on the future development of the area. The three economic clusters that are most relevant to Lephalale LM are firstly coal and petrochemical, secondly red meat and thirdly tourism (Lephalale LM IDP, 2013/16).

The regional Gross Value Added (GVA) for 2010 is shown in Table 2-27.

Table 2-27: Regional Gross Value Added (2010)

Industry	Waterberg DM	Lephalale LM
Agriculture, forestry and fishing	3%	4%
Mining and quarrying	51%	71%
Manufacturing	3%	1%
Electricity, gas and water	2%	3%
Construction	2%	1%
Wholesale and retail trade, catering and accommodation	8%	4%
Transport, storage and communication	8%	4%
Finance, insurance, real estate and business services	12%	5%
Community, social and personal services	3%	1%
General government	9%	4%

Source: Quantec, 2010

2.9.14.5 Employment Levels

The provincial and regional employment profile is summarised in Figure 2-46.

The unemployment rate measures the percentage of employable people in the country's workforce who are over the age of 16 and who have either lost their livelihoods or have unsuccessfully sought jobs previously and are still seeking employment. This category also includes, children, pensioners and disabled persons.

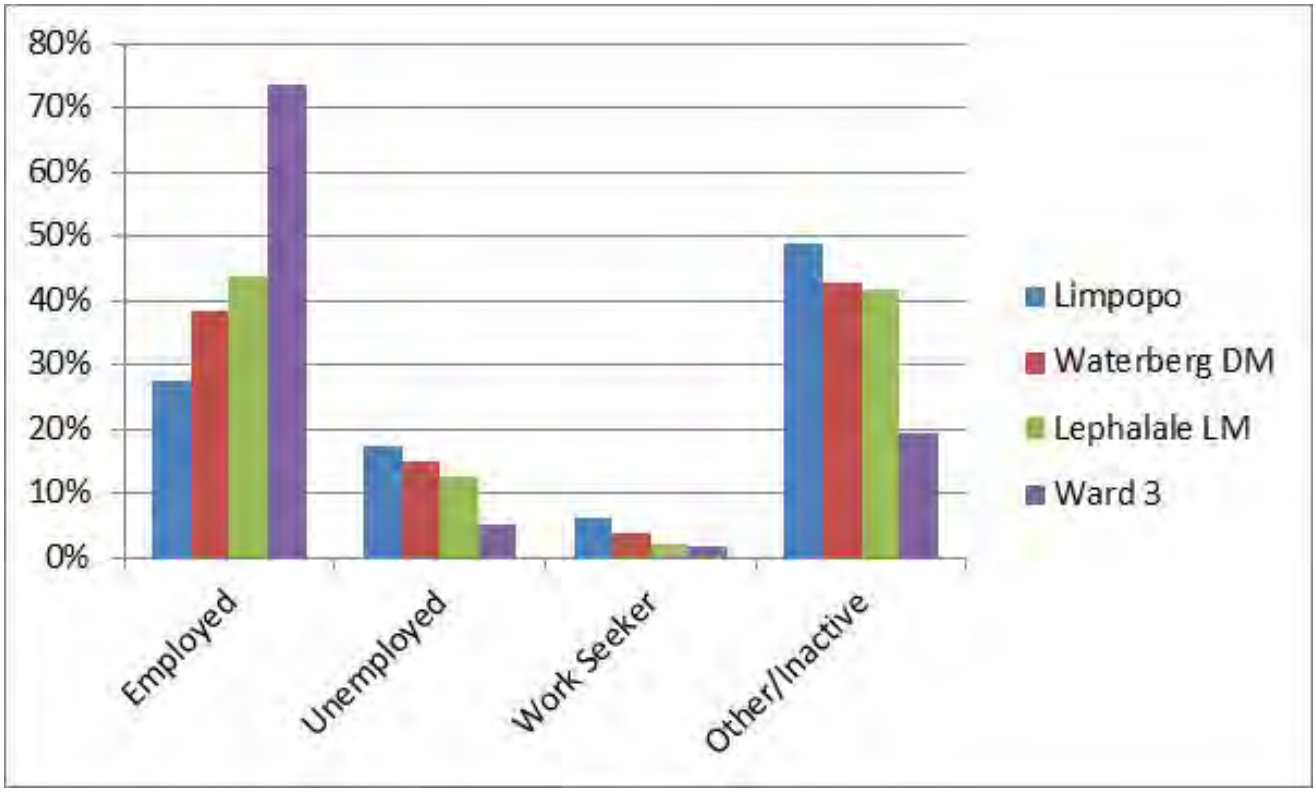


Figure 2-46: Employment Distribution in the Regional and Local Study Area (Stats SA 2011 census)

2.9.15 Summary of the Baseline Environmental Conditions

The following section summarises key aspects of the environment that may be affected by the proposed project activities.

2.10 Impacts Identified

The following potential impacts were identified during the scoping phase:

1) Groundwater: Abstraction of groundwater to provide safe mining conditions and water for use in the mine and plant will result in a cone of depression (lowering of the groundwater table) around the mine and spillages of hydrocarbons could cause groundwater pollution. The profile of this cone of depression will change as the mining front advances. Taking into account the small number of groundwater users in the vicinity of the project, the poor quality of the groundwater (Table 2-20) and the fact that Khongoni will be able to supply them with potable water from its water treatment plant, the project expected to have an impact of ***moderate*** significance on the groundwater regime and groundwater users;

2) Surface water: The opencast mining operation will remove five surface water features and two drainage lines on Haaskraal 221 LQ, one of which feeds a pan on the adjacent farm of Blinkwater 23 LQ. Establishment of surface infrastructure will also remove a pan on Eigendomsbult 222 LQ. Dirty runoff from the project area could also cause surface water pollution off site. Without appropriate mitigation measures, the project could have a ***very high*** impact on the surface water regime.

3) Ecology: The project will result in the removal of vegetation from the combined footprint area (opencast mine and infrastructure) of about 1247 ha over time. Due to ongoing rehabilitation in accordance with the rollover method of mining (see Figure 2-3), less than half of the aforementioned surface area will be bare at any particular time during the life of the mine. Due to the destruction of their habitat, the current faunal population of the project area will have to relocate until suitable habitat has been restored by the rehabilitation programme.

4) Air Quality: Particulate mobilisation by drilling, blasting, loading, hauling, stockpiling, backfilling and coal processing has the potential for an impact of ***high*** significance on air quality within and in the vicinity of the project area, particularly in the downwind direction. Gaseous emissions due to blasting and the diesel engines on mining vehicles are expected to have an impact of ***low*** significance on air quality.

5) Noise: Considering the small number of human receptors in the vicinity of the project area due to the sparsely populated nature of the land adjacent to the project area, unmitigated noise levels due to the mining and coal processing activities are expected to have an impact of ***low*** significance;

6) Blasting and vibration: There is one homestead complex (that of Mr Frikkie Pistorius) about 360 metres to the south-west of the perimeter of the proposed opencast mine, an existing lodge about 165 m to the east and an existing farmstead about 630 m to the east of the future mine perimeter. The latter two sets of buildings will form part of the infrastructure of Khongoni on Eigendomsbult 222LQ. The RoM coal stockpiles and primary coal crushing plant will be located about 300 m to the east of the perimeter. Blasts will have to be designed and monitored with the objective of avoiding any damage from fly rock, air blast and ground vibration at these or any other identified potentially vulnerable receptors. Other infrastructure will be located within about 150 m of the eastern perimeter of the mining right area. See Figure 2-47. Vibration levels experienced at surface from underground blasting are expected to be well below the levels at which structural damage could occur. The blasting impacts are therefor expected to be of ***moderate*** significance. The duration at any particular receptor will depend on the detailed mining operations at the time;

7) Visual; The opencast mine and infrastructure will have a ***very high*** visual impact at close range only, due to the flat terrain and the screening vegetation on adjacent areas;

8) Cultural and heritage; There is a single grave within the footprint of the opencast mine and a small graveyard within the footprint of the preferred infrastructural layout (see Figure 2-47). The grave will have to be relocated, but the graveyard can be fenced off and protected. The nett impact on cultural and heritage resources is likely to be of ***moderate*** significance; and

9) Socio-economics: The project is expected to create about 636 employment opportunities, of which about 440 will be with mining contractors, to spend about R 685 million on capital goods and works, of which more than R 400 million will be spent locally, and to inject about R 800 million per annum into the local economy in terms of personnel remuneration, contract mining and the purchase of local goods and services. The local socio-economic impact is expected to be of ***moderate to high*** significance.

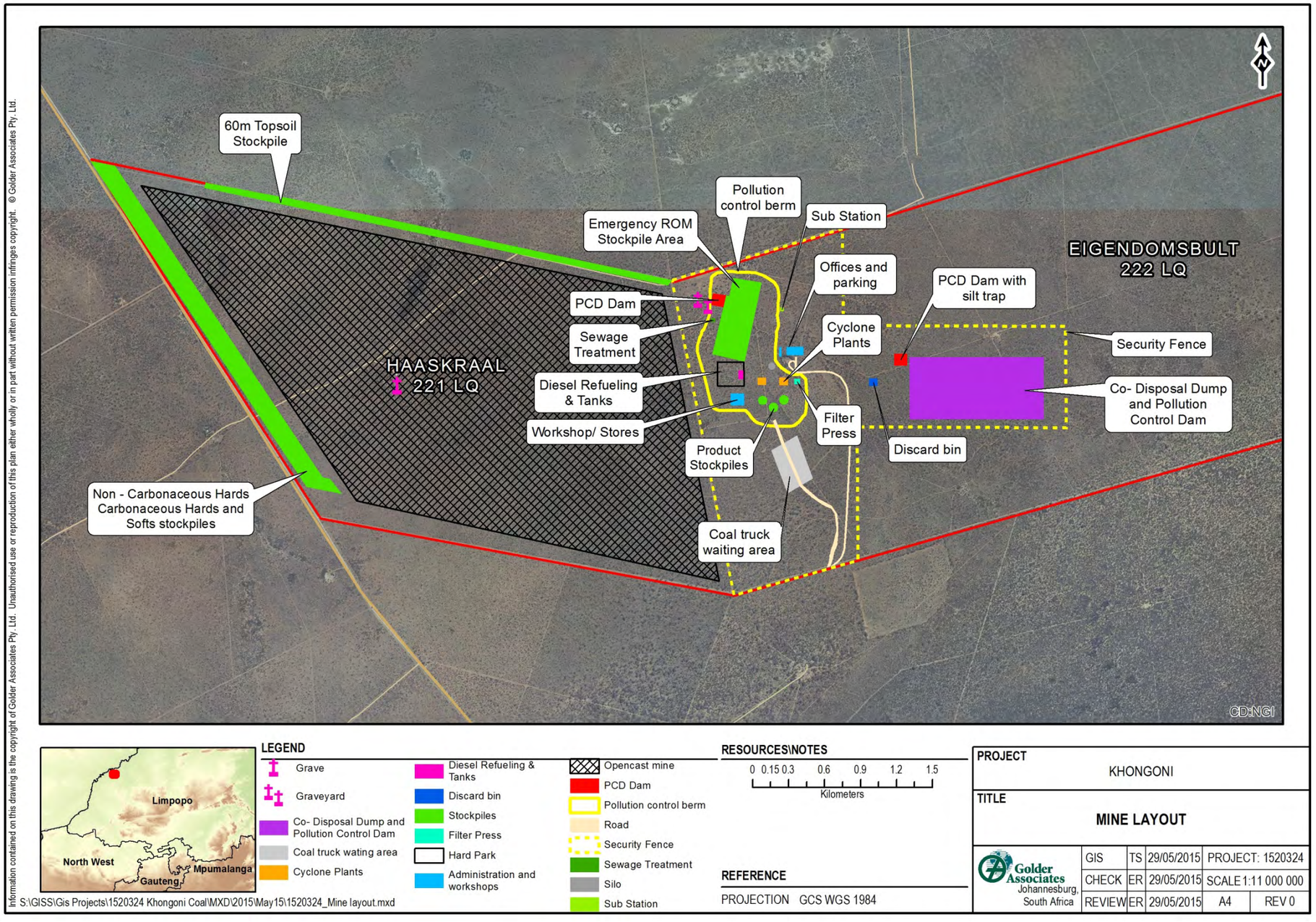


Figure 2-47: Mine and infrastructure layout

2.11 ESHIA Process and Methodology

The overall process and methodology that was followed for the scoping phase of the ESHIA was based on standard best practice guidelines (International Finance Corporation Performance Standards (IFC, 2012) and the requirements of South African legislation (specifically NEMA and MPRDA).

The approach included the following key stages:

- Gap Analysis of existing information against the Project compliance criteria;
- Project Definition and Analysis of Alternatives – inclusive of data review, red flag and constraints mapping, input to alternatives analysis and preferred layout planning and Project description;
- Screening (legal and process review) – review of all applicable compliance criteria inclusive of IFC, South African legal and administrative requirements;
- ESHIA Scoping (identification of key issues and development of plan of study for carrying out the impact assessment). This report is presented to the public for comment and to the South African Government departments dealing with mining and environmental authorisations for a decision on whether the scope proposed for the ESHIA is appropriate;
- Environmental, Social and Health Baseline Studies – carrying out monitoring, data collection and fieldwork to determine the baseline conditions of the environment that could be affected by the Project;
- Stakeholder Engagement – was undertaken throughout the Scoping process to record issues and comments received from the public. These issues and comments are integrated into the process and will be considered in the impact assessment phase of the ESHIA. A Stakeholder Engagement Plan (SEP) was developed for the Project and is appended as APPENDIX D.

The following activities will be undertaken during the next phase of the ESHIA:

- Impact Assessment – evaluation of potential impacts and benefits of the Project utilising qualitative and quantitative evaluation as determined by the scoping phase;
- Environmental and Social Management Systems Development – establishment of a system for the management of environmental, social and health impacts supported by a number of action plans;
- Preparation of an ESHIA report – documenting all processes and presenting the findings of the impact assessment. The ESHIA report is presented to the public for comment and to the relevant South African Government departments for a decision on whether the Project may proceed and if so under what conditions; and
- Stakeholder Engagement – will continue throughout the remainder of the ESHIA process to record issues and comments received from interested and affected parties. All issues and comments will be integrated into the process and considered during the ESHIA. A Stakeholder Engagement Plan (SEP) was developed for the Project and is appended as APPENDIX D.

The overarching principles that guide the ESHIA include:

- Sustainability – development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs;
- Mitigation hierarchy – The mitigation hierarchy describes a step-wise approach (BBOP, 2009) that illustrates the preferred approach to mitigating adverse impacts as follows (the governing principle is to achieve no net loss and preferably a net positive impact on people and the environment as a result of the Project):

1) The preferred mitigation measure is **avoidance;**
2) Then **minimisation;**
3) Then **rehabilitation** or **restoration**; and
4) Finally **offsetting** residual, unavoidable impacts.

- Duty of care towards the environment and affected people.

The assessment of the impacts of the proposed activities will be conducted within the context provided by these principles and objectives.

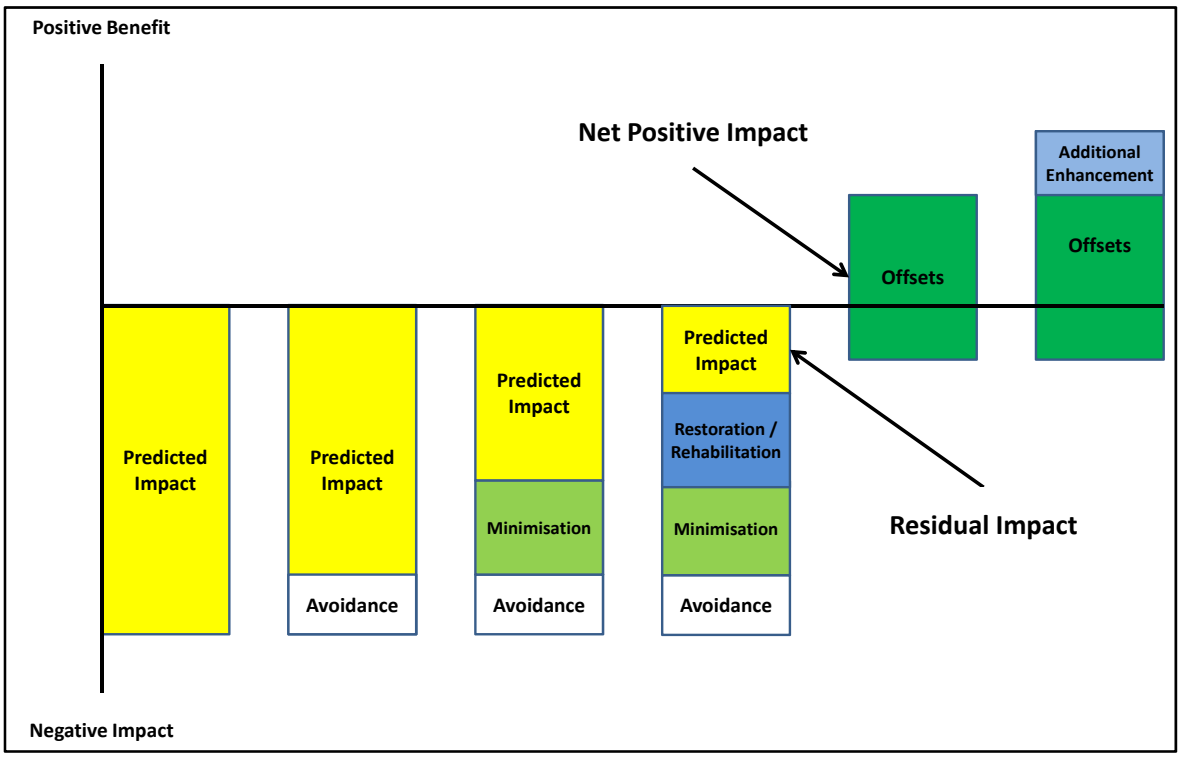


Figure 2-48: Mitigation Hierarchy Adapted from BBOP, 2009

2.11.1 Scoping Methodology

The methodology specifically adopted for the scoping phase included the following:

- Stakeholder consultation as set out in the Stakeholder Engagement Plan (APPENDIX D);
- Review of existing data;
- Fieldwork by the ESHIA specialist team to obtain additional baseline data;
- Workshops with the specialist team to identify key impacts and issues and to outline the plan of study; and
- Compiling the Scoping report.

2.11.2 Assumptions and Limitations

The ESHIA /EIA was limited to the scope of the assessment outlined in more detail in Section 3.0 of this document.

Information on the mineral resources, reserves, projected capital and operating costs, mine life and production rates was sourced from Khongoni Haaskraal Coal's (KHC's) Mining Work Programme (MWP),

which was prepared in terms of the South African MPRDA. The MWP is based on certain assumptions and information supplied by KHC.

The MWP does not address Occupational Health and Safety as required by IFC Performance Standard 2. KHC has established health and safety policies and procedures for prospecting, which were applied during the prospecting activities undertaken on Haaskraal 221 LQ between 2009 and 2014. The company has not undertaken mining activities yet, but will develop appropriate environmental, health, safety, security and quality control procedures prior to the commencement of construction.

Although all effort was made by the Project team to identify all environmental social and health aspects, impacts and mitigation measures, errors and omissions may have occurred. The Environmental and Social Management System that was developed as part of the ESHIA process will be a live database that can be adapted and updated should additional information, aspects or impacts be identified. The objective of the ESMS is for the KHC Project team to continually improve environmental and social performance. In addition, according to South African legislation, the EMP will need to be updated or amended with new information when there are significant changes during the life of the Project.

Every effort was made to engage stakeholders to the extent possible, however not every stakeholder may have been consulted, or their comments may have been recorded erroneously. A grievance mechanism has been put in place through which stakeholders are able to raise grievances and continue to contribute their concerns and issues with the Project team.

More detail on the assumptions and limitations of the ESHIA/EIA will be provided once the impact assessment has been completed. These assumptions and limitations may relate to the accuracy of quantitative and qualitative impact assessment methods utilised.

2.11.3 Key authorities for the EIA application

The DMR will be the decision-making authority for the mining right application and environmental authorisation processes, and the EMPR supported by the EIA, which is being undertaken in terms of the 2014 EIA Regulations.

The Integrated Water and Waste Management Plan (IWWMP) and Water Use Licence Application (WULA) will be submitted to the Department of Water and Sanitation (DWS).

2.11.4 International Conventions and Agreements

Relevant environmental and social international conventions and agreements to which South Africa is a party are presented in **Table 2-28** below.

Table 2-28: International conventions to which South Africa is a party

Convention	Summary of objectives or relevant conditions	South Africa Status
Antarctic Treaty (23 June 1961)	To ensure that Antarctica is used for peaceful purposes only (such as international cooperation in scientific research); to defer the question of territorial claims asserted by some nations and not recognized by others; to provide an international forum for management of the region; applies to land and ice shelves south of 60 degrees south latitude.	Party to.
Convention on Biological Diversity (29 December 1993)	Develop strategies, plans or programs for conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programs which shall reflect, inter alia, the measures set out in this Convention.	Party to.

Convention	Summary of objectives or relevant conditions	South Africa Status
Convention for the Conservation of Antarctic Seals (11 March 1978)	To promote and achieve the protection, scientific study, and rational use of Antarctic seals, and to maintain a satisfactory balance within the ecological system of Antarctica.	Party to.
Convention on Fishing and Conservation of Living Resources of the High Seas (20 March 1966)	To solve through international cooperation the problems involved in the conservation of living resources of the high seas, considering that because of the development of modern technology some of these resources are in danger of being overexploited.	Party to.
Convention on Wetlands of International Importance (Ramsar) (21 December 1975)	To stem the progressive encroachment and loss of wetlands now and in the future.	Party to.
Convention on the Conservation of Antarctic Marine Living Resources (7 April 1982)	To safeguard the environment and protect the integrity of the ecosystem of the seas surrounding Antarctica, and to conserve Antarctic marine living resources.	Party to.
Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES) (1 July 1975)	To protect certain endangered species from over-exploitation by means of a system of import/export permits.	Party to.
Convention on the Prevention of Marine Pollution (London Convention) (30 August 1975) in force 1996	To control pollution of the sea by dumping and to encourage regional agreements supplementary to the convention.	Party to.
International Convention for the Regulation of Whaling (10 November 1948)	To protect all species of whales from overhunting; to establish a system of international regulation for the whale fisheries to ensure proper conservation and development of whale stocks; and to safeguard for future generations the great natural resources represented by whale stocks.	Party to.
United Nations Framework Convention on Climate Change - Kyoto Protocol (23 February 2005)	To further reduce greenhouse gas emissions by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries and through the clean development mechanism (CDM) (where developed countries can invest in developing country clean technology to offset emissions).	Party to.
Montreal Protocol on Substances That Deplete the Ozone Layer (1 January 1989)	Calculated levels of consumption and production of CFCs must not exceed the stipulated thresholds.	Party to.
Protocol of 1978 Relating to the International Convention for the Prevention of Pollution From Ships, 1973 (MARPOL) (2 October 1983)	To preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances.	Party to.

Convention	Summary of objectives or relevant conditions	South Africa Status
Protocol on Environmental Protection to the Antarctic Treaty (14 January 1998)	To provide for comprehensive protection of the Antarctic environment and dependent and associated ecosystems; applies to the area covered by the Antarctic Treaty.	Consultative party.
Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water (10 October 1963)	To obtain an agreement on general and complete disarmament under strict international control in accordance with the objectives of the United Nations; to put an end to the armaments race and eliminate incentives for the production and testing of all kinds of weapons, including nuclear weapons.	Party to.
United Nations Convention on the Law of the Sea (LOS) (16 November 1994)	To set up a comprehensive new legal regime for the sea and oceans; to include rules concerning environmental standards as well as enforcement provisions dealing with pollution of the marine environment.	Party to.
United Nations Convention to Combat Desertification (26 December 1996)	To combat desertification and mitigate the effects of drought through national action programs.	Party to.
United Nations Framework Convention on Climate Change (21 March 1994)	Protection of the climate system: Operations must protect the climate system by controlling greenhouse gases not controlled by the Montreal Protocol, which cause climate change through anthropogenic interference with the climate system.	Party to.
* Sources: United States Central Intelligence Agency World Fact book (www.cia.gov/library/publications/the-world-factbook/index.html)		
Stockholm Convention on Persistent Organic Pollutants (POPs) (17 May 2004)	This convention seeks to ban the production and use of persistent organic chemicals but allow the use of some of these banned substances, such as DDT, for vector control.	Party to.
The Fourth ACP-EEC Convention 15 December 1989 (Lomé)	Control of hazardous and radioactive waste: the operation must be aware that international law emphasises strict control of hazardous waste and compliance with domestic legislation in this regard. It also seeks to prohibit imports and exports of such substances.	Party to.
Convention concerning the Protection of the World Cultural and Natural Heritage 1972 (Paris)	Ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage	Ratification.
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (24 February 2004)	Promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm	Party to.

2.11.5 International Standards

2.11.5.1 International Finance Corporation Performance Standards

Khongoni Haaskraal Coal is committed to complying with the International Finance Corporation (IFC) performance standards (PS) on social and environmental sustainability. These were developed by the IFC and were last updated on 1st January 2012. The overall objectives of the IFC PS are:

- To fight poverty;
- To do no harm to people or the environment;
- To fight climate change by promoting low carbon development;
- To respect human rights;
- To promote gender equity;
- To provide information prior to project development, free of charge and free of external manipulation;
- To collaborate with the project developer to achieve the PS;
- To provide advisory services; and
- To notify relevant countries of any trans-boundary impacts as a result of a project.

The PS comprise of eight performance standards namely:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

The PS framework is presented in Figure 2-49. Performance Standard 1 establishes the importance of:

(i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects;
(ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
(iii) the management of social and environmental performance throughout the life of a project through an effective Environmental and Social Management System (ESMS).

PS 1 is the overarching standard to which all the other standards relate. The ESMS should be designed to incorporate the aspects of PS 2 to 8 as applicable.

Performance Standards 2 through 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its Social and Environmental Management System consistent with Performance Standard 1.

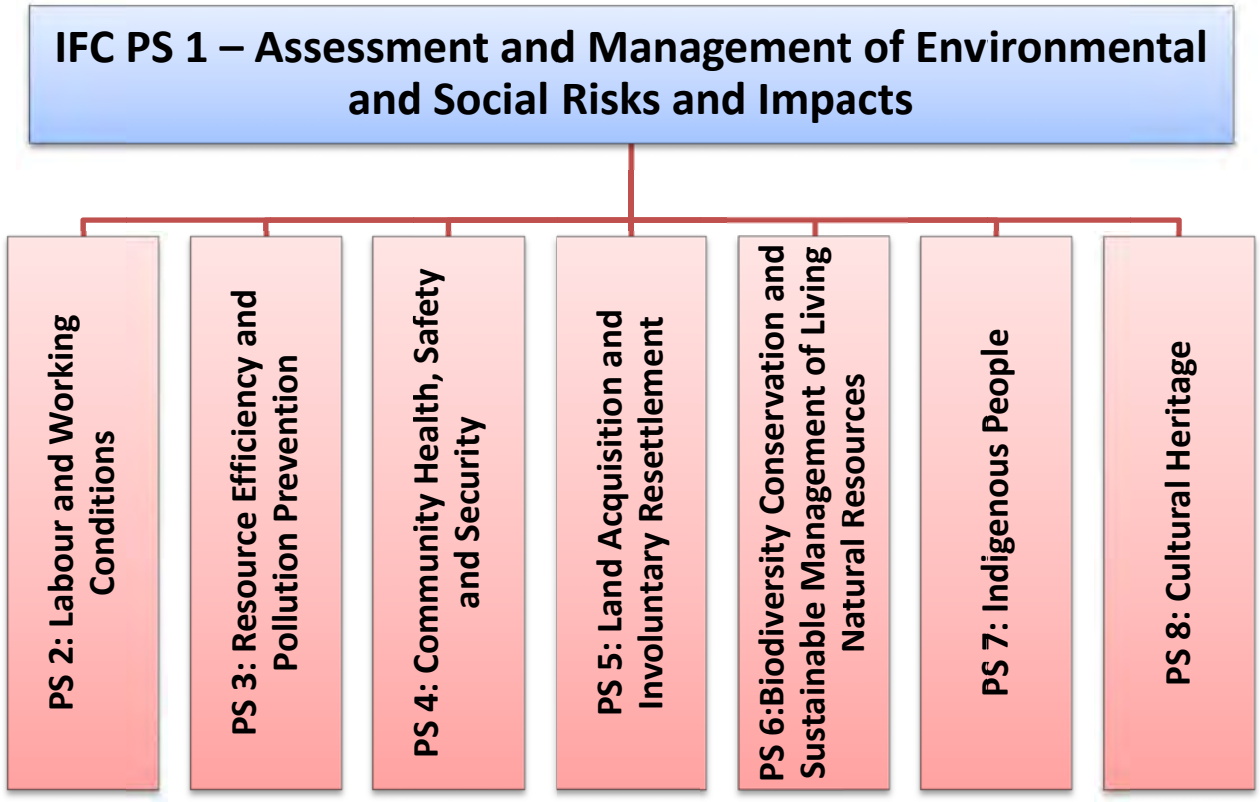


Figure 2-49: The IFC PS Framework

2.11.5.2 Equator Principles

The Equator Principles (EPs) constitute a credit risk management framework for determining, assessing and managing environmental and social risk in Project Finance transactions. Project Finance is often used to fund the development and construction of major infrastructure and industrial projects.

The EPs are adopted by financial institutions and are applied where total project capital costs exceed US$10 million. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs are based on the International Finance Corporation Performance Standards on social and environmental sustainability and on the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

The Equator Principles Financial Institutions (EPFIs) have consequently adopted these Principles in order to ensure that the projects they finance are developed in a manner that is socially responsible and reflect sound environmental management practices.

EPFIs will only provide loans to projects that conform to the following principles:

- Principle 1: Review and Categorisation;
- Principle 2: Social and Environmental Assessment;
- Principle 3: Applicable Social and Environmental Standards;
- Principle 4: Action plan and Management;
- Principle 5: Consultation and Disclosure;
- Principle 6: Grievance Mechanism;
- Principle 7: Independent review;
- Principle 8: Covenants;
- Principle 9: Independent Monitoring and Reporting; and
- Principle 10: EPFI Reporting.

2.11.5.3 The World Bank Group Environmental Health and Safety (EHS) Guidelines

The EHS Guidelines (World Bank Group, 2007) are technical reference documents with general and industry specific (i.e. mining) examples of Good International Industry Practice (GIIP). Reference to the EHS guidelines is required under IFC PS 3.

The EHS Guidelines contain the performance levels and measures normally acceptable to the IFC and are generally considered to be achievable in new facilities at reasonable cost. When host country regulations differ from the levels and measures presented in the EHS Guidelines, Projects are expected to achieve whichever standard is more stringent.

2.11.6 Environmental and Social Management System and Action Plans to be developed

IFC Performance Standard 1 establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of Projects; (ii) effective community engagement through disclosure of Project-related information and consultation with local communities on matters that directly affect them; and (iii) the management of social and environmental performance throughout the life of the Project through an effective Environmental and Social Management System (ESMS). PS 1 is the overarching standard to which all the other standards relate. The proposed ESMS is designed to incorporate the aspects of PS 2 to 8 as applicable (Figure 2-49).

The following standard components of an ESMS and corresponding Environmental and Social Management Plan (ESMP) report will be addressed to the extent that they are applicable to this project:

Step 1 – Development of Stakeholder Engagement and Monitoring Modules

- Development of the framework Stakeholder Engagement and Grievance Mechanism Module;
- Development of the framework module for recording environmental and social monitoring data; and
- Development of the ArcGIS server platform, monitoring dashboards and reporting.

Step 2 – Development of the ESMP

The ESMP will be developed following completion of the Impact Assessment and will be structured to include (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review. The ESMP will be structured as a stand-alone document that will then be converted into an Environmental and Social Management System (ESMS). The management / action plans will be developed based upon the framework below:

- Identification and rating of impacts through the impact assessment process;
- Development of specific mitigation measures based on the mitigation hierarchy (avoidance, reduction, rehabilitation and compensation/offsetting) to manage those impacts;
- Determine suitable timeframes, responsibilities, methods, performance indicators and targets, and costs for selected mitigation/management measures (in consultation with proponent/Project design team); and
- Consolidate selected measures, timeframes, responsibilities and performance indicators into comprehensive action plans.

The ESMP will include the following additional plans which will be generated by the specialist studies.

- Groundwater Management Plan;
- Blast Vibration Management Plan;
- Rehabilitation and Closure Plan;
- Risk and Emergency Control Plan;
- Resettlement Action Plan;
- Stakeholder Engagement Plan;
- Influx Management Plan;
- Community Development Plan (see below for further detail);
- Community Health and Safety Plan (see below for further detail); and
- Recruitment and Training Plan.

Step 3 – Conversion of the ESMP to the ESMS

Based on the framework laid out by the ESMP, the ESMS will be developed on an Isometrix™ platform. The ESMS will be customised to KHC's organisational structure, and will include all the measures and specific management plans outlined in the ESMP, with responsibilities assigned. The ESMS will also allow for new or unforeseen impacts to be rated and new mitigation measures to be assigned once the ESMS goes live. Mitigation measures will also go through a process of continual review, with the database updated and changes tracked.

At the end of the process KHC will have a customised live, easily auditable ESMS that will track management actions, stakeholder issues and monitoring actions, and will be easily updated. Regular reporting will be automated by the system in the format as required by the client, regulator or financier.

2.11.7 Health, Safety and Security

KHC will develop and implement appropriate policies and emergency response plans to address the health, safety and security of KHC's personnel and any communities that may be in close proximity to the mining operations.

2.11.7.1 Safety, Health, Environment and Community Policy

KHC's SHEC Policy will be conveyed to each new personnel member during induction and training upon appointment. It will also be prominently displayed in all work areas.

The application of the policy will set out in the Company's SHEC Management System Manual, which will be developed prior to the commencement of construction.

2.11.7.2 Emergency Response Plans

KHC will also develop and implement an appropriate emergency response plan to deal with general emergency situations such as fire, injuries, bomb threats, leakage of radionuclides from nuclear instruments etc. (Mandatory Code of Practice on Emergency Preparedness and Response - Ref Number: MCOP-VP-03. Revision No: 1, 2012). There will also be procedures for dealing with hydrocarbons and other wastes, including a spillage response procedure.

2.12 Positive and negative impacts of initial site layout and alternatives

All layouts will result in the relocation of a grave from the farm Haaskraal 221 LQ and the removal of vegetation from about 800 ha on Haaskraal and from up to 300 ha on Eigendomsbult 222 LQ.

The initial site layout as shown on Figure 2-4 would also have an impact of high significance on a thick stand of marula trees (*Sclerocarya birrea)*, which is a protected species, in the south-western corner of Eigendomsbult.

See section 2.14 for a discussion on the alternative layouts and their positive and negative impacts.

2.13 Possible mitigation measures and levels of risk

The issues discussed with I&APs during the scoping process were as follows:

1) **Air Quality:** The project's main potential effect on air quality will be particulate mobilisation by drilling, blasting, loading, hauling, dumping, stockpiling, crushing, screening and dry washing of coal. Wet suppression will be employed in the mine, on haul roads and at stockpiles. Dust extraction and capture by either bag filters or wet scrubbers will be employed at all unit operations in the coal washing plant. The objective will be to maintain a ***low*** risk of exceeding national standards for PM_{10} concentrations and rates of dust fall.

2) **Soil, Land Capability and Land Use:** The risk of causing a significant degradation of topsoil quality and associated loss of land capability after rehabilitation will be minimised to a ***low*** level by:

    a. Taking care to strip and stockpile topsoil, subsoil and overburden layers selectively and to prevent mixing of especially topsoil with any of the other layers;

    b. Backfilling the opencast void with discard material, overburden, subsoil and topsoil, in that order;

    c. Analysing the topsoil, fertilising it appropriately and re-vegetating it with locally indigenous flora to re-establish the pre-project land use, which was natural veld suitable for grazing by game.

3) **Ecology:** Successful restoration of the land capability will encourage natural re-colonisation of the rehabilitated area by mammals, birds, reptiles and insects, but it may require re-introduction of some

species over time in order to reduce the risk of a low-functioning or unbalanced ecosystem to a ***low*** level.

4) **Surface water:** There are no perennial watercourses within or close to the project area, only a few drainage lines that exhibit ephemeral flow immediately after a significant rainfall event. The Limpopo River, which is the closest perennial watercourse, lies more than 8 km to the north of Haaskraal and the risk of contaminated runoff from the project area reaching the river is ***very low***. It will be reduced even further by constructing clean water diversion berms to divert uncontaminated runoff around potential sources of contamination and collection channels to transport contaminated water to pollution control dams, as required by Regulation 704 under the National Water Act.

5) **Groundwater levels, availability and quality:** The abstraction of groundwater *via* boreholes for mine dewatering purposes will be aimed at controlling, but not eliminating, seepage into the opencast and underground workings. Safe and acceptable working conditions will be maintained by pumping out the seepage. This approach will minimise the cone of depression around the mine, but it will increase the risk of flooding if undetected pockets of groundwater are encountered. The coal and shale layers are expected to have moderate acid forming potential and the risk of significant pollution of groundwater as a result of the project is considered to be ***moderate***. The following mitigation measures will be implemented.

    a. Sampling and geochemical characterisation of each new boxcut or underground area to be mined about 6 months before it is reached;

    b. Mixing potentially acid-forming materials with enough calcrete to neutralise all potential acid formation before backfilling such material into the opencast void;

    c. Covering the backfilled potentially acid-forming materials with layers of non-acid-forming materials and compacting such layers to create a perched aquifer and limit ingress of air and water into the lower layers of potentially acid-forming materials;

    d. Placing product coal, discard coal and other potentially acid-forming materials on impermeable barriers; and

    e. Regular monitoring of groundwater quality *via* a series of appropriately placed boreholes.

    The risk of groundwater users being affected by groundwater contamination will be assessed by solute transport modelling after completion of the geochemical and groundwater studies.

6) **Noise:** The project area is sparsely populated and there are very few potential receptors in the vicinity of the project area. The risk of people being exposed to unacceptable levels of noise is ***low.*** Off-site noise levels will be mitigated by:

    a. Selection of mining vehicles and coal processing equipment for lower sound levels;

    b. Regular maintenance of sound attenuation equipment;

    c. Locating topsoil and overburden stockpiles to act as acoustic barriers between the opencast mine and receptors where practical; and

    d. Enclosing noisy equipment, such as crushers, in buildings clad with sound-absorbing materials where necessary.

7) **Blasting and vibration:** Blasts will be monitored and each blast will be designed to avoid exceedances of guidelines for air blast, fly rock and ground vibration. Vibration levels experienced depend on distance from the blast, the energy density of the blast and the characteristics of rock formations between the blast and the observer. The ground vibration levels will be controlled by monitoring each blast and taking the results into account when designing subsequent blasts. Residential buildings of sound construction can safely withstand a peak particle velocity (PPV) of 50 mm/s. Poorly constructed buildings should not be subjected to PPVs of more than 10 mm/s. There are no residential areas on or

in close proximity to the mining right area, but the blasts will be designed for off-site PPVs < 50 mm/s. Underground blasts will not result in any air blast effects on the surface.

The risk of causing injuries or vehicle damage by fly rock will be minimised by closing off sections of public road within 600 metres of a blast immediately prior to each blast.

8) **Visual aspects:** The terrain is quite flat and not much of the opencast mine will be visible from the local roads. The haul trucks traveling over the haul roads along the perimeter of the mine to and from the coal processing plant will be visible from the local public roads. Judicious placement of topsoil and overburden stockpiles can screen the mine from certain viewshed areas, but the stockpiles would also be visually prominent and potentially intrusive, unless they were vegetated to mitigate the visual impact. The main visibility risk is inadequate dust suppression, when dust plumes will be highly visible above the mine from distances of up to 7 km. Diligent application of wet suppression or chemical binders on unpaved roads would reduce this risk to ***low*** level.

9) **Cultural and Heritage aspects:** There is a single grave, which is no longer visible on the ground, near the centre of the proposed opencast mine on Haaskraal 221LQ and a graveyard with three graves in the north-western corner of Eigendomsbult 222 LQ. The single grave will have to be relocated, but the graveyard can be retained and protected by appropriate layout of the infrastructure on Eigendomsbult and by fencing off the graveyard.

10) **Traffic:** The travel of personnel and visitors to and from the mine is expected to generate about 100 light vehicle and 30 bus trips per day. The transport of 3.5 million tons of coal per annum to the railhead at Steenbokpan or to Eskom's rail yard at Matimba in 35 ton trucks will add 100 000 truck trips per annum, which translates to 383 per day, if coal is transported on weekdays only, or 274 per day, if the transportation is done for 7 days per week. Assuming the coal transport to be restricted to daylight hours (07h00 to 17h00), there would be 39 or 27 truck trips per hour.

    KHC's operations would result in a highly significant increase in the existing traffic on any of the possible routes to Steenbokpan and/or Matimba. A detailed traffic assessment will be required to determine to what extent roads and intersections would need to be upgraded.

11) **Socio-economics:** The significant positive socio-economic effects on inhabitants within the economic sphere of influence of the project will be countered by adverse effects such as:

    a. An influx of people seeking jobs or looking to provide services, which could lead to the development of one or more informal settlements and an increase in social pathologies such as crime, substance abuse and prostitution.

    b. Putting a strain on the ability of provincial and local municipal authorities to provide services such as policing, housing, water, power, waste management, medical, road maintenance and traffic control.

    Measures to mitigate the adverse effects will need to be developed in consultation with the relevant authorities.

2.14 Site selection matrix and final site layout plan

The alternative site layouts shown in figure Figure 2-50, Figure 2-51 and Figure 2-52 were evaluated on the basis of the following criteria:

- Sterilisation of coal reserves. If infrastructure is placed on an area that contains coal that can be mined by opencast methods, Khongoni will be unable to mine the reserves underneath the footprint of the infrastructure;
- Size of area available for infrastructure. At least 300 ha is needed to accommodate the run-of-mine (RoM), product coal and discard coal stockpiles, coal processing plant, load-out systems, weighbridges, access roads etc.;

- Environmental features. The aim is to minimise the environmental impacts; and
- Haul distance. Layouts with shorter haul distances from the mine to the RoM coal stockpile would be preferable.

2.14.1 Mine layout

The layout of the opencast mine as shown on Figure 2-4 and Figure 2-47 is dictated by the mining costs, which are in turn determined by the thickness of the overburden and interburden, the thickness and grades of the coal seams and, to a lesser extent, by the mining equipment chosen.

KHC has applied for a mining right on the entire farm of Haaskraal 221 LQ. The coal bed dips from the north-west to the south-east at an angle of about 0.75 degrees or 1:130 and the thickness of the overburden increases from about 30 metres in the north-western portion of the farm to more than 200 metres in the south-eastern part. With reference to Figure 2-2, zones 7 to 11 can be mined by truck and shovel opencast methods, but the deeper zones 2, 3 and 4 will have to mined by underground methods. Zone 1 is uneconomically thin and will be left *in situ.* Opencast mining will commence in the north-western part of Haaskraal and progress towards the south-east. After about ten years, a decline shaft will be constructed from the open pit and underground mining will commence.

The in-pit haul roads will move around as the pit geometry develops, but the locations of the exterior haul roads as shown on Figure 2-4 are dictated by the perimeter of the final open pit. Topsoil and overburden berms will be constructed between the perimeter of the open pit and the adjacent public roads. The RoM delivery point could be on Eigendomsbult, in which case all the RoM coal would have to be delivered by haul truck, or it could be at a point along the pit perimeter, from where it would then be transported to the processing plant by a conveyor belt system. The delivery point would be relocated from time to time as the mine progresses.

2.14.2 Location and layout of infrastructure

Due to the dip of about 0.75 degrees in the coal seam from the north-west to the south-east, the overburden is much thinner on Olieboomsfontein 220 LQ immediately west of Haaskraal 221 LQ and on large portions of Blinkwater 23 LQ and Klippan 224 LQ immediately north and south of Haaskraal respectively. Placing the infrastructure on areas where the overburden is thin enough to make opencast mining feasible, but not thick enough to make underground mining feasible, would sterilise the coal reserves beneath the site for many years. This consideration leaves the south-eastern parts of Haaskraal and Klippan, and all of Eigendomsbult and Sterkwater 24 LQ as candidate areas for the infrastructure.

Alternative 1, shown on Figure 2-50, considers placing the coal handling and processing infrastructure on Haaskraal and the discard stockpile on Eigendomsbult, or *vice versa*. Either option would sterilise a substantial portion of the opencast minable reserves on Haaskraal for about 50 years.

The coal seams on Eigendomsbult are too deep for viable opencast mining and placement of infrastructure on this farm would not sterilise any reserves. Two alternative layouts on Eigendomsbult were considered.

The south-eastern part of Haaskraal and the adjacent areas on Klippan and Eigendomsbult are more thickly populated with marula trees (*Sclerocaryea birrea)*, which species is protected under the National Forests Act of 1998 (Act 84 of 1998), than Sterkwater and the rest of Eigendomsbult. In terms of this Act, protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water and Sanitation.

Alternative 2, shown on Figure 2-51, would affect a thick stand of *Sclerocaryea birrea* and a large part of an isolated patch of *Acacia* thicket.

Alternative 3, shown on Figure 2-52, is the preferred layout, as it avoids both the *Acacia* thicket and the stand of marula trees.

Locations on Sterkwater and further east on Eigendomsbult would result in longer transport distances of coal from the mine to the coal handling and processing infrastructure, with an adverse effect on the economics of the operation.

The positions of the clean water diversion berms and pollution control dams as shown on Figure 2-52 have been chosen to utilise the local topography of the land.

The alternative infrastructure layouts were evaluated by means of the selection matrix shown in Table 2-29. The evaluation criteria included sterilisation of coal reserves, the size of the area available for the establishment of infrastructure, environmental impact and the haul distance for RoM coal. Ratings were assigned for each criterion on an acceptability scale of 0 to 10, with 0 being the least desirable. The total score for each alternative was calculated as the sum of the individual ratings.

Table 2-29: Site and layout selection matrix

Site	Sterilisation of reserves	Available area	Environmental	Haul distance	Total score
Alternative 1 Haaskraal	0	5	8	10	23
Alternative 2 Eigendomsbult	8	7	5	7	27
Alternative 3 Eigendomsbult - preferred	8	10	8	7	33

Figure 2-50: Layout alternative 1 - substantial infrastructure on Haaskraal

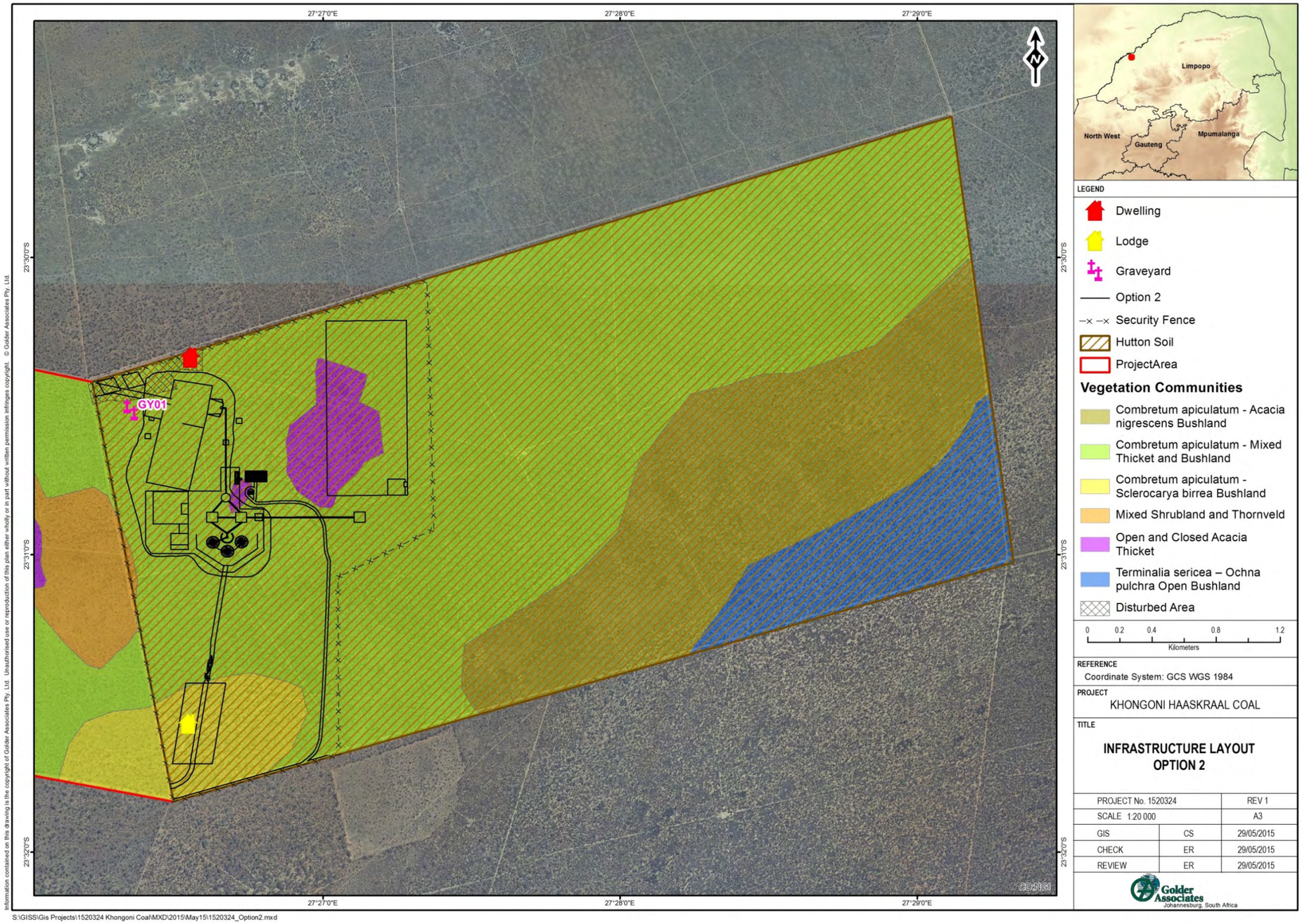


Figure 2-51: Layout alternative 2 - all infrastructure on Eigendomsbult, some in ecologically more sensitive areas

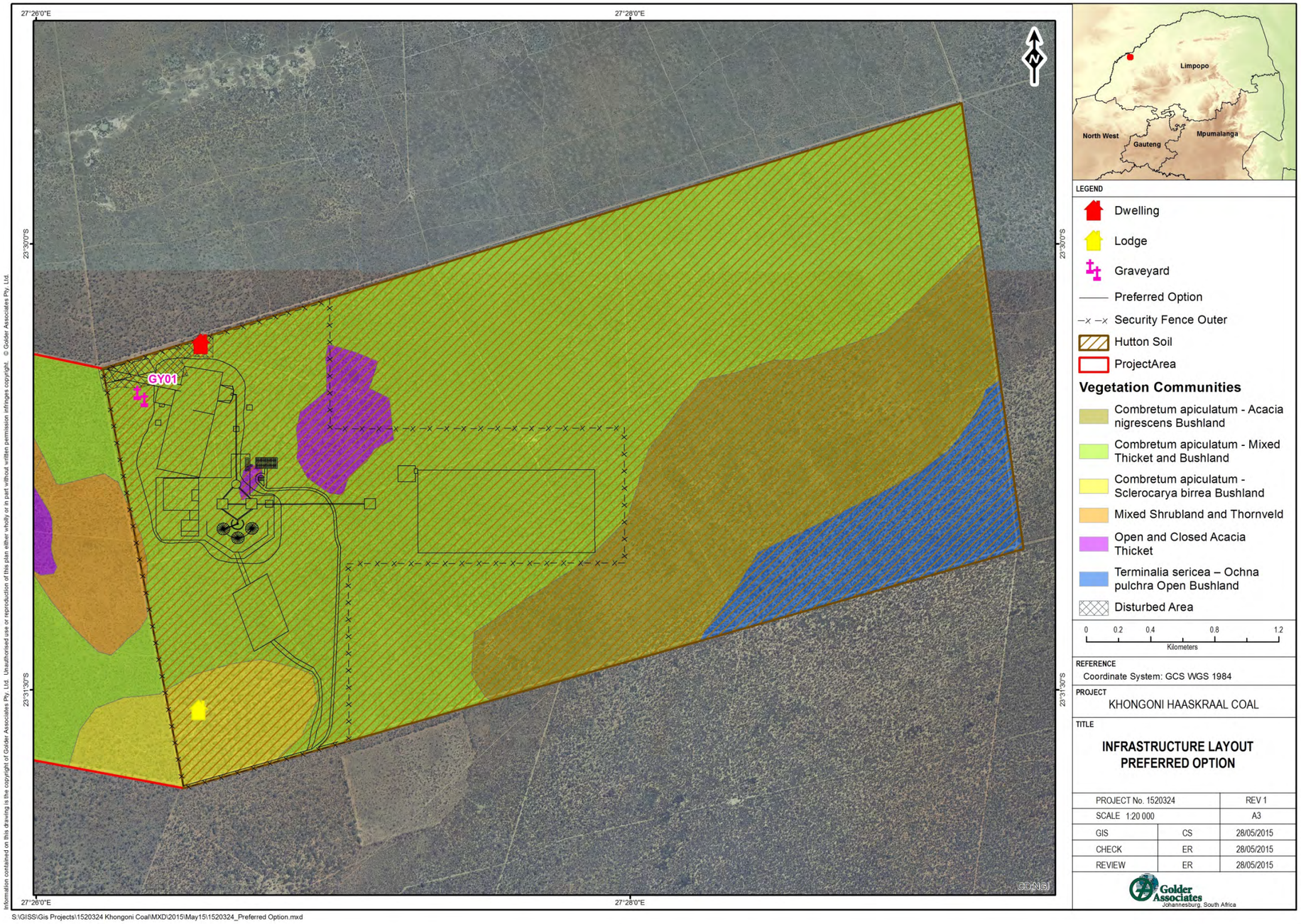


Figure 2-52: Layout alternative 3 - preferred option

2.15 Motivation for not considering alternative sites

Not applicable. Alternative sites were considered as discussed in section 2.14 above.

2.16 Statement motivating the preferred site and layout

The site and layout shown on Figure 2-52 represent the best overall option as determined *via* the site selection and layout matrix – see Table 2-29.

3.0 PLAN OF STUDY FOR IMPACT ASSESSMENT

3.1 Alternatives to be considered

Basic alternatives such as opencast mining, underground mining, utilisation of low grade coal, location of the supporting infrastructure, postponement of the project and not undertaking the project at all, are discussed in section 2.8.1.

3.2 Aspects to be assessed during impact assessment process

The following aspects, which are directly associated with KHC's application for a mining right and the subsequent mining and coal processing activities on Haaskraal 221 LQ and Eigendomsbult 222 LQ respectively, will be assessed:

3.2.1 Infrastructure location and site layout

Practical, economic and environmental aspects of various possible locations of the coal handling, processing and storage infrastructure required to support the mining operations and various possible layouts on the preferred site.

3.2.2 Geochemistry and waste classification

Drilling will be done on the north-western portion of Haaskraal 221 LQ, where the overburden is thinnest and where the first cut of the opencast mine will be made. Samples of the various coal and interburden seams will be collected. Testwork on the samples will include:

- Mineralogical analysis;
- Whole element analysis;
- Sulphur speciation to establish the chemical form in which the sulphur occurs;
- Analysis for major cations (Ca, Mg, Na, K, Fe, Al, Mn, Cu, Pb, Zn, Cr, Ni, Cd, As, Sb) and anions (F, Cl, SO_4, NO_3);
- Leach testing;
- Acid base accounting (ABA);
- Net acid generation (NAG) tests;
- Geochemical modelling of leach test results to determine potential drainage qualities using XRD mineralogy to identify likely equilibrium mineral phases;
- Assessment of acid rock drainage risk and potentially leachable mass of contaminants from stockpiles;
- Waste classification with regard to all mine residues in accordance with the Waste Classification and Management Regulations published as Government Notice 614 of 10 August 2012; and
- Development of conceptual models of the product coal and waste material stockpiles, including a discussion of geochemical conditions which may influence seepage quality. This will guide the identification of conceptual mitigation strategies;

3.2.3 Socio-economics

The impacts of the proposed project on the current socio-economic fabric of the surrounding area, as described in section 2.9.13.1, will be identified. Information on the capital cost (local and imported) and the estimated local spend on remuneration, goods and services will be used to assess the socio-economic impact of the proposed project on relevant socio-economic characteristics of the area such as the population demographics, number of employment opportunities, number of unemployed and Gross Geographical Product. Recommendations for mitigation of adverse impacts and enhancement of positive effects will be provided.

3.2.4 Site-specific studies

The following environmental aspects will be assessed with specific reference to the preferred site:

3.2.4.1 Air quality

The impact assessment study will encompass the following:

- A summary of applicable air quality legislation, policies and standards;
- Identification of sensitive receptors in the vicinity of the site;
- Identification of potential health effects associated with PM_{10} and $PM_{2.5}$;
- Identification and filling of any gaps in the available baseline information;
- Establishing of an emissions inventory, including emission sources in the vicinity of the proposed mine;
- Dispersion modelling of key pollutants identified in the emissions inventory during the operation of the proposed mine. While construction phase emissions are expected, these will not be modelled, but a professional opinion will be provided;
- A detailed list of information required for modelling purposes will be generated and provided to KHC upon appointment;
- Available emission rates will be used for identified sources where available, otherwise the USEPA AP-42 or NPI EET documents will be consulted to obtain emission rates for the identified sources. A qualitative assessment of potential cumulative health impacts on residents in the vicinity of the mine will be provided; and
- Development of appropriate mitigation measures for inclusion in the EMPr.

3.2.4.2 Soil, Land Capability and Land Use

In addition to characterising the baseline conditions as described in section 2.9.6, this study will involve the following:

- Compilation of soil utilisation guide and plan (stripping & stockpiling for later rehabilitation);
- Assessment of anticipated positive and negative environmental impacts on soils during the construction, operational and decommissioning phases and after mine closure; and
- Description of recommended mitigation measures for incorporation into the EMPr.

3.2.4.3 Ecology

The objectives of the terrestrial ecosystem assessment are to describe the pre-project baseline ecological conditions in the project area and to assess the ecological impacts of the construction, operational and closure phases of the mine. The baseline assessment included a desktop literature study and a field survey undertaken during April 2015 (dry season) to establish the pre-mining baseline conditions described in section 2.9.7.

A wet season survey will be undertaken to identify plants, insects, arachnids, reptiles and amphibians that become visible after the first rains, and birds that visit the area in the spring and summer months. This will

provide a more comprehensive understanding of the study area's baseline ecological attributes on which to base the impact assessment.

The potential impacts of the proposed project during the construction, operational and decommissioning phases and after mine closure will be identified and assessed. Potential mitigation and management measures will be defined for inclusion in the environmental management programme (EMPr).

3.2.4.4 Wetlands

Figure 2-27 shows the natural surface water features that were observed within and adjacent to the project area during the dry season survey in April. Although most or all of them are supplied from boreholes to provide watering for game and livestock, their extent and current status as wetlands will be investigated, and the project's impacts on them will be assessed.

3.2.4.5 Surface Water

The impact assessment will be done by exploring and predicting the effects of the proposed mining project on the pre-project baseline conditions described in section 2.9.8 and acceptable conditions as defined by standards, guidelines and good practice. The surface water study will also take cognisance of Regulation 704 under the National Water Act (Act 36 of 1998) (NWA) and make recommendations for achieving compliance with the requirements of this regulation. Accordingly, study will encompass the following:

- Determining the quantity and quality of runoff from the proposed mining areas for rainfall events with 50 year and 100 year recurrence intervals to properly size and design stormwater control measures;
- Delineating clean and dirty areas on the site from the mining and infrastructure layout plans;
- Determining the site water balance and identifying opportunities for recycling runoff from the dirty water collection areas to the mining process. The water balance model will also be used for the water use licence applications;
- Design criteria will be set up for sizing the storm water management structures;
- A model (PCSWMM) will be set up and applied to determine the layout and sizes of the conveyance structures required for the clean and dirty water collection systems and pollution control dams to meet the requirements of Regulation 704 of the NWA;
- The impacts of the proposed mining operations on the local surface water resources will be assessed and appropriate mitigation measures will be recommended for inclusion in the EMP; and
- Development of a programme for monitoring of the surface water quality.

3.2.4.6 Groundwater

When developing a mine plan, some of the most important requirements with regard to groundwater are to:

- Assess the extent to which groundwater flow into the mine workings may affect the safety and efficiency of the mining operations;
- Identify local groundwater users and determine their dependence on the groundwater resource;
- Determine the pre-project (baseline) groundwater quality;
- Assess the potential impact of the proposed mining operations on the groundwater quality and yield;
- Estimate the rate of groundwater flow into the mine workings; and
- Develop an appropriate dewatering plan that will provide safe working conditions while minimising any adverse effects on groundwater quality and groundwater users in the vicinity of the mine.

The aquifers on Haaskraal will be investigated by a dedicated groundwater drilling and testing programme during the impact assessment phase. The groundwater investigation will encompass the following:

- Desktop study of proposed mining plans, available geological information, borehole maps and logs, groundwater reports and monitoring data in the vicinity of the proposed mining area;

- Interpretation of exploration drilling logs and available stereo pair black and white aerial photographs to identify major structural features and photo lineaments.
- Geophysical survey to establish suitable locations for monitoring boreholes and such dewatering boreholes as may be required;
  - The geophysical survey will target deep weathering and fractures in the Karoo Sequence sediments which could act as preferential groundwater flow paths;
  - The survey will comprise magnetic, electromagnetic and 2D Earth Resistivity Imaging (ERI) methods. The survey will be conducted at 10m station intervals at selected target areas which will be confirmed prior to the geophysical survey.
- Drilling of 5 new monitoring boreholes, 3 on Haaskraal and 2 on Eigendomsbult, which will provide:
  - Direct geological and hydrogeological control across the proposed mining right area as required;
  - Facilities to undertake aquifer testing and water sample collection; and
  - Future monitoring points (initial groundwater monitoring network).
- Drilling targets will be based on the geophysical survey results. The boreholes will be drilled to specification under the supervision of an experienced hydrogeologist who will determine final drilling depths and also record the geology intersected, and the depth/blow yield of water strikes;
- Aquifer testing of new monitoring boreholes to determine hydraulic parameters and update the conceptual groundwater model. Three new monitoring boreholes will be subjected to short term test pumping - 12 hour Constant Discharge Tests (CDT). The hydraulic parameters determined from the test data will provide essential inputs to the numerical flow and transport model. Nearby boreholes will be used to monitor the impact of the testing of water levels.
- Slug testing will be conducted on low yielding boreholes (<0.2l/s), to provide hydraulic parameters for groundwater modelling. Test pumping will be done under supervision of an experienced hydrogeologist who will also conduct the falling head or slug testing;
- Sampling of the newly drilled monitoring boreholes:
  - Five groundwater samples which will be collected and analysed for major cations (Na, K, Mg, Ca), major anions (Cl, F, SO_4), physico-chemical parameters (pH, conductivity, Total Dissolved Solids, Total alkalinity) and trace elements (including Fe, Cr, Mn, Al, Zn, NO_3 and others determined by ICP-OES);
- Update of conceptual groundwater model with new information generated,
- The conceptual model will indicate the dynamics of the groundwater system, aquifer distribution, role of geological structures and groundwater flow directions and it will provide basic input to the groundwater modelling;
- Geochemistry and mine residue classification to determine the:
  - Risk of acid rock drainage / metal leaching (ARD/ML) from the rock material which will be exposed/disturbed/deposited during the mining operations,
  - Residue characteristics of the discard and run of mine coal (waste assessment in terms of the National Environmental Management Waste Act, NEMWA), and
  - Long term seepage quality of the mine and its residue storage facilities (source-terms).

  Seventeen samples representing overburden, coal, interbedded shales and carbonaceous sandstone have been supplied by KHC. These will be subjected to:
  - Acid-base accounting (ABA) testing;
  - Mineralogical analysis by X-Ray diffraction;
  - *Aqua regia* digestion and XRF / ICP scans to determine total concentrations of inorganic constituents of concern (CoCs);

- Australian Standard Leach Procedure (ASLP) with deionised water (applicable for mono-disposal), followed by ICP scan to determine leachable concentrations of inorganic CoCs as well as determination of cation and anion concentrations and pH; and
- Net Acid Generation Leach testing (NAG leach) to determine the leachable concentrations of inorganic CoCs under the maximum possible level of oxidation.

Source-terms (concentration loadings of the potential constituents of concern) will be developed on the basis of maximum and minimum leachate qualities from the ASLP and NAG results.

- Numerical modelling and Impact assessment.

  The potential impact of the opencast coal mine and related infrastructure on the groundwater system, migration of possible contaminant plumes from the mining, potential pollution control dams, stockpile areas and tailings dams will modelled, using **FEFLOW**, a sophisticated and powerful 3D finite element modelling package designed to cope with complex hydrogeological and mine schedule situations.

- The model will be used to assess the likely impacts of the mining activities on the existing groundwater regime, including:
  - Calculation of passive inflow into the opencast mine;
  - Impacts on the existing users in terms of depression of groundwater levels/reduction in yield of existing boreholes, caused by the need to pump to maintain dry working conditions for the opencast mine;
  - Impacts on the groundwater quality of existing users;
  - Possible development of pollution plumes emanating from the mining activities;
  - Impacts on the existing groundwater level, and
  - Transport model for pollution impact assessment and control.
- Appropriate mitigation measures will be formulated and incorporated in the EMPr.

3.2.4.7 Noise

The characterisation of the project area in terms pre-project noise levels, topographical features and locations of sensitive receptors, as described in section 2.9.10, was done during April 2015.

The noise levels will be assessed by constructing an acoustic model of the operations, using the proprietary software CadnaA, which conforms to international standard ISO9613. The model will be developed based on local mapping data, project description and site plans provided by KHC and will include static noise sources, as well as mobile and linear sources such as road traffic and conveyors. Topography will be assumed to be flat and smooth, representing “worst-case” in terms of noise attenuation.

The noise impacts of the proposed opencast mining operations will be assessed by comparing predicted noise levels at the perimeter of the mining and coal processing operation and at identified receptor points against pre-project baseline conditions and acceptable levels in terms of South African and international standards, guidelines and good practice. The dominant noise sources will be identified and recommendations provided for mitigation measures to control the noise at source.

3.2.4.8 Vibration, air blast and fly rock due to blasting

South African and international guidelines for the design and monitoring of blasts to remain within acceptable levels regarding noise levels generated by air blast, ground vibration levels and fly rock travel distance will be discussed.

3.2.4.9 Cultural and heritage aspects

As required in terms of Section 38 of the National Heritage Resources Act 25 of 1999 (NHRA), the South African Heritage Resources Agency (SAHRA) will be notified of the intended development and a phase I heritage study will be undertaken to assess the impacts of the proposed project on the baseline situation as described in section 2.9.12. Where appropriate, mitigation measures will be formulated. These will include

chance find procedures, as the possibility of unearthing buried artefacts or human remains during construction cannot be ruled out.

3.2.4.10 Traffic

The anticipated traffic volumes during construction, operation and eventual closure of the project will be obtained from KHC. After meeting with local roads authorities to obtain information on their future planning, the traffic volumes predicted for the project will be superimposed on the existing traffic patterns as described in section 2.9.13, taking into account any planned upgrades in roads and traffic control systems, and the traffic impact of the proposed project will be assessed. Appropriate recommendations for site access points and upgrades of roads and traffic systems as may be necessary will be developed.

3.2.4.11 Visual aspects

The visual impact assessment will be undertaken against the backdrop of the baseline characterisation provided in section 2.9.11 and will involve the following:

- Identification of potentially sensitive receptors;
- Impact assessment by visual observation and photographic analysis to evaluate:
  - Visual intrusion;
  - Visibility; and
  - Visual exposure;
- Professional opinion and recommendations for mitigation measures.

3.3 Aspects to be assessed by specialists

The following aspects will be assessed *via* specialist studies:

- Geochemistry;
- Air quality;
- Soil, Land Use and Land Capability;
- Ecology;
- Wetlands;
- Surface Water;
- Groundwater;
- Noise;
- Vibration, air blast and fly rock due to blasting;
- Visual aspects;
- Cultural and heritage aspects;
- Traffic; and
- Socio-economics.

3.4 Method of assessing environmental aspects and alternatives

The significance of the identified impacts will be determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach incorporates two aspects for assessing the potential significance of impacts, namely occurrence and severity, which are further sub-divided as follows:

Occurrence		Severity	
Probability of occurrence	Duration of occurrence	Scale / extent of impact	Magnitude (severity) of impact

To assess each of these factors for each impact, the following four ranking scales are used:

Table 3-1: Ranking scales for assessment of occurrence and severity factors

Probability	Duration
5 - Definite/don't know	5 - Permanent
4 - Highly probable	4 - Long-term
3 - Medium probability	3 - Medium-term (8-15 years)
2 - Low probability	2 - Short-term (0-7 years) (impact ceases after the operational life of the activity)
1 - Improbable	1 – Immediate
0 - None	
SCALE	**MAGNITUDE**
5 - International	10 - Very high/don't know
4 - National	8 - High
3 - Regional	6 - Moderate
2 - Local	4 - Low
1 - Site only	2 - Minor
0 - None	

Once these factors are ranked for each impact, the significance of the two aspects, occurrence and severity, is assessed using the following formula:

SP (significance points) = (magnitude + duration + scale) x probability

The maximum value is 100 significance points (SP). The impact significance will then be rated as follows:

SP >75	Indicates high environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 – 75	Indicates moderate environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <30	Indicates low environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that constitutes an improvement over pre-project conditions

3.5 Method of assessing duration significance

See Table 3-1, where it is explained how durations ranging from immediate (i.e. lasting for only seconds or minutes, such as air blast, noise and vibration caused by a blast) to permanent (e.g. removal of coal from economically viable seams) are assigned scores ranging from 1 to 5.

3.6 Stages at which competent authority will be consulted

The competent authority will be consulted:

- Upon submission of the application for a mining right;
- During the 30 day period for public review of the scoping report;
- During the 43 day period of evaluation of the scoping report by the DMR;
- During the 106 day period of development of the EIR and EMPr;
- During the 30 day period for public review of the EIR and EMPr;
- During the 107 day period of evaluation of the EIR and EMPr by the DMR; and
- In the event of an appeal.

3.7 Public Participation during the Impact Assessment Phase

Public participation during the impact assessment phase of the ESHIA / EIA will entail a review of the findings of the ESHIA / EIA, presented in the ESHIA Report and Environmental Management Programme (EMP), and the specialist studies. These reports will be made available for public comment for a period of 30 days.

3.7.1 Notification of interested and affected parties

All registered I&APs will be advised timeously and by e-mail, fax or telephone call of the availability of these reports, which they could either download from Golder's public website or request from Golder's Public Participation Office. They will be encouraged to comment either in writing (mail or email) or by telephone. Ample notification of due dates will be provided.

3.7.2 Engagement process to be followed

All the issues, comments and suggestions raised during the comment period on the Draft ESHIA Report/EMP will be added to the Comments and Response Report (CRR) that will accompany the Final ESHIA Report/EMP. The Final ESHIA Report/EMP will be submitted to the Department of Mineral Resources (DMR), the Department of Water and Sanitation (DWS) and the Department of Environmental Affairs (DEA) for a decision about the proposed project.

On submission of the Final ESHIA Report/EMP to the authorities, a personalised letter will be sent to every registered I&AP to inform them of the submission and the opportunity to request copies of the final reports.

3.7.3 Information to be provided to I&APs

In addition to all the information provided in this scoping report, specifically the mining layout plan shown in Figure 2-4, the project description provided in sections 1.1 and 2.4, the description of the baseline environment provided in section 2.9, the potential impacts identified in section 2.10 and the potential mitigation measures discussed in section 2.13, the results of the specialist assessments and their recommended mitigation measures will be provided to I&APs during the impact assessment phase.

3.8 Tasks to be undertaken during environmental impact assessment process

The various specialist studies that will be undertaken during the environmental impact assessment process are described in section 3.2 and are briefly summarised here.

3.8.1 General

3.8.1.1 Finalisation of site layout

The location and preliminary layout of the mine's supporting infrastructure has been determined with consideration of the environmental baseline information generated during the scoping process. The layout will be finalised after taking into consideration the additional information generated during the environmental impact assessment process.

3.8.2 Air Quality

As described in section 3.2.4.1, a professional opinion will be provided on the impacts of the proposed project on the current air quality in the surrounding area, which is described in section 2.9.4. Without actual measured data on the characteristics of the operations and the affected soils and overburden, which will not be available until mining is in progress, modelling of particulate mobilisation and dispersion would be of little practical value. It is proposed that modelling be undertaken using measured characteristics if air quality standards are not met once the mine is in operation. The impact assessment study will encompass the following:

- A review of applicable air quality legislation, policies and standards;
- Identification of sensitive receptors in the vicinity of the site;
- Identification of potential health effects associated with PM_{10} and $PM_{2.5}$;
- Identification of any gaps in the available baseline information;
- Professional opinion on the air quality impacts of the proposed project; and
- Development of appropriate mitigation measures and criteria for modelling and monitoring for inclusion in the EMP.

3.8.3 Groundwater

When developing a mine plan, some of the most important requirements with regard to groundwater are to:

- Assess the extent to which groundwater flow into the mine workings may affect the safety and efficiency of the mining operations;
- Identify local groundwater users and determine their dependence on the groundwater resource;
- Determine the pre-project (baseline) groundwater quality;
- Assess the potential impact of the proposed mining operations on the groundwater quality and yield; and
- Develop an appropriate dewatering plan that will provide safe working conditions while minimising any adverse effects on groundwater quality and groundwater users in the vicinity of the mine.

The groundwater investigation will encompass the following:

- Hydrocensus of existing boreholes in the area;
- Review of existing groundwater information;
- Geophysical survey to establish suitable locations for monitoring boreholes and such dewatering boreholes as may be required;

- Sampling and pump-testing of boreholes to characterise the groundwater regime;
- Assessing the potential environmental and safety aspects of storing abstracted water in mined out underground voids; and
- Formulating appropriate mitigation measures.

3.8.4 Noise and Vibration

The noise and vibration impact assessment will involve the following:

- Identification of sensitive receptors in the vicinity of the proposed mine and coal processing operations;
- Prediction of noise levels at sensitive receptors during the operational phase of the mine;
- Evaluation the predicted noise levels in the context of the baseline characterisation to identify any significant noise impacts arising from mining activities;
- Providing guidelines for acceptable vibration levels in terms of damage to structures and
- Provision of recommendations regarding noise mitigation procedures and on-going monitoring and compliance surveys as may be necessary.

The noise impact will be assessed by constructing an acoustic model of the operations, using the proprietary software CadnaA, which conforms to international standard ISO9613. The model will be developed based on local mapping data, project description and site plans provided by KHC and will include static noise sources, as well as mobile and linear sources such as road traffic and conveyors. Topography will be assumed to be flat and smooth, representing “worst-case” in terms of noise attenuation.

Predicted noise levels at receptor points will be evaluated by comparison with South African and international standards and guidelines. The dominant noise sources will be identified and recommendations provided for mitigation measures to control the noise at source.

South African and international guidelines for the design and monitoring of blasts to remain within acceptable levels regarding noise levels generated by air blast, ground vibration levels and fly rock travel distance will be discussed.

3.8.5 Socio-economics

The establishment the Medupi Power Station and the spurt in the development of the Waterberg coal resources have resulted in a significant influx of people into the Lephalale area.

Various municipal consultations undertaken in the scoping phase have indicated that there has been increased pressure on the existing social infrastructure and social amenities. The informal settlements in and around the Lephalale area are increasing in size. There is an evident shortage of skilled labour in the area, and employment and population influx are potentially vital social impacts.

KHC needs to gain a good understanding of the extent to which the local authorities are addressing these issues, as well as their plans for future social and economic development.

The socio-economic impacts of the KHC project in terms of job creation and local spend on goods and services will be assessed against the existing demographics, jobs and skills profile and gross geographic value. Appropriate mitigation measures will be developed.

3.8.6 Health

The approach to the health impact assessment (HIA) is in compliance with international industry practice, and specifically to comply with the International Finance Corporation (IFC) Performance Standard 4 which deals specifically with community health, safety and security. The Good Practice Note for HIA, as developed by the IFC to support PS4, has been used as the preferred methodology.

The HIA process is being approached in a phased manner as per the IFC methodology. The current phase consists of the scoping study, which (i) describes the potential health impact areas of concern; (ii) analyses the available evidence or data to adequately describe the significance of these impacts; (iii) identifies data gaps and opportunities for data gap closure; iv) defines the next steps in the HIA process; and v) presents some high level recommendations based on the initial findings.

The potential health and safety impacts on local residents and communities associated specifically with the KHC project will be assessed in terms of the predicted effects on air quality, surface and groundwater quality, noise levels, air blast, vibration and fly rock.

3.9 Measures to avoid, reverse, mitigate, manage impacts determine residual risks

Table 3-2: Activities, impacts, mitigation and residual risks

Activity	Potential Impact	Mitigation Type	Potential for Residual Risk
Underground blasting	Vibration at surface	Monitoring and adaptive blast design	Possible exceedance of acceptable limits if a blast is inappropriately designed, but not likely – low residual risk
Mine dewatering	Lowering of groundwater table and contaminant transport	Numerical modelling, monitoring, tailoring abstraction to inflow of groundwater into underground workings	Variations in rock permeability and transmissivity could temporarily result in higher inflow than expected. Unknown water pockets could be encountered. Contaminant transport could occur when workings are flooded after mine closure
Preparation for mine closure	Inadequate development of personnel skills and/or projects that are sustainable after closure	Progress monitoring during life of mine	Inability of former personnel to sustain livelihoods after mine closure

4.0 OTHER INFORMATION REQUIRED BY COMPETENT AUTHORITY

4.1 Impact on socio-economic conditions of any directly affected persons

The socio-economic impacts on the owners and occupants of the farms Haaskraal 221 LQ, Eigendomsbult 22LQ and other farms close enough to be directly affected can only be determined properly after the specialist studies described in section 3.0 (Plan of Study for Impact Assessment) have been completed.

At this stage it is evident that, if the project is authorised and implemented, KHC will have to acquire surface right ownership of the land on which the mine and coal processing facilities will be established and that the current occupants of the land will have to be relocated, before construction and mining may commence.

4.2 Impact on any national estate

There is a single grave on Haaskraal 221 LQ and a small graveyard on Eigendomsbult 222 LQ (see Figure 2-41. The single grave will have to be relocated after obtaining permission for the exhumation and relocation from the descendants of the deceased (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local police.

5.0 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE NEMA

- Section 24(4)(a) (iii) requires that a description of the environment likely to be significantly affected by the proposed activity be provided. This has been done – see section 2.9 of this report;
- Section 24(4)(a) (iv) requires an investigation of the potential consequences for or impacts on the environment of the activity and assessment of the significance of those potential consequences or impacts. See section 2.10 of this report, where potential impacts were identified. Their assessment, as detailed in the Plan of Study for Impact Assessment (section 3.0) will be done during the impact assessment phase of the EIA;
- Section 24(4)(a) (v) references public information and participation procedures, which have been dealt with in section 2.8.2 of this report.

6.0 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I, Etienne Roux herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties have been correctly recorded in this report.

17 July 2015

7.0 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I, Etienne Roux herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with Interested and Affected parties and stakeholders has been correctly recorded and reported herein.

17 July 2015

8.0 BIBLIOGRAPHY

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