ANGLO OPERATIONS PROPRIETARY LIMITED:

LANDAU COLLIERY: PROPOSED NAVIGATION WEST - SOUTH BLOCK EXTENSION PROJECT

FINAL SCOPING REPORT UNDER NEMA, 1998

DARDLEA Ref No: 17/2/3N-363

Date: April 2015

SHANGONI
Management Services (Pty) Ltd

www.shangoni.co.za

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PROJECT DETAILS

Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA)

Reference No.: 17/2/3N-363

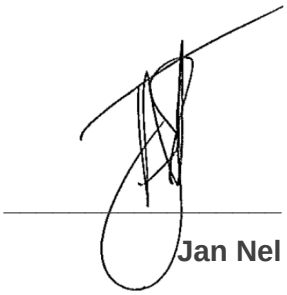
Project Title: LANDAU COLLIERY: PROPOSED NAVIGATION WEST - SOUTH BLOCK EXTENSION

Project Number: ANG-LAN-14-01-30

Compiled by: Minnette Le Roux

Date: April 2015

Technical Reviewer: Jan Nel



Jan Nel

EXECUTIVE SUMMARY

The Applicant:

Landau Colliery is a business unit of Anglo Coal, a Division of Anglo Operations Proprietary Limited (AOPL), and consists of two sections, namely the Kromdraai Section and the Navigation Section. Coal is mined at Landau Colliery from the No.1, 2 and 4 Seams of the Witbank Coal Field using opencast methods. Coal was historically mined underground at Landau; however this mining method ceased in 1991.

The Navigation Section is divided into three areas, namely the Navigation Plant, Schoongezicht No. 2 Seam mini-pit (also referred to as the Schoonie Mini-Pit) and the Navigation West Section (also referred to as Umlalazi - Mini-Pit). Mining at Navigation West Section is currently done at the North and South Block and coal is crushed and washed at the Ngwenya Plant within the boundary of the Navigation West Section. Navigation West Section is located south of the town KwaMthunzi Vilakazi (Previously known as Clewer) where a combination pre-strip (truck and shovel) and dragline opencast operation is in progress.

Project Background:

The Landau Colliery is situated in the Mpumalanga Highveld Region, within the eMalahleni Magisterial District and is served by the eMalahleni Local Municipality, which falls within the Nkangala District Municipality.

Landau Colliery proposes to extend the Life of Mine at the Navigation Section by expanding the mining at the Navigation West-South Block opencast pit.

Location:

The proposed Navigation West - South Block Extension Project and associated infrastructure will be located on Portion 2 of the farm Elandsfontein 309 JS.

The centre co-ordinates of the site are as follows:

- 25º 58.048’ S;
- 29º 12.111’ E.

Background description:

Landau Colliery straddles the Wilge River (B2) and Olifants River (B1) Catchment areas and falls in the upper reaches of the tributaries to these watercourses. The Kromdraai Section falls into quarterly sub catchments B20G and B11K. The Navigation Section falls into quarterly sub-catchments B20G, B11K and B11G.

A number of streams and drainage lines associated with the Schoongezicht Spruit, the Grootspruit and the Brugspruit are found within or near the mine boundary area of the Navigation Section. The

Schoongezichtspruit originates on-site just north of the Old Navigation Dump and it drains to the north through the Schoongezicht Valley. Navigation Dam, Middle Dam and the Schoongezicht Dam are all pollution control dams within the Schoongezicht valley and are located within the central and northern parts of the Navigation Section mine boundary area. A tributary of the Grootspruit originates on-site, west of the Navigation West area, and it drains to the west. The Clewer Dam and two other unnamed dams are all in-stream dams of this tributary. The Schoongezichtspruit and Highveld Steel Spruit drain the northern part of the Navigation Section towards the Brugspruit that flows into the Klipspruit.

Features such as the Blaauwkrans Co-disposal Facility, old mine dumps, the railway link from Kromdraai Section to the Navigation Beneficiation Plant, an overland conveyer from the Navigation Beneficiation Plant to the Rapid Loading Terminal, the surface water management system and old diggings are representative of the mining and related activities that have taken place at the Navigation Section.

Other infrastructure at the Navigation Section includes the pipelines between the Navigation Plant and the Emalahleni Water Reclamation Plant (EWRP), which convey contaminated mine water and brine to and from the EWRP, respectively. Furthermore, the Navigation Section accommodates the infrastructure associated with the Water Uses (as defined in Section 21 of the National Water Act, 1998 (Act 36 of 1998)) that are currently taking place at this section of the mine.

Process:

As part of the proposed Navigation West - South Block Extension Project the project activities require the upgrade of existing infrastructure and the development of new infrastructure, a Scoping and Environmental Impact Assessment (EIA) will be required in compliance with the National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) for the authorisation of listed activities contained in GNR 544 of 18 June 2010 (GNR 544), GNR 545 of 18 June 2010 (GNR 545) and GNR 546 of 18 June 2010 (GNR 546) published in terms of Sections 24(2) and 24D the NEMA. An Integrated Water Use License Application (IWULA) in terms of the National Water Act (Act No. 36 of 1998) (NWA) and an amendment of the existing Environmental Management Programme (EMPR) as per Minerals, Petroleum and Resources Development Act (MPRDA), Act No. 28 of 2002 will be required. An integrated process will be followed to meet the requirements of the NEMA, NWA and MPRDA.

In order to obtain environmental authorisation, a Scoping Report and an Environmental Impact Assessment Report (EIR) must be compiled as described in terms of Regulations 26 to 35 of the Environmental Impact Assessment Regulations, 2010 promulgated in terms of Section 24(5), 24M and 44 of the NEMA, 1998.

It is the intention of this Scoping Report (which has been compiled in terms of the NEMA, 1998) to provide the necessary information pertaining to the proposed activities associated with the project, as required in terms of the Environmental Impact Assessment Regulations (EIA Regulations R543: EIA Regulations in terms of Chapter 5 of the NEMA, 1998, dated June 2010) under the NEMA, 1998.

This Scoping Report intends to highlight information relevant to the proposed Navigation West - South Block Extension Project only, since the existing operation has been fully described in the approved Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) Reports under the NEMA, 1998 and the Mineral and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA, 2002) and the approved Navigation Integrated Water Use Licence under the National Water Act, Act 36 of 1998 respectively.

Anticipated impacts:

For the purpose of the Scoping report it is required by Regulation 28 (g) (of Regulation 543) of the EIA Regulations dated 2010, under the NEMA, 1998 that the major potential impacts the activities, processes and actions may have on the surrounding environment, are identified.

Regulation 31 (of Regulation 543) of the EIA Regulations, 2010, under NEMA, 1998, requires that an EIR includes an assessment of the status, extent, duration, probability, reversibility, replaceability of resources, and mitigatory potential of the major potential environmental impacts of the proposed project be undertaken.

The identification of the major potential impacts has therefore only been included as part of the requirements for the compilation of the Scoping Report. The prediction of the nature of each impact, the evaluation of each impact by rating its significance and the management and mitigation measures adopted to address each impact, will be assessed during the EIR.

The activities associated with the proposed project are described in full in Part 2 and the anticipated impacts of the proposed project are described in Part 6.2.

The major impacts that are expected to occur as a result of the anticipated activities as part of the proposed project within the existing mine boundary area, may combine with impacts resulting from surrounding activities and land uses to form cumulative impacts, or to contribute to cumulative impacts that already exist. Regulation 28 (g) (of Regulation 543) of the EIA Regulations dated 2010, under the NEMA, 1998 requires that cumulative impacts are also considered.

Knowledge gaps:

The following knowledge gaps and uncertainties have been identified during the scoping process of the proposed Navigation West - South Block Extension Project and require further investigations that will be comprehensively carried out as part of the EIA process for the proposed project:

- All relevant specialist studies need to be conducted for the area associated with the proposed - Navigation West - South Block Extension. The studies identified during the Scoping Phase include a Geohydrological Study, Fauna and Flora Study, Wetland Study, Soil, Land-use and Land Capability Study, Hydrology Study, Blasting and Vibration Study and Heritage Impact Assessment.
- While impacts have been identified as part of the scoping process, it is required as part of the EIA Phase to fully quantify impacts to all aspects of the environment.

- High level designs are being developed for the proposed Navigation West - South Block Extension and the associated infrastructure. These designs will be presented as part of the final EIR.

Content of the scoping report:

This Scoping Report (compiled in terms of the NEMA, 1998) is divided into the following parts:

- Part 1: Introduction.
- Part 2: Description of the project.
- Part 3: Description of the existing environment.
- Part 4: Public Participation Process.
- Part 5: Description of alternatives.
- Part 6: Identification of anticipated Environmental Impacts.
- Part 7: Plan of study for EIA.
- Part 8: Discussion and Conclusion.

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DEFINITIONS

Environment

The surroundings (biophysical, social and economic) within which humans exist and that are made up of

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them; and
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Aspects

Elements of an organisation's activities, products or services that can interact with the environment.

Environmental Degradation

Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

Environmental Impacts

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Environmental Impact Assessment

A study of the environmental consequences of a proposed course of action.

Environmental Impact Report

A report assessing the potential significant impacts as identified during the environmental impact assessment.

Environmental impact

An environmental change caused by some human act.

Land use

The various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

Pollution Prevention

Any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

Public Participation Process

A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.

Topography

Topography, a term in geography, refers to the "lay of the land" or the physio-geographic characteristics of land in terms of elevation, slope and orientation.

Vegetation

All of the plants growing in and characterising a specific area or region; the combination of different plant communities found there.

Waste

'waste' means—

a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the National Environmental Management: Waste Amendment Act, 2014; or
b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette

Residue Stockpile

Residue stockpile means any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, beneficiation plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated for potential re-use, or which is disposed of, by the holder of a mining right, mining permit, production right or an old order right.

Residue Deposit

Residue deposit means any residue stockpile remaining at the termination, cancelation or expiry of a prospecting right, mining right, mining permit, exploration right, production right or an old order right.

ABBREVIATIONS

AMD – Acid Mine Drainage
AOPL – Anglo Operations Proprietary Limited
AEMC – Attainable Ecological Management Classes
BID – Background Information Document
CBD – Central Business District
CRR – Comments and Response Report
DARDLEA - Department of Agriculture, Rural Development, Land and Environmental Affairs
DWA – Department of Water Affairs
DWS – Department of Water and Sanitation
DMR – Department of Mineral Resources
EAP – Environmental Assessment Practitioner
EIA – Environmental Impact Assessment
EIS – Ecological Importance and Sensitivity
EIR – Environmental Impact Report
EMC – Ecological Management Class
EMF – Environmental Management Framework
EMP – Environmental Management Programme
GN – Government Notice
IWULA – Integrated Water Use Licence Application
IWWMP – Integrated Water and Waste Management Plan
I&AP – Interested and Affected Party
KM – Kilometres
KV – Kilovolts
LOM – Life of Mine
MAMSL – Metres Above Mean Sea Level
MAP – Mean Annual Precipitation
MAE – Mean Annual Evaporation
MM – Millimetres
MDEDET – Mpumalanga Department of Economic Development, Environment and Tourism
MPRDA – Mineral and Petroleum Resources Development Act, Act 28 of 2002
MT – Million Tons
NEMA – National Environmental Management Act, Act 107 of 1998 as amended
PES – Present Ecological Status
PPP – Public Participation Process
R – Regulation
RE – Remaining Extent
RLT – Rapid Loading Terminal
ROM – Run of Mine
SASS – South African Scoring System
S&EIR – Scoping and Environmental Impact Report

1. INTRODUCTION

Landau Colliery is a business unit of Anglo Coal, a Division of Anglo Operations Proprietary Limited (AOPL) and consists of two sections, namely the Kromdraai Section and the Navigation Section. Landau Colliery falls within the Emalahleni Local Municipality of the Nkangala District Municipality in the Mpumalanga Province (refer to Figure 1 and Plan 1 in Appendix A).

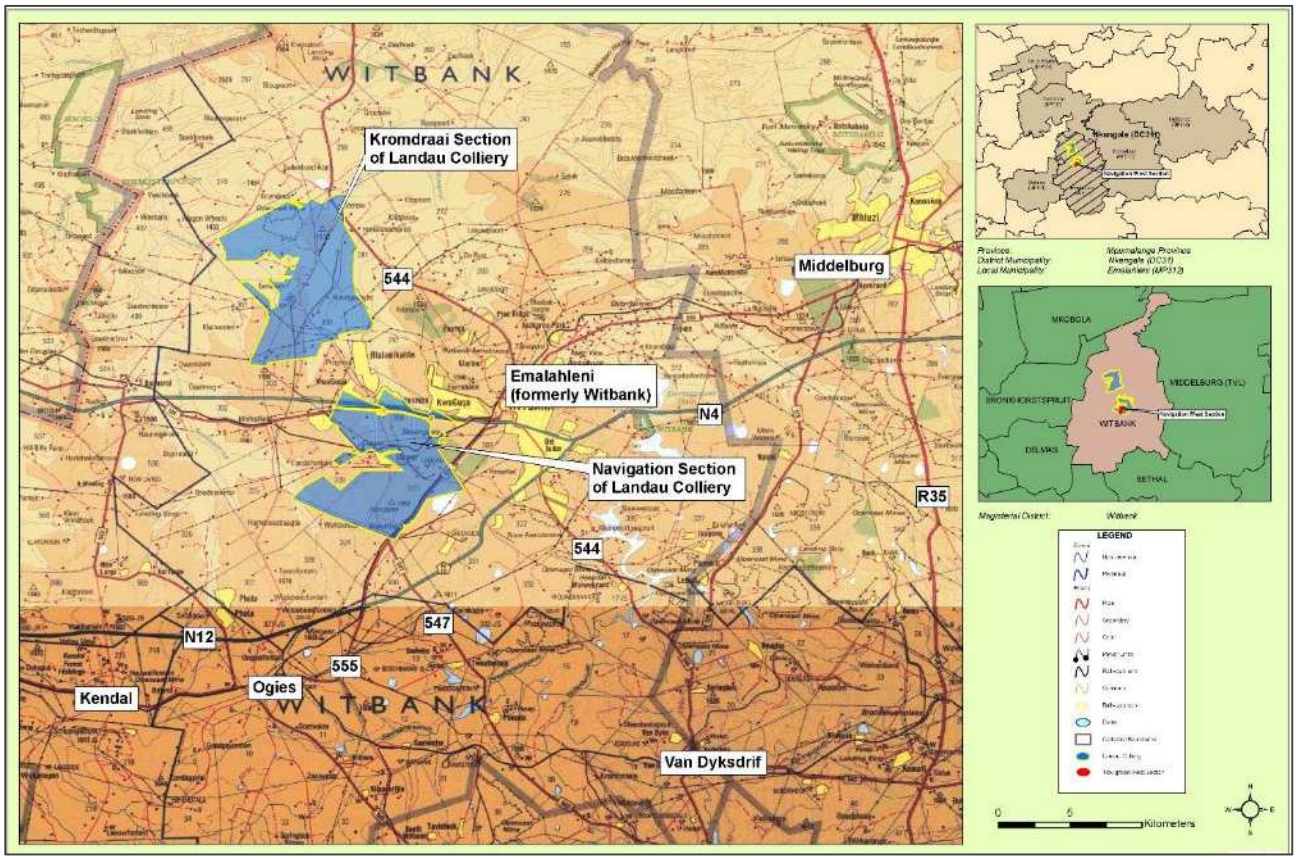

Figure 1: Regional setting of Landau Colliery

(*Source: Approved EMPR dated 2010*)

The Kromdraai Section is divided into the Kromdraai opencast mine and the Excelsior mini –pit. It is situated 15 km north-west of Emalahleni and approximately 5 km north of the Navigation Section of Landau Colliery.

The Navigation Section is located approximately 6km south-west of Emalahleni. It is divided into three areas, namely the Navigation Plant, Schoongezicht No. 2 Seam mini-pit (also referred to as the Schoonie Mini-Pit) and the Navigation West Section (also referred to as Navigation West - Mini-Pit). Mining at Navigation West Section is currently done at the North and South Block and coal is crushed and washed at the Ngwenya Plant within the boundary of the Navigation West Section. Navigation West Section is located south of the town KwaMthunzi Vilakazi (Previously known as Clewer) where a combination pre-strip (truck and shovel) and dragline opencast operation is in progress.

Coal is mined at Landau Colliery from the No.1, 2, and 4 Seams of the Witbank Coal Field using opencast methods. Coal at Landau was historically mined as an underground operation; however this mining method ceased in 1991.

Landau Colliery proposes to extend the Life of Mine at the Navigation Section by expanding the mining of the Navigation West: South Block opencast pit (Refer to Figure 2 and 3, and Plan 2 and 3 in Appendix A).

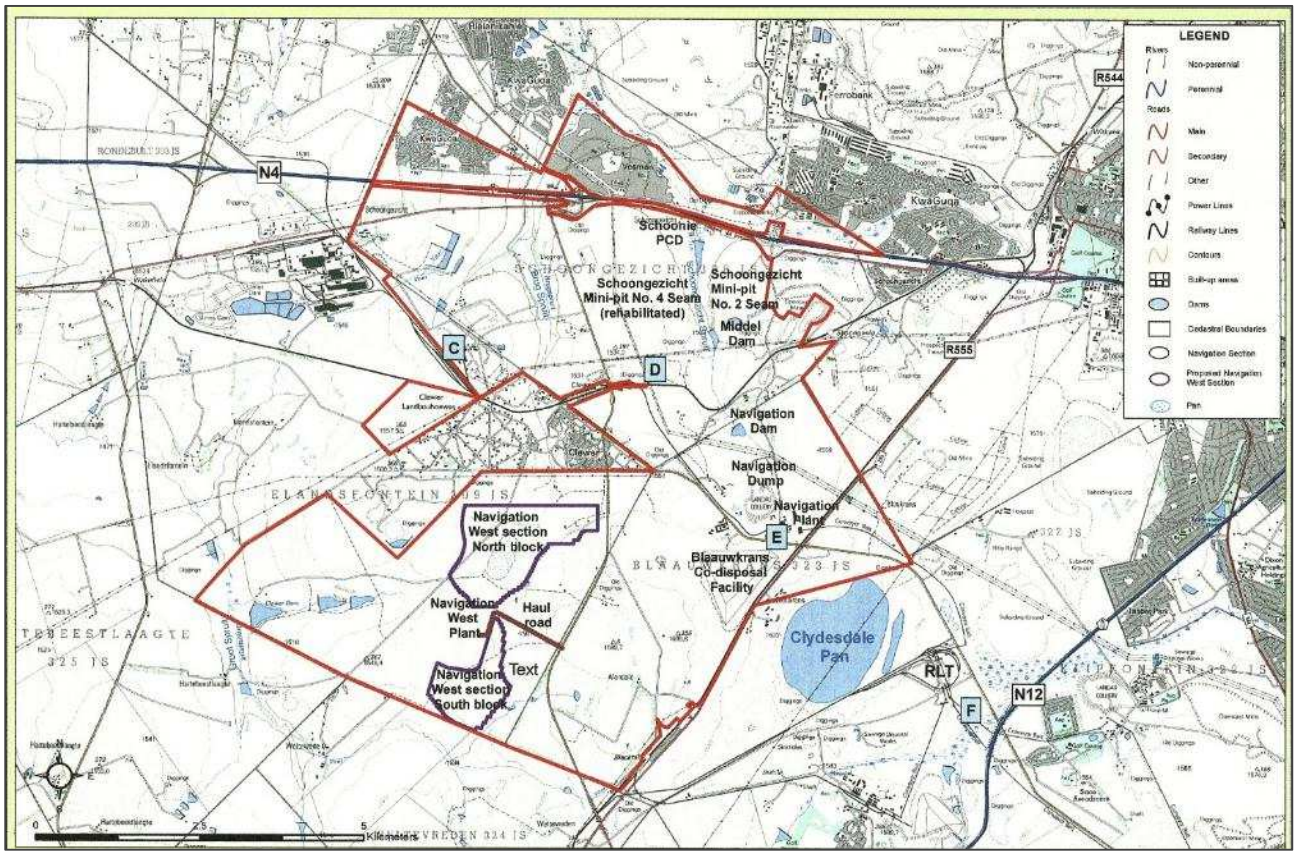

Figure 2: Surface infrastructure serving the Navigation Section of Landau Colliery

(*Source: Approved EMPR dated 2010*)

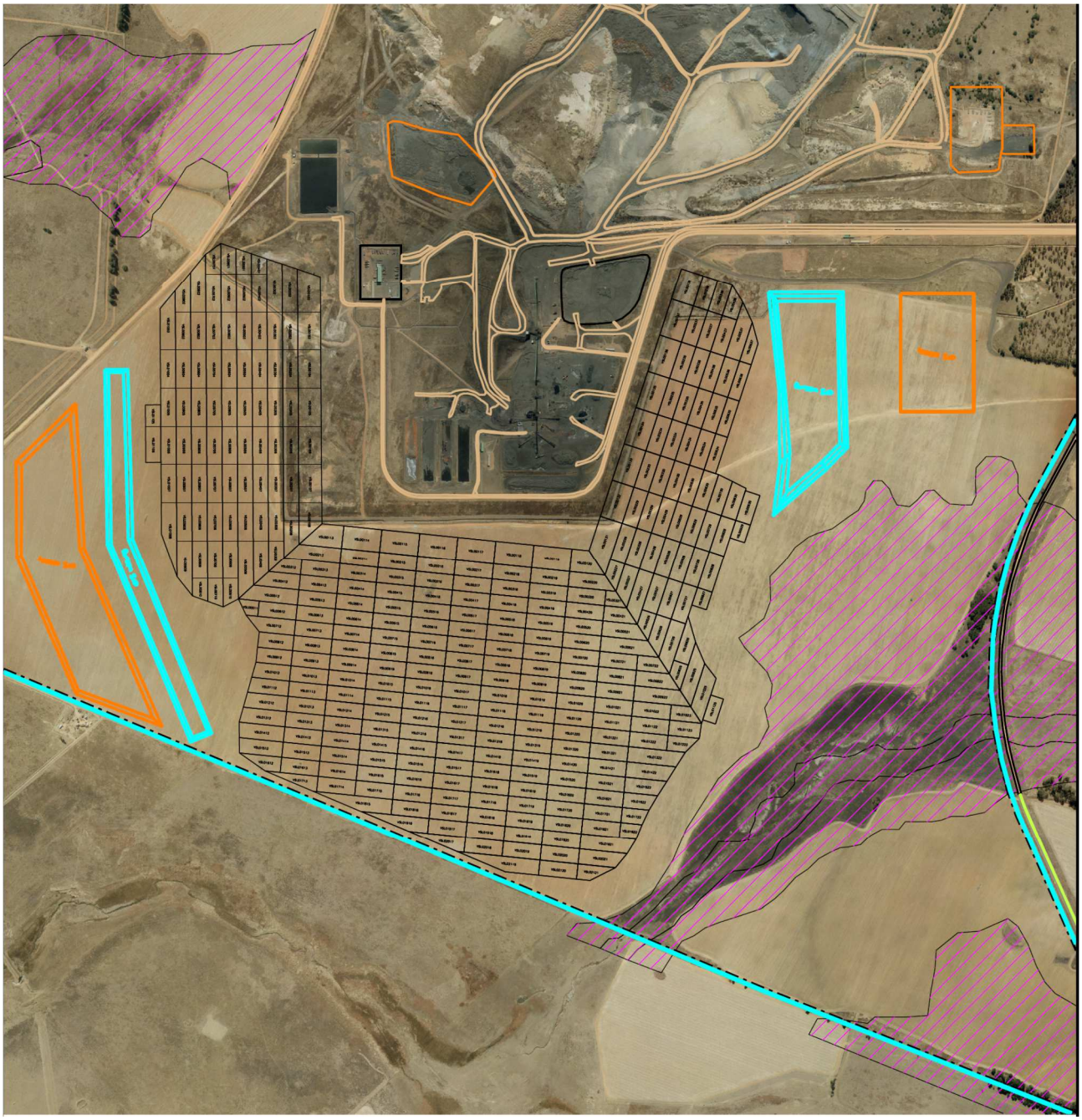

Figure 3: Proposed Navigation West - South Block Extension infrastructure map

1.1 Regulatory requirements

As part of the proposed Navigation West - South Block Extension Project the project activities require the upgrade of existing infrastructure and the development of new infrastructure, a Scoping and Environmental Impact Assessment (EIA) will be required in compliance with the National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) for the authorisation of listed activities contained in GNR 544 of 18 June 2010 (GNR 544), GNR 545 of 18 June 2010 (GNR 545) and GNR 546 of 18 June 2010 (GNR 546) published in terms of Sections 24(2) and 24D the NEMA. An Integrated Water Use License Application (IWULA) in terms of the National Water Act (Act No. 36 of 1998) (NWA) and an amendment of the existing Environmental Management Programme (EMPR) as per Minerals, Petroleum and Resources Development

Act (MPRDA), Act No. 28 of 2002 will be required. An integrated process will be followed to meet the requirements of the NEMA, NWA and MPRDA.

The Application for Environmental Authorisation for activities associated with the Navigation West - South Block Extension project has been done in terms of the requirements of the NEMA, 1998. The applicable application for authorisation in terms of the NEMA, as amended and the Environmental Impact Assessment Regulations, 2010 was submitted on 21 May 2014 to the then Mpumalanga Department of Economic Development Environment and Tourism (MDEDET). The application was accepted by the then DEDET on the 30th of May 2014 and subsequently the reference number 17/2/3N-363 was assigned to the application. The letter of acknowledgement indicating the above mentioned reference number is attached as Appendix B1.

The proposed activities involve the following listed activities as identified in terms of Section 24(2) and 24D of the NEMA, 1998:

Table 1: Listed Activities in terms of NEMA, 1998

Number and date of the relevant notice	Activity No	Activity Description	Project Description
GN. No. 544 Listing Notice 1 18 June 2010	Activity 9 (i) and (ii)	*The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water -* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more,* *excluding where:* *a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or* *b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.*	Construction of storm water management measures such as trenches for the separation of clean and dirty water management areas. Construction of pipelines for the removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 11 (ii) (vi) (xi)	*The construction of:* *(i) canals;* *(ii) channels;* *(iii) bridges;* *(iv) dams;* *(v) weirs;*	The following will be constructed within 32metres from the wetland area: Stockpiling of topsoil, subsoil and overburden.

Number and date of the relevant notice	Activity No	Activity Description	Project Description
		(vi) bulk storm water outlet structures; *(vii) marinas;* *(viii) jetties exceeding 50 square metres in size;* *(ix) slipways exceeding 50 square metres in size;* *(x) buildings exceeding 50 square metres in size; or* *(xi) infrastructure or structures covering 50 square metres or more* *where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.*	Construction of storm water management measures such as berms for the separation of clean and dirty water management areas. Progressive development of the box-cut(s), including continues stripping and stockpiling or direct placing of topsoil, subsoil and overburden. Construction of other infrastructure such as: • Pipelines for the removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 12	*The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010*	The construction of a new pollution control dam has been included as an alternative and will be assessed as part of the EIA.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 18 (i)	*The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from of more than 5 cubic metres from;* *(i) a watercourse;* *(ii) the sea;* *(iii) the seashore;* *(iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater-* *but excluding where such infilling, depositing, dredging, excavation, removal*	The construction of haul roads Stockpiling of topsoil, subsoil and overburden of the initial box-cut at the opencast area. Construction of storm water management measures such as berms for the separation of clean and dirty water management areas. Expansion of the necessary surface water pollution control infrastructure

Number and date of the relevant notice	Activity No	Activity Description	Project Description
		or moving *(i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or* *(ii) occurs behind the development setback line.*	Erection of the tip and in-pit crushers for the separate processing of the No. 4 Top Seam and No. 4 Select Seam ROM coal. Progressive development of the box-cut(s), including continues stripping and stockpiling or direct placing of topsoil, subsoil and overburden. Construction of other infrastructure such as: • Pipelines for the removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 22 (ii)	*The construction of a road, outside urban areas,* *(i) with a reserve wider than 13,5 meters or,* *(ii) where no reserve exists where the road is wider than 8 metres, or* *(iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.*	The construction of haul roads
GN. No. 544 Listing Notice 1 18 June 2010	Activity 26	*Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).*	In terms of Subsection 53(2) of the Biodiversity Act, a listed ecosystem is identified as a geographical area in terms of Subsection 24(2) of NEMA. Also in terms of Subsection 53(2) of the Biodiversity Act, a threatening process in a listed ecosystem becomes a specified activity in terms of Subsection 24(2) of NEMA. The activity will be

Number and date of the relevant notice	Activity No	Activity Description	Project Description
			confirmed by the Biodiversity specialist.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 28	*The expansion of or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a new permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.*	The expansion of the existing pollution control dam would constitute a Water Use (as defined in Section 21 of the National Water Act, 1998 (Act 36 of 1998). an Amendment of the existing Environmental Management Programme (EMPR)as per Minerals, Petroleum and Resources Development Act (MPRDA), Act No. 28 of 2002 will be required.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 41	*The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more.*	The expansion of the existing pollution control dam.
GN. No. 544 Listing Notice 1 18 June 2010	Activity 47 (ii)	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -* *(ii) where no reserve exists, where the existing road is wider than 8 metres –* *excluding widening or lengthening occurring inside urban areas.*	Upgrading of some of the existing haul roads
GN. No. 545 Listing Notice 2 18 June 2010	Activity 5	*The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case*	The expansion of the existing pollution control dam, dewatering of the Navigation West - South Block pit and backfilling of the pit with discard would constitute a Water Use (as defined in Section 21 of the National Water Act, 1998 (Act 36 of 1998). An amendment of the existing Environmental Management Programme (EMPR) as per Minerals, Petroleum and

Number and date of the relevant notice	Activity No	Activity Description	Project Description
		that Act will apply.	Resources Development Act (MPRDA), Act No. 28 of 2002 will also be required.
GN. No. 546 Listing Notice 3 18 June 2010	Activity 4(ii) (cc)	*The construction of a road wider than 4 metres with a reserve less than 13,5 metres.(a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape provinces:* *i. In an estuary;* *ii. Outside urban areas, in:* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;*	Construction of haul roads. The proposed site falls within an Ecological Sensitive Area: Local Corridor, as identified in the Mpumalanga Biodiversity Sector Plan.
GN. No. 546 Listing Notice 3 18 June 2010	Activity 16 (iv) (a) (ii) (dd)	*The construction of:* *(i) jetties exceeding 10 square metres in size;* *(ii) slipways exceeding 10 square metres in size;* *(iii) buildings with a footprint exceeding 10 square metres in size; or* *(iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line* *(a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape:* *i. In an estuary;* *ii. Outside urban areas, in:* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;*	The construction of haul roads Stockpiling of topsoil, subsoil and overburden of the initial box-cut at the opencast area. Construction of storm water management measures such as berms for the separation of clean and dirty water management areas. Expansion of the necessary surface water pollution control infrastructure Progressive opencast operations. Erection of the tip and in-pit crushers for the separate processing of the No. 4 Top Seam and No. 4 Select Seam ROM coal. Construction of other infrastructure such as: • Pipelines for the removal of groundwater influx and mine

Number and date of the relevant notice	Activity No	Activity Description	Project Description
			process water from the open pits. The proposed site falls within an Ecological Sensitive Area: Local Corridor, as identified in the Mpumalanga Biodiversity Sector Plan.
GN. No. 546 Listing 3 18 June 2010	Activity 19 (ii) (cc)	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *(a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape provinces:* *ii. Outside urban areas, in:* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;*	Construction and upgrading of haul roads. The proposed site falls within an Ecological Sensitive Area: Local Corridor, as identified in the Mpumalanga Biodiversity Sector Plan.

In order to obtain environmental authorisation, a Scoping Report and an Environmental Impact Assessment Report (EIR) must be compiled as described in Regulations 26 to 35 of the EIA Regulations, 2010 promulgated in terms of Section 24(5), 24M and 44 of the NEMA, 1998.

It is the intention of this Scoping Report (which has been compiled in terms of the NEMA, 1998) to provide the necessary information pertaining to the proposed activities associated with the Navigation West - South Block Extension Project, as required in terms of the EIA Regulations (EIA Regulations R543: Environmental Impact Assessment Regulations in terms of Chapter 5 of the NEMA, 1998, dated June 2010) under the NEMA, 1998.

This Scoping Report intends to highlight all information relevant to the proposed Navigation West - South Block Extension only, since the existing operations has been fully described in the current approved Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) under the Mineral and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA, 2002) and NEMA, 1998; and the approved Navigation Section Integrated Water Use Licence under the National Water Act, Act 36 of 1998

1.2 Process to be followed

1.2.1 Objectives of the Scoping Process and the Scoping Report

Scoping is the procedure that is undertaken during the initial stages of the Planning Phase of a project, and is used to determine the extent of, and approach to an EIA (i.e. terms of reference). This process is required for the proposed project in terms of the NEMA, 1998 and the EIA Regulations, 2010 there under.

The objectives of the Scoping Process are to:

- Provide an opportunity for the Applicant, relevant Authorities and Interested and Affected Parties (I&APs) to exchange information and express their views and concerns regarding the proposed project before the EIA is undertaken.
- Focus the study on relevant anticipated impacts, issues and concerns, as well as reasonable alternatives, to ensure that the resulting EIA is useful to the Authorities for decision-making, and addresses the impacts, issues and concerns as identified.
- Facilitate an efficient assessment process that saves time, resources and costs.

The objectives of this Scoping Report are to provide:

- An overview of the proposed project.
- An overview of the environmental features of the proposed site and immediate surrounding area.
- An indication of the I&APs identified to date.
- An indication of issues of concern/comments received from I&APs to date.
- An indication of potential environmental impacts that could take place as a result of the proposed project.
- Report on the Scoping Process.
- Assess the adequacy and appropriateness of the scoping procedure followed and the Scoping Report submitted.
- Ensure that the Scoping Report reflects the impacts and provides appropriate alternatives.
- Ensure that the Scoping Report is adequate and appropriate, and contains relevant information that will determine the way forward and set appropriate boundaries for the EIA.

1.2.2 Methodology applied to conducting the scoping process

The Scoping Process for the project will be carried out in terms of the NEMA, 1998. The Scoping Process therefore consists of the following:

- Landowners within and adjacent to the mine boundary area, the relevant organs of state and stakeholders must be contacted and informed of the project (refer to Part 4).
- An Application for Environmental Authorisation Form must be compiled and submitted to the DARDLEA (refer to Appendix B1).
- A Scoping Report describing all project activities as well as the listed activities (in terms of the NEMA, 1998) must be compiled in accordance with the requirements of the NEMA, 1998.

- The proposed project must be advertised in a local newspaper informing all potential I&APs of the project (refer to Appendix D).
- This Scoping Report must be made available to the public for comment for a period of 40 days.
- All comments received from the public during the public consultation period must be noted and recorded as part of the Scoping Report (refer to Appendix D and Part 4).
- The Scoping Report must be finalised taking all public comments into consideration.
- The Scoping Report must be submitted to the DARDLEA and the I&APs for review.
- Provided that the Scoping Report is approved by the DARDLEA, the EIA process can be carried out.

1.2.3 The Scoping Report in terms of the requirements of the NEMA, 1998

Regulation 28(1) of the EIA Regulations, 2010 under the NEMA, 1998, lists aspects that must be included in Scoping Reports. Table 2 below indicates where the information has been provided as part of this Scoping Report:

Table 2: The Scoping Report in terms of the EIA Regulations, 2010, under the NEMA, 1998

Regulation No:		Description	Scoping Report Part
R543 Regulation 28(1)(a)		Details of the Environmental Assessment Practitioner (EAP).	Part 2 & Appendix C
	(i)	Details of the EAP who prepared the report.	
	(ii)	Details of the expertise of the EAP to carry out scoping procedures.	
R543 Regulation 28(1)(b)	(b)	A description of the proposed activity.	Part 2
	(c)	Any feasible and reasonable alternatives that have been identified.	Part 5
R543 Regulation 28(1)(c)		A description of the property on which the activity is to be undertaken and the location of the activity on the property.	Part 2
R543 Regulation 28(1)(d)		A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity.	Part 3
R543 Regulation 28(1)(f)		An indication of all legislation and guidelines that have been considered in the preparation of the scoping report.	Part 1
R543 Regulation 28(1)(g)		A description of environmental issues and potential impacts, including cumulative impacts that have been identified.	Part 6
R543 Regulation 28(1)(h)		Details of the public participation process conducted in terms of Regulation 27(a).	Part 4 & Appendix D

Regulation No:		Description	Scoping Report Part
R543 Regulation 28(1)(h)	(i)	Steps taken to notify potentially interested and affected parties of the application.	
	(ii)	Proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the application have been displayed, placed or given.	
	(iii)	A list of all persons or organisations that were identified and registered in terms of Regulation 55 as interested and affected parties in relation to the application.	
	(iv)	A summary of the issues raised by interested and affected parties, the date of receipt of, and the response of the EAP to those issues.	
R543 Regulation 28(1)(i)		A description of the identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and communities that may be affected by the activity.	Part 5
R543 Regulation 28(1)(j)		A description of the need and desirability of the proposed activity.	Part 2
R543 Regulation 28(1)(k)		Copies of any representations and comments received in connection with the application or the scoping report from interested and affected parties.	Part 4 & Appendix D
R543 Regulation 28(1)(l)		Copies of any minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants.	Part 4 & Appendix D
R543 Regulation 28(1)(m)		Any responses by the EAP to those representations and comments and views.	Part 4 & Appendix D
R543 Regulation 28(1)(n)		A plan of study for Environmental Impact Assessment (EIA) which sets out the proposed approach to the EIA of the application.	Part 7
	(i)	A description of tasks that will be undertaken as part of the EIA process including any specialist reports or specialised processes, and the manner in which such tasks will be undertaken.	
	(ii)	An indication of the stages at which the competent authority will be consulted.	Part 1, Part 4 & Part 7
	(iii)	A description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity.	Part 5, 6 and Part 7

Regulation No:		Description	Scoping Report Part
	(iv)	Particulars of the public participation process that will be conducted during the EIA process.	Part 4 and Part 7
R543 Regulation 28(1)(o)		Any specific information required by the competent authority.	Appendix B
R543 Regulation 28(1)(p)		Any other matters required in terms of Section 24(4) (a) and (b) of the Act.	Noted

* No specific requests have been received from the competent authorities to date.

The EIA process, which will be undertaken subsequent to the Scoping Process, will be conducted in accordance with Regulations 31 of the Environmental Impact Assessment Regulations, 2010 under the NEMA, 1998. The EIA document for the proposed project will include detailed information pertaining to anticipated or potential impacts that may be associated with the proposed project.

1.3 Applicable legislation, policies and / or guidelines

Table 3 below provides an indication of the main legislation, policies and / or guidelines applicable to the said project.

Table 3: Applicable legislation, policies and / or guidelines

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)		To establish a Constitution with a Bill of Rights for the RSA.
Development Facilitation Act, 1995 (Act 67 of 1995)		To provide for planning and development.
Environment Conservation Act, 1989 (Act 73 of 1989)	Department of Economic Development, Environment and Tourism	To control environment conservation.
National Environmental Management Act, 1998 (Act 107 0f 1998)	Department of Economic Development, Environment and Tourism	To provide for the integrated management of the environment.
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)	Department of Economic Development, Environment and Tourism	To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards

		regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)	Department of Economic Development, Environment and Tourism	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bio prospecting involving indigenous biological resources; the establishment and functions of a South African Biodiversity Institute; and for matters connected therewith.
National Environmental Management: Waste Act, 2008 (Act 59 of 2008)	Department of Economic Development, Environment and Tourism	To reform the law regulating waste management in order to protect health and the environment by providing for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.
Environmental Impact Assessment Regulations, 2010 (Government Gazette No. 33306 of 18 June 2010)	Department of Economic Development, Environment and Tourism	Regulations pertaining to environmental impact assessments.
National Water Act, 1998 (Act 36 of 1998)	Department of Water and Sanitation	To control water management aspects.
Natural Heritage Resources Act, 1999 (Act 25 of 1999)	South African Heritage Resources Agency	This legislation aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations.
Conservation of the Agricultural Resources Act, 1983 (Act 43 of 1989)	Department of Agriculture, Forestry and Fisheries	To provide control over the utilization of the natural resources of the Republic in order to promote

		the conservation of soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.
Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)	Department of Mineral Resources	To make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources; and to provide for matters connected therewith.
Mineral and Petroleum Resources Development Regulations, 2004 (No. R527 of 23 April 2004; GG 26275)	Department of Mineral Resources	
Mine Health and Safety Act, 1996 (Act 26 of 1996)	Department of Mineral Resources	To promote employee health and safety.
Health Act, 1977 (Act 63 of 1977)	Department of Health	To promote public health.
Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998)	Mpumalanga Tourism and Parks Agency	To control nature conservation.
Various by-laws of the eMalahleni Local Municipality	eMalahleni Local Municipality	To regulate land use with the eMalahleni Local Municipality area.
Integrated Development Plan for the eMalahleni Local Municipality	eMalahleni Local Municipality	Broad spatial framework guidelines for the eMalahleni Local Municipality.
Spatial Development Framework for the eMalahleni Local Municipality	eMalahleni Local Municipality	Spatially based policy guidelines whereby changes, needs and growth in the region can be managed to benefit the whole community.

2. DESCRIPTION OF THE PROJECT

2.1 Details of the project applicant

The details of the applicant proposing the project are given in Table 4.

Table 4: Details of the applicant

Name of Mine	Landau Colliery
Applicant	Anglo Operations Proprietary Limited
Physical Address	Navigation Plant, R455, Clewer, 1036, South Africa
Postal Address	P O Box 78, Clewer/ Kwa Mthunzi Vilakazi, 1036

Responsible Person	Francois Grove/ Sandile Vilakazi
Telephone Number	013 693 0842/013 693 0722
Facsimile Number	013 656 9016
Cell Phone Number	082 938 6814/ 076 611 0941
E-Mail Address	Francois.grove@angloamerican.com/ Sandile.vilakazi@angloamerican.com
Company Registration No.	01/06730/06

2.2 Details of the environmental assessment practitioner

Shangoni Management Services (Pty) Ltd was appointed by AOPL to compile this Scoping Report for the proposed project in accordance with the requirements of the NEMA, 1998 and the EIA Regulations, 2010 there under. Shangoni Management Services (Pty) Ltd details are provided in Table 5 below.

Table 5: Details of the Environmental Assessment Practitioner

Name	**Shangoni Management Services (Pty) Ltd**
Postal address:	P.O. Box 74726 Lynwood Ridge 0040
Contact person:	Minnette Le Roux
Affiliations:	Founding member of EAPSA
Tel:	+27 (0)12 807 7036
Fax	+27 (0)12 807 1014
Cell:	+27 (0)83 660 0622
E-mail:	minnette@shangoni.co.za

As required by Regulation 28(1) (a) (ii) of the EIA Regulations, 2010 under the NEMA, 1998, a summary of the CV of the EAP involved in the conducting of the Scoping Process and compiling the Scoping Report is given below, the full CV is also attached hereto in Appendix C.

Minnette completed a B.Sc. Honours degree from the University of Pretoria and is currently enrolled in the M.Sc. Environmental Management programme at the North West University (Potchefstroom). She also holds a Certificate in Implementing Environmental Management Systems (ISO 14001) and is a Founding member of the Environmental Assessment Practitioner Association of South Africa. Minnette has experience in completing the Environmental Assessment Processes for various projects, in the construction and large scale mining sectors, including amongst other; Environmental Impact Assessments, Scoping Reports, Basic Assessment Reports, Environmental Management Plans, Environmental Management Programmes, Integrated Water Use Licence Applications, Integrated Water and Waste Management Plans, Regulation GN 704 Audits, Water Use Licence Audits, Waste Licence Applications and various Application Forms as part of the Environmental Application Process.

2.3 Property description

The Navigation Section of Landau Colliery straddles the Wilge River (B2) and Olifants River (B1) Catchment areas and fall in the upper reaches of the tributaries to these watercourses. The Navigation Section falls into three quarterly sub-catchments, namely catchments B20G, B11K and B11G (refer to Figure 4 and Plan 4 in Appendix A).

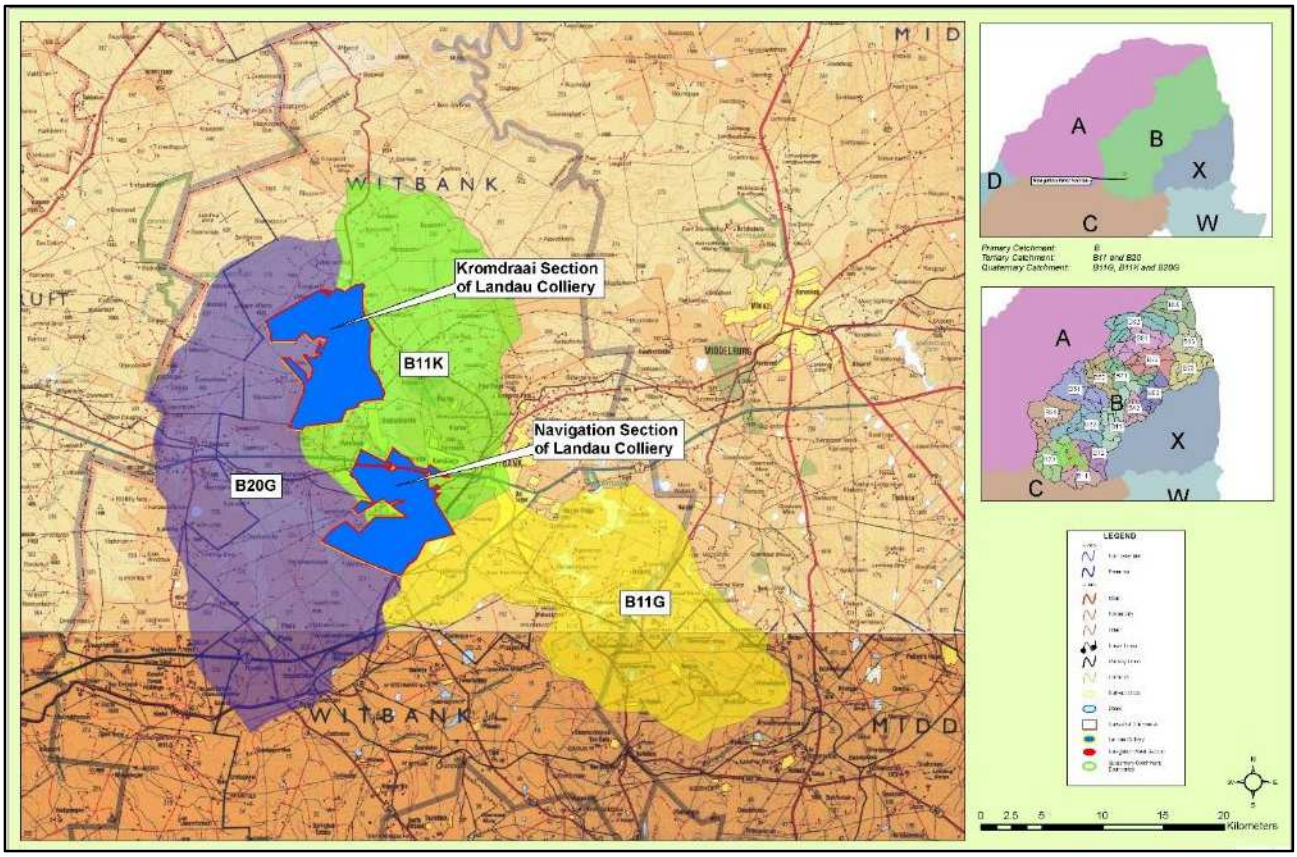

Figure 4: Map indicating the catchment boundaries relevant to Landau Colliery

(*Source: Approved EMPR dated 2010*)

The Schoongezicht Spruit (also known as the Schooniespruit) and Highveld Steel Spruit drain the northern part of the Navigation Section. The Schoongezicht Spruit then flows into the Brugspruit, which flows into the Klipspruit. An unnamed tributary of the Grootspruit, which flows into the Wilge River further downstream, drains the western and southern parts of the Navigation West Section. The positions of these tributaries in relation to the Navigation Section mine boundary area can be seen in Figure 5 and Plan 5 in Appendix A.

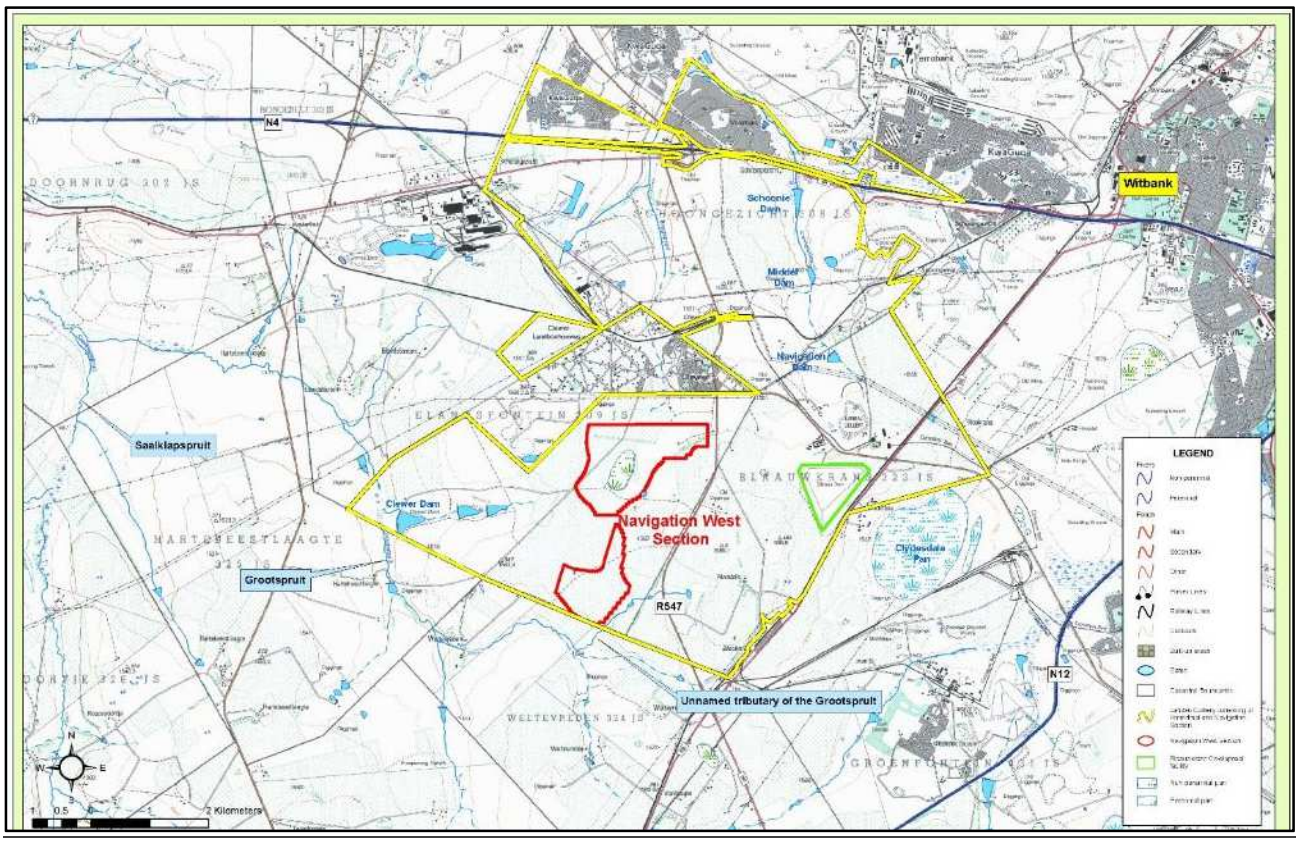

Figure 5: Pre-mining topography and water features near and within the Navigation West Section (2007)

(*Source: Approved EMPR dated 2010*)

2.3.1 Mineral rights holders

Anglo Operations Limited currently holds the new order Mining Right for Landau Colliery. The Mining Right Holder(s) for the farms within and surrounding the Navigation Section mine boundary area are listed in Table 6 below.

Table 6: List of farm portions for which Landau Colliery has mining rights associated with the Navigation Section

Farm name	Mineral Rights Holder	Area (ha)
Blaauwkrans 323 JS	Anglo Operations Ltd	2327
Elandsfontein 309 JS	Anglo Operations Ltd	1564.1
Groenfontein 331 JS	Anglo Operations Ltd	2996.3
Klipfontein 322 JS	Anglo Operations Ltd	2109.3
Schoongezicht 308 JS	Anglo Operations Ltd	1822.0
Weltevreden 324 JS	Anglo Operations Ltd	536.4
Vlaklaagte 330 JS	Anglo Operations Ltd	102.0

2.3.2 Surface rights holders

Anglo Operations Limited holds the Surface Rights over the largest part of the mine boundary area. Refer to Table 7 below for the surface owners of the farm portions of the land within, and surrounding, the mine boundary area of the Navigation Section of Landau Colliery.

Table 7: Surface owners of the farm portions of the land within, and surrounding, the mine boundary area of the Navigation Section of Landau Colliery

Farm name	Portion	Surface owner	Area (ha)
Blaauwkrans 323 JS	2	Anglo Operations Ltd	1031.8
Elandsfontein 309 JS	2	Anglo Operations Ltd	1658.1
Groenfontein 331 JS	0	Anglo Operations Ltd	2579.3
Kleinkopje 15 JS	1	Anglo Coal & IND Operations Ltd	720.7
Klipfontein 322 JS	RE	Anglo Coal & IND Operations Ltd	270.3
	9	Anglo Coal & IND Operations Ltd	299.4
	22	Anglo Coal & IND Operations Ltd	210.3
	27	Anglo Coal & IND Operations Ltd	259.3
	28	Anglo Coal & IND Operations Ltd	259.3
	52	Anglo Coal & IND Operations Ltd	4.0
	67	Anglo Coal & IND Operations Ltd	42.6
Klipfontein 322 JS	75	Anglo Coal & IND Operations Ltd	0.9
	77	Anglo Coal & IND Operations Ltd	7.7
	78	Anglo Coal & IND Operations Ltd	12.2
	95	Anglo Coal & IND Operations Ltd	0.0
	96	Anglo Coal & IND Operations Ltd	0.0
	107	Anglo Coal & IND Operations Ltd	120.8
	145	Anglo Coal & IND Operations Ltd	300.3
Klippan 332 JS	RE	Anglo Coal & IND Operations Ltd	212.6
	1	Anglo Coal & IND Operations Ltd	48.8
	2	Anglo Coal & IND Operations Ltd	624.4
	RE 4	Anglo Coal & IND Operations Ltd	207.0
	RE 5	Anglo Coal & IND Operations Ltd	116.6
	6	Anglo Coal & IND Operations Ltd	201.9
	7	Anglo Coal & IND Operations Ltd	209.8
	8	Anglo Coal & IND Operations Ltd	142.7
	9	Anglo Coal & IND Operations Ltd	48.8
	10	Anglo Coal & IND Operations Ltd	97.5
	11	Anglo Coal & IND Operations Ltd	116.6
	12	Anglo Coal & IND Operations Ltd	116.6

Farm name	Portion	Surface owner	Area (ha)
Schoongezicht 308 JS	0	Anglo Operations Ltd	929.4
	7	Anglo Operations Ltd	0.3
	9	Anglo Operations Ltd	0.1
	33	Black Top Property (Pty) Ltd	-
	34	Black Top Property (Pty) Ltd	-
	64	Anglo Operations Ltd	1.7
Schoongezicht 308 JS	80	Anglo Operations Ltd	4.0
Wolverkrans 17 JS	7	Anglo Coal & IND Operations Ltd	7.0
	31	Anglo Coal & IND Operations Ltd	30.1
	33	Anglo Coal & IND Operations Ltd	33.2

The contact information of the landowners is available from the mine on request.

2.3.3 Land tenure and use of immediately adjacent land

Anglo Coal's Navigation West - Conservancy, Elandsfontein Colliery (Anker Coal), Greenside Colliery, Highveld Steel and Vanadium Corporation Ltd, and Clewer Sand, a sand mining operation, are situated within close proximity to the Navigation Section of Landau Colliery. Refer to Figure 2 and Plan 2 in Appendix A.

The town of KwaMthunzi Vilakazi (formerly known as Clewer) lies approximately 500 m to the north of the Navigation West Section). KwaMthunzi Vilakazi is comprised of residential and light industrial areas. The surrounding area is predominantly used for agricultural, mining and industrial purposes.

2.4 Regional Setting and Location of Activity

2.4.1 Magisterial District and Administrative boundaries

Landau Colliery falls within the administrative boundaries of the Emalahleni Local Municipality as shown in Table 8. Figure 1 and Plan 1 in Appendix A which shows the regional setting of the Landau Colliery.

Table 8: **Administrative boundaries of the Landau Colliery**

Province	Mpumalanga
District Municipality	Nkangala (DC31)
Local Municipality	Emalahleni (MP312)
Ward(s)	23, 9, 11 and 30
Department of Minerals Resources (DMR) Local Office	Emalahleni
Department of Water and Sanitation (DWS) Local Office	Bronkhorstspruit
Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) Local Office	Emalahleni
Catchment Zone(s)	B20G, B11K and B11G

Rainfall Zone(s)	B1C and B2C
Water Management Area	Olifants and Wilge
Water Forums	Olifants River Forum

2.4.2 Location of the Mine

The Kromdraai Section is situated 15 km north-west of Emalahleni and approximately 5 km north of the Navigation Section of Landau Colliery. The Navigation Section is located approximately 6km south-west of Emalahleni. The positions of the Kromdraai and Navigation Sections in relation to other towns and major transport routes are shown on Figure 1 and Plan 1 in Appendix A.

2.4.3 Location of the Site

The Landau Colliery is situated in the Mpumalanga Highveld Region and the surface is characteristic of the area with gently undulating landscapes giving way to streams and accommodating wetlands. Both sections of the Landau Colliery have a history of underground mining and a number of years of opencast mining activities, and therefore, the present condition of the sites are typically that of disturbed land use areas.

Landau Colliery straddles the Wilge River (B2) and Olifants River (B1) Catchment areas and falls in the upper reaches of the tributaries to these watercourses. The Kromdraai Section falls into quarterly sub catchments B20G and B11K (refer to Figure 4 and Plan 4 in Appendix A. The Navigation Section falls into quarterly sub-catchments B20G, B11K and B11G (refer to Figure 4 and Plan 4 in Appendix A).

The proposed Navigation West - South Block Extension project and associated infrastructure will be located on Portion 2 of the farm Elandsfontein 309 JS.

The centre co-ordinates of the site are as follows:

- 25º 58.048’ S;
- 29º 12.111’ E.

2.4.4 Site description

Figure 2 and Plan 2 in Appendix A depicts the mine boundary area of the Navigation Section on a topographical map. The map clearly indicates the surface infrastructure and main topographical features present at the Navigation Section of the Landau Colliery. The N4 highway runs from east to west along the northern boundary of the Navigation Section.

A number of streams and drainage lines associated with the Schoongezicht Spruit, the Grootspruit and the Brugspruit are found within or near the mine boundary area of the Navigation Section. The Schoongezichtspruit originates on-site just north of the Old Navigation Dump and it drains to the north through the Schoongezicht Valley. Navigation Dam, Middle Dam and the Schoongezicht Dam are all pollution control dams located within the central and northern parts of the Navigation Section mine boundary

area within the Schoongezicht Valley. A tributary of the Grootspruit originates on-site, west of the Navigation West area, and it drains to the west. The Clewer Dam and two other unnamed dams are all in-stream dams of this tributary. The Schoongezichtspruit and Highveld Steel Spruit drain the northern part of the Navigation Section towards the Brugspruit that flows into the Klipspruit.

The Navigation Section is divided into three areas, namely the Navigation Plant, Schoongezicht No. 2 Seam mini-pit (also referred to as the Schoonie Mini-Pit) and the Navigation West Section (also referred to as Umlalazi - Mini-Pit). Mining at Navigation West Section is currently done at the North and South Block and coal is crushed and washed at the Ngwenya Plant within the boundary of the Navigation West Section. Navigation West Section is located south of the town KwaMthunzi Vilakazi (Previously known as Clewer) where a combination pre-strip (truck and shovel) and dragline opencast operation is in progress. The Navigation West Section can be seen in Figure 2 and Plan 2 in Appendix A.

Details regarding the LOM plan for the Navigation Section can be seen in Figure 6 and 7, and Plan 6 and 7 in Appendix A.

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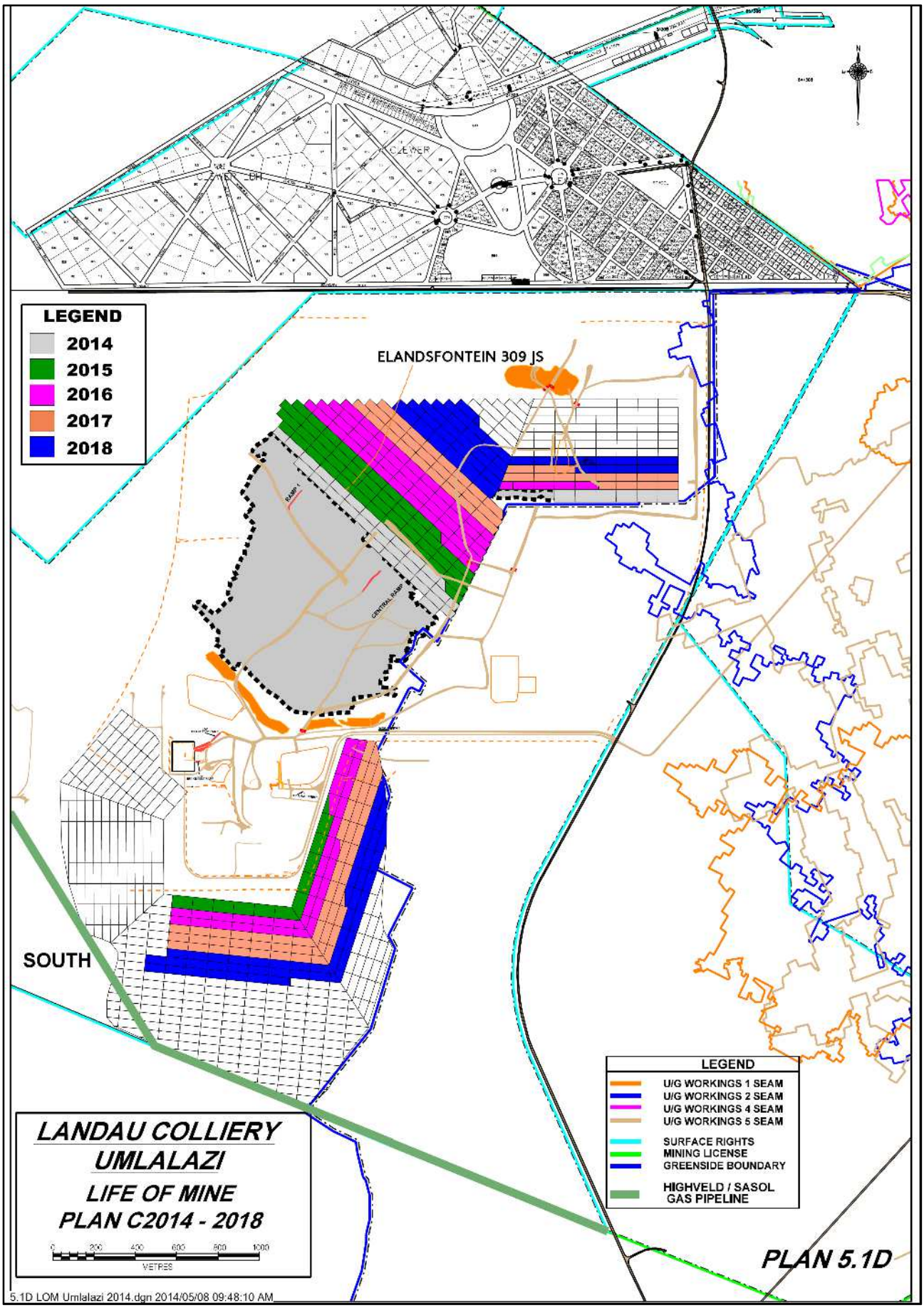


Figure 6: Existing Life of Mine (LOM) plan for the Navigation West - Section (Navigation West)

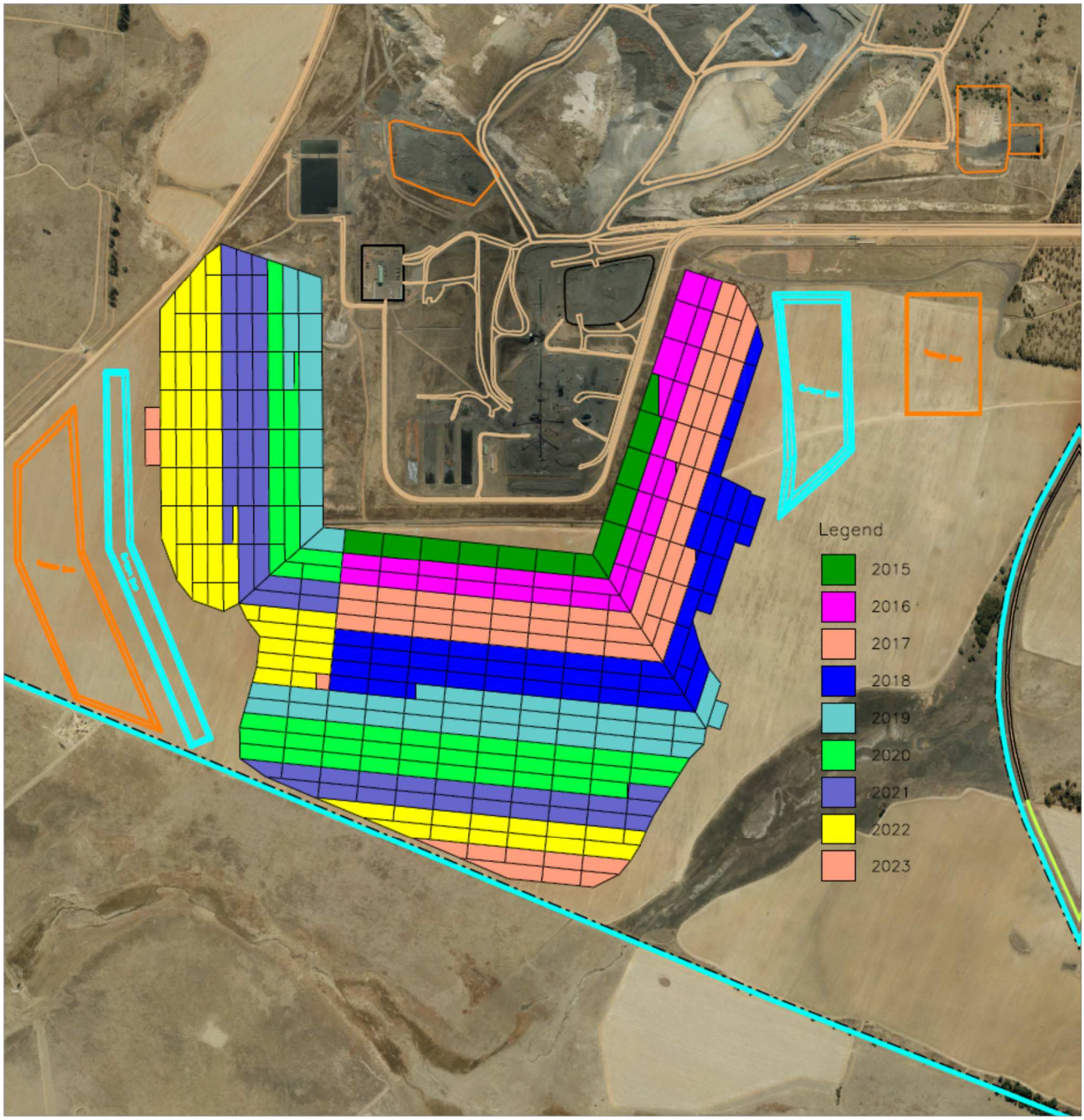


Figure 7: Proposed Life of Mine (LOM) plan for the Navigation West - South Block Extension Project

Features such as the Blaauwkrans Co-disposal Facility, old mine dumps, the railway link from Kromdraai Section to the Navigation Beneficiation Plant, an overland conveyer from the Navigation Beneficiation Plant to the Rapid Loading Terminal, the surface water management system and old diggings are representative of the mining and related activities that have taken place at the Navigation Section and these too are indicated on Figure 2 and Plan 2 in Appendix A.

Other infrastructure at the Navigation Section includes the pipelines between the Navigation Plant and the Emalahleni Water Reclamation Plant (EWRP), which convey contaminated mine water and brine to and from the EWRP, respectively. Furthermore, the Navigation Section accommodates the infrastructure associated

with the Water Uses (as defined in Section 21 of the National Water Act, 1998 (Act 36 of 1998)) that are currently taking place at this section of the mine.

2.4.5 Servitudes

Infrastructure services displayed on the topographic maps, Figure 2 and 3, are covered by servitudes over the properties they traverse. More information regarding these servitudes is available from the mine upon request.

In addition to the service infrastructure that is visible on the surface, a servitude for a Sasol gas pipeline (refer to Figure 8 and Plan 8 in Appendix A) is located within the south western part of the Navigation Section, near the Navigation West mining area.

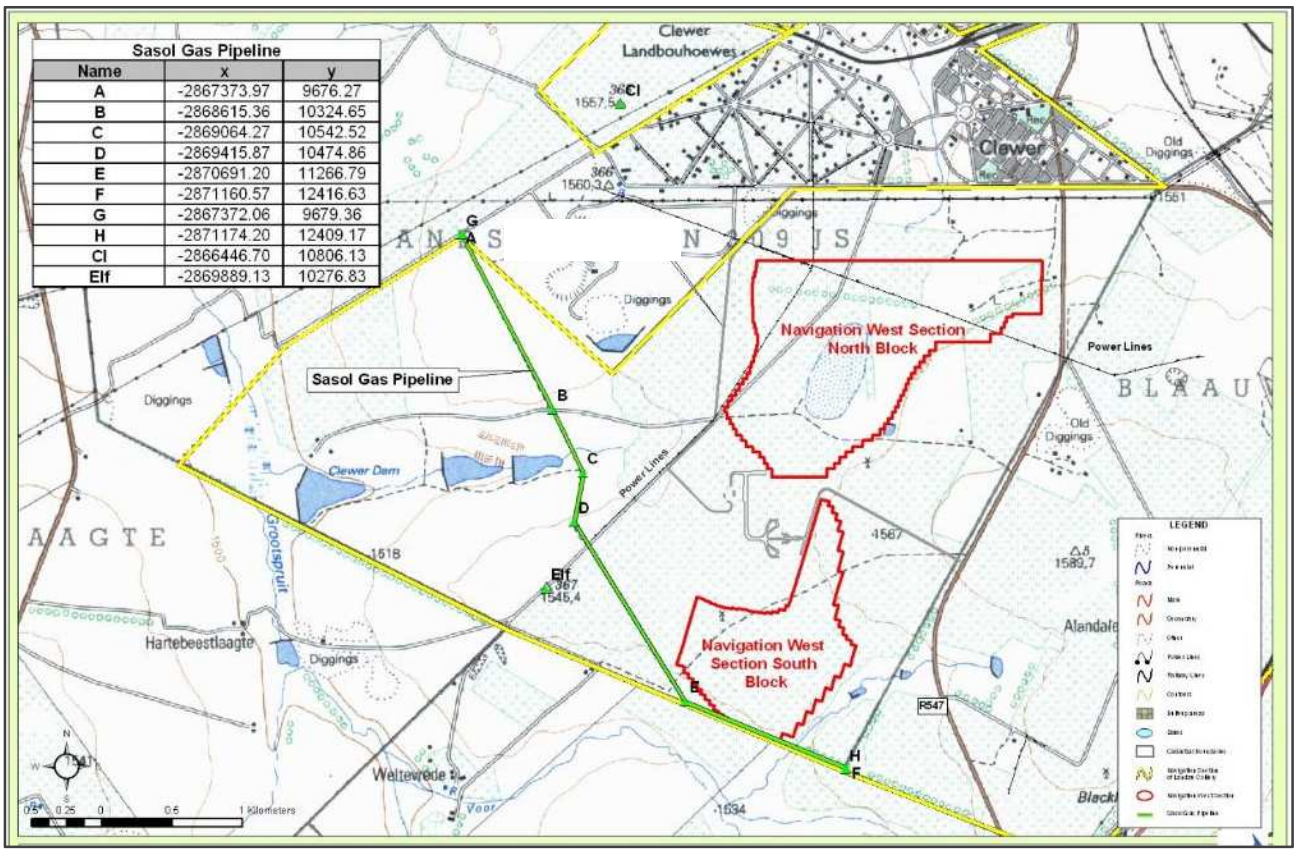


Figure 8: The location of the Sasol gas pipeline relative to the Navigation West Section

(*Source: Approved EMPR dated 2010*)

2.4.6 Adjacent land uses

Anglo Coal's Navigation West - Training Centre, Clewer Nature Reserve, Elandsfontein Colliery (Anker Kohlen), Greenside Colliery, Highveld Steel and Vanadium Corporation Ltd, and Clewer Sand, a sand mining operation, are situated within close proximity to the Navigation Section of Landau Colliery. Refer to Figure 9 and Plan 9 in Appendix A for an indication of the land uses surrounding the Navigation Section.

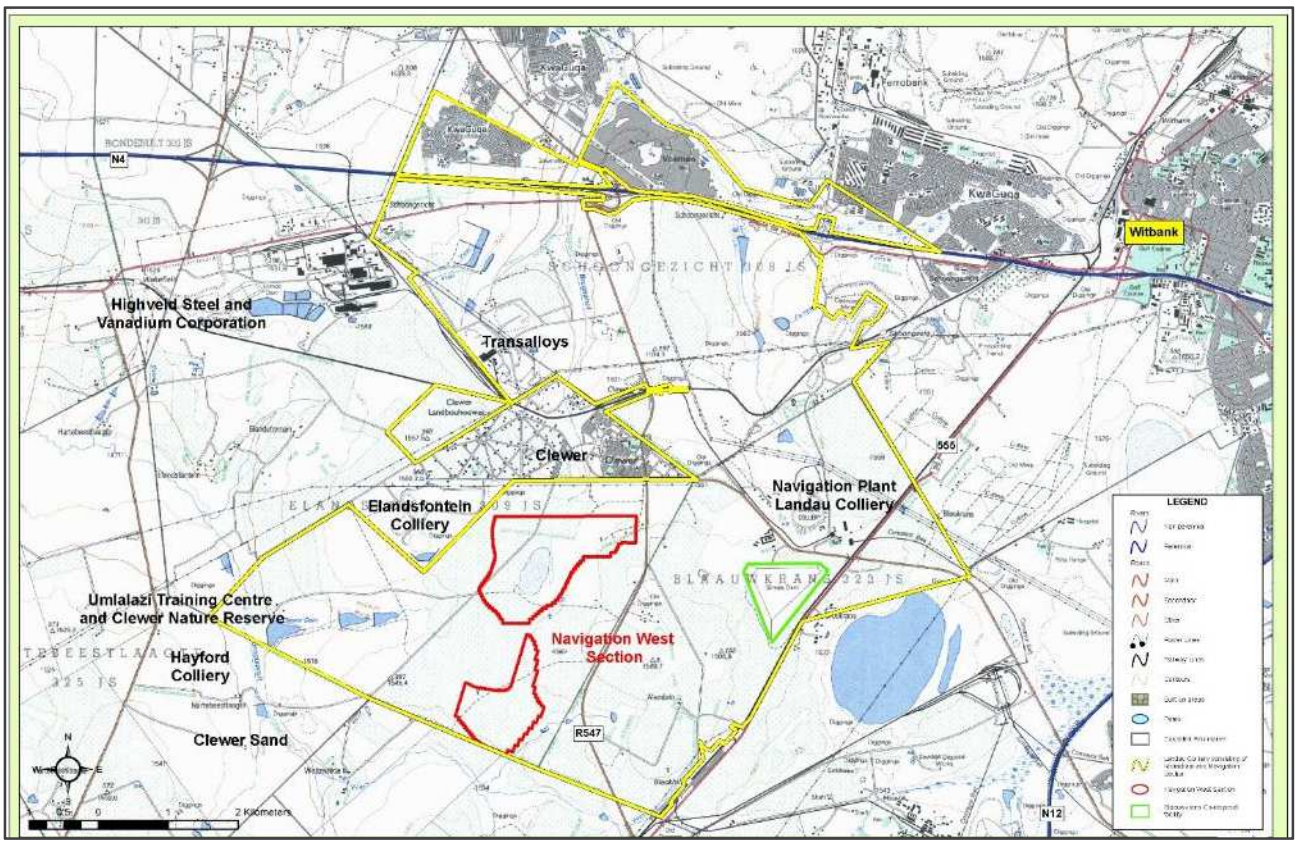


Figure 9: Adjacent land uses relevant to the Navigation West Section

(*Source: Approved EMPR dated 2010*)

The town of KwaMthunzi Vilakazi (formerly known as Clewer) lies approximately 500 m to the north of the Navigation West Section). KwaMthunzi Vilakazi is comprised of residential and light industrial areas. The surrounding area is predominantly used for agricultural, mining and industrial purposes.

The defunct Hayford Colliery (BHP Billiton – Ingwe Collieries) was operated on the south western boundary of the Clewer Nature Reserve, i.e. south west of the Navigation West South Block. This mini-pit operation exploited the No. 1 Seam until 1995

2.5 Description of the proposed activity

2.5.1 Nature of the activity / development

Landau Colliery proposes to extend the Life of Mine at the Navigation Section by expanding the mining at the Navigation West - South Block opencast pit. The proposed Navigation West – South Block Extension Project will include the following activities.

2.5.1.1 Construction phase activities

The following mining and related activities, which are expected to impact on the surrounding environmental aspects during the construction phase of the proposed Navigation West –South Block Extension project include, but are not limited to the following:

- The construction of haul roads and the upgrading of the existing Navigation West access road to accommodate the additional trucks.
- The development of the initial box-cut with ramp.
- Stripping and separate stockpiling of topsoil, subsoil and overburden of the initial box-cut at the opencast area.
- Construction of storm water management measures such as berms for the separation of clean and dirty water management areas.
- Erection of the tip and potentially in-pit crushers for the separate processing of the No. 4 Top Seam and No. 4 Select Seam ROM coal.
- The expansion of the existing Navigation West Pollution Control Dam.
- The construction of ablution facilities.
- The construction of pipelines for the removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.
- The internal relocation of 22kV powerline.
- Diversion of the Sasol gas pipeline as mining away from the proposed mining area.

2.5.1.2 Operational Phase activities

The following mining and related activities, which are expected to impact on the surrounding environmental aspects during the operation phase of the proposed Navigation West –South Block project include, but are not limited to the following:

- Progressive development of the box-cut(s), including continues stripping and stockpiling or direct placing of topsoil, subsoil and overburden.
- Construction of haul roads and ramps as mining progresses.
- Blasting followed by extraction of the No. 5 and No. 4 Top Seam coal and subsequently extraction of No. 4 Seam Select coal.
- Concurrent rehabilitation of the opencast pit areas will be undertaken as the pit advances. Carbonaceous material will be placed back into the open voids up to the coal level, followed by the sequential replacing and compaction of overburden and subsoil layers, followed by the replacement of topsoil prior to the re-vegetation of the surface as part of the rehabilitation strategy that will be implemented by the Navigation West Section.
- Hauling of ROM coal to the tip and potentially in-pit crushers, with separate crushing and stockpiling of crushed ROM coal from the No. 4 Top Seam, the No. 4 Select Seam and the No.5 Seam.
- The lower No. 4 Select Seam is to be hauled to either the Ngwenya Plant or the plant at Navigation Plant for processing.
- The No. 4 Top Seam is transported to Eskom, or one of the municipalities generating their own power e.g. Rooiwal.
- Discards are to be returned to the tip from the plant using return trip of ROM haulers.
- Discards required to fill up the mining void to avoid the formation of post-mining depressions.

- Utilisation of water management measures including pollution control measures such as the pollution control dam and the construction of additional water management measures as required in the development of the Navigation West - South Block opencast area.
- Utilisation of the existing Ngwenya Plant to wash the No.4 Select Seam coal.
- Utilisation of the existing infrastructure at Navigation West such as:
  - Site offices.
  - Ablution facilities
  - Workshops.
  - Security facilities (access boom and guard hut).
  - A fuel depot.
  - Wash-bay.
  - Storage areas.
  - Waste accumulation areas.
  - Pipelines for the transportation of potable water (for domestic use) and process water (for dust suppression and process use).
  - Transportation of sewage sludge from the onsite sewage facilities to the sewage treatment plant at Navigation Section.
  - Slurry will be pumped to the existing slurry dams to dry and from the slurry dams disposed of in the pits.
  - The tip and in-pit crushers for the separate processing of the No.4 Top Seam and No.4 Select Seam ROM coal.
  - Pipelines for the transportation of excess contaminated water from the proposed pollution control dam to the Navigation Dam.
  - Water pumped to the Navigation West PCD is re-used at the Ngwenya Plant and also for dust suppression
  - Removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.

2.5.1.3 Decommissioning Phase

The following mining and related activities, which are expected to impact on the surrounding environmental aspects during the decommissioning phase of the proposed Navigation West –South Block project include, but are not limited to the following:.

- Backfilling of the final void(s).
- Removal of carbonaceous material from areas such as footprints of ROM coal stockpiles, crusher plant areas, along haul roads, and disposal in the final voids prior to final rehabilitation.
- Levelling of remaining in-pit spoils, and shaping and landscaping of rehabilitated open voids.
- Removal of infrastructure at the tip area as well as ripping of tip area and haul roads.
- Removal of redundant surface infrastructure (depending on the agreed end land use), and rehabilitation of the remaining footprint areas.

- Monitoring and maintenance of rehabilitated surface land use areas, as well as surface water and groundwater.
- Utilisation and management of the water balance to reflect the actual situation during the Decommissioning Phase.

2.5.1.4 Mining method

Navigation West - South Block will be mined by roll-over opencast strip mining methods using a combination of dragline, dozer and truck and shovel methods to extract coal. As part of the opencast roll-over mining method, the spoils are rehabilitated as the mining operation advances, which are maintained so as to ensure that the rehabilitation of the disturbed area is no further than three cuts behind the active mining void.

For each strip, the topsoil, subsoil, and overburden is removed sequentially. Topsoil is removed and stockpiled separately or live placed where permitted for rehabilitation. Not including the boxcut, the subsoils is hauled around the pit, dumped and levelled to backfill previous voids. The hard overburden is blasted into the previous void and moved by combination of Dragline, dozers and truck and shovel to expose coal. The exposed coal is then removed and the No. 4 Seam will be 'split-mined' in a No. 4 Top Seam and No. 4 Select Seam horizons.

The No. 4 Top and select Seams are blasted simultaneously and loaded separately to separate the two grades of coal. After coal removal overburden and subsoil is selectively dumped behind the direction of progressive mining, before being reshaped. Thereafter, topsoil will be replaced and the backfilled void will be rehabilitated.

The No. 4 Seam in the Navigation West - South Block consists of a low quality upper section (No. 4 Top Seam) and a higher quality lower section referred to as No. 4 Select Seam. In some areas of the pit the 5 seam is present. The No. 5 and No. 4 Top Seam is loaded, crushed and transported to Eskom, or one of the municipalities generating their own power e.g. Rooiwal. The lower No. 4 Select Seam is loaded and crushed prior to being hauled to the Navigation West Beneficiation Plant for processing aimed at the 5850 export market.

2.5.2 Reason for project

Landau Colliery proposes to extend the Life of Mine at the Navigation Section by expanding mining of the Navigation West Section: South Block opencast pit.

AOPL requires the necessary environmental authorisations for the construction of the proposed Navigation West - South Block Extension. A Scoping and Environmental Impact Assessment (EIA) will be required in compliance with the National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) for the authorisation of listed activities contained in GNR 544 of 18 June 2010 (GNR 544), GNR 545 of 18 June 2010 (GNR 545) and GNR 546 of 18 June 2010 (GNR 546) published in terms of Sections 24(2) and 24D the NEMA. An Integrated Water Use License Application (IWULA) in terms of the National Water Act (Act

No. 36 of 1998) (NWA) and an amendment of the existing Environmental Management Programme (EMPR) as per Minerals, Petroleum and Resources Development Act (MPRDA), Act No. 28 of 2002 will be required. An integrated process will be followed to meet the requirements of the NEMA, NWA and MPRDA.

2.5.3 Extent of activity

The footprint area of the Navigation West - South Block Extension will be approximately 71.52 hectares in size and the proposed new opencast pit and associated infrastructure will be located on Portion 2 of the farm Elandsfontein 309 JS (refer to Figure 2 and 3).

2.5.4 Activity infrastructure description

2.5.4.1 The mine plan

Figure 7 and Plan 7 in Appendix A shows the Life of Mine plan for the Navigation West - South Block Extension within the Navigation Section, and Figure 6 and Plan 6 in Appendix A shows the existing Life of Mine plan for the Navigation West Section: North Block and South Block. The grey areas on Figure 6 indicate the areas that have already been mined out, and are about to be or in the process of being rehabilitated. The Navigation West - South Block extension will conclude mining in 2024 and the existing Navigation West North Block and South Block will conclude in 2018.

Figure 10 and Plan 10 in Appendix A indicate the existing mining and related surface infrastructure associated with the Navigation West Section; North Block and South Block and the Navigation West - South Block, respectively.

Figure 3 and Plan 3 in Appendix A indicate the infrastructure associated with the Navigation West - South Block Extension Project.

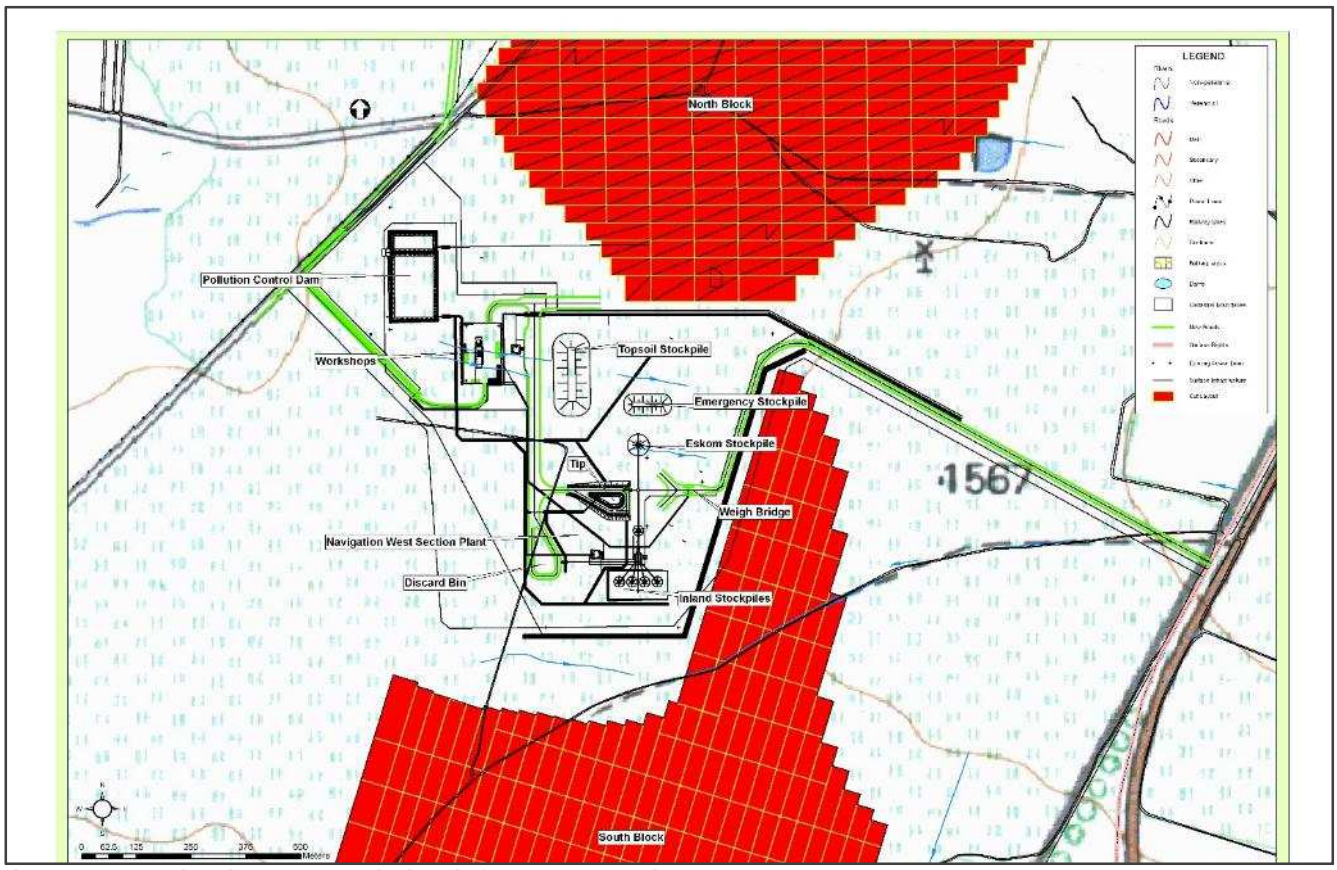


Figure 10: Navigation West existing infrastructure plan

(*Source: Approved EMPR dated 2010*)

2.5.4.2 Access to workings and the mining area

The employees of Landau Colliery are collected from various bus stop location within their respective communities and bussed to the Kromdraai offices area, Navigation Beneficiation Plant area and to the Navigation West Section.

For the Navigation West section, the existing gravel road currently providing access to the Clewer Nature Reserve is utilised by light vehicles to gain access to the Navigation West Section. Entry to the gravel access road can be gained from Carl Road in KwaMthunzi Vilakazi as well as from the adjacent R547 to the east.

A haul road was constructed to provide an access route for heavy vehicles from the Navigation West Plant to the R547 Provincial road. The route of the haul roads and access roads to the Navigation West Section is shown on Figure 11 and Plan 11 in Appendix A.

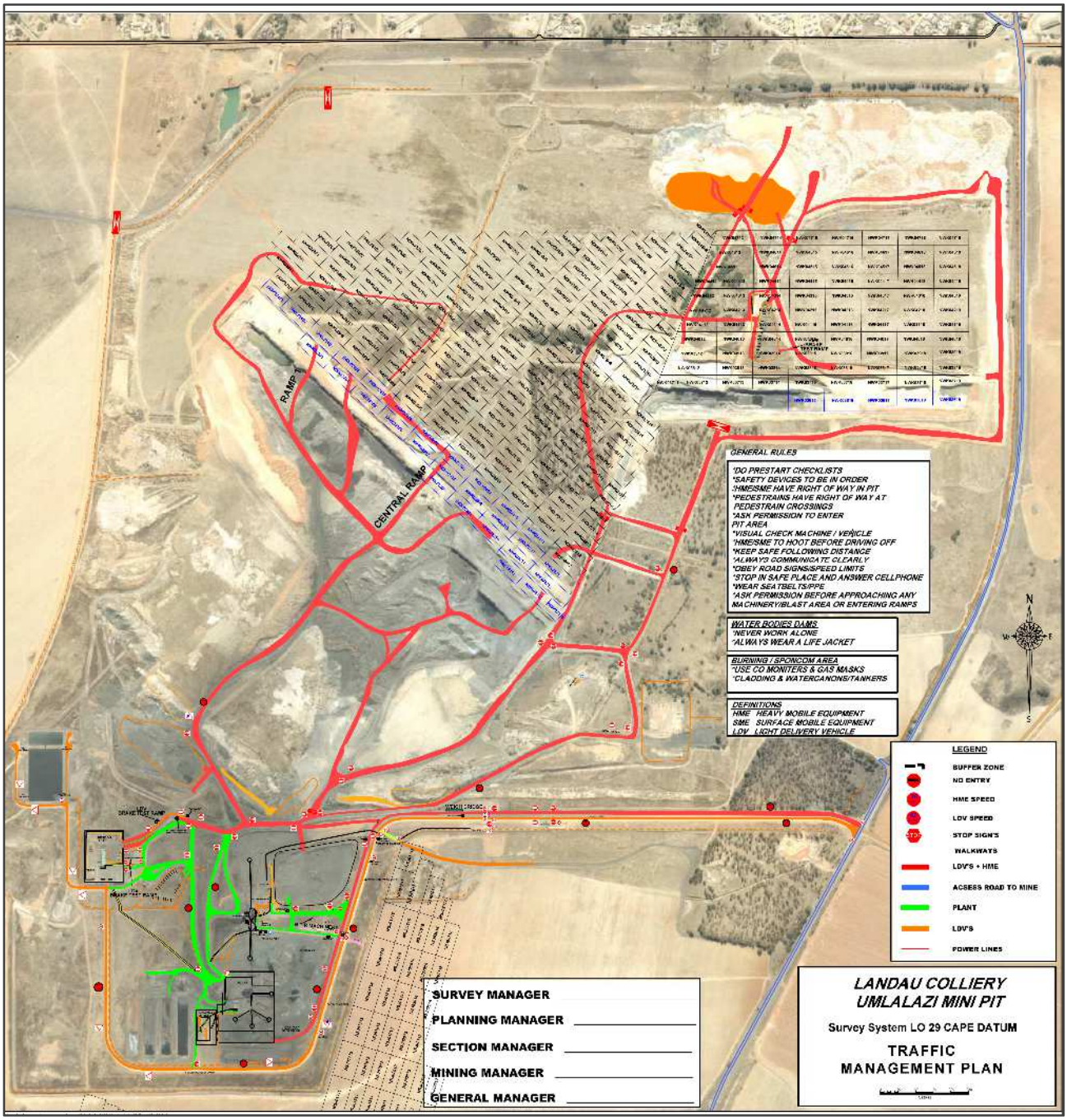


Figure 11: Traffic Management Plan for Navigation West Section

The construction of a network of haul roads and low wall ramps has commenced to carry Articulated Dump Trucks (ADTs) from the mining cuts to the ROM tips at Navigation West area. The construction of the haul roads and low wall ramps will advance as mining advances, and the roads and ramps will remain in place until the coal reserves at the Navigation West Section have been depleted, where after they will be rehabilitated during the Decommissioning Phase of the operation.

2.5.4.3 Transportation of the product

Export grade coal product that has been processed at the Navigation Beneficiation Plant is transported to the SACE Rapid Loading Terminal (RLT) via conveyor, from where it is transported by train to the Richards Bay Coal Terminal.

Lower grade coal product from the Navigation West Section is transported by Heavy Goods Vehicles to the domestic market(s).

2.5.4.4 Workshops and office complex

At the Navigation West Section the office and workshop complex (refer to Figure 10 and Plan 10 in Appendix A) includes offices for the permanent staff, a change-house for all employees and a workshop to perform repairs and maintenance on-site, diesel tanks and a refuelling bay. The workshops include a large workshop for the diesel fleet. The workshop is divided into boiler-making, mechanical, electrical and diesel machine areas.

2.5.4.5 Processing Plants

There are two plants at Navigation Section where coal can be processed and both will be utilised for the proposed Navigation West – South Block Extension Project. The Ngwenya Plant is located within the boundary of the Navigation West Mini pit on Portion 2 of the farm Elandfontein 309 JS and can be viewed on Figure 10.

The other plant is the main Navigation Beneficiation Plant located on Portion 23 of the farm Blaauwkrans 323 JS near the old Navigation dump, the Blaauwkrans Co-disposal facility and the Navigation Workshop and Office Complex.

2.5.4.6 ROM tip and crushers

ROM coal mined at the Navigation West Section is hauled to the Ngwenya Plant, where is offloaded at the ROM tip and is crushed and stockpiled before being transported to the domestic market(s). It is proposed that the existing crusher Navigation West section will be upgraded with a new secondary, reversible 1800 feeder (refer to Part 5 for the alternative option considered in terms of the crusher).

2.5.4.7 Haul roads

Haul roads at the Navigation West Section; North Block and South Block are shown in Figure 11. New haul roads will be constructed for the proposed project. (Refer to Part 5 for the alternative option considered in terms of the haul roads).

2.5.4.8 Power supply system

For the Navigation West area power is supplied to the mining area and supporting infrastructure via a 22 kV overhead line from the existing Navigation Beneficiation Plant. This provides power to the ROM tip, crushers, workshops, office complex, pumps and lights.

A 6.6 kV line was constructed along the mining area to facilitate easy access to the grid via a transformer skid that will be moved to different areas to supply the pump and auxiliary equipment. The major production equipment is diesel driven.

2.5.4.9 Housing, recreation and other employee facilities

AOPL employees associated with the Landau Colliery utilise existing facilities belonging to the SACE such as the Landau Mine Village. Many employees are housed in Emalahleni, KwaMthunzi Vilakazi and Kwa-Quqa.

Recreational facilities are provided for the SACE complex at the AOPL SACE clubhouse, which is not located within the Landau Colliery mine boundary area.

2.5.4.10 Roads

Figure 2 and Plan 2 in Appendix A indicates the roads present at the Navigation Section of the Landau Colliery. Bailey Avenue (D328) crosses the Navigation Section in a north / south direction and passes through KwaMthunzi Vilakazi. It connects with the R104 in the north which runs parallel to the N4 in a westerly direction where it then crosses the N4 highway and goes through Kwa-Quqa towards the Kromdraai Section. Bailey Avenue is used as a main access route for the area, connecting KwaMthunzi Vilakazi and the surrounding areas to the N4 highway. A section of the R104 falls within the mine boundary in the Northwest and passes Highveld Steel to the west of the mine boundary.

Another secondary provincial road (D2769) crosses the Navigation Section from west to east from KwaMthunzi Vilakazi and eventually crosses the N12 highway in the South-east outside of the mine boundary. This road is used to access the Navigation Beneficiation Plant and crosses the R555 within the mine boundary area. The R555 crosses the mine boundary in a north-south direction just east of the Navigation Beneficiation Plant and then runs along the mine boundary to the southeast.

Gravel roads used to access Transalloys (Pty) Ltd, which are located within the mine boundary area, extend north from KwaMthunzi Vilakazi.

At the Navigation West area, a gravel road extends through the site. This gravel road is used to access Clewer Sand, the farm of Mr. H.J.Scheffer (Remainder of Portion 2 of the farm Weltevreden 324 JS), the Navigation West - Training Centre and the Clewer Nature Reserve. Elandsfontein Colliery also uses a portion of this gravel road as a haul road. It is anticipated that Elandsfontein Colliery will continue to use the mentioned gravel road as a haul road. Other smaller gravel roads are also present on the Navigation West

site from which access is obtained to the agricultural activities currently undertaken on-site to the southeast of the site.

2.5.4.11 Railways

The railway line is shown in Figure 2 and Plan 2 of Appendix A. The route from the Kromdraai Plant runs parallel to the R432 road to the south of the mine boundary. At point B on Plan 21 it joins the existing siding 237 from Trans Alloys. The track between points A and B was constructed for the mining operations at Kromdraai so as to connect the Kromdraai Section with the Navigation Beneficiation Plant. From point B, the railway line was constructed on the existing railway line servitude through farmlands until it joins up with the Pretoria – Emalahleni line, after which the line runs parallel to the Transnet line through KwaMthunzi Vilakazi until it crosses the Transnet reserve and continues on the old KwaMthunzi Vilakazi / Navigation railway line servitude until reaching the Navigation Beneficiation Plant at point D.

The above mentioned Pretoria – Emalahleni line continues through the Navigation Section mine boundary area and exits the mine boundary area to the North-east. Blackhill siding is located on the south-eastern boundary of the Navigation Section and a railway line running parallel to the R555 runs along and through the mine boundary and crosses the N4 highway in the North-east around 4km outside of the mine boundary area. This line will eventually reach the Richards Bay Coal Terminal on the KwaZulu Natal coast.

2.5.4.12 Conveyors

A conveyor is located at the Navigation West Section: North Block to facilitate the backfilling of discard into the open pit. The discard is conveyed from the Navigation West crushing plant to the open pit that is being backfilled.

2.5.4.13 Power lines

Some of the 22kV power lines traversing the Navigation West opencast mining areas will need to be deviated to allow for the construction of haul roads Refer also to the Life of Mine Plan (Figure 6 and 7).

2.5.4.14 Water use and management

Water is managed using an integrated approach at both the Kromdraai and Navigation Sections of Landau Colliery. Figure 12 and Plan 12 in Appendix A diagrammatically represents the integrated water management system that is implemented at the Navigation Section of the mine.

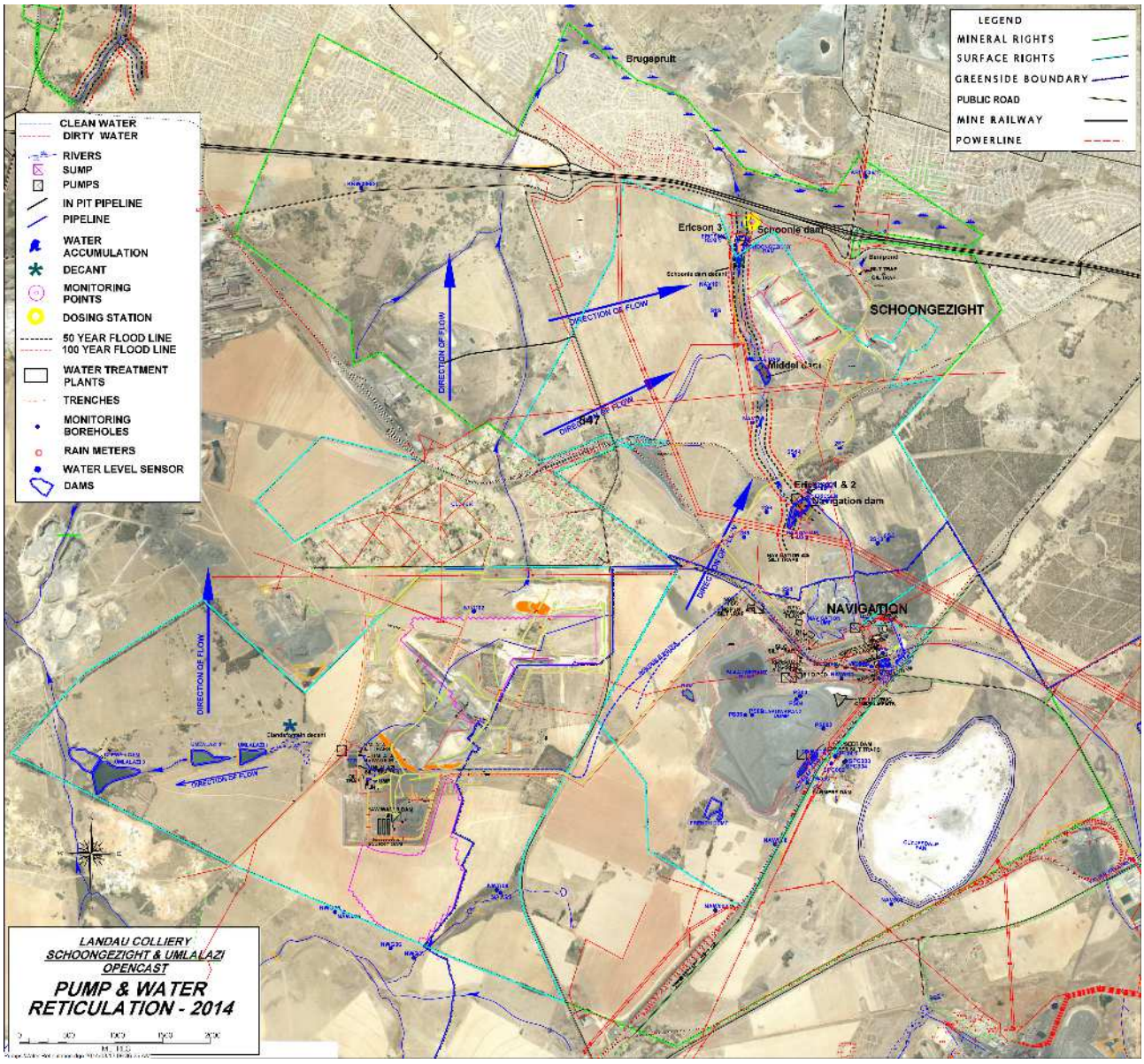


Figure 12: Diagrammatic representation of the integrated water management system at the Navigation Section of Landau Colliery

Potable water for domestic use at the Navigation Section is obtained from the Emalahleni Water Reclamation Plant via a pipeline to the potable water tank at the Navigation Plant. This water is then sent to the potable water tank at Navigation West Section via a 110 mm HDPE pipeline.

Runoff from the dirty water management areas and excess pit water-make collected in the Navigation West PCD is pumped to the process water tank at Navigation West and reused for process water in the plant. Some of the water is also sent to the dust suppression tanks and used for dust suppression on site. The reuse of water at Navigation West Mini Pit indicates that detailed investigations were carried out to ensure proper usage of process water and to avoid excessive usage of potable water from an external source.

The Navigation West Section is divided into clean and dirty water management areas where clean runoff is diverted to natural watercourses and contaminated runoff is contained for evaporation and treatment before

being re-used. The operational / land use areas are protected by cut-off drains diverting clean storm water, from undisturbed surface areas as well as rehabilitated surfaces, into the catchment of the unnamed tributary of the Grootspruit near the Navigation West Section

Affected water at the Navigation West Section is primarily liberated pit water and runoff from the haul road surfaces, workshop area and ROM Tip area. Water spill and liberated water from the product and discard bins at the on-site plant are also sources of polluted water.

The on-site Beneficiation Plant is located on the terrain adjacent to the workshops at the Navigation West Section. The site slopes gently to the west, and thus the drainage pattern is generally from east to west.

The dirty water storage facilities that are operated at the Navigation West Section and are licensed under the Landau Colliery - Navigation Section Integrated Water Use License, license number 04/B20G/ABCGIJ/1498, include the:

- Navigation West Pollution Control Dam (PCD).
- Navigation West Process Water Storage Tank.
- Navigation West In-pit Impoundment(s).
- Navigation West Dust Suppression Water Storage Tank.
- The slurry dams

The Navigation West PCD is positioned downstream (western downslope) of the Tip area and workshop facility to intercept affected runoff from the site. This 60Ml PCD is lined with an HDPE liner.

All liberated water (including groundwater inflow, recharge from the in-pit spoils and direct rainfall) emanating from the Navigation West Section opencast mine is accumulated within the void and contained in In-pit Impoundment(s). Excess water make is pumped to the PCD from where it can be pumped to the onsite process water tank for re-use in the plant and for dust suppression. The re-use of contaminated water from the In-pit Impoundments(s) or PCD for process water and dust suppression purposes is in line with the requirements of the Regulations GN 704, dated June 1999, under the NWA, 1998.

2.5.4.15 Sewage Management Facilities

Domestic wastewater generated at the Navigation West Section is treated at an on-site, standalone sewage treatment plant.

Domestic wastewater generated at the Navigation West Section flows into the Navigation West Sewage Plant. This plant is a biodisk plant that is operated by an external qualified contractor, and monthly reports are submitted to the mine to report on the operational status of the plant. The plant end products are both sludge and treated effluent.

The final treated effluent from the sewage plant is discharged into the Navigation West PCD and recycled for re-use within the Ngwenya Plant. Over time the septic tanks within the plant require de-sludging. Once every 4 months the qualified contactor de –sludge the septic tank using a honey sucker. The sludge is sent to the Navigation Plant sewage treatment plant for final treatment, drying and disposal with the rest of the sludge entering the Navigation sewage treatment plant.

Disposal of solid sewage waste at the Navigation sewage treatment plant is done in the following manner:

- Solid waste is dried in the drying beds constructed for that purpose.
- The dried sewage waste is then stored on a concrete based facility until an adequate load of material has accumulated.
- The dried sewage waste is then taken to the Kromdraai rehabilitation department where it is dumped in the rehabilitation area and mixed with the topsoil to assist in the vegetation of rehabilitated areas or it is buried on-site.

2.5.4.16 Storm Water management

The Navigation West Section surface area has been divided into clean and dirty water management areas where clean runoff is diverted to natural watercourses and contaminated runoff is contained for evaporation and treatment before being re-used.

The operational / land use areas are protected by cut-off drains diverting clean storm water, from undisturbed surface areas as well as rehabilitated surfaces, into the catchment of the unnamed tributary of the Grootspruit near the Navigation West Section.

The extent of contaminated land use areas and / or dirty water management areas is minimised as far as practicable, thereby contaminating the smallest volume of storm water possible that has to be contained. This contaminated runoff is collected and directed to the Navigation West pollution control dam for re-use.

The existing storm water management infrastructure that has been constructed for the Navigation West Section, was developed with the following in mind:

- Maximisation of clean water catchment areas and minimisation of dirty water management areas within the study area.
- Separation of clean and dirty water, with the capability of maintaining the separation during 1:50 year storm events.
- The collection, containment and re-use of affected water, thereby protecting water resources (in terms of quality and quantity).

The storm water management measures at the Navigation West Section consist of measures to secure the dirty water management areas (i.e. the Ngwenya Plant, haul roads, and the general mining area including the open pit), and the diversion of clean upslope water around the outside perimeter of the mine. The storm water management measures are indicated in Figure 13.

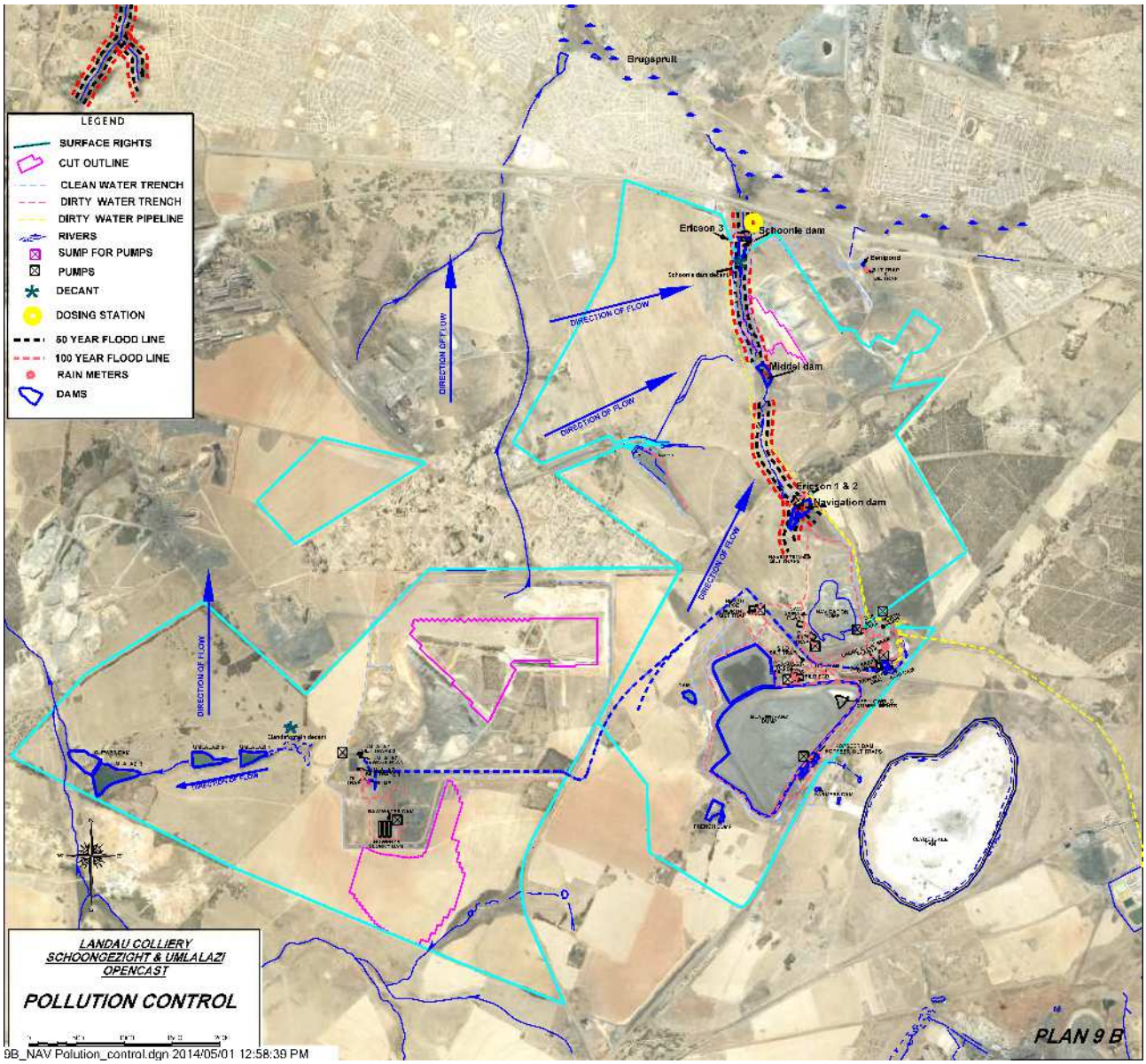


Figure 13: Stormwater management measure at Navigation Section

In addition, all affected water is captured and contained. Regular inspection and maintenance are undertaken to prevent scouring, erosion and / or silting-up of drains and damage to berms.

The surfaces isolated and treated as dirty areas at the Navigation West Section are the open void/s and spoils, haul roads, the stockpiles (carbonaceous hard over burden), workshop terrain and the tip facility. The storm water measures (, which is available from the mine upon request) used to isolate the affected area from clean areas mainly consist of the upslope clean water diversion berms with flow drain combination, the downslope berms cutting off dirty runoff from the active open cast area preventing it from discharging into the drainage lines and internal dirty drains directing runoff towards the PCD. The berms thus secure the dirty water management area.

Dirty runoff from both the Ngwenya Plant and tip area is directed with surface drains to the PCD at the Navigation West Section. A silt trap is positioned at the mentioned PCD to trap all silts washed down in the

drain. The surface drains inside the plant and workshop areas is lined with concrete *in situ* moulded panels with size to enable cleaning by light mechanical means.

The PCD is sufficient to contain the affected runoff water generated within Ngwenya Plant, tip and dispatch terrain. The haul roads at the plant terrain were properly constructed and the drainage pattern of the site enhanced to ensure runoff is effectively directed towards surface drains and that no ponding on the terrain occurs.

Topsoil removed from the mine area during construction is separated from the rest of the overburden, and is stockpiled within designated areas. During the mass earthworks to remove the overburden, the dirty carbonaceous fraction immediately overlaying the coal seam is stockpiled and kept within the pit or inside the barriers of clean “softs” and “hards”. Upslope clean surface runoff is therefore diverted around the mine area (Drains C2 and C3) and discharges towards the Southern and Northern drainage lines. The barrier berm with flow drains is capable of managing a 1 in 50 year flood event as required by Regulation GN 704, dated June 1999, under the National Water Act (NWA), 1998 (Act 36 of 1998).

Runoff emanating from the Navigation West Section surface land use area is directed towards the open pit area. Temporary east-west running berms (“T” berms) were necessary to divert clean runoff captured in the pan (that was located within the Navigation West Section mine boundary area prior to mining) towards the western drainage line. Berm C2 ensured that not a large volume of runoff to the pan will have to be dealt with. A temporary berm was established as the mining proceeded through the pan basin. Another east-west berm located further to the north of the North Block will still be established when mining has progressed through the pan area to prevent dirty runoff from the active high wall mining preparation activities to discharge in the northerly drainage line (i.e. towards Emalahleni). During the initial stages of mining, the high wall upslope catchment drained towards the open void. At this stage the pan has been mined and the runoff drains north, away from the void.

The storm water management activities undertaken at the proposed opencast mine are:

- Provision of an in-pit sump (impoundment) area.
- Extraction of excess water to the Navigation West PCD.
- A temporary upslope drain (“T” berms) diverting clean runoff away from the box-cut.
- Down slope isolation berms (“D” berms) to the isolate mine area from spilling coal silts & fines.

All excess in-pit water make is firstly contained and evaporated, and excess water is pumped to the Navigation West PCD for re-use.

Landau Colliery’s Water Reclamation and Conservation Policy is reflected in the approach to the minimisation and re-use of mine water. Components of the water re-use and reclamation strategy implemented at the mine include:

- The decant collection system for treatment at the Liming Plant and the use of the treated water at the Kromdraai surface complex.

- The re-use of contaminated water generated from the Blaauwkrans Co-disposal facility water management system.
- The mine water reticulation and management system implemented at the Navigation Section, to ensure the containment of decant water, polluted runoff and seepage water.
- The treatment of the contaminated water from the Navigation pollution control facilities for re-use in the Navigation Beneficiation Plant.
- The utilisation of affected mine water for dust suppression in contained dirty water management areas such as opencast mining areas, haul roads and mine residue disposal facilities.
- The implementation of water treatment in terms of the lime treatment facilities, the sulphate reduction technologies, as well as the Emalahleni Water Reclamation Plant to enable the treatment of affected mine water to standards required for re-use.
- The recycling of all dirty water at Navigation West Section for re-use in the plant and for dust suppression.

The primary principle underlying a water reclamation strategy is to clearly define the water quality requirements of all the water users within the system. This water quality is defined as the poorest quality that the users can tolerated without creating other water quality related problems, such as corrosion or health issues. By minimising the intake of raw water from outside “clean water” sources the mine reflects its intent towards water resource conservation in the catchment.

2.5.4.17 Solid Waste Management

Waste management at Landau Colliery takes the following aspects into consideration:

- Recycling and minimisation of waste.
- The development of Operational Procedures and Closure plans for waste disposal facilities.
- Monitoring to ensure set objectives are met.

2.5.4.17.1 Industrial (excluding mine residue) and domestic solid waste management

A part of the EMS implemented at Landau Colliery consists of a detailed Waste Management Standard Procedure, which describes the system that the mine has in place to deal with domestic, hazardous, scrap, industrial and recyclable paper waste. This procedure applies to all areas that generate the above-mentioned waste.

The objective of the procedure is to minimise the impact waste has on the environment by setting standards for the correct handling, storage and disposal of waste. The objective of this procedure is to:

- Identify all the waste in the related areas.
- Ensure correct waste disposal facilities.
- Ensure correct separation and disposal of the different types of waste streams.
- Promote awareness amongst mine employees on the impact waste has on the environment, and thus the importance of proper waste management.

Reference can be made to the Standard Procedure on Waste Management for detail regarding the responsibilities and distribution of the Environmental Standard Procedure of Waste Management. Included in the above-mentioned Standard Procedure is reference to the relevant documents, definitions and abbreviations, the procedure / methodology and reference to the procedure regarding reporting and documentation. The procedure / methodology of waste disposal at Landau Colliery is summarised below.

The following waste skips are available at all designated sites, attached to the above-mentioned Standard Procedure.

Type of waste	Skip	Bins
Domestic waste	Green	Green
Hazardous waste	Red/Black with a red line	Red
Scrap Metal waste	Blue	-
Recyclable Paper bin	-	white
Fluorescent Tubes	red/ yellow pvc bags	-
Industrial waste	Yellow	yellow

Dedicated areas have been demarcated for these skips at both the Ngwenya Plant and the Navigation West Section. Signs state the classified waste types to be disposed of in these drums / skips. No other waste types are allowed into these drums and skips.

Dedicated areas are demarcated for hazardous waste skips. Signs state that only hazardous waste, as identified above, may be disposed of in these skips. The areas are demarcated for hazardous waste and have concrete floors and collection trenches, or bunded area around the concrete to catch any contaminated runoff and to prevent soil and surface water pollution. A valve is installed in these bunds to control movement of any liquids into the receiving environment. An absorbent material is stored close by to treat any oil spillages that might arise. The Hazardous waste is collected by a qualified and competent waste handler and disposed of at Holfontein which is a licensed Hazardous landfill site.

Dedicated areas are demarcated for scrap metal skips. Signs state the relevant waste types to be disposed into the skip. No other waste types are allowed into these skips. If scrap metal parts are still contaminated with oil / grease, the contaminated areas need to be cleaned from any excessive oil and grease before being disposed of in the scrap metal waste skips. The oily rags, used for cleaning the scrap material must be disposed of in the hazardous waste skips. Scrap metal is recycled for re-use at an external facility.

Industrial waste is stored in the salvage / erection yards according to the type and usage, until final disposal.

Fluorescent tubes are stored in PVC bags and collected by a reputable and licensed contractor for disposal.

Old oil is stored in 210 l oil drums, in concrete bunded areas with oil trap or containment areas. "No smoking" signs are present and only oil drums are allowed in these areas. It can also be pumped into bulk used oil containers that are bunded in a concrete area with "no smoking" signs put in place. A valve is also installed in these bund walls to control any movement of liquids into the environment. The oil is collected by an external contractor for re-use.

2.5.4.17.2 Mine residue

The No. 4 Select Seam ROM coal that is mined from the Navigation West Section is screened on-site at the Navigation West Section Beneficiation Plant the discards are backfilled at the bottom of the mined out pits to assist in attaining a positive volume balance for the mined area.

The slurry generated at the Ngwenya Plant at the Navigation West Section is pumped to the slurry dams adjacent the plant to allow for the slurry to dry, prior to disposal into the voids as per approved EMPR alignment, with license number MP 30/5/1/2/3/2/1 (306).

2.5.4.17.3 Backfilling / in-pit disposal at the Navigation West Section

The mine residue (discard) is backfilled into the opencast pit as part of the roll-over opencast mining method to be employed at the Navigation West Section.

The location of the Navigation West Section mining area is shown on Figure 2. The sequential lateral roll-over technique is used, and thus rehabilitation follows three cuts behind the working face. The entire mined out area will be backfilled by the end of Life of Mine.

The excess coarse discard which will be placed back into the pit is anticipated to be approximately 2 576 000 tons in total.

Since the excess coarse discard is replaced into the open pits (up to the original depth of the shallowest coal layer), the final area over which the backfilling will have taken place will be that of the final area over which opencast mining has taken place, which has been planned to be ± 214 ha.

The mine plan (Figure 7 and Plan 7 in Appendix A) is suited to the roll-over opencast mining method with relatively short pit lengths, and continuous rehabilitation, as the mining advances. It was decided that mining will commence in the northern-most cut of the South Block, and will move northwards from there.

2.5.5 Need and desirability of the project

2.5.5.1 Local Economic Development

The Life of Mine for Landau Colliery is expected to end in the year 2018 for all sites. The proposed project will ensure the continuance of the mine for another 8 years, which will be beneficial not only to the company,

but also to the employees who would face job losses in the year 2018 and the surrounding communities that are benefiting from the existence of the mine.

Should the Navigation West - South Block Extension Project not be implemented, Landau Colliery would run out of coal to mine and the Colliery will not be able to continue to supply coal to the existing markets at the current rate of demand. In return the jobs of workers that are currently employed at the Landau Colliery may be lost.

Expected direct and indirect benefits of the proposed project include:

- Continued employment of staff.
- Potential for the creation of additional jobs.
- Continued upliftment of the surrounding communities.
- Rehabilitation of environmental issues within the wetland areas.
- Continued supply of coal to the local, national, and international markets, and therefore contribution to local, provincial and national economy.

2.5.5.2 Where is it intended that the product(s) will be sold

About 10% of the coal produced at Landau Colliery is for the local South African market with the balance being for export via Richards Bay Coal terminal to the international market. Consumers of the coal would typically be power stations and steel and vanadium producers. Table 9 below lists Landau Colliery's product consumers and what the product is used for.

Table 9: List of Product Consumers

Market	Customer	Country / Region	Use
Local	Scaw Metals	South Africa	Heat
	Trans alloys	South Africa	Power Generation
	Sappi	South Africa	Heat
	Cape Gate	South Africa	Heat
Regional	Sappi	KZN	Heat
International	RAG	Germany	Various
	Eskom	South Africa	Power Generation
	Enel	Italy	Power Generation
	EDF	France	Power Generation
	Carboex	Spain	Power Generation

2.5.5.3 An estimate of the total annual expenditure at full production

Costs applicable to the mining operation are detailed in Table 10 below (all given as un-escalated costs – extracted from the 2010 Mining Works Programme for Landau Colliery). Operating Costs for Landau Colliery

total approximately R 10.6 billion over the LOM, which is approximately R 46.63 per ROM ton in 2007, increasing to approximately R 126.74 by 2027.

Table 10: Estimate of mining operations costs (2010)

Cost Item	Description	Annual Cost
Stores	Average R3.6m per month	R83,222,111
Working Cost Suspense	Average R8.6m per month	R9,307,841
Training & Education	Skills development levy, training courses.	R6,834,334
Administration overheads	Includes insurance, bank, legal, vehicles, security, security, communications, rates & taxes, Power & Water	R61,317,994
Mining contractor	Hire of Labour / Equipment & Services	R94,097,943
Anglo Coal SA fees	Reimbursable, Chamber of Mines & AAC Fee	R25,983,476
Technical mine services	Rock engineering, environmental, geology, grade control, project services, metallurgical, VOHE, electrical, mine planning etc…	R12,268,428
Computing / audit services	Computing network, auditing etc.	R2,831,047

Beneficiation of the coal has cost implications, both for plant maintenance and operation. According to the Mining Works Programme (2010), these costs total approximately R60.9 million in 2007 money terms or R2.19 billion over the LOM, equivalent to approximately R9.60 per ROM tonne.

Table 11: Estimate of processing costs

Item	R / t	R pa	LOM Cost
Plant maintenance	R 4.12	R 26,172,810	R 939.3 m
Processing	R 5.47	R 34,712,099	R 1,245.7 m

2.5.5.4 Labour Force

Landau Colliery is BBBEE compliant, as indicated in the Social and Labour plan, dated 10 April 2008. According to Landau Colliery's Employment Equity Plan (2006 – 2010) that is available from the mine upon request, the mine is committed to the attainment of equity in the workplace through the promotion of equal opportunity and fair treatment in employment. To this effect, Landau Colliery aims at eliminating all unfair discrimination and implementing employment equity measures to redress the disadvantages in employment experienced by designated groups and to ensure their equitable representation throughout the workplace at the Navigation Section. Management has committed Landau Colliery to achieving the employment equity goals and objectives spelt out in the afore-mentioned plan, not only as required by legislation, but also to maximise the benefits of diversity, equal opportunity and fair treatment of employees, for the purpose of maximising the growth and productivity of the Navigation Section.

Anglo Coal has established a consultative forum that recognised the requirements of Section 16(2) of the Employment Equity Act and used as a model for representation of employees in the consultative forum, the principles set out in the guidelines for workplace forums in Schedule 2 to the Labour Relations Act. The committee consists of 15 members who were nominated to represent the following constituencies:

- Management (2).
- ER Section (1).
- Training Section (1).
- Skilled Employees (4).
- Senior Skilled Employees (2).
- Officials (1).
- Female (2).
- Disabled (1).

Landau Colliery (under Anglo Coal, a division of Anglo Operations Limited) consults with the consultative forum on all matters referred to in Section 17 of the Act. Furthermore, Landau Colliery has gathered information and completed an analysis in terms of relevant legislation, and compiled a demographic profile of its workforce. This process will be ongoing. Refer to Table 12 (below) for a representation of the Employment Equity statistics for 2008 (taken from the Social and Labour Plan of Landau Colliery dated 10 April 2010).

Table 12: Workforce profile for Landau Colliery as per occupational categories (2010)

Landau Colliery											
Occupational Levels	**Male**				**Female**				**Total African**	**Disabled**	
	African	**Coloured**	**Indian**	**White**	**African**	**Coloured**	**Indian**	**White**		**Male**	**Female**
Top Management	0	0	0	0	0	0	1	0	0	0	0
Senior Management	2	0	0	3	1	0	0	0	6	1	0
Professionally qualified and experienced specialists and mid management	21	0	0	7	10	0	0	4	42	0	0
Technical and academically qualified workers, junior management, supervisors, foremen and superintendents	8	0	0	3	14	0	1	5	31	0	0
Discretionary decision making	63	2	0	0	7	0	0	0	72	0	0
Defined decision making.	280	4	0	4	61	0	0	1	350	0	0
TOTAL	**374**	**6**	**0**	**17**	**93**	**0**	**2**	**10**	**502**	**1**	**0**
Non-permanent employees	0	0	0	0	2	0	0	1	3	0	0
Total Permanent	**328**	**6**	**3**	**107**	**96**	**0**	**1**	**10**	**505**	**1**	**0**

2.5.5.5 An estimate of the multiplier effect on the local, regional and national economy

The employment of 502 people at the Landau Colliery have a positive effect on the local economy. According to the approved EMPR a multiplier effect of eight (8) was used to understand the extent to which the local community will benefit. The EMPR bought the approximate number of people to 4016 that are expected to benefit from the employment opportunities at the Landau Colliery.

3. DESCRIPTION OF THE EXISTING ENVIRONMENT

This chapter provides an overview of the baseline environmental situation of the Landau Colliery in terms of the Climate, Geology, Topography, Soil, Land capability and Land use, Fauna and flora, Surface water, Groundwater, Air quality, Noise and vibration, Sites of historical and archaeological significance, Sensitive landscapes, Visual aspects and the Socio-economic environment, which may directly or indirectly be affected in the immediate and surrounding environment.

This section merely summarises the information obtained from existing documents with their supporting specialist studies. Information from various studies regarding the pre-mining environmental status as well as the changes to the environment due to existing mining activities have been conducted and pertinent information is included in this section.

The following specialist studies have been initiated as part of the Scoping process and will be included in the EIA process:

- Geohydrological Study.
- Fauna and Flora Study.
- Wetland Study.
- Soil, land-use and land capability Study.
- Hydrology Study.
- Blasting and Vibration Study.
- Heritage Impact Assessment.

The following terminology has been used throughout this document to describe the relevant surface areas that apply to this Report.

Table 13: Terminology

Area	Definition
Mining area	Actual mine boundary area as defined in terms of the new order Mining Right under the MPRDA, 2002 for the Landau Colliery.
Study area	The extent of the study area is determined by the area of influence of the different environmental components relevant to each aspect. Thus, the study area referred to within the text applies to the specific component under description. The extent of the study area is therefore not influenced by the mine boundary area, but rather by the specific activity relative to the environmental component.
Area of surface disturbance	This refers to the area where the soil and vegetation is physically disturbed due to activities, i.e. the open-pit, the infrastructure associated with the mining, etc.

Dirty water management area	Surface area where polluted water is managed and will impact on receiving environment if not contained.

3.1 Geology

3.1.1 Regional Geology

Throughout the Witbank area a thin succession of Vryheid Formation sediments is present. At their thickest these sediments attain some 120 – 140m and can contain a number of coal seams of which four are considered to have economic potential (Figure 14).

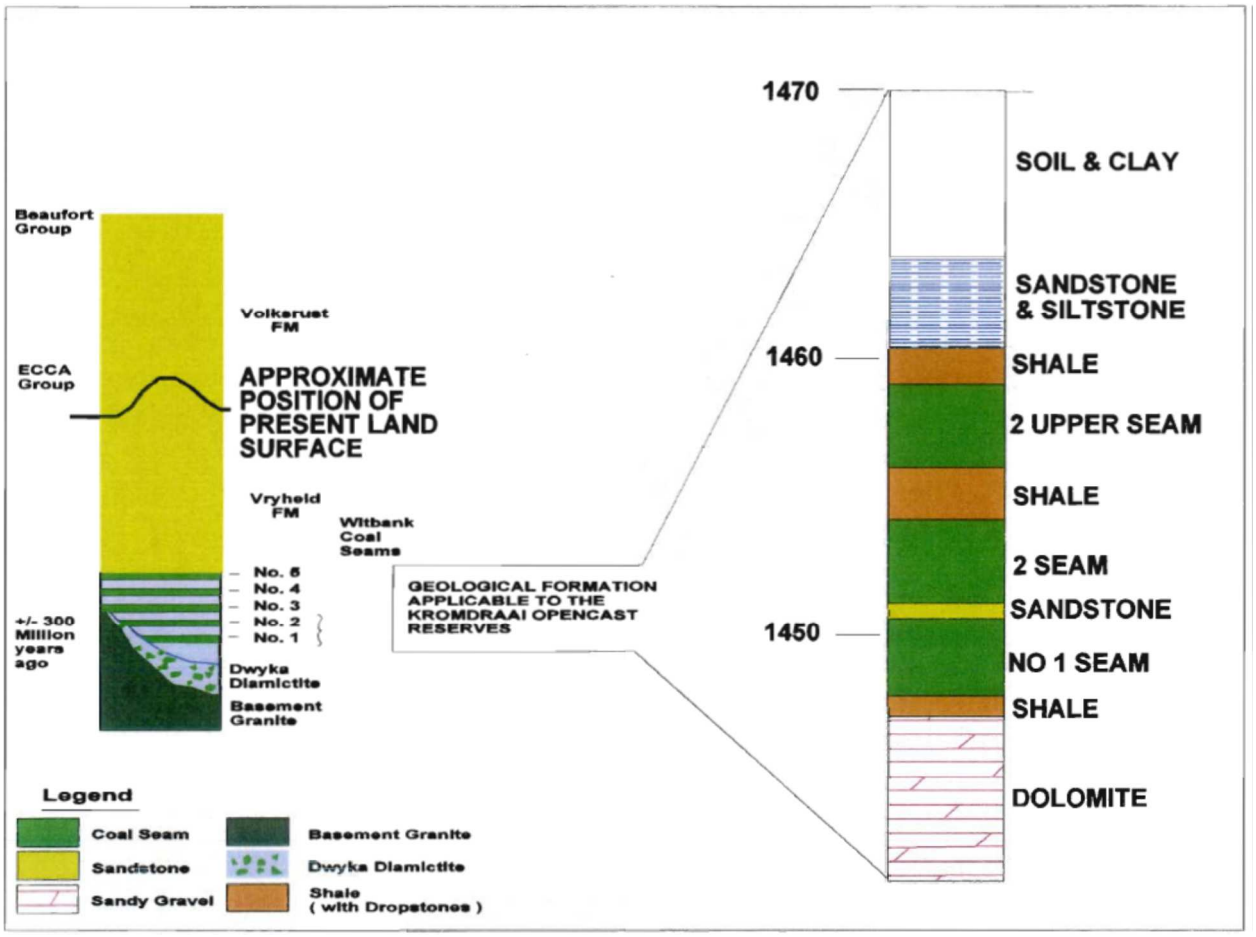


Figure 14: General geological profile of the Witbank region depicting the five (5) coal seams

The deposition of the Vryheid Formation sediments is to a great extent controlled by the Pre-Karoo platform on which they deposited. These Pre-Karoo rocks, consisting mainly of Waterberg quartzites or outliners of the Bushveld Igneous Complex, have been glacially sculptured giving rise to uneven basement topography. A thin veneer of Dwyka sediments over lies the pre-Karoo but is generally not thick enough to ameliorate the irregularities in the placated surface, which therefore affected the deposition of the younger Karoo sediments.

3.1.2 Site specific Geology

The Navigation West Section is situated in the northern part of the Witbank coalfield. The coal measures form part of the Vryheid formation of the Ecca group. All five coal seams, common to the Witbank coalfield, are present in the Navigation West Section area. The No. 4 Seam is suitable for mining by opencast methods. The No. 2 Seam is mostly thin and of moderate to low quality, as are the remaining No. 3, 4U and 4A Seams. The No. 5 Seam 'sub-outcrops' near the eastern boundary of the proposed mining area, and although of good quality, is not laterally extensive enough over the Navigation West Section to include in the mining plan.

The No. 4 Seam dips predominantly to the east, but also to the west (in the extreme west) as it is draped over a regional Pre-Karoo basement high. It is over the western part of the area that the No. 4 Seam is completely weathered as a result of its close proximity to surface. This 'no coal' area forms a major indent into the South Block and had a defining influence on the mining layout possibilities. Figure 15 shows a typical borehole log demonstrating the geological stratigraphy in the Navigation West Section. The topography to the west, influenced by the upper reaches of the Grootspruit valley, dips fairly steeply towards the west, resulting in a sub-outcrop of the No. 4 Seam. To the east, the various seams dip at about 30 minutes towards the Greenside Colliery underground reserves, where all of the major seams have been preserved and mined to some extent.

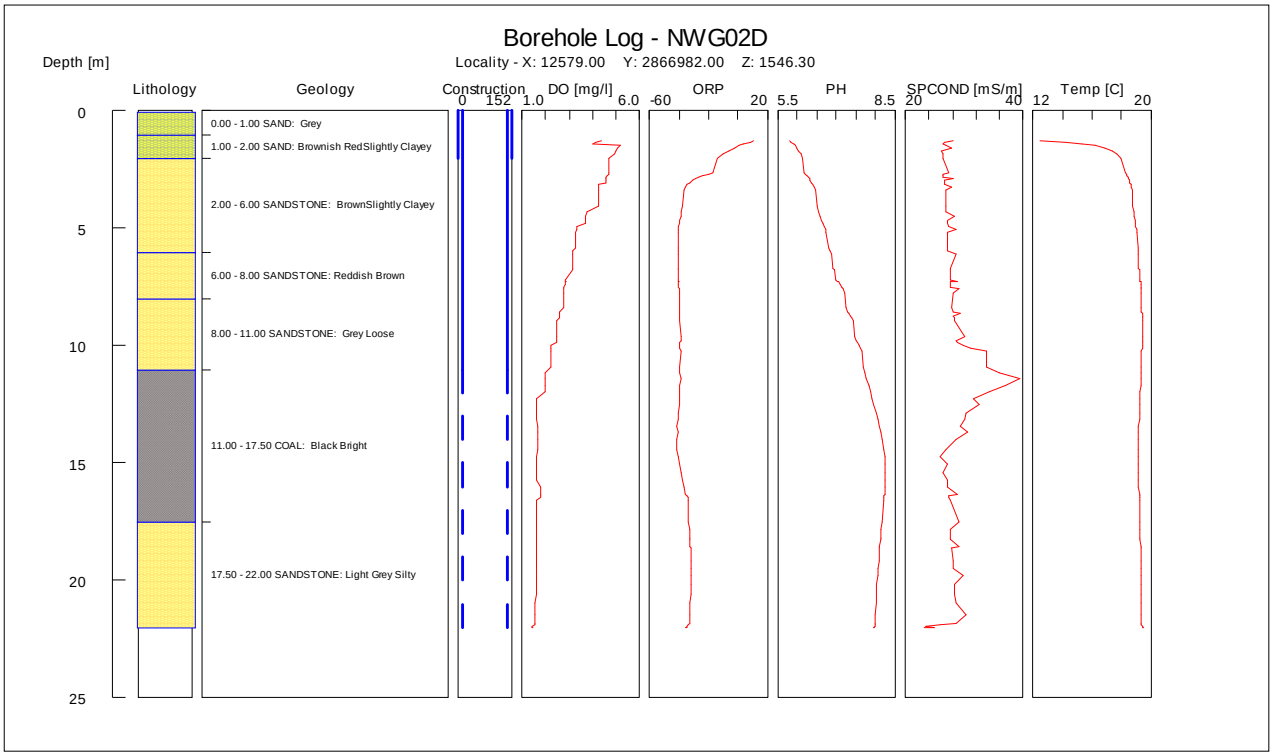


Figure 15: Typical geological stratigraphy at the Navigation West Section: North Block

3.1.3 Presence of Dykes, Sills and Faults

Dedicated ground geophysics was conducted as part of the groundwater investigation undertaken for the proposed Navigation West Section which is documented in the report titled: "*Landau Colliery: Navigation West Project. Report on geohydrological investigation as part of the EMPR*" dated February 2007.

The intention of the dedicated ground geophysics undertaken was to delineate any significant geological structure or intrusion. Ground magnetic as well as electro-magnetic methods were employed during the survey. Borehole positions were firstly defined based on the surface topography and flow directions from existing water level data in the study area.

Geophysical traverse lines were then set out across the positions of the proposed boreholes and perpendicular to the expected flow direction from the [then] proposed mining area. The results of the geophysics were used to site the groundwater monitoring boreholes on areas where structures occur that could act as preferred flow paths.

The dykes at the adjacent Greenside Colliery show very narrow zones of burnt coal surrounding them and thus it can be assumed that, where dykes do intersect the study area, this should not significantly affect the Navigation West Section operation.

3.2 Climate

3.2.1 Regional climate

Landau Colliery falls within the summer rainfall region of Southern Africa. The climate is moderate with warm summers and cold, dry winters. Sharp frost is common in winter. Rain occurs mostly as showers and thunderstorms during summer months (October to March), with the maximum rain falling during December to February. Hailstorms are also common in the summer rainfall region and occur on an average of 4 to 7 times annually, depending on the altitude. The average summer temperature range is from 12°C to 29°C with an average temperature of 20°C. The winter temperature varies from - 3°C to 20°C with an average temperature of 9°C, the first frost being experienced in May and the last in August. The prevailing winds are from the Northwest with an average wind speed of 2.9 m per second.

3.2.2 Mean monthly and annual rainfall

Landau Colliery is located within the B1C and B2C rainfall zones. The MAP measured at the rainfall stations situated with the B1C rainfall zone is presented in Table 14 below (WRC, 1990).

Table 14: MAP measurements from the rainfall stations within the B1C rainfall zone

Weather Station(s)		MAP (mm)
Number	Name	
0478546	Vandyksdrift*	695.8
0515079	Kleinwater*	660.9
0515155	Waterval*	681.0
0515196	Riverside*	659.9
0515234	Clewer*	737.1
0515382	Witbank**	704.9
0515386	Landau	689.2
0515412	Witbank**	715.9
0515732	Botsabelo	695.7
0515826	Middelburg	710.6
0516096	Vancouver	714.0
0516190	Bankfontein	688.0
Average MAP		**696.1**

** Note: MAP is determined from stations within the rainfall zone as well as some outside of the rainfall zone, resulting in repetition of the use of some stations in these calculations.*

*** Note: The name Witbank is assigned to two different weather stations (refer also to station number.*

The Navigation Section is within an area of mean annual precipitation (MAP) that ranges from 660 - 740 mm. Rainfall gauges situated closest to the study area is KwaMthunzi Vilikazi (0515234), Landau (0515386) and Witbank (0515412). The Water Research Commission (WRC) report rainfall figures were adopted for the study area. Table 15 indicates the average annual rainfall recorded at the selected gauges. The MAP adopted for the site is 714 mm with a weight of 40 % allocated to the KwaMthunzi Vilikazi and Landau rainfall gauges and 20 % to the Witbank rainfall gauge. Table 16 presents the average monthly precipitation typical for the tertiary drainage region B11 (rain zone B11K). It is common for this summer drainage region that within an average of seven months (October to April), 90 % of the rainfall occurs.

Table 15: Mean Annual Rainfall (MAP) for the Navigation Section

Weather Bureau Gauge No.	Station name	Latitude		Longitude		Record used	Useable years	MAP (mm)
		D	M	D	M			
0515234	Kwa-Mthunzi Vilikazi	25	54	29	08	1922-1974	53	737
0515386	Landau	25	56	29	13	1950-1989	40	689
0515412	Witbank	25	52	29	14	1956-1989	34	716
Adopted MAP in (mm) with weighted average of 40:40:20								**714**

Table 16: Average Monthly Rainfall (mm) for the Navigation Section

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
% Distribution	9.70	16.80	15.86	17.26	13.20	11.44	6.55	2.51	1.20	1.04	1.02	**3.42**	**100**
Monthly rain	69.26	119.95	113.24	123.24	94.25	81.68	46.77	17.92	8.57	7.43	7.28	24.42	**714**

3.2.3 Maximum rainfall intensities

Maximum rainfall intensities recorded for the KwaMthunzi Vilikazi weather station are presented in Table 17.

Table 17: Maximum Rainfall Intensities in 24 hours (KwaMthunzi Vilikazi Weather Station)

Years of record	Maximum in 24 hours (mm)	Recurrence Interval (mm)	
		50 years	100 years
52	150	119	136

3.2.4 Mean monthly maximum and minimum temperatures

Temperature information from the Witbank Weather Station is presented in Figure 16 below (South African Weather Service, 2006). The highest average maximum daily temperatures occur from November to March ranging from 25.2ºC to 27.5ºC. June, July and August are the coldest months of the year with the average minimum temperatures ranging from 5ºC to 6ºC.

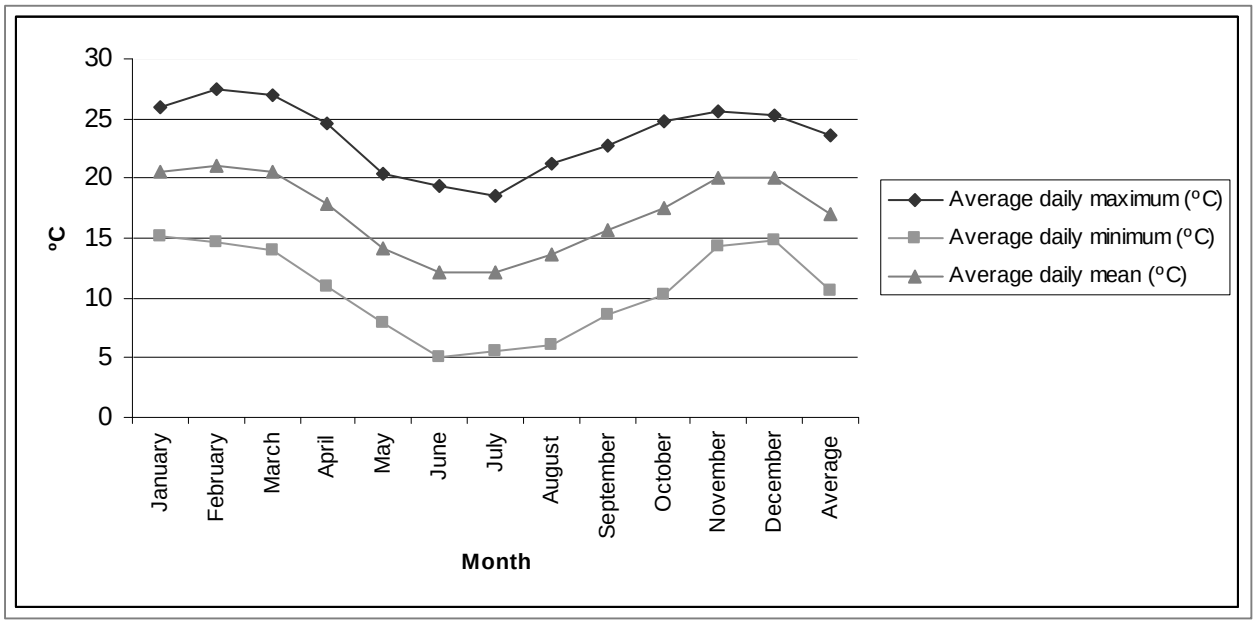
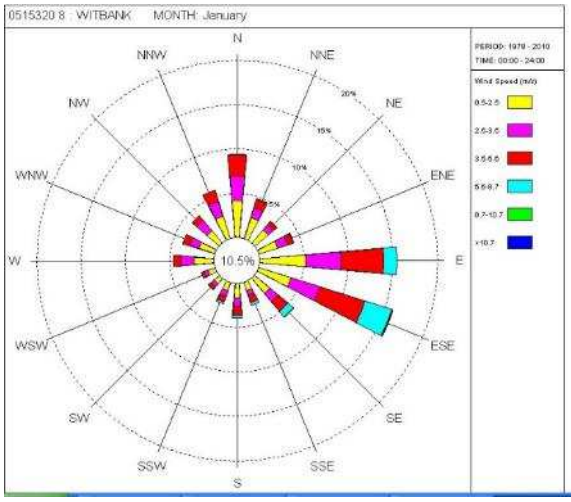
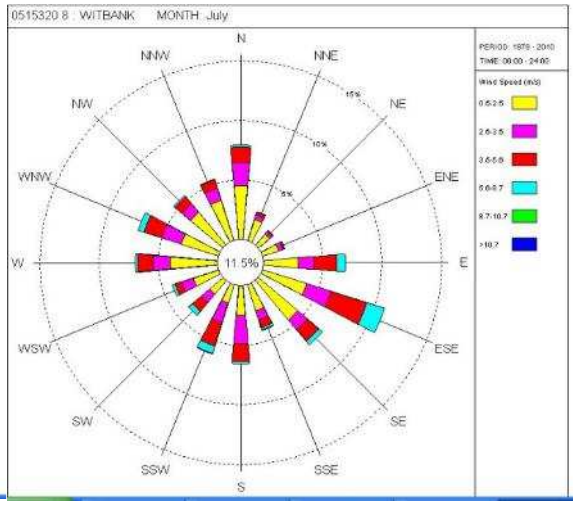
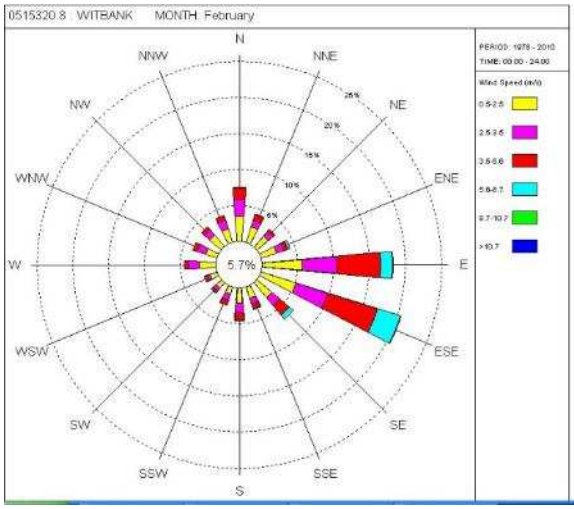
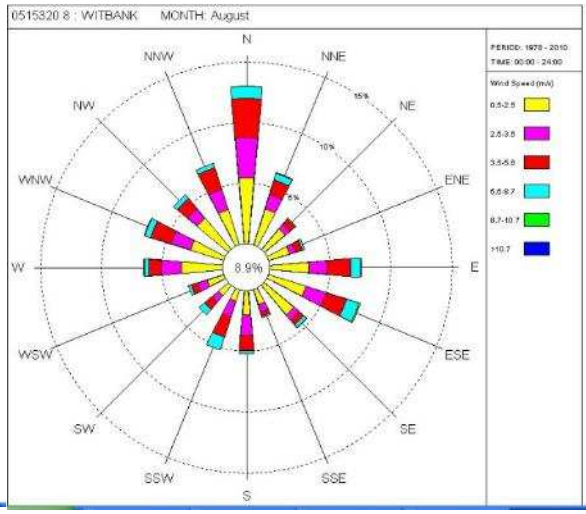
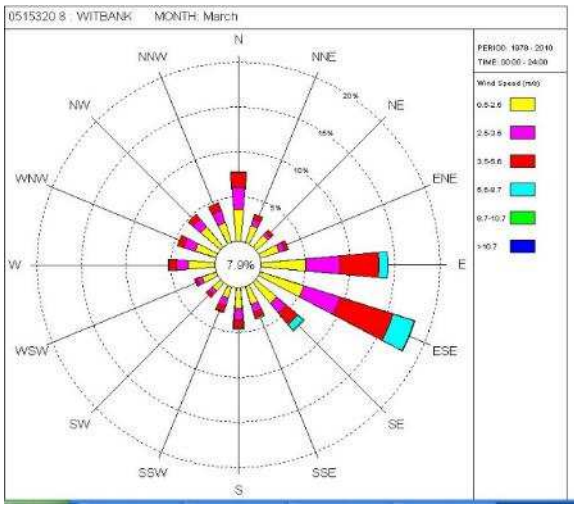


Figure 16: **Average monthly maximum and minimum temperatures (Witbank weather station)**

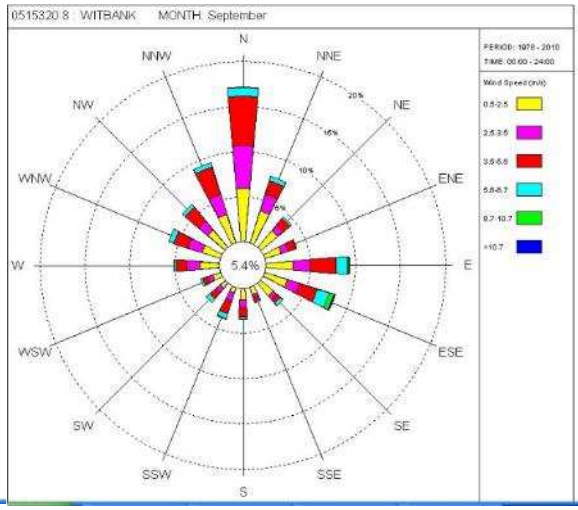
3.2.5 Mean monthly wind direction and speed

Wind in the Landau Colliery area blows predominantly in a northerly direction during winter and spring, and predominantly in a south easterly direction during summer and autumn (refer to Figure 17 below).

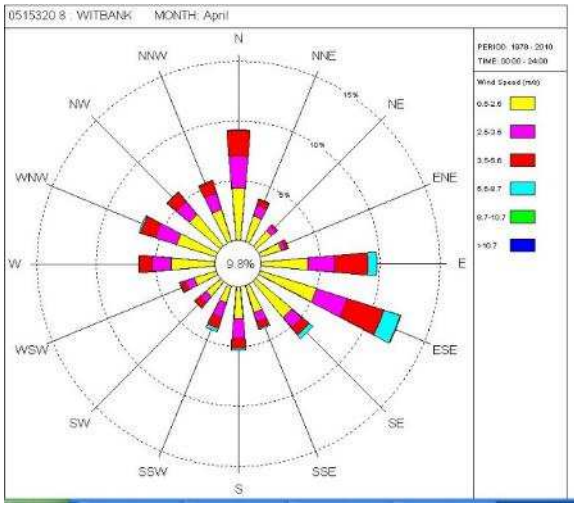
<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>January</td><td>July</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>February</td><td>August</td></tr>
</table>



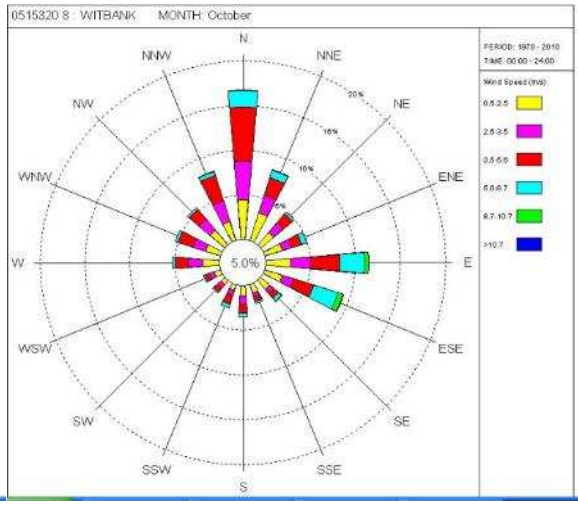
March



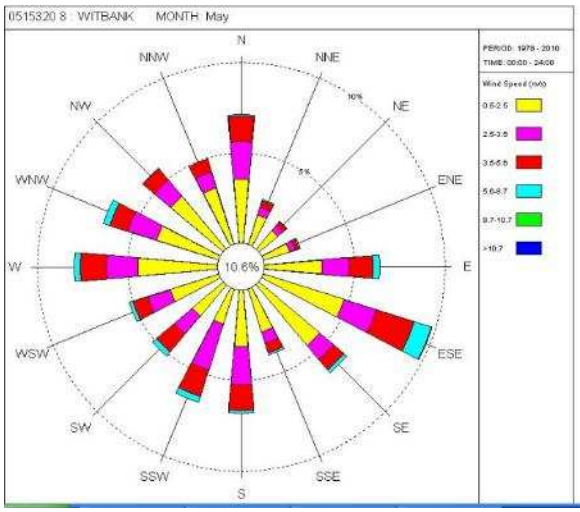
September



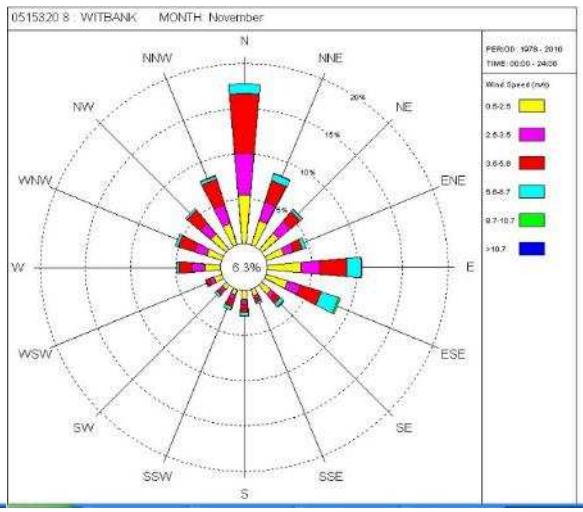
April



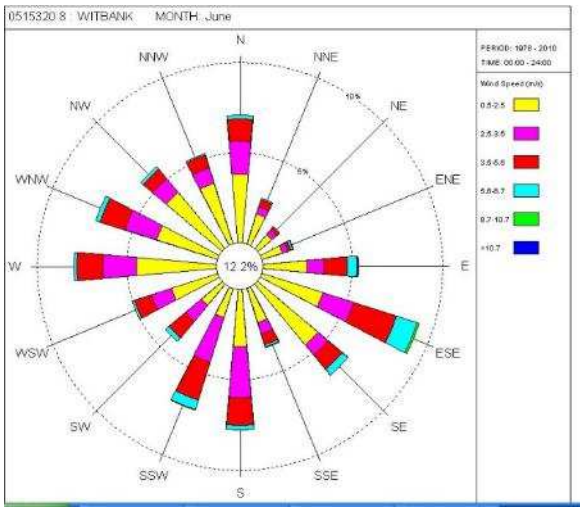
October



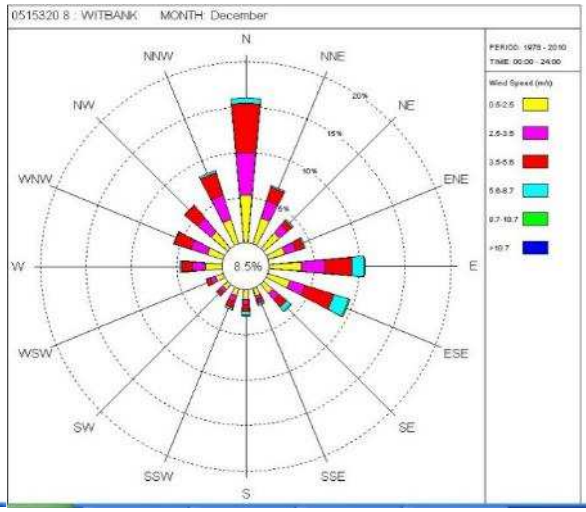
May



November



June



December

Figure 17: Seasonal wind roses as modelled for Ogies (South African Weather Service, 2009)

The average monthly wind speed for the period 1993 - 2003 was 10.26 m/s. The maximum wind speed of 13.6 m/s was measured in October 1995 and the minimum wind speed of 8 m/s was experienced in June and July 2000.

3.2.6 Mean monthly evaporation

The Landau Colliery falls within the 4A evaporation zone as defined by the WRC (1990). The Landau Colliery is located within an area with a Mean Annual Evaporation (MAE) of approximately 1700mm (S-pan). Table 18 below presents the monthly evaporation for the 4A Evaporation Zone.

Table 18: Mean monthly evaporation for Landau Colliery

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
S Pan %	10.8	10.2	11.2	11.0	9.2	9.1	7.0	5.9	4.8	5.2	6.9	8.9	**100.2**
S Pan (mm)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Lake evap (mm)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

The mean annual lake evaporation is 1430 mm with monthly extreme values of 158 mm (maximum) in December and 69 mm (minimum) in June. These figures are for clean water and should be verified and reduced accordingly for water of high salinity.

The mean monthly evaporation for the Witbank Dam (1963-1998) is shown in Table 19 below.

Table 19: Mean monthly evaporation for Witbank Dam

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
S Pan (mm)	170	165	174	178	144	136	100	81	68	74	100	136

3.2.7 Incidence of extreme weather conditions

Rainfall occurs mainly as thunderstorms during the summer months. These are accompanied by lightning and usually occur with strong winds, heavy rains and occasionally hail. These storms are localised and rainfall can vary markedly within a short distance. On average, hail occurs six times per year.

Frost is common in the winter months (May to September), with an average occurrence of 58 frost days per year. Of these frost days, a maximum monthly average of nine days occurs in July.

3.3 Topography

3.3.1 General

The main features associated with the current opencast mining and related activities at the Navigation Section are the opencast operations, the coal processing plant, the Blaauwkrans Co-disposal facility and old Navigation discard facility, the railway link from Kromdraai Section to the Navigation Beneficiation Plant, an overland conveyer from the Navigation Beneficiation Plant to the Rapid Loading Terminal and the surface water management system. Other infrastructure at the Navigation Section includes the pipelines between the Navigation Plant and the Emalahleni Water Reclamation Plant that convey contaminated mine water to and from the EWRP, respectively. Furthermore, the Navigation Section also accommodates the infrastructure associated with the Water Uses (as defined in Section 21 of the National Water Act, 1998 (Act 36 of 1998)) that are currently taking place at this section of the mine.

3.3.2 Site specific

The regional topography can be seen on the 1:250 000 topocadastral maps relevant to the study area (i.e. 2528 Pretoria and 2628 East Rand). The local topography of the study area is illustrated on the topocadastral maps numbered 2529 CC and 2529 AA on a scale of 1:50 000 (refer to Figure 2 and Plan 2 in Appendix A). Also available from the mine are orthophoto plans to a scale of 1:10 000 with surface contour intervals of 5 metres.

The Navigation West Section is situated in the Mpumalanga Highveld. The pre-mining Navigation West Section surface land use area consisted mainly of agricultural land under cultivation and a game reserve that forms part of Anglo Coal's Navigation West - Training Centre. The surface is gently undulating with elevations of between 1 350 and 1 400 mamsl. The Navigation West Section is predominantly situated over a gentle, rolling hill except in the area adjacent to the main drainage line (an unnamed tributary of the Grootspruit situated to the southeast of the South Block – refer to Figure 5), where it becomes more steeply sloping. A number of small rock outcrops are found on the northern side of the mentioned unnamed tributary of the Grootspruit.

Surface water drains mainly westwards into the Wilge River catchment. Water in the North Block is likely to flow northwards into the Olifants River catchment. Refer to Figure 4 as well as Plan 4 in Appendix A for an indication of the catchment boundaries.

A small unnamed tributary of the Grootspruit and a number of minor drainage lines run through the western and southern sides of the study area. There was a 1.5km pan within the boundaries of the Navigation West Section, which did not hold much water during summer and was dry during winter (refer to Figure 5 and Plan 5 in Appendix A). The pan has been mined in line with the approved Navigation Water Use License, Licence number 04/B20G/ABCGIJ/1498.

The following structures are located near to the Navigation West Section mining area:

- The Kromdraai / Navigation railway line.
- Old coal discard dumps (such as the old Schoongezicht, Navigation and the Anglo-French dumps as well as the Blaauwkrans Co-disposal facility) and shafts, which form part of Landau Colliery.
- The Hayford Colliery coal siding.
- Other existing infrastructure such as roads and the adjacent buildings which form part of the KwaMthunzi Vilakazi town area.

3.4 Soil, Land Capability and Land Use

3.4.1 Soil

Nine dominant soil units were identified within the pre-mining land use area at the Navigation West Section. These included: Hu1, Hu2, Cv1, Cv2, Av1, Gc1, Lo1, Lo2, and Ka. Table 20 below presents the

pre-mining distribution of soil types at the Navigation West Section. Figure 18 shows the distribution of the dominant soil units within the pre-mining study area.

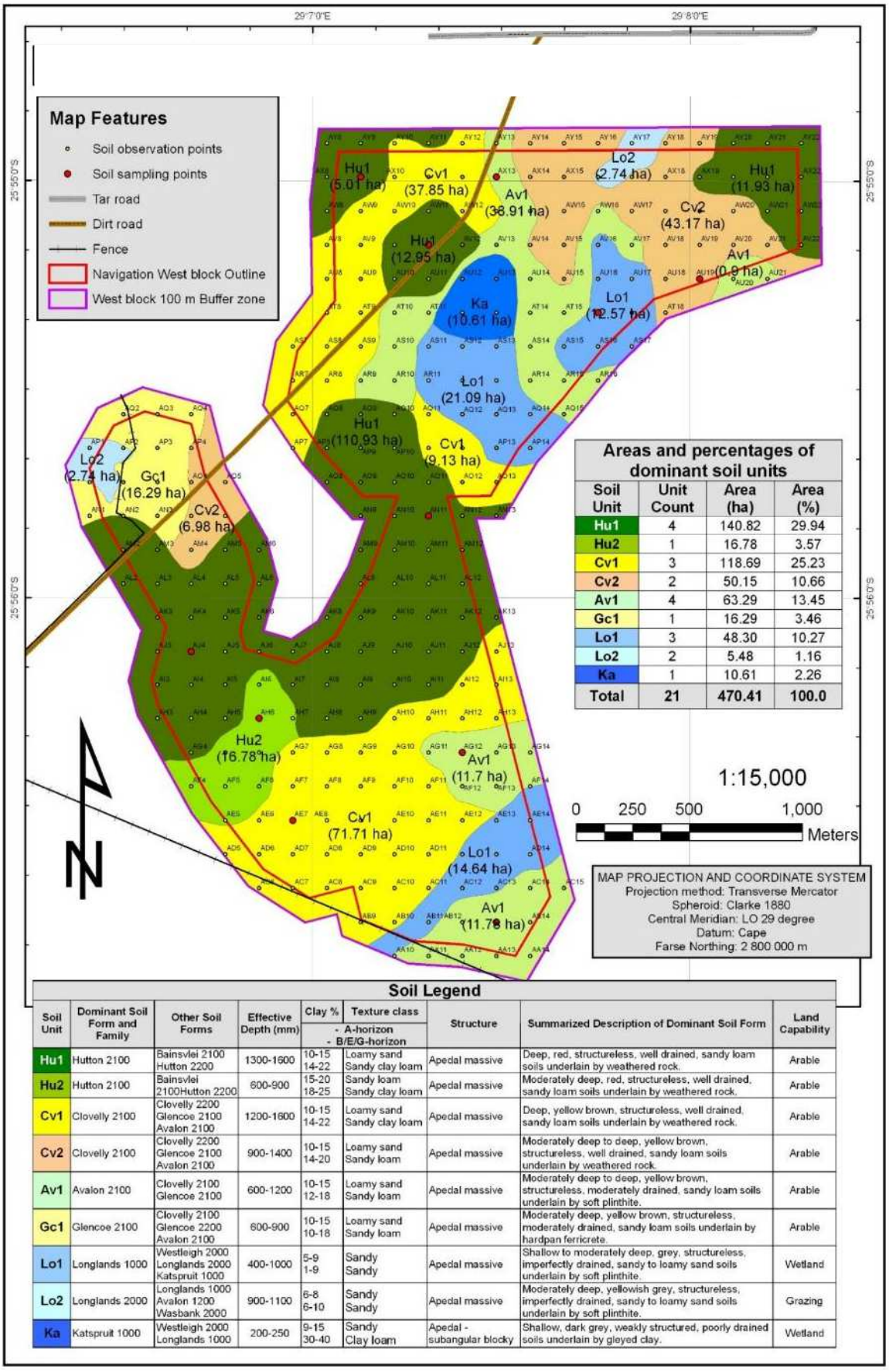
The Hu1 soil unit consists of deep, well-drained, red soils which are not subject to depth restrictions, have no mechanical limitations, and are well drained, have favourable structure and texture, have low erosion susceptibility and occur on flat to gentle slopes. This soil unit was classified as highly arable land. Soil unit Hu2 has similar soil properties as unit Hu1 but has shallower effective soil depth. Soil unit Hu2, however qualifies as arable land.

Soil units Cv1 and Cv2 consist of deep, well-drained, yellow soils which are not subject to depth restrictions, have no mechanical limitations, and are well drained, have favourable structure and texture, have low erosion susceptibility and occur on flat to gently slopes. These soil units were classified as highly arable land. Soil unit Cv2 has similar soil properties as unit Cv1 but has somewhat shallower effective soil depth.

Soil units Av1 and Gc1 consist of moderately deep, moderately-drained, yellow soils which are somewhat subject to depth restrictions, have no mechanical limitations, and are moderately drained, have favourable structure and texture, have low erosion susceptibility and occur on flat to gently slopes. These soil units were classified as arable land. Soil unit Av1 and Gc1 have similar soil properties, but differs mainly in terms of underlying material.

Soil unit Lo1 consists of grey leached imperfectly drained soils occurring in pans, seepage zones and drainage lines. This unit shows clear evidence of seasonal wetness, lateral movement of water in the soil profile and fluctuating water tables and was classified as having a wetland land capability. Soil unit Lo2 occurs in seepage zones showing less prominent signs of seasonal wetness and lateral movement of water in the soil profile and was classified as grazing potential.

Soil unit Ka1 consists of shallow, poorly drained soils occurring in the pan in the northern part. Soil unit Ka was classified as wetland.



Areas and percentages of dominant soil units

Soil Unit	Unit Count	Area (ha)	Area (%)
Hu1	4	140.82	29.94
Hu2	1	16.78	3.57
Cv1	3	118.69	25.23
Cv2	2	50.15	10.66
Av1	4	63.29	13.45
Gc1	1	16.29	3.46
Lo1	3	48.30	10.27
Lo2	2	5.48	1.16
Ka	1	10.61	2.26
Total	21	470.41	100.0

Soil Legend

Soil Unit	Dominant Soil Form and Family	Other Soil Forms	Effective Depth (mm)	Clay % (A-horizon / B/E/G-horizon)	Texture class (A-horizon / B/E/G-horizon)	Structure	Summarized Description of Dominant Soil Form	Land Capability
Hu1	Hutton 2100	Bainsvlei 2100 Hutton 2200	1300-1600	10-15 / 14-22	Loamy sand / Sandy clay loam	Apedal massive	Deep, red, structureless, well drained, sandy loam soils underlain by weathered rock.	Arable
Hu2	Hutton 2100	Bainsvlei 2100Hutton 2200	600-900	15-20 / 18-25	Sandy loam / Sandy clay loam	Apedal massive	Moderately deep, red, structureless, well drained, sandy loam soils underlain by weathered rock.	Arable
Cv1	Clovelly 2100	Clovelly 2200 Glencoe 2100 Avalon 2100	1200-1600	10-15 / 14-22	Loamy sand / Sandy clay loam	Apedal massive	Deep, yellow brown, structureless, well drained, sandy loam soils underlain by weathered rock.	Arable
Cv2	Clovelly 2100	Clovelly 2200 Glencoe 2100 Avalon 2100	900-1400	10-15 / 14-20	Loamy sand / Sandy loam	Apedal massive	Moderately deep to deep, yellow brown, structureless, well drained, sandy loam soils underlain by weathered rock.	Arable
Av1	Avalon 2100	Clovelly 2100 Glencoe 2100	600-1200	10-15 / 12-18	Loamy sand / Sandy loam	Apedal massive	Moderately deep to deep, yellow brown, structureless, moderately drained, sandy loam soils underlain by soft plinthite.	Arable
Gc1	Glencoe 2100	Clovelly 2100 Glencoe 2200 Avalon 2100	600-900	10-15 / 10-18	Loamy sand / Sandy loam	Apedal massive	Moderately deep, yellow brown, structureless, moderately drained, sandy loam soils underlain by hardpan ferricrete.	Arable
Lo1	Longlands 1000	Westleigh 2000 Longlands 2000 Katspruit 1000	400-1000	5-9 / 1-9	Sandy / Sandy	Apedal massive	Shallow to moderately deep, grey, structureless, imperfectly drained, sandy to loamy sand soils underlain by soft plinthite.	Wetland
Lo2	Longlands 2000	Longlands 1000 Avalon 1200 Wasbank 2000	900-1100	6-8 / 6-10	Sandy / Sandy	Apedal massive	Moderately deep, yellowish grey, structureless, imperfectly drained, sandy to loamy sand soils underlain by soft plinthite.	Grazing
Ka	Katspruit 1000	Westleigh 2000 Longlands 1000	200-250	9-15 / 30-40	Sandy / Clay loam	Apedal - subangular blocky	Shallow, dark grey, weakly structured, poorly drained soils underlain by gleyed clay.	Wetland

Figure 18: Pre-mining soil distribution at the Navigation West Section

Table 20: Pre-mining distribution of soil types at the Navigation West Section

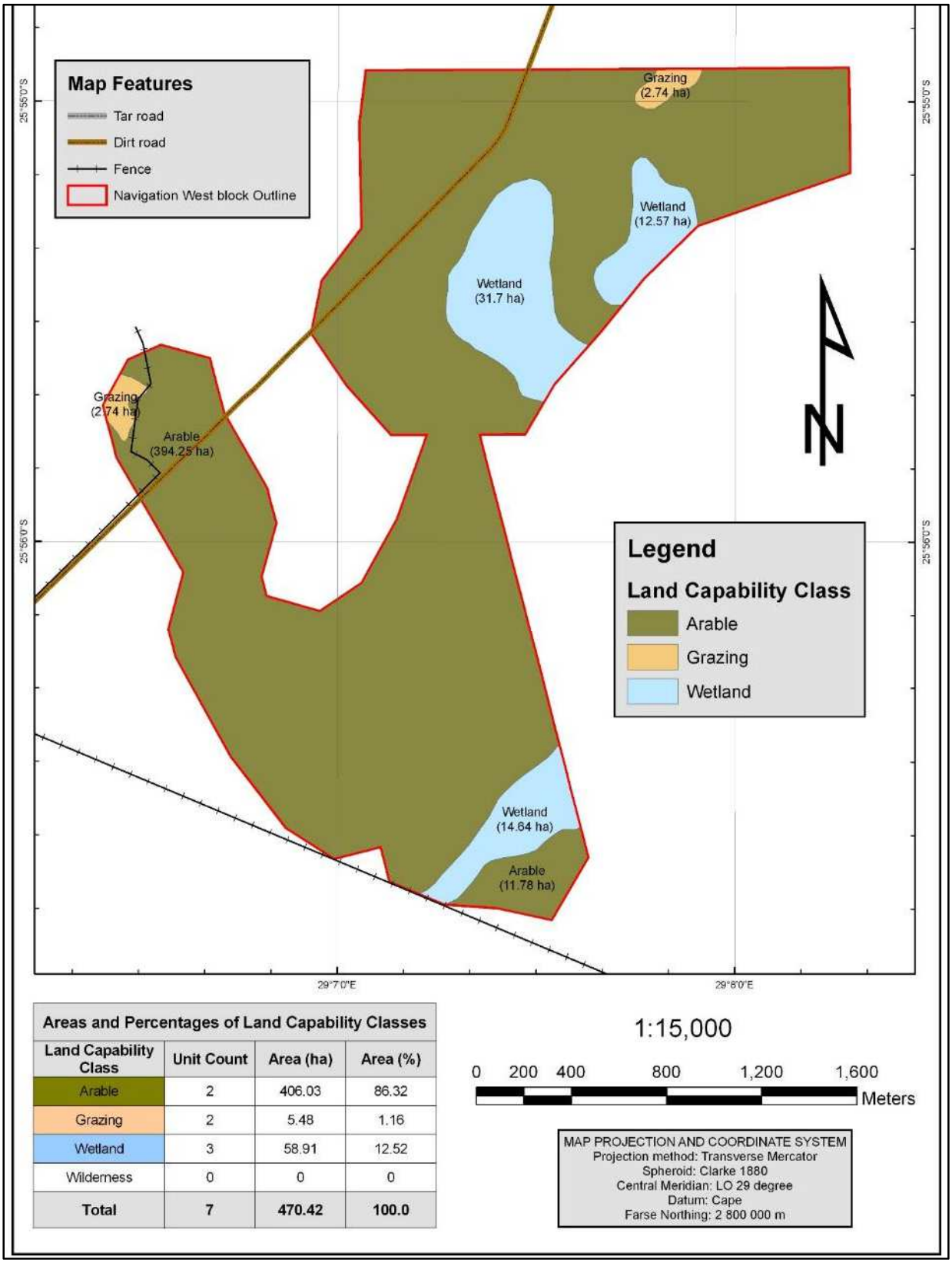
Areas and percentages of dominant soil units			
Soil Unit	**Unit Count**	**Area (ha)**	**Area (%)**
Hu1	4	140.82	29.94
Hu2	1	16.78	3.57
Cv1	3	118.69	25.23
Cv2	2	50.15	10.66
Av1	4	63.29	13.45
Gc1	1	16.29	3.46
Lo1	3	48.30	10.27
Lo2	2	5.48	1.16
Ka	1	10.61	2.26
Total	**21**	**470.41**	**100.0**

3.4.2 Land Capability

The soil units in Figure 19 were classified according to the relevant guidelines into four land capability classes, namely arable land, grazing land, wetlands and wilderness land. The area and percentage of each land capability class is presented in Table 21 below.

Table 21: Areas and percentages of land capability classes for the Navigation West Section

Land Capability Class	Unit Count	Area (ha)	Area (%)
Arable	2	406.03	86.32
Grazing	2	5.48	1.16
Wetland	3	58.91	12.52
Wilderness	0	0	0
Total	**7**	**470.42**	**100.0**



Areas and Percentages of Land Capability Classes

Land Capability Class	Unit Count	Area (ha)	Area (%)
Arable	2	406.03	86.32
Grazing	2	5.48	1.16
Wetland	3	58.91	12.52
Wilderness	0	0	0
Total	**7**	**470.42**	**100.0**

Figure 19: Pre-mining land capability classes at the Navigation West Section.

3.4.3 Land Use

The localities and boundaries of land use practices within the Navigation West Section land use area were captured on a Geographic Positioning System (GPS) during the time of the survey. The pre-mining land uses within this area are shown in Figure 20, and the areas and percentage comprised by each land use are shown in Table 22 below.

Table 22: Areas and percentages for pre-mining land uses within the Navigation West Section study area

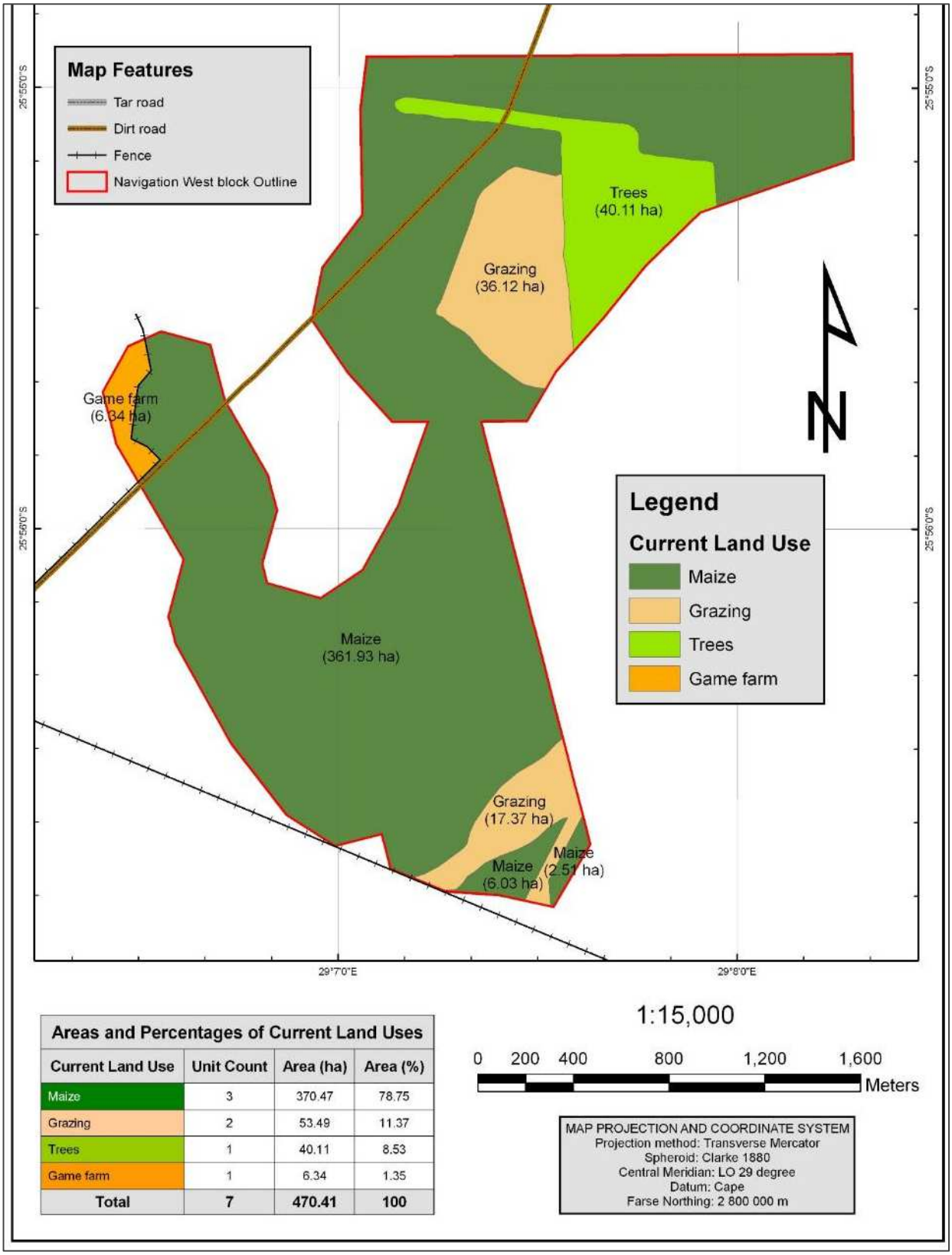
Current Land Use	Unit Count	Area (ha)	Area (%)
Maize	3	370.47	78.75
Grazing	2	53.49	11.37
Trees	1	40.11	8.53
Game farm	1	6.34	1.35
Total	**7**	**470.41**	**100**

Landau Colliery is an existing mine. Agricultural information available for pre-mining conditions is thus limited.

Historical agricultural production related to the Navigation West Section is presented in Table 23. Historical agricultural production information was obtained from Mr. Gert Smith (Smith Brothers), who was leasing the surface overlying the Navigation West Section at the time of the study. Information was obtained during a telephonic conversation on 6th January 2006. The yield ranges presented in Table 23 below reflects variations from high and low rainfall seasons.

Table 23: Historical agricultural potential for cultivation

Product	Agricultural potential (tons/ha/annum)
Maize (Dry land)	5.2 – 6.0
Soy beans (Dry land)	1.8 - 2.0



Areas and Percentages of Current Land Uses

Current Land Use	Unit Count	Area (ha)	Area (%)
Maize	3	370.47	78.75
Grazing	2	53.49	11.37
Trees	1	40.11	8.53
Game farm	1	6.34	1.35
Total	**7**	**470.41**	**100**

Figure 20: Pre-mining land use at the Navigation West Section

3.5 Ecology (Vegetation and Animal Life)

3.5.1 Vegetation

As part of the EIA for the Navigation West Section, an ecological survey was undertaken by a suitably qualified person entitled Ecological Evaluation of the Umlalazi South Block Extension, Landau Colliery: Navigation Section. 2014. Pachnoda Consulting.

The study site forms part of the Grassland Biome and more specifically that of the Mesic Grassland Bioregion as defined by Mucina & Rutherford (2006). It comprehends two ecological types known as the (1) Rand Highveld Grassland and (2) Eastern Highveld Grassland (Mucina & Rutherford, 2006).Indicated in Figure 21.

The former type historically occurred on the western extremity of the study site but was subsequently transformed by agricultural activities. When untransformed, Rand Highveld Grassland is typical of the extensive sloping plains and rocky ridges that extent from the Pretoria area to Witbank. It is rich in plant taxa (especially when in pristine condition) and constitutes a sour grassland dominated by graminoid genera such as *Themeda, Heteropogon, Eragrostis* and *Elionurus*. The forb composition is equally diverse and well represented by members of the Asteraceae family, while woody communities formed a typical, albeit sparse, component of the ridges. This grassland type is poorly conserved and good examples are preserved, for example, in the Bronkhorstspruit Dam Nature Reserve. Large parts of this ecological type have been transformed by agriculture, afforestation and urbanisation, thereby placing it in the threatened category (Endangered).

Approximately 20 % of the study site consists of Eastern Highveld Grassland (Mucina & Rutherford, 2006). This grassland is restricted to moderately undulating plains and includes a number of low hills and pan depressions. The vegetation is short and dominated by graminoid species of the genera *Themeda, Aristida, Agrostis* and *Eragrostis*. Nearly 44 % of this grassland type is already transformed by cultivation, coal mines and the creation of artificial impoundments. Although the latter has contributed to the regional waterfowl diversity, severe transformation has led to the demise of the local biodiversity that historically occupied the area.

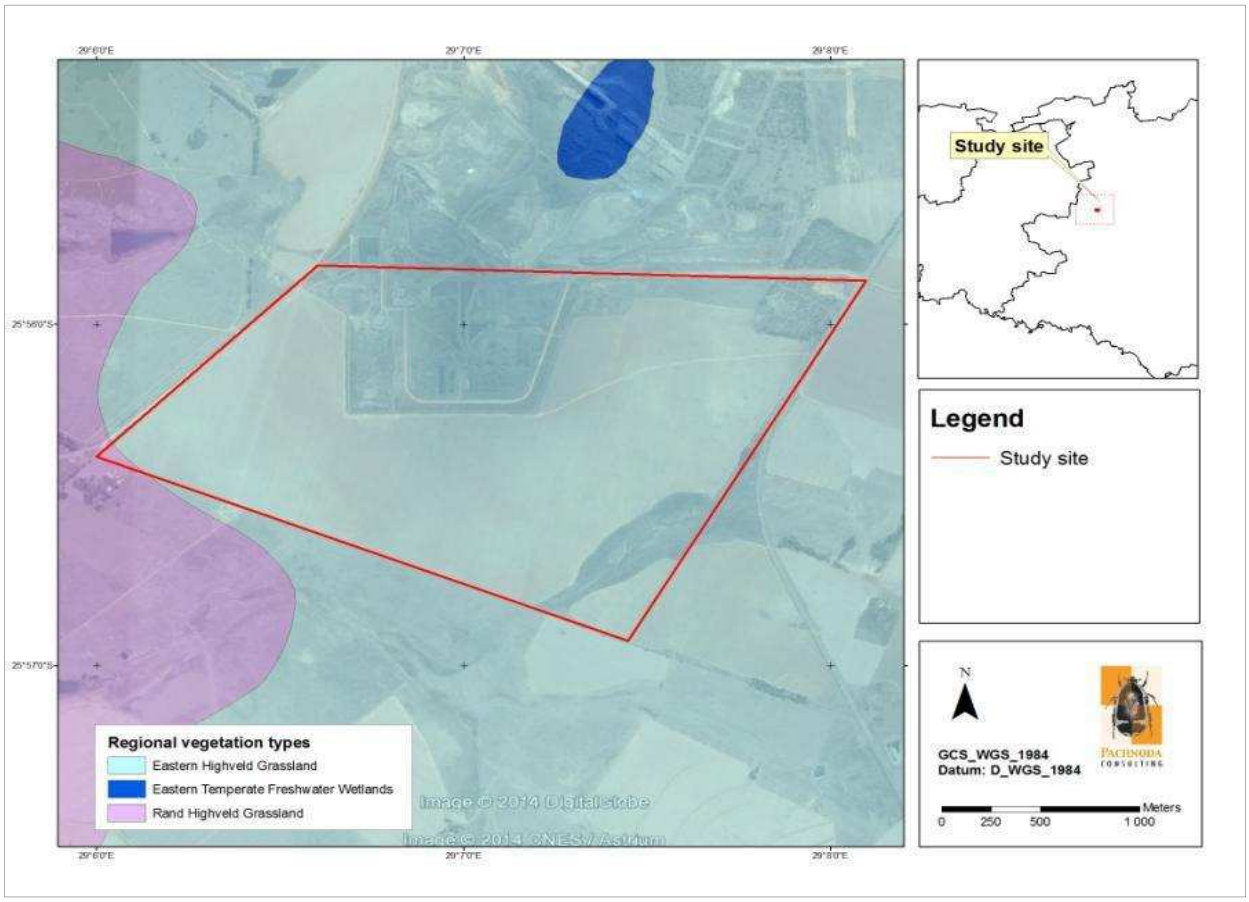


Figure 21: The spatial position of the study area in context of the regional vegetation types as defined by Mucina & Rutherford (2006).

According to the Mpumalanga Biodiversity Sector Plan (2013), it is evident that a large section of the site is composed of "heavily modified habitat" (at CBA Level 2) with only a small section restricted to a natural tributary on the south-eastern section as "other natural areas"1 habitat (Figure 22). However, it is worth mentioning that the study site is bordered on the western boundary by "irreplaceable" habitat which comprises of natural grassland. Therefore, most of the site, according to the Mpumalanga Biodiversity Sector Plan (2013) is regarded to be unimportant from a conservation perspective, based on the perceived occurrence of agricultural land. These categories (terminology) was recommended by the Government Gazette (No. 32006, 16 March 2009) for use during Bioregional Plans (which require the identification of Critical Biodiversity Areas and Ecological Support Areas). In addition, the proposed study site coincides with two threatened ecosystems (Rand Highveld and Eastern Highveld Grassland (of April 2009)) of which the only remaining patch persists along a seasonal tributary on the south-eastern section of the study site (Figure 23).

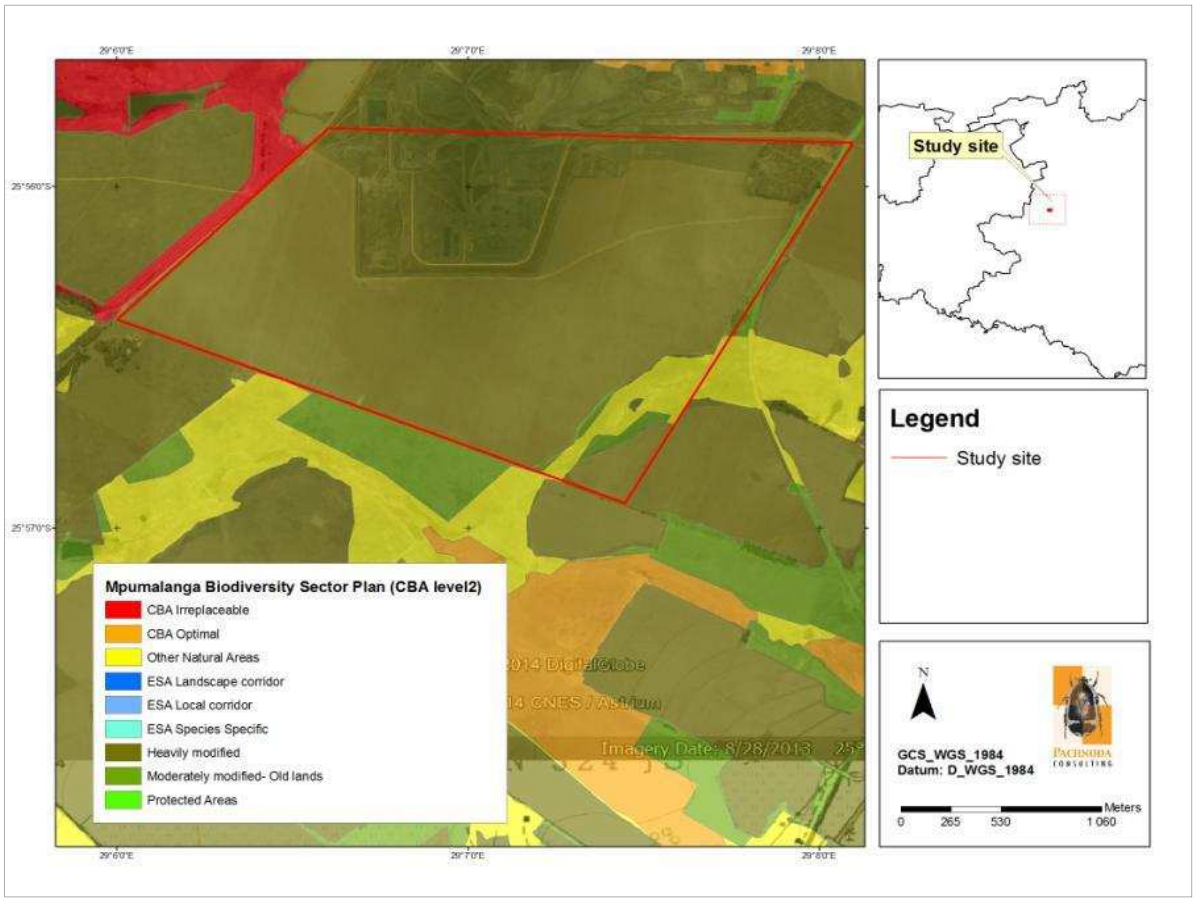


Figure 22: A map illustrating the local conservation categories based on the Mpumalanga Biodiversity Sector Plan (2013).

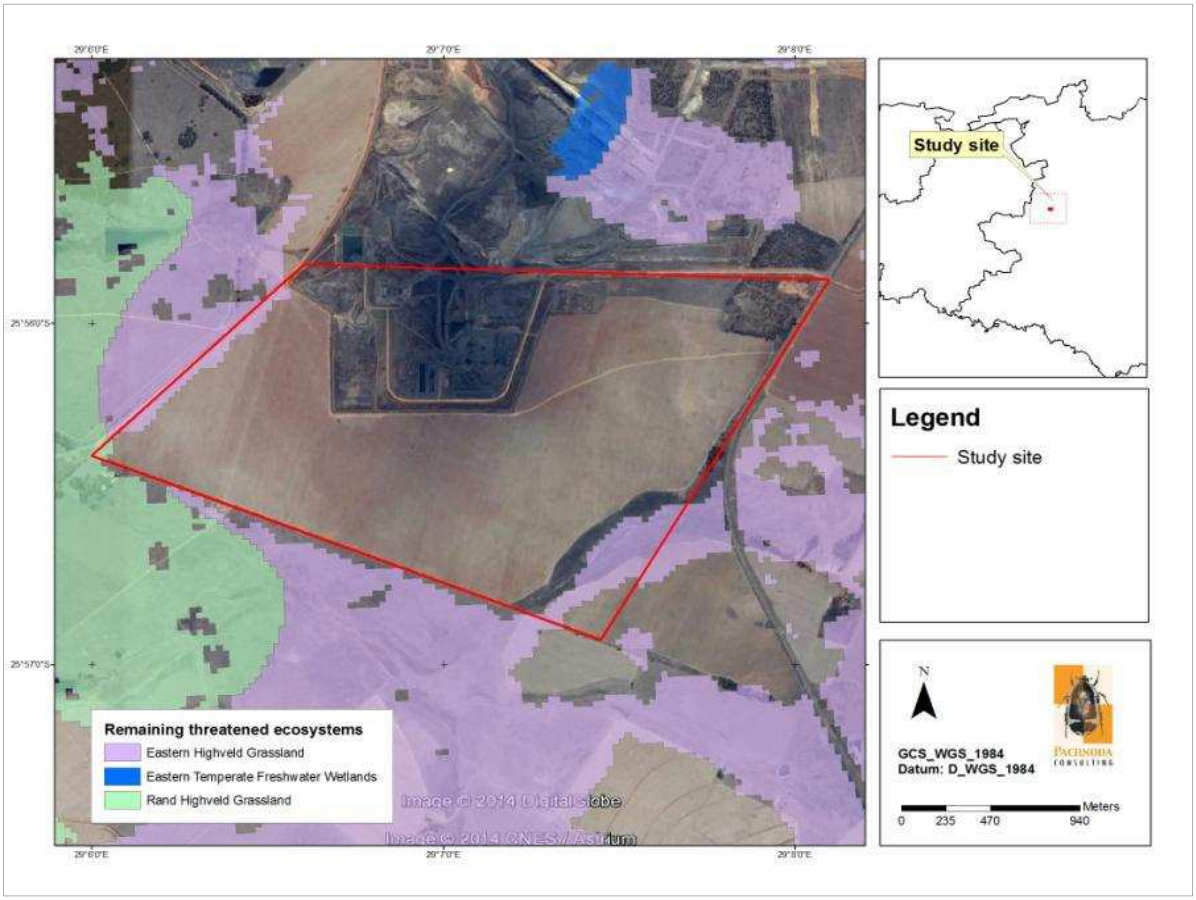


Figure 23: A map illustrating the remaining threatened ecosystems on the study site.

On a regional scale, the study area is located within the Eastern Highveld Grassland (Figure 24); this vegetation unit is classified as being endangered at a national level. The vegetation is described as follows (Rutherford & Mucina, 2006):"Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis Africana, Diospyros lycioides subsp. lycioides, Parinari capensis, Protea caffra, P welwitschii* and *Searsia magalismontanum*). No biogeographically Important Taxa or Endemic taxa is listed for this unit. Only a very small fraction conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported but *Acacia mearnsii* can become dominant in disturbed areas. Erosion is very low."

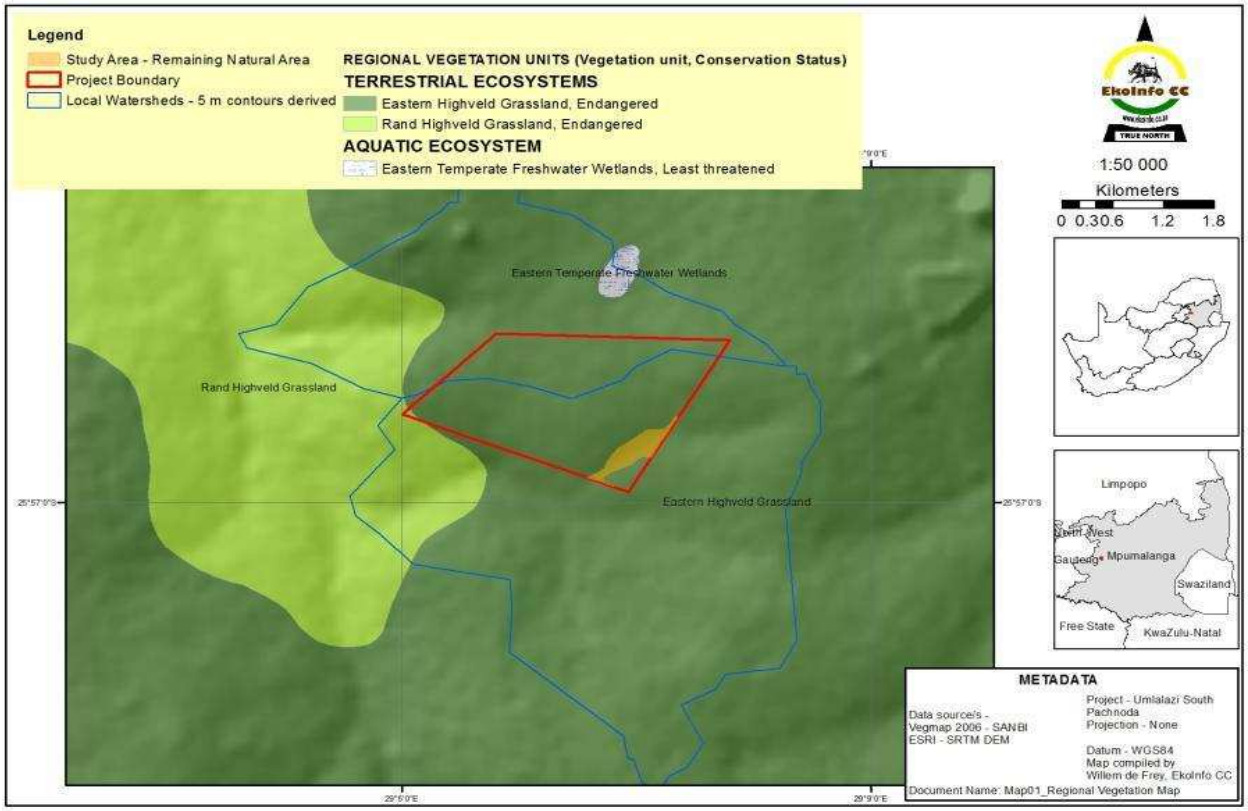


Figure 24: Regional vegetation unit in which the study area is located.

On a local scale, three vegetation communities had been identified during the vegetation surveys completed in March 2014 (Figure 25). Community one contains two variations which cannot be mapped with the current information available. The three communities are:

1. Tall red grass dominated grassland on temporary/ seasonal wet, fine textured soils with water table below 1 m
2. Very tall cotton wool dominated grassland on seasonal/ temporary wet, coarse textured soils with water table from 0.5 m
3. Very tall swamp cut grass dominated grassland on seasonal/ permanent wet, fine textured soils with water table above 0.5 m

It is evident from the TWINSPAN analysis and Canonical Correspondence Analysis (CCA) executed on the floristic and environmental data using a Multivariate Statistical Package (Kovach, 2007) that:

1. Community three is well correlated with open water or over saturated soils or inundation.
2. Community two and three are correlated with soil depth, with community three once again correlated with shallower water tables, while community one is correlated with soils where the water table is not close to the surface.
3. Community two and three are correlated with tall, dense vegetation, while community one is associated with less tall, open vegetation.
4. Community three is negatively correlated with soil depth, because of the presence of the open water, while soil depth has an influence on both community one and two.

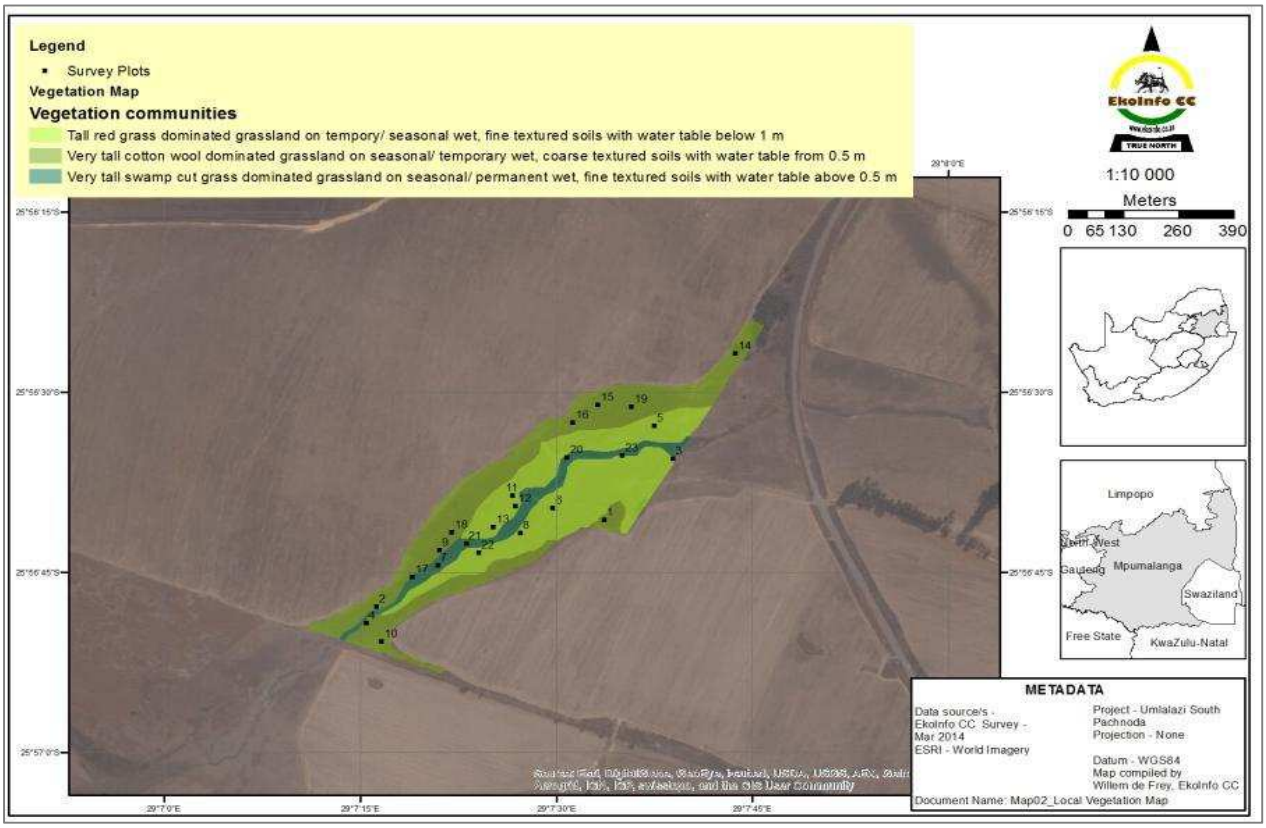


Figure 25: Local vegetation map based on a vegetation survey completed during March 2014.

On regional scale, the study area is located within the topocadastral grid 2529CC, in which according to the PRECIS database, a minimum of 250 species had been recorded, of which one is a Red Data listed threatened species, namely the endangered *Frithia humilis. Frithia humilis* is a very small succulent from the Mesembryanthemaceae family, which is found in association with sandstone outcrops. The study area is not suitable habitat for this species, and the site visit confirmed it, as no outcrops were observed.

During the vegetation survey, a minimum of 105 species were recorded, of which 59% (62 species) was forbs, 39% (41 species) was grasses and 2% (2 species) was woody species. They represent 29 plant families of which the following four families contains more than 60% of the species recorded: Poaceae, Asteraceae, Cyperaceae, Fabaceae. The 29 plant families represent 84 genera, of which the following seven genera contains 20% of the species recorded: *Eragrostis, Cyperus, Helichrysum, Senecio, Aristida, Berkheya, Bidens*. Therefore if rehabilitation is required it is evident that as a minimum species from these genera and families need to be re-introduced.

No nationally protected species were recorded in terms of the National Environmental Biodiversity Act (No 10 of 2004). The following provincially protected species in terms of the Mpumalanga Nature Conservation Act (No 10 of 1998) were recorded: *Eucomis autumnalis*, *Eulophia* species, *Gladiolus crassifolius*, *Habenaria filicornis*, *Satyrium* species. It should be noted that all the species in the genera

Eucomis and *Gladiolus*, and all of the species in the family Orchidaceae are protected and therefore a permit is required for the picking, sale and transport of these species.

The following species with medicinal properties (Van Wyk *et al*., 2000) were recorded: *Centella asiatica, Datura stramonium, Eucomis autumnalis, Hypoxis hemerocallidea, Scabiosa columbaria, Typha capensis, Vernonia oligocephala*.

The following alien invasive species in terms of the Conservation of Agricultural Resources Act (No 43 of 1983): *Acacia mearnsii, Cirsium vulgare, Datura stramonium*.

A single species which are utilised specifically by birds was recorded within the study area, associated with community three, namely *Typha capensis*.

3.5.2 Animal Life

3.5.2.1 Mammals

Of the approximate 164 mammal species recorded from Mpumalanga (according to Emery *et al*., 2002), 43 species could occur on the study site (Appendix 2 in the Biodiversity study) of which 16 (37%) were confirmed during the respective site visit (Table 15 and Figure 14 of the Biodiversity study). Among those confirmed were two antelope species, five rodents, two canines (jackals), two herpestids (mongoose), one viverrid (genet), one mustelid, one suid (pigs), one felid (cat) and one leporid (hares).

The mammal richness is high considering the small area of natural grassland that persists on the study site. In addition, the presence of wetland-features and drainage lines has contributed towards the observed and expected richness values. More importantly, the drainage line on the south-eastern section of the study site (the only area of natural habitat on the study site) function as an important dispersal corridor for mammal taxa, thereby facilitating gene flow and resource utilisation with populations to the north-east and south-west (although Bailey Avenue is likely to impact on dispersal ability of some species, e.g. high mortality due to road kills).

3.5.2.2 Amphibians

Of the 51 amphibian species occurring in Mpumalanga (Minter *et al.,* 2004), 11 taxa could be present on the study site. However, one of these (*c*. *Amietophrynus rangeri*) is peripheral to the study area and is believed to be sporadic in occurrence. Four species were confirmed, which include widespread taxa.

The observed frog species breed mostly in temporary water bodies and inundated grassland, and it are these areas that should be protected if emphasis is placed on the conservation of amphibian fauna on the study site. However, these habitat features are localised on the study site and restricted to a seasonal tributary of the Grootspruit - Saalklapspruit system. It represents the only habitat which provides suitable breeding conditions for most of these species.

Currently, none of the frog species under consideration are threatened or near-threatened (Minter *et al.*, 2004).

3.5.2.3 Reptiles

Of the 154 reptile species recorded by Jacobsen (1989) in Mpumalanga, 26 taxa (comprising of 15 snakes, one chameleon and 9 lizards and one gecko) have been recorded from the QDG cell 2529CC which corresponds to the study site (Bates *et al*., 2014). Of the 26 species known to occur in the region, only three were confirmed while six are probably absent.

According to the habitat diversity present, the study region is likely to support between 25-37 reptile species of which three are endemic (*c*. *Duberria lutrix lutrix, Lamprophis aurora* and *Chamaesaura aenea*) to South Africa (Bates *et al*., 2014). The latter species is regarded to be rare or absent on the study site due the absence of suitable habitat (although the grassland patches south of the study site appears to be suitable).

According to a recent conservation assessment (see Bates *et al*., 2014), two near-threatened *Chamaesaura* lizard species are known to occur in the study region . Both *C. aenea* and *C. macrolepis* are inherently rare and seldom encountered [*c*. Whittington-Jones *et al.* (2008) only recovered two specimens of *C. aenea* during intensive surveys in Gauteng between the period 2000-2008]. These lizards occur within fairly pristine grasslands (and are invariably associated with the upland primary grasslands) and does not appear to tolerate any significant disturbances or habitat alterations. In general, the populations of these species are scattered and appear to have experienced population declines over the last 18 years due to fragmentation, overgrazing of its primary grassland habitat and urbanization. They are also vulnerable towards veld fires and rely heavily on the presence of rocky outcrops for protection against veld fires.

Based on their inherent "rareness" and their association with rocky primary grassland, these species are considered to be highly irregular or absent on the study site.

3.5.2.3 Avifauna

According to the South African Bird Atlas Project (SABAP1: Harrison *et al*., 1997), 260 bird species have been recorded from the study region based on the quarter degree square that is sympatric to the study site (2529CC Witbank). This equates to 27 % of the approximate 963 species listed for the southern African subregion. However, the SABAP2 database suggests that the study area is more likely to sustain on 93 species (www.sabap2.adu.org.za). On a national scale, the species richness on the study site is considered moderate. Nevertheless, 80 species were confirmed during the site visit (Appendix 4 in the Biodiversity Study), which represents 86 % of the current SABAP2 total. The richness values (moderate richness) are correlated to the small surface of natural available in a matrix of homogenous (monoculture) manmade habitat.

An analysis of data collected showed that the study site is dominated by members of the Ploceidae (weavers) with a high membership of Euplectine widowbirds and Columbiform (dove) taxa. Examination of the dominant taxa is strongly correlated with SABAP2 taxa with high reporting values. 50 % of those taxa with high SABAB2 reporting values were also dominant on the study site. However, these species are widespread and abundant on the Mpumalanga highveld.

Based on the dominant habitat types prevalent on the study site, three discrete avifaunal communities are relevant:

1. *A community confined natural moist grassland and Typha/Phragmites reedbeds along a natural tributary*: Typical members include Euplectine taxa (c. Southern Red Bishop *Euplectes orix,* White-winged Widowbird *E. albonotatus* and Fan-tailed Widowbird *E. axillaris*) and Levaillant's Cisticola (*Cisticola tinniens*). Indicator taxa (taxa that are restricted to a particular habitat type) include Corncrake (*Crex crex*), Yellow-billed Duck (*Anas undulata*), Cloud Cisticola (*Cisticola textrix*) and African Quailfinch (*Ortygospiza atricollis*);
2. *A transient community confined to the agricultural land*: Typical species include White-winged Widowbird (*Euplectes albonotatus*) and Laughing Dove (*Streptopelia senegalensis*). Indicator species include the African Reed Warbler (*Acrocephalus baeticatus*).
3. *A community confined to patches of Acacia mearnsii groves*: Typical species include Cape Sparrow (*Passer melanurus*), Cape Turtle Dove (*Streptopelia capicola*) and Southern Masked Weaver (*Ploceus velatus*). Indicator taxa include Marsh Warbler (*Acrocephalus palustris*), Yellow-fronted Canary (*Serinus mozambicus*), Streaky-headed Seed-eater (*Serinus gularis*) and Black-chested Prinia (*Prinia flavicans*).

Table 18 of the Ecological Evaluation provides an overview of bird species of “special conservation concern” recorded in the study area, as well as those previously recorded in the area based on their known distribution range (Harrison *et al*., 1997) and the presence of suitable habitat. According to Table 18, a total of 13 species are sympatric to the area, of which two are likely to be resident (African Grass-owl *Tyto capensis*) or regular summer visitors (Abdim's Stork *Ciconia abdimii*).

3.5.2.4 Diurnal Butterflies

Six diurnal butterfly species is known to occur on the QDG 2529CC that is sympatric to the study site. However, this list is incomplete and an additional 10 species were confirmed during the site visit. The marsh sylph (*Metisella meninx*) is regarded as a rare habitat specialist to the region (Mecenero *et al*., 2013).

3.5.3 Ecological sensitivity of the study area

3.5.3.1 Areas of high ecological sensitivity

The following habitat units and floristic communities are considered to be of high ecological sensitivity (Figure 26):

- *Themeda triandra - Berkheya radula* tall grassland on temporary/ seasonal wet, clayey soils with water table below 1 000 mm;
- *Miscanthus junceus - Imperata cylindrica* very tall grassland on seasonal/ temporary wet, loamy soils with water table between 500 mm and 1 000 mm*;* and
- *Leersia hexandra - Setaria sphacelata* very tall grassland on seasonal/ permanently wet, clayey soils with water table below 500 mm

These units are of high sensitivity based on the following arguments:

- These grassland units consist of plant species consisting a number of facultative and obligate wetland species. In addition, they provide habitat for protected plant taxa, in particular members of the Orchidaceae (genera *Habenaria* and *Eulophia*);
- These units provide suitable roosting and breeding habitat for the rare habitat specific *Metisella meninx*, the regionally near-threatened Serval (*Leptailurus serval*) and the regionally vulnerable African Grass-owl (*Tyto capensis*); and
- These units show a high ecological connectivity with adjacent natural grassland. They function as dispersal corridors for animal taxa, thereby linking populations to the east and south of the study site;

3.5.3.2 Areas of low ecological sensitivity

The following habitat types and floristic assemblages are considered to be of low ecological sensitivity (Figure 26):

- Agricultural land

These units are of low sensitivity based on the following arguments:

- These areas are not considered to be pristine and occurred on areas where severe disturbances took place (e.g. tilling);
- Many of these areas are composed of monocultures and provide habitat for invader taxa, thus contributing little towards local biodiversity; and
- The vegetation assemblages are at an advanced state of degradation and will seldom (if ever) revert back to that of a late-successional unit that typifies the regional vegetation types.

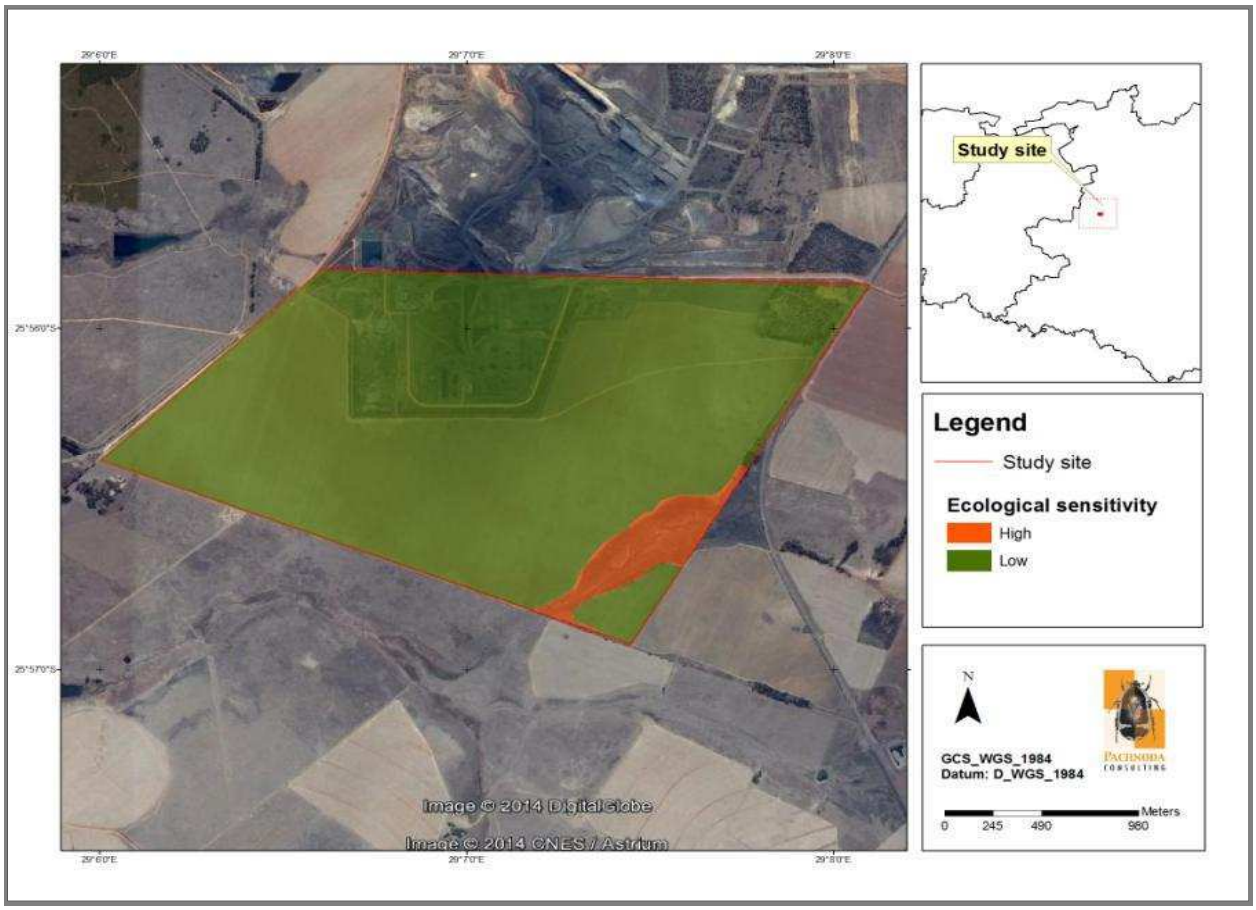


Figure 26: A sensitivity map based on the structure and floristic composition of the study site.

3.6 Surface Water

Stewart and Scott Inc. developed a hydrogeological study during September 1992 entitled "Stewart & Scott Incorporated (September 1992): (a) Modelling the Surface Water Balance of Kromdraai Opencast Mining Area, and (b) Modelling the Surface Water Balance of Navigation Plant and Discard Area". The study covered the pre-mining, mining and Post-closure periods.

The document entitled "Wates, Meiring & Barnard (October 1991): Review of Proposed Water Management and Water Balances" is a review of the water management and water balances.

3.6.1 Surface water management area

The catchment boundaries and relevant streams at the Navigation Section are shown on Figure 4.

As mentioned previously, the Navigation Section, which forms part of Landau Colliery, straddle the Wilge (B2) and Olifants (B1) Catchment areas and falls in the upper reaches of tributaries to these watercourses (refer to Figure 5 and Plan 5 in Appendix A).

The Navigation Sections falls into both the B20G and B11K catchments, while a southern portion of the Navigation Section mining area falls in the B11G catchment area.

Approximately 30 % of the Navigation West Section land use area is located within the Brugspruit catchment area, while the remaining 70 % is situated within the Grootspruit catchment area.

The Loskop Dam, Witbank Dam, Klipspruit, Wilge River, Brugspruit, Saalklapspruit, and the Olifants River form the bulk of the water supply and river network of this region. The receiving water body is the Loskop Dam. The Schoongezichtspruit and Highveld Steel Spruit drain the northern part of the Navigation Section towards the Brugspruit.

3.6.2 Mean Annual Runoff (MAR)

The MAR for the Navigation catchment is 0.73 x 10^6 m^3, which equates to 45 mm over the 16.12 km^2 catchment.

As mentioned previously, the Navigation West Section land use area forms part of the B11K and B20G quaternary sub-catchments with a MAP - MAR response behaviours represented respectively as response No. 7 and 8. This implies a MAR of ± 45 mm for pristine conditions.

The catchments under consideration are typical of the Eastern Highveld with its grasslands on the interior plateau. However the closer surrounding area has been developed for cultivated lands (maize crops). The estimated MAR are tabulated in Table 24.

Table 24: Mean annual runoff (MAR) for the relevant catchment areas

Catchment	Catchment area (km^2)	MAR (10^6 m^3)	MAR % of total
Clewer Dam Stream	8.8	0.39	1.7
South Stream (S1, S2 & S3)	14.8	0.65	2.8
Grootspruit	89.9	3.96	17.2
Brugspruit N1	17.1	0.79	4.5
B11K: Quaternary	**378**	**17.4**	**100.0**
B20G: Quaternary	**522**	**23.0**	**100.0**

The total Clewer Dam Stream and the South Stream contributes approximately 26 % run-off to the Grootspruit and 4.5 % to the B20G quaternary catchment. The area just downstream of the site associated with the Navigation West Section (south of KwaMthunzi Vilakazi) contributes ± 17 % to the Brugspruit N1 catchment that in turn contributes 4.6.2 % to the B11K quaternary catchment.

The collective flows of all sub-catchments are vital and the runoff from the Navigation West Section site, apart from the small volumes, can also be seen as substantial.

3.6.3 Mean Monthly Evaporation

The Landau Colliery falls within the 4A evaporation zone as defined by the WRC (1990). The Landau Colliery is located within an area with a MAE of approximately 1700mm (S-pan). Table 25 below presents the monthly evaporation for the 4A Evaporation Zone.

Table 25: Mean monthly evaporation for Landau Colliery

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
S Pan %	10.8	10.2	11.2	11.0	9.2	9.1	7.0	5.9	4.8	5.2	6.9	8.9	**100.2**
S Pan (mm)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Lake evap (mm)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

The mean annual lake evaporation is 1430 mm with monthly extreme values of 158 mm (maximum) in December and 69 mm (minimum) in June. These figures are for clean water and should be verified and reduced accordingly for water of high salinity.

The mean monthly evaporation for the Witbank Dam (1963-1998) is shown in Table 26 below.

Table 26: Mean monthly evaporation for Witbank Dam

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
S Pan (mm)	170	165	174	178	144	136	100	81	68	74	100	136

3.6.4 Average dry weather flow

As part of the EIA process for the Navigation West Section, the dry weather flow was calculated as the average expected flow under pristine conditions based on the three driest months of a hydrological year. These months are July to September for the Navigation West Section site during which period 9 % of MAR occurs.

The Navigation West Section site is within Hydro Zone 1-J according to the WRC Report No.298/6.1/94 with an average MAR of 44 mm. For the Clewer Dam Stream an average dry weather flow of 12000 m^3/per month or 13.4 l/s. The total average dry weather flow for the South Stream is 19500 m^3/per month or ± 7.3 l/s. (The flow rates were derived from the Deficient flow-duration-frequency curves as published in Volume I of the WRC Report No.298/6.1/94).

3.6.5 Flood peaks and volumes

None of the mining activities at Navigation Section, with the exception of the Navigation West Section, are located within the 1:100 year flood lines of the watercourses, and as such flood peaks and volumes are not readily available.

The catchments relative to Navigation West Section (Clewer Dam Stream of 8.8 km^2 and the South Stream S1 of 2.6 km^2) may, according to hydrology standards, be classified as a small-sized catchment. As indicated in the above mentioned report, flood peaks were calculated by employing the SDF method recently developed by WJR Alexander. The method based on the Rational method, was cross-checked by converting the RMF to the applicable peak flows for the 50 and 100 year occurrence periods. The values were in general agreement. The catchment runoff coefficients were in the order of 0.45 and 0.5 for the 1 in 50 and 1 in 100 year floods respectively. The time of concentration, calculated using the Bransby-Williams formula for the individual streams, are 1.2 hours for the Clewer Dam Stream and 0.5 hours for the S1 stream. The area reduction factors (it varied from 1.01 to 1.04) were used to adjust the point precipitation depth deriving at the net effective rainfall intensities for each sub-catchment.

Employing the Francou-Rodier method of flood peak classification as described in the Technical Report TR 137 of the Directorate of Hydrology of the DWA, the RMF flood peaks were derived accordingly. The sub-catchments and receiving water bodies fall within an area that is classified as a Francou-Rodier "K" 4.6 Region. The flood peaks and related volumes for the 50-year and 100-year return periods as well as the RMF are tabulated in Table 27.

Table 27: Estimated flood peaks and volumes

Catchment	Return period					
	50 year		100 year		RMF	
	Flood peak (m^3/s)	Volume (Ml)	Flood peak (m^3/s)	Volume (Ml)	Flood peak (m^3/s)	Volume (Ml)
Clewer dam stream exit	82	540	105	688	236	1 529
Clewer dam stream downstream of North Pit	47	304	61	395	156	1 010
S1 adjacent to South Pit	43	119	55	151	145	399

The volumes were estimated by integrating the area below the graph of the hydrograph. A simplified hydrograph was assumed based on the time to peak (Tc) and total runoff time of 3Tc (typical assumption for the Rational method).

The 100-year flood lines for the Clewer Dam Stream and the South S1 Stream, which are the streams adjacent or in close proximity of the Navigation West Section mining area, were determined. Typical flow parameters were adopted after inspection of the site. A few cross sections were extracted from a 1 m

contour map and the dimensions of each section were used to calculate the normal flow depths at each chainage point. The impact of natural control points was examined and it was found that the natural flow depths will be sufficient to use as water surface.

The Clewer Stream flow originates just downstream of the Navigation West Section; North Block where a wetland area exists. The flow velocity in this North Block area, due to the wide valley bed (± 100 m+), is low and depth under extreme floods will be in the order of 0.4 – 0.5 m up to where it coincides with the tail water surface of the first dam.

Stream S1 is a typical hill slope drainage line where it starts with a steep gradient and flattens out towards the discharge point. Flow is close to critical (Froude number > 1) upstream of the Navigation West; South Block and as the valley floor flattens and widens the flow converts into a sub-critical flow (Froude number < 1) regime. The calculated flow depths vary during extreme flood peaks between 1.6 m and 1.7 m.

In selecting cross sections for calculating water surface profiles, the following standard criteria were met:

- The ratio of wetted perimeters of two consecutive sections must not exceed 1.7.
- The ratio of flow areas of two consecutive sections must not exceed 1.4.
- Dead water areas (i.e. water trapped inside bays), must be excluded from the effective flow area.
- The effect of energy losses due to converging and diverging of flow must be included.
- The expected flow path under extreme conditions must be determined.

Conservative roughness coefficients were used to also allow for secondary losses and poor stream alignment in the calculations (the Manning (n) and Chezy (k) (mm) parameters were taken as 0.05 and 350 mm respectively). The flow velocities are 1.5 m/s for the upstream part of the Clewer dams drainage line and varies between 1.2 to 2.2 m/s along the S1 Stream.

The flood lines are delineated in Figure 2 of Supporting Information Report No. F3.1 (available from the mine) indicating that the area to be disturbed but the opencast mining activities, according to the current mine plan is close but outside the flood zone. The 100 m boundary measured from the centre of the stream is also displayed. The South Block mining activities according to the current mine plan will be located within this 100 m boundary.

3.6.7 Drainage densities

The drainage density for the area of surface disturbance of the Navigation West Section: North Block is approximately 0.6 km/km^2. The unnamed tributary of the Grootspruit (to the south-east of the Navigation West Section: South Block) is within a local catch area with a drainage density of 0.7 km/km^2.

3.6.8 Surface water quality

A comprehensive surface water monitoring program is undertaken at Landau Colliery. This entails monthly sampling by the operation and quarterly catchment-wide river and stream sampling by a third party, Aquatico Scientific.

The surface water monitoring implemented at Landau Colliery is subdivided into the monitoring of surface water flow and water bodies within the mine boundary area and river monitoring which is essentially the monitoring of the surface receiving water resources.

3.6.8.1 Surface water monitoring results

Surface water quality monitoring locations and results are contained in the DWA Landau Quarterly Report which is attached in Appendix E1.

Water samples are taken from seven PCDs on a monthly basis and samples sent for laboratory analysis. Compliance is measured against the limits set on page 21 of 29 of the Navigation IWUL (04/B20G/ABCFGIJ/1498). Results discussed below are of those samples not compliant to the limits set in the licence.

Water samples are collected at these dams, the Navigation West/Umlalazi Pollution Control Dam, Schoongezicht Pollution Control Dam, Navigation Acid Water Dam, Navigation Pollution Control Dam, Navigation Raw Water Dam, Toe Seep Emergency Dam and the Toe Dam.

The Navigation West PCD is used to collect contaminated runoff from the Navigation West Section Plant and Workshop areas, for re-use as process make-up water. This dam is used to temporarily store in-pit water prior to the re-use thereof. The Schoongezicht PCD mainly contains decant from old Schoongezicht underground workings, for treatment at the Navigation Liming Plants and re-use.

The Navigation Acid Water Dam is used as a balancing dam prior to treatment in the Navigation Liming Plant. The Navigation PCD is used to contain contaminated runoff water, overflow from the penstock return water system and Toe Dam as well as water from Navigation West Section PCD for treatment at the Navigation Neutralisation Plant and re-use.

The Toe Seep Emergency Dam is utilised to capture toe seep water emanating from the Blaauwkrans Co-Disposal Facility, the Toe Dam is used to contain seepage and polluted runoff from Blaauwkrans Co-disposal facility. Water from both dams is pumped for treatment at the Navigation Liming Plants before being re-used as make-up water at the Navigation Beneficiation Plant.

The water monitoring points representing these dams are:

- WP068 – Schoongezicht PCD

- WP069 – Navigation Acid Water Dam
- WP070 – Navigation Raw Water Dam
- WP072 – Navigation PCD
- WP078 – Toe Dam
- WP203 – Toe Seep Emergency Water Dam
- WP409 – Navigation West/Umlalazi PCD

Figure 27 below shows the location of the surface water monitoring points at Landau Colliery.

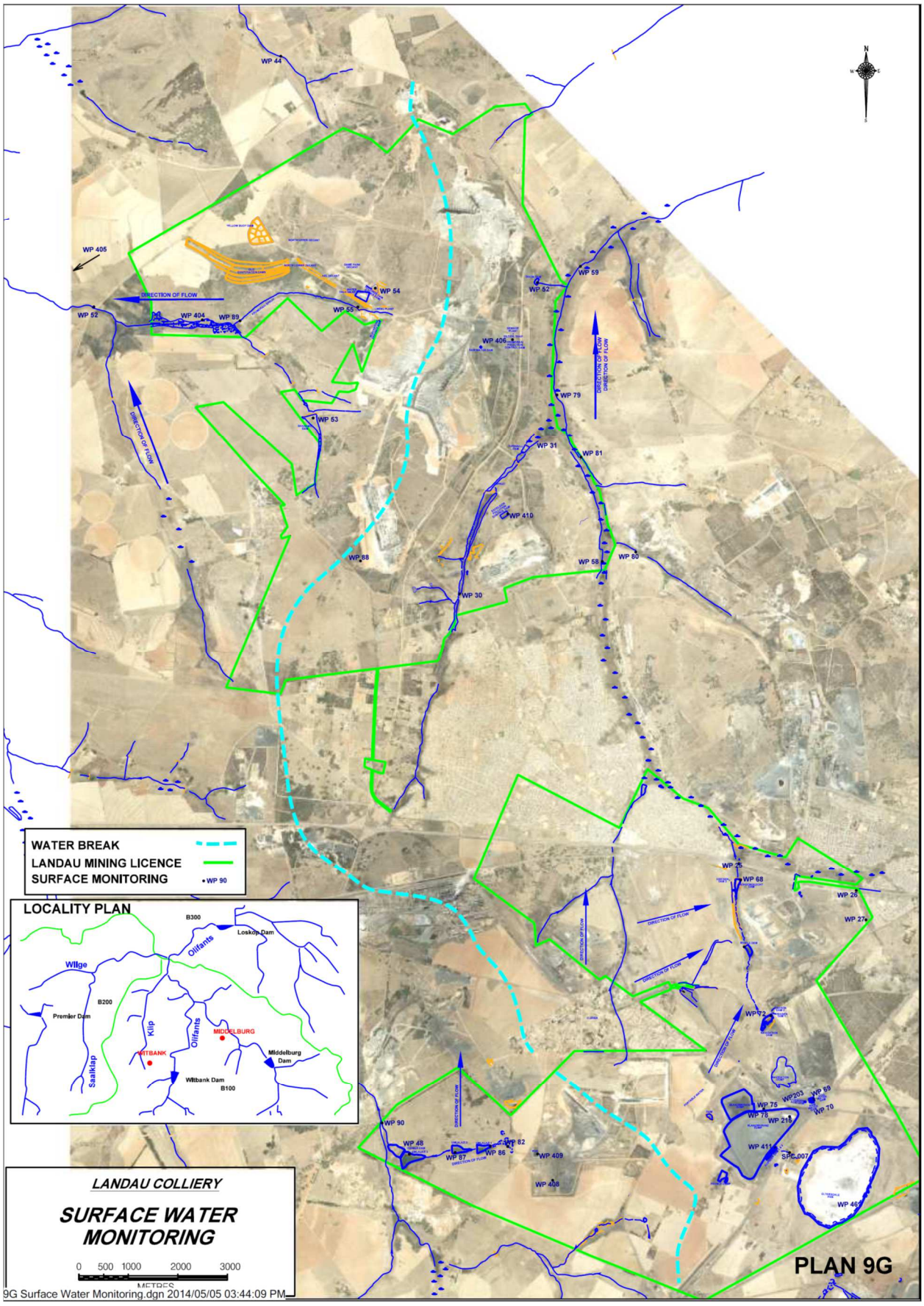


Figure 27: Surface water monitoring points at Landau Colliery

3.6.8.2 Quarterly Water Quality Assessment for SACE (river monitoring)

External Quarterly Upper Olifants River Basin Water Quality Assessments (river monitoring) have been conducted from March 1996 till 2013.

The emphasis of the above-mentioned investigation focuses on the water quality profiles along the Brug-, Klip- and Saalboomspruit, Olifants River, Wilge River and Kromdraaispruit.

The main objective of the river monitoring programme is to conduct sufficient monitoring in order to understand the effect that mining may have on the water resources in this important sub-catchment of the Olifants River. The water quality data is further also used to support impacts assessments and to calibrate simulations models if and when required.

It is endeavoured through the monitoring programme to sample each stream at a locality upstream and downstream from another stream's confluence where proper mixing has already occurred. Role players can thus understand the impact of each pollution source in a manner that facilitates water management decisions.

The latest External Quarterly Upper Olifants River Basin Water Quality Assessment is included as a separate submission as part of the DWA Landau Quarterly Water Quality Report.

Table 28 indicates the selected monitoring localities that form part of the above-mentioned Water Quality Assessment for SACE.

Table 28: Surface water monitoring localities that form part of the quarterly Water Quality Assessment for SACE

Monitoring locality	Description
MP01	Tributary of the Brugspruit, upstream of Townshipspruit confluence
MP02	Schoongezichtspruit at N4, downstream of Landau Colliery: Schoongezicht Section
MP03	Brugspruit, upstream of Ferrobank sewage works discharge
MP04	Brugspruit, downstream of Trans Alloys at N4
MP05	Klipspruit, downstream of Highveld Steel and before the Kromdraai Colliery's contribution
MP06	Klipspruit at the Verena road crossing, downstream of Brugspruit confluence
MP07	Brugspruit, upstream from DWA Treatment Plant
MP08	Blesbokspruit before the confluence with Klipspruit
MP09	Kromdraaispruit before the confluence with Saalboomspruit
MP10	Saalboomspruit, upstream of Kromdraaispruit confluence
MP11	Saalboomspruit, downstream of Kromdraaispruit confluence

Monitoring locality	Description
MP13	Suikerboschspruit, downstream of Kromdraai Colliery
MP14	Klipspruit at the Zaaihoek weir, downstream of the Blesbokspruit confluence
MP15	Wilge River before the confluence with the Olifants River
MP16	Olifants River, downstream of Loskop Dam
MP17	Loskop Dam at the dam wall
MP19	Wilge River, upstream of Saalboom- and Kromdraaispruit confluence
MP20	Olifants River, downstream of the Wilge River (and Klipspruit) confluence
MP21	Olifants River, upstream of Klipspruit confluence
MP22	Olifants River, downstream of Klipspruit confluence
MP26	Brugspruit, downstream of Ferrobank sewage works discharge
MP27	Klein Olifants River before the confluence with the Olifants River
MP28	Olifants River, upstream of Klein Olifants confluence
MP29	Brugspruit, downstream of Schoongezichtspruit confluence
MP32	Brugspruit, downstream of DWA Treatment Plant
MP33	Townshipspruit at the N4 highway, downstream of South Witbank Colliery
MP34	Klipspruit, downstream of the contribution from Landau Colliery: Kromdraai Section
MP35	Brugspruit, downstream of the Schoongezichtspruit and Trans Alloys contributions

3.6.8.3 Resource class and river health

In South Africa, a river health classification scheme is used to standardise the output of different river systems. The document titled “Resource Directed Measures for Protection of Water Resources: River Ecosystems Version 1.0.24”, dated September 1999, compiled by the DWA, provides the indexes of Attainable Ecological Management Classes (AEMC) as shown in Table 29 below. Each index is calibrated so that its results can be expressed in terms of ecological and management perspectives.

Table 29: Resources classes as set out by the DWA

River Health Class	Ecological perspective	Management perspective
Natural / Excellent (Class A)	No or negligible modification of in-stream and riparian habitats and biota.	Protected rivers; relatively untouched by human hands; no discharges or impoundments allowed.
Good (Class B)	Ecosystems essentially in good state; biodiversity largely intact.	Some human-related disturbance but mostly of low impact potential.
Fair (Class C)	A few sensitive species may be lost; lower abundances of biological populations are likely to occur, or sometimes, higher abundances of tolerant or opportunistic species occur.	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation.

River Health Class	Ecological perspective	Management perspective
Poor (Class D)	Habitat diversity and availability have declined; mostly only tolerant species present; species present are often diseased; population dynamics have been disrupted (e.g. biota can no longer reproduce or alien species have invaded the ecosystem).	Often characterised by high human densities or extensive resource exploitation. Management intervention is needed to improve river health – e.g. to restore flow patterns, river habitats or water quality.

The DWA initiated the design and implementation of a National River Health Programme (RHP) in 1994. The programme was designed to expand the ecological information available for managing rivers in South Africa. It provides a systematic framework for quality controlled collection and assessment of river health data, and for reporting on the results.

Information on the resource class and river health of water resources in the receiving environment of the Navigation Section of Landau Colliery is not yet available.

Biomonitoring will be conducted on an annual basis (during the dry season) by a suitably qualified scientist at localities upstream and downstream from the Landau Colliery: Navigation Section mine boundary area to establish the status of, and impact on, the health of the river system(s). Such information will be forwarded to the DWA.

3.6.8.4 Set Resources Class Objectives (DWA / Reserve)

Each ecological class, as indicated in Table 29 above, has a set of flow and water quality eco-specifications, which define its objectives. Different user impacts are associated with each ecological class. The final management class objectives are Resource Quality Objectives (RQOs), which are made up of eco-specifications and appropriate user-specifications. Sustainability is achieved when management actions result in the instream RQOs for the selected class being met.

According to the document titled: “Environmental water quality in water resource management”, dated 2004, compiled by the Water Research Commission (WRC), a detailed ecological Reserve assessment for water quality of the Olifants River was conducted.

There are some 40 monitoring points in the upper Olifants catchment. Of these, 25 are situated in the Olifants and Klein Olifants River catchments upstream of the Wilge River confluence. Eleven are situated in the Wilge River catchment, and one monitoring station is situated between the Wilge River confluence and the inflow into the Loskop Dam (WRC, 2004).

The DWA Target Water Quality Guidelines for aquatic ecosystems provided guidelines for single-substance toxicants on the basis of toxicity test results, but for salinity the guideline was that it should not exceed 15 % of the "natural" range.

A reference or "natural site" and an impacted or "present day" site in each water quality reach in the Olifants River was identified as part of the afore-mentioned assessment. The median monthly TDS concentration was compared between the reference and the impacted site and the percentage difference noted. A preliminary guide was suggested that the percentage difference (as indicated in Table 30 below), would relate to specific classes.

Table 30: Percentage deviation from the natural condition i.t.o. salinity

Ecological Health Class		Salinity - % deviation from the natural (Class A) condition
A	Excellent	15
B	Good	20
C	Fair	30
D	Poor	40

When this was applied to the Olifants River salt data, nearly all the reaches had to be classified as "Poor". Most of the recorded salinities at impacted sites had been more than 40 % higher on average than they would have been in the natural state.

SASS scores (biomonitoring) were also related to classes for the Olifants River (refer to Table 31 below for the results thereof).

Table 31: Total SASS score and average per taxon (ASPT) related to river classes

Class	SASS score	ASPT
Excellent	> 175	> 7
Good	120 - 175	6 - 7
Fair	60 - 120	4.8 – 5.9
Poor	< 60	< 4.8

When the biomonitoring results were assessed, it was clear that while there were reaches in which the biological indicators showed a "Poor" class, there were also reaches in each of the other classes. This indicated that 40 % salinity increases above the natural were within the tolerance limits of many fish and invertebrates. In addition, a large number of nymphs of the mayfly Tricorythus discolour were collected from a reference site in the Upper Olifants River and, using sodium sulphate as a model for mining-influenced salinisation, a series of salt tolerance tests were undertaken. Refer to Table 32 below for the results.

Table 32: Relationship between river class and salinity for river reaches in the Olifants study area

Assessment class	Electrical conductivity (mS/m)	Total dissolved salts (mg/l)
A	20 - 35	130 - 195
B	35 - 45	195 - 295
C	45 - 80	295 - 520
D	80 - 120	520 - 780
E/F	> 120	> 780

It was apparent that there were a few resource units where the biomonitoring indicated a “Poor” condition even though the salinity was “Good” (WRC, 2004). The land use around the resource units with a “Poor” biomonitoring status was assessed and those units where mining or intensive agriculture activities were / are undertaken were noted. The toxicity of the river water in those resource units was tested, and in two instances the river water was found to be toxic.

It was suggested as part of the afore-mentioned document that a combination of water chemistry, biomonitoring and eco-toxicology be routinely used as part ecological Reserve assessments.

Landau Colliery (a division of Anglo Operations Limited) will comply with all requirements of the DWA regarding the class objectives for the river systems and streams situated within and surrounding the Landau Colliery: Navigation Section mine boundary area.

Anglo Operations Ltd compiled a document in April 2010 (refer to Appendix E2 that sets out the Resource Water Quality Objectives for Anglo Coal operations involved in the Controlled Release Scheme or falling within the upper Olifants River Catchment. The Navigation Section of Landau Colliery is located within three water management units, namely those associated with the Wilge River, Brugspruit and Naauwpoortspruit. The Resource Water Quality Objectives are set out in Tables 6 and 13 of the said report (Appendix E2), and encompass objectives for physical, inorganic and organic, metal, plant material and microbiological parameters.

3.6.8.5 Surface water user survey

A surface water user survey was carried out on the downstream users from the Landau Colliery area to the receiving water body, Loskop Dam. The information was compiled during April 1999 and is recorded in Supplementary Report No. 24 of the approved Landau Colliery EMPR, dated June 1999, which is available from Landau Colliery upon request.

From existing surface water user information for the Navigation Section, it is anticipated that the main utilisation of surface water from the receiving water resources relevant to the Navigation West Section includes livestock and game watering, informal domestic use, possibly limited irrigation, and aquatic environment and recreational use.

3.6.8.6 Water authority

The relevant water authority for the area is the Department of Water and Sanitation (DWS): Mpumalanga Regional Office.

3.6.9 Sensitive areas

Several sensitive landscapes were identified to occur within, or within close proximity to, the [then] proposed Navigation West Section mining area during the specialist studies conducted for the purpose of the EIA, the most noteworthy being the wetland areas.

A study was conducted within the then proposed Navigation West Section mining area to delineate the wetland areas, and to determine their ecological status. The study was undertaken by Wetland Consulting Services, and a report was compiled titled, *"Wetland Delineation Report: Navigation West on the farm Elandsfontein 309JS, near Clewer, Mpumalanga"*, dated November 2005.

According to the wetland report, the mentioned pan has a hillslope seepage wetland on the slopes of the pan basin. The wetlands and pan in the study area associated with the then proposed Navigation West Section mine boundary area had all been anthropogenically impacted to a lesser or greater extent. For example, a portion of the flow feeding the stream draining north into KwaMthunzi Vilakazi appeared to originate from possibly a sinkhole, while flows from largely undisturbed areas in the west also contribute to the stream.

Similarly, perched flows to the pan were intercepted by the impoundment east of the pan as had surface flows in the stream draining south-west in the southern portion of the property Approximately a quarter (26 %) of the wetland systems in the study area had a high to very high ecological importance and sensitivity score possibly attributed to the anthropogenic alterations to the systems. Certainly in the impounded drainage line, both the removal and replacement of soil in the earth walls of the impoundments, as well as the impoundments themselves, had resulted in the development of a mosaic of habitats that would otherwise not have been present.

Similarly, the area surrounding and flows from what was considered to be a sinkhole had resulted in the development of an environment that is not frequently encountered. As a result of these attributes, the wetlands comprising a mixture of hillslope seepage and valley bottom wetlands had a high Ecological Importance and Sensitivity (EIS). In order for the mining of the coal at the Navigation West Section to be feasible, the mentioned pan has been mined out in accordance to the Navigation IWUL (04/B20G/ABCFGIJ/1498). A conservation strategy will however be developed by Landau Colliery for the neighbouring KwaMthunzi Vilikazi Nature Reserve, including the associated wetlands.

3.7 Groundwater

3.7.1 Pre-mining groundwater status

A pre-mining geohydrological investigation was conducted for the Navigation West Section Report titled, *"Landau Colliery Navigation West Project Report on Geohydrological Investigation as part of the EMPR"* with Reference Number 400385/04, dated February 2007, compiled by Clean Stream Groundwater Services, and the resulting report is available from the mine upon request.

According to the above-mentioned geohydrological report, the following aspects delineated the applicable "Groundwater zone" associated with the Navigation West Section:

- The thickness, soil characteristics, infiltration rate and water bearing properties of the unsaturated zone.
- The geological properties and dimensions of each unit in the geological column that could potentially be impacted upon by groundwater contamination. This included rock type, thickness of aquifer(s) and confining units, aerial distribution, structural configuration, storativity, water levels, infiltration or leakage rate, if appropriate.
- Aquifer recharge and discharge rates.
- The direction and rate of groundwater movement in potentially impacted units.
- Groundwater and surface water relationships.
- Background water quality of potentially impacted units.
- Potential sources and types of contamination.

3.7.1.1 Geology of the study area

All five coal seams, common to the Witbank coalfield, are present in the Navigation West Section mine boundary area. The No. 4 Seam is suitable for mining by opencast mining methods. The No. 2 Seam is mostly thin and of moderate to low quality, as are the remaining No. 3, 4U and 4A Seams. The No. 5 Seam sub-outcrops near the eastern boundary of the proposed mining area, and although of good quality, is not laterally extensive enough for inclusion into the mining plan.

3.7.1.2 Geophysical investigations

Dedicated ground geophysics was conducted as part of the groundwater investigation to delineate any significant geological structure or intrusions within the Navigation West Section study area. Ground magnetic as well as electro-magnetic methods were employed during the survey. Borehole positions were firstly defined based on the surface topography and flow directions from existing water level data in the study area. Geophysical traverse lines were then set out across the positions of the proposed boreholes and perpendicular to the expected flow direction from the proposed mining area.

The results of the geophysics were used to site monitoring boreholes on areas where structures occurred that could act as preferential flow paths. .

3.7.1.3 Unsaturated zone

Based on the geological profile descriptions the unsaturated zone is composed of soils, alluvium and colluvium underlain by sandstone, siltstone, shale or coal, depending on the position in the project area. The unsaturated zone impacts on the aquifer in terms of both groundwater quality and quantity. The permeability and thickness of the unsaturated zone are some of the main factors determining the infiltration rate, the amount of runoff and consequently the effective recharge percentage of rainfall to the aquifer. The type of material forming the unsaturated zone as well as the permeability and texture will significantly influence the mass transport or attenuation of mass where contamination sources occur on surface. Factors like ion exchange, retardation, bio-degradation and dispersion all play a role in the unsaturated zone.

The thickness of the unsaturated zone was determined by subtracting the pre-mining static water levels in the study area from the topography. Water level measurements in the direct vicinity of the proposed mine showed that the depth to water level, and thus the unsaturated zone, varies between ± 3 and ± 10 meters below ground level (mbgl). Deeper static water levels (in excess of 30 m) occur around the mining area where dewatering or abstraction occurs. As these points are listed in the NGDB with no accurate coordinates, interpretation of reasons for the deeper water levels cannot be made.

3.7.1.4 Aquifer delineation

Aquifer delineation is conducted to show which part of the aquifer was used or considered during simulation exercises (numerical modelling). Because the main aquifer is a fractured rock type and fractures could assume any geometry and orientation, the physical boundary or ‘end’ of the aquifer is very difficult to specify or quantify. More appropriately, the aquifer boundary conditions that have been considered during numerical model simulations can be described.

Aquifer boundaries in a model are usually either no-flow boundaries (groundwater divides) or constant head boundaries. No-flow boundaries are groundwater divides (high or low areas / lines) across which no groundwater flow is possible. Constant head boundaries are positions in the model where the groundwater level is fixed at a certain elevation and cannot change.

In the regional model constructed for the Navigation West Section study area, no-flow as well as constant head boundaries were used as model boundaries. The constant head boundaries were not inserted as constant head nodes in the model but river nodes were rather employed on the same elevations and positions where tributaries of the Grootspruit and Brugspruit streams occur west and north of the proposed mining area. The streams are mostly perennial and therefore act as constant head boundaries. Pre-mining water levels in the aquifer were largely fixed at these points and the streams / river will add

water to or remove water from the aquifer if the surrounding model water levels respectively decrease below or rise above the assigned elevation of the stream / river.

The two streams to the west (Grootspruit) and north (Brugspruit) of the Navigation West Section study area resulted in very few parts of the model area acting as true no-flow boundaries. A no-flow boundary in a numerical model is usually represented by the end / edge of the active cells of the model grid.

3.7.1.5 Aquifer thickness

Aquifer thickness in a fractured rock aquifer is virtually impossible to determine because the actual 'aquifer' consists of fractures with any orientation, dip, strike or aperture. As a compromise, the aquifer thickness in the coal mining environment is often taken as the difference between the estimated static water level of the aquifer and the base of the lowest mined coal seam. In the Navigation West Section area this would yield a pre-mining aquifer thickness of between 4 and 16 m.

Considering the fact that the actual 'aquifer' consists of transmissive fractures, fissures or cracks of any orientation, extent of aperture in any of the rock types underlying the site, an approximation could at best be made on the thickness of the aquifer.

In the boreholes drilled in the pre-mining Navigation West Section project area, few water-yielding fractures were intersected. Those that were intersected occurred from relatively close to surface (± 10 m) to a maximum depth of more than 17.5 m. It was thus considered more accurate or appropriate to calculate the aquifer thickness from the piezometric water level to the deepest water yielding fractures in the study area. On this basis, the pre-mining aquifer thickness in the Navigation West Section mine boundary area varied between 7 and ±15 m.

3.7.1.6 Groundwater levels

Groundwater levels in the pre-mining Navigation West Section project area were measured after groundwater monitoring boreholes were drilled (June 2005). The pre-mining groundwater levels with the borehole names and co-ordinate information are provided in Table 33 below.

Table 33: Pre-mining groundwater level data in the Navigation West Section area

Borehole number	Static water level (mbgl)	Borehole Depth	X coordinate	Y coordinate	Collar Elevation (mamsl)
NWG01	8.12	22	13350.00	-2867316.00	1549.50
NWG02D	1.41	22	12579.00	-2867282.00	1546.30
NWG02S	1.65	7	12586.00	-2867277.00	1546.30
NWG03	5.00	22	11541.00	-2868615.00	1546.60

Borehole number	Static water level (mbgl)	Borehole Depth	X coordinate	Y coordinate	Collar Elevation (mamsl)
NWG04	N/D	N/D	10678.00	-2868820.00	1528.00
NWG05	2.99	22	11266.00	-2870466.00	1535.80
NWG06	5.25	22	11837.00	-2870852.00	1536.70
NWG07D	2.35	22	12117.00	-2870965.00	1534.00
NWG07S	3.84	8	12123.00	-2870970.00	1534.00
NWG08	1.61	27	12835.00	-2870300.00	1553.00

Note:

mamsl = meter above mean sea level

mbgl = meter below ground level

Pre-mining regional static groundwater levels around the Navigation West Section project area varied between 1.5 meters below surface in the topographically lower lying areas to approximately 8.5 meters below surface in topographically higher areas, before the commencement of mining. Because the boreholes were low-yielding, pumping caused deep drawdown of the groundwater levels / piezometric heads and depression cones formed that were deep, but not wide in extent. Due to impacts from these groundwater abstraction areas as well as nearby mining activities and different interactive aquifer systems, the groundwater level did not always follow the trend of the surface topography.

The highest static water level elevations in the area were approximately 1 585 mamsl and occurred in the topographically higher region to the east of the then proposed Navigation West Section project area. The lowest static water level elevations were at approximately 1525 mamsl in the down gradient direction (south and west) where the Grootspruit is located

Impacts from nearby existing underground mining areas such as Elandsfontein Colliery to the north-west and Navigation Colliery to the east were localised and only evident in boreholes within very close proximity (± 300 m).

The pre-mining groundwater levels in the [then planned] Navigation West Section mining area together with levels measured during a hydrocensus survey were used as calibration points for the regional and site-specific numerical groundwater models to verify the conceptual model and construction thereof. Seen in the light of water level differences because of mining, pumping and recharge effects, filtering and processing of water levels was conducted to remove water levels considered anomalous high or low. The final interpolated potentiometric surface of the water levels was thus bound to contain local over- or under estimations of the actual water levels but it was considered to be representative of the general regional trend of the static groundwater level.

The natural flow direction for groundwater in the Navigation West Section project area differed locally but as a generalisation could be described as towards the south-west and west (Grootspruit) and to the north (Brugspruit).

In Karoo-type sediments like those underlying the Navigation West Section mining area, it is generally accepted that the majority of groundwater flow occurs through the bedding plane fractures between the different sedimentary units. Prior to the commencement of opencast mining at the Navigation West Section the coal-bearing Karoo layers had not been deformed, displaced or folded significantly. The No.4 coal seam was slightly undulating with a localised higher topography in the central and north-western portion of the mining area that dipped at approximately 1.4 degrees to the south-east of the mining area. A digital iso-surface model of the pre-mining base of the No.4 seam that is currently being mined at Navigation West Section

The coal seam was not expected to have a marked effect on groundwater movement because of the relatively low dip in the coal seam, and the groundwater gradient would be the most important factor in groundwater flow rate. Since the mine will extend to the depth of the coal seam, it will fill up from south-east north-west and could only decant once it has filled up to the lowest surface elevation where mining has taken place. Such a point occurs at an elevation of approximately 1 526 mamsl to the west of the mining area where the catchment valley of an unnamed tributary of the Grootspruit occurs to the west. The second highest point occurs to the south of the mining area at 1 537 mamsl where another small valley is formed by an unnamed tributary of the Grootspruit. Approximately 10 hectares of coal reserves were initially sterilised to increase the decant point to 1537 mamsl by not mining into the top of the steep valley towards the west of the reserve. This no-mining area was subsequently increased to nearly 60 hectares of coal reserve to accommodate the mining configuration of the dragline intended for use in the mining operation.

Such an increase is expected to contribute greatly to the prevention of decant after Closure since the gradient of the mined out opencast pits will be significantly reduced. These mitigation measures also implied that the opencast pits will fill up most of their void spaces before decanting could occur.

3.7.1.7 Presence of boreholes and springs

Pre-mining hydrocensus information revealed that a few domestic water supply boreholes occurred within a 3 km radius of the [then proposed] Navigation West Section mining area. A total of 15 open boreholes were recorded during a hydrocensus survey conducted in August 2005. These boreholes mainly occurred to the west and south of the mining area. The Navigation Colliery occurs to the east of the project with boreholes only being used at the time for groundwater monitoring purposes.

Elandsfontein Colliery occurs on the north-western boundary of the Navigation West Section project area. Groundwater and surface water monitoring data was received from Elandsfontein Colliery that is situated in the down gradient direction from the Navigation West Section project area.

The potential radius of influence on the groundwater regime around a coal mine in Karoo sediments is usually accepted as ± 1 km. This is subjective, because the radius of influence depends strongly on geological structures such as faults and dykes (preferred groundwater flow paths), groundwater gradients, nearby mining operations and the presence of other groundwater production boreholes in the study area.

Experience from other coal mines has, however, shown that the influences of open pit and underground coal mining activities on the regional groundwater level are usually not very extensive and usually limited to as little as ± 0.5 km. The heterogeneous nature of the aquifer(s) and preferred flow paths could cause the radius of influence to be higher. The presence of numerous dykes and faults that compartmentalize the aquifer(s) would on the other hand limit or contain the water level impact on the other hand.

Different types of groundwater information were obtained for boreholes during the pre-mining groundwater study at the Navigation West Section. The yields of the monitoring boreholes drilled and pump tested in the mining area varied from 0 l/s to a maximum of 0.3 l/s. The yields in the boreholes recorded in the National Groundwater Database (NGDB) varied between 0 l/s and 0.75 l/s with the yields of the boreholes in the hydrocensus survey also estimated to be in that range.

Springs occurred to the west and south of the Navigation West Section mining area. Springs in a semi-confined or confined fractured rock aquifer usually occur where structural discontinuities in the aquifer bisect the confining layer / material and a fracture or fracture system reaches the surface. For a spring to occur, the water level or piezometric head at that point in the aquifer must be higher than the land surface. The springs to the west and south of the mining area generally formed at or near the 1 560 elevation where discharge from mostly the shallow aquifer occurred where steeper slopes occurred in the topography.

Although the natural trend for the groundwater level or piezometric head is to follow the surface topography, the water level is the closest to surface in the topographically low-lying areas. For this reason, springs will mostly occur in these areas, or at least on the slopes of hills. In perched and confined aquifers however, groundwater or piezometric levels may also be high in topographical higher lying areas with subsequent spring formation. As evident from the topographical map of the mining area, drainage was away from the topographical high areas to the south, west and north of the Navigation West Section.

The groundwater monitoring boreholes for the Navigation West Section project were mostly sited down gradient of the [then planned] opencast mining area with two boreholes in the up gradient direction. The

boreholes were all close to the planned mining areas and as such were within the hydro-geographical regime that was anticipated to be affected by the mining activities.

The boreholes were drilled specifically for monitoring purposes at the Navigation West project and were constructed accordingly. Drilling results indicated that most of the intersected aquifers (coal / shale, siltstone and sandstone) had relatively low groundwater yields. Yields varied from zero to less than one litre per second in the Navigation West Section project area with the most common groundwater intersections occurring in contact zones between sedimentary rocks.

3.7.1.8 Groundwater quality

Pre-mining groundwater qualities around the Navigation West Section mining area were evaluated for approximately 35 groundwater localities. Of these, 11 samples represented boreholes of surrounding users that were mostly used for domestic water supply purposes. The remaining boreholes represented water quality monitoring points from the adjacent Elandsfontein Colliery to the west and Navigation Colliery to the east as well as a few water qualities obtained from the National Groundwater Data Base (NGDB). A map showing the distribution of the boreholes is presented Figure 28 and Plan 28 in Appendix A.

The most important quality characteristics of the different ambient groundwater types are summarised below.

- Boreholes NW04 and NW10 plotted in field 2 of the diagram where alkalinity and magnesium dominate the macro element content, indicating fresh water that had undergone a limited degree of ion exchange. The two boreholes occurred to the south-east of the mining area.
- NW05, NW08 and NW13 plot in field 8 of the diagram where magnesium dominated the cation content and chloride and / or nitrate dominated the anion content. The nitrate content in boreholes NW05 and NW08 was elevated, which caused the plot to be positioned in field 8.
- In the remainder of the boreholes analysed around the mining area sulphate dominated the macro element anion content. Although sulphate was the dominating anion, the sulphate concentrations were still well below the ideal concentration for drinking water and overall water qualities are very good. NW01 with 126 mg/l had by far the highest sulphate concentration. The other boreholes in this group were unaffected by any contamination and overall qualities were excellent.

The typical impacts on groundwater quality caused by coal mining operations include different chemical reactions such as ion exchanges, mobilization and precipitation of ions and / or groups of ions. Sulphate (SO4) related chemical reaction is one of the most important reactions in this regard and is a fair representation of pollution in coal mines. SO4 related reactions take place when it enters the

groundwater system through oxidation of pyrite through chemical weathering, mining, washing or percolation through stockpiles of the host material, coal. Iron sulphate forms, as well as sulphuric acid (H_2SO_4), causing decreases in the pH and mobilization of metal ions (that are usually more soluble at a low pH), the reactions collectively referred to as “acid mine drainage”.

As seen from the reaction equation, oxygen is required for the oxidation and consequent acidification to take place. At the pre-mining environment of Navigation West Section project, coal reserves and associated pyrite occurred below the static groundwater level and under anaerobic conditions, causing a reducing chemical environment and none of the acid mine drainage reactions to occur.

The Navigation West Section opencast mining is located within an area where no previous mining had occurred. Although drilled into the coal seam in the majority of the boreholes, the coal seam existed under reducing conditions (no oxygen) and therefore no acid-mine-drainage reactions occurred. Prior to mining, the water quality was unaffected by the carbonaceous material and the overall quality was very good. The pH in the majority of the boreholes was below neutral but this acidity was thought to be caused by the presence of the massive sandstone occurring over most of the surface area.

3.7.1.9 Hydro-census

A pre-mining groundwater survey was performed for the Navigation West Section mining area as well as a possible impact zone of more than 3 km around the mentioned mining area. The results of the survey are presented in the geohydrological report, dated February 2007.

As part of the above-mentioned study, a hydro-census was conducted during which groundwater users around the mining area were identified, boreholes were surveyed in terms of positions, flow and water quality and water uses were determined.

As described in the above-mentioned geohydrological report and from historical information in the Landau area it is known that boreholes are mainly used for livestock and domestic water supply and borehole yields are usually inadequate to sustain large-scale irrigation. Borehole yields are typical for Karoo-type aquifers and vary between zero and approximately 2.5 l/s.

Widespread pollution or depletion of the groundwater resource would thus impact negatively on the resource, and could affect a limited number of users that reside in the direct vicinity of the mine that depend on groundwater as the sole source of domestic water supply as well as water for livestock. Any adverse impacts would thus be on the surrounding natural environment as well as on human and livestock users that depend on the source.

3.7.1.10 Potential pollution sources

The pre-mining groundwater contours relevant to the Navigation West Section are available from the mine upon request. These contours represent steady state conditions without impacts from sources or actions other than natural conditions like rivers, natural spring discharges, pans or wetland recharge areas.

A large number of manmade actions were anticipated to impact on the groundwater regime; including the aquifer structure, flow paths and directions, storage, discharges and recharge. Possible impacts (identified prior to the commencement of mining) relevant to the Navigation West Section are discussed briefly below:

- **Aquifer structure, flow paths and directions**

  Opencast and underground coal mining have been ongoing in the regional area surrounding the Navigation West land use area for many years. During active mining and thereafter, the voids created by mining (open cast and underground) will impact on the natural groundwater movement. Mine voids destroy the *in situ* aquifer structures and could be compared to areas of very high (even infinitely high) transmissivity and also high storativity. Because groundwater will follow the route of least resistance, groundwater will prefer to move through the mined-out areas. Even after the mine has been closed and the opencast voids have been filled and rehabilitated on surface, the transmissivity and storativity remain much higher than in the pre-mining natural aquifer(s). The extent of the impact depends mostly on the transmissivity of the *in situ* aquifer material.

- **Aquifer discharge**

  A mining and processing operation may impact significantly on the discharge of an aquifer in different ways. If mining occurs and / or mine dewatering is required, the natural aquifer discharge will decrease by the volume of groundwater removed through dewatering. Aquifer discharge may also increase with the use of PCDs, slurry dams and other dams through leakage of water to the subsurface, especially if water is imported to the Navigation West Section from outside sources. Other factors that may decrease the aquifer discharge are compacted surfaces, haul roads and concrete surfaces that prevent infiltration to the aquifer and decrease groundwater discharge, although increasing surface runoff.

  After Closure, however, effective recharge is usually higher on the backfilled opencast pits even if surfaces have been left to drain freely and compaction was completed. After the mine voids have filled up, the discharge is usually also higher than before the disruption by mining due to higher long-term recharge.

- **Aquifer recharge**

  All the aspects mentioned under aquifer discharge apply to aquifer recharge. Creation of a mine void filled later with coarse fill material causes a significant increase in aquifer recharge percentage. Surface water features like dams (tailings, slurry, process water, storm water, return water etc.) will also usually increase the recharge to the aquifer but compacted or concrete surfaces and roads will decrease the recharge.

Around the wider Navigation West mining area the majority of pre-mining ambient groundwater qualities were good. The main reason for the good ambient groundwater quality was considered to be the relatively good rainfall of around 700 mm per year combined with the inert sandstone aquifer host rocks and low recharge in some areas. Although the effective recharge percentage was relatively low, seepage in especially the weathered zone was sufficient to prevent stagnant aquifer conditions.

The natural salinity in most of the 11 boreholes of the surrounding groundwater users was low with the EC below 60 mS/m for all boreholes. The pH in the mainly sandstone host rock environment is usually slightly acidic with the majority of the values being around 6. The spring to the west of the mining area had a very low pH of 3.9 and was probably attributable to the spring being situated on or near the sub-outcrop of the coal horizon to cause a natural acid-mine drainage reaction area.

Aquifer flow dynamics, in spite of the relatively low matrix transmissivity, were definitely sufficient to facilitate the existence of fresh natural groundwater in the Navigation West Section area. The seepage rate (governed by groundwater gradient, storativity and transmissivity), the type of aquifer host rock and the prevailing redox conditions determined the degree of ion exchange that would take place. The type of bedrock that hosts the aquifer is mostly inert massive sandstone material that causes the groundwater salinity to be very low at nearly rainwater quality.

3.7.1.11 Groundwater model

In order to predict the movement of water and mass in the subsurface, a conceptual geohydrological model of the study area was developed. The basis of the model was the structural geological make-up of the study area.

As discussed previously, it is likely that the geohydrological regime in the study area is made up of two aquifer systems. The first, the upper, unconfined aquifer would occur in the alluvium / colluvium surface cover or the weathered zone. This aquifer was, however, poorly developed in the study area and only seepage moisture was normally intersected during pre-mining drilling. It was concluded that this aquifer only develops during times of high rainfall (e.g. summer months) and was not used as a reliable source of water supply.

The second, main aquifer is associated with fractures, fissures, joints and other discontinuities within the consolidated Karoo bedrock and associated intrusions, if those were to be present. This semi-confined aquifer generally occurred deeper than 8 meters below surface.

Mining in the Navigation West Section project area was anticipated to penetrate both the weathered and solid bedrock aquifers and the physical structure of these two aquifers will be destroyed within the pit footprint.

Surface precipitation or artificial recharge would migrate vertically downwards through the relatively sandy soil until a more impervious layer that forms a perched aquifer is encountered. As the perched aquifer did not feature prominently during drilling at Navigation West Section it was considered to be likely that the majority of recharge water will migrate downwards into the saturated zone. From there it would migrate in the direction of the hydraulic gradient until it eventually enters surface water bodies (i.e. rivers or fountains) from where it would discharge as surface water.

The lateral rate of migration usually exceeds the vertical rate, especially in a sedimentary rock environment where the layers are more or less horizontal. In the pre-mining Navigation West Section area, the coal reserves were relatively flat and horizontal movement would not be impeded or interrupted by steep dips in the geology or by dykes / faults that act as barriers for horizontal flow as no records of such structures exist.

3.7.2 Present groundwater status

3.7.2.1 Aquifer characterisation

Firstly, perched water aquifers occur at shallow depths at the base of residual or transported soils and flow above unweathered rock layers. Recharge occurs via surface infiltration and flow is generally in the direction of the surface topography.

Secondly, sandstone aquifers within the coal bearing horizons are considered to form part of a non-continuous, multi-layered aquifer system. Infiltration and seepage along open joints and dyke contacts recharge these relatively shallow aquifers. The distribution and well-cemented nature of the Dwyka diamictites at the base of the Karoo sequence has provided an extensive, impermeable lining to the coal bearing formations in this region. There is therefore a low probability of any mayor hydraulic connections between the coal bearing horizon and the underlying Waterberg sequence. The capacity of the Waterberg Formation to hold groundwater is limited.

3.7.2.2 Groundwater zone

The natural groundwater in the region can be divided into two aquifers within the Karoo sequence of the Navigation Section, namely the perched aquifers occurring at shallow depths at the base of residual or transported soils above unweathered rock layers, and secondly, the sandstone aquifers within the coal bearing horizons.

3.7.2.3 Geology of the study area

Throughout the Emalahleni (formerly Witbank) area a thin succession of Vryheid Formation sediments is present. At their thickest these sediments attain some 120 m to 140 m and can contain a number of coal seams of which four are considered to have economic potential. The deposition of the Vryheid Formation sediments is to a great extent controlled by the Pre-Karoo platform on which they were deposited. These

Pre-Karoo rocks, consisting mainly of Waterberg Quartzite's of outliers of the Bushveld Igneous Complex, have been glacially sculptured giving rise to uneven basement topography. A thin veneer of Dwyka sediments overlies the Pre-Karoo but is generally not thick enough to ameliorate the irregularities in the placated surface, which therefore affected the deposition of the younger Karoo sediments.

These sediments overlie an uneven Dwyka Floor, which is controlled by the topography of the Pre-Karoo platform upon which these Karoo sediments were deposited. The overburden, which consists mainly of thickness and preservation of the coal seams, are dependent on the surface geomorphology, as well as the palaeotopography of the pre-Karoo basement floor. Interbedded shales, sandstones and siltstones comprise the overburden sequence at the Navigation Section.

A gritty sandstone parting referred to as the P1 parting separates the No. 2 Seam and No. 1 Seam. This unit varies in thickness from 0 m to 3.0 m, but is typically 1.08 m thick.
The structure of the mining block is relatively simple, with a few known occurrences of dolerite dykes and sills and some minor normal faulting. From the geological model it has been possible to prepare plots of physical features useful for mine planning.

The No. 2 Seam is mined in the Schoongezicht mini-pit, to the east of the rehabilitated No. 4 Seam mini-pit. Three minor dolerite dykes were encountered in the Schoongezicht mini-pit but did not significantly hamper mining.

The perched water aquifers may flow locally across major geological boundaries as the groundwater movement is mainly controlled by the depth of weathering and surface topography of the area.

3.7.2.4 Depth of water level(s)

The mine water levels and changes (June 2005 – June 2006) for the Navigation and Schoongezicht underground mining compartments are indicated in Table 34 below.

Table 34: Mine water levels and changes for old Navigation-Schoongezicht underground mining compartments (June 2005 – June 2006)

Underground mining compartments	Volume (Ml) June 2006	Full capacity (%)	Water Elevation (mamsl) June 2005	Water Elevation (mamsl) June 2006	Change (metres)
Schoongezicht 1 Seam	0.62	33.2	1 485.20	1 484.86	-0.34
Schoongezicht 2 Seam	2.48	71.5	1 485.94	1 485.51	-0.43
Navigation 1 Seam	3.08	47.6	1 512.24	1 511.38	-0.86
Navigation 2 Seam	20.05	98.2	1 510.90	1 511.09	0.19

Underground mining compartments	Volume (Ml) June 2006	Full capacity (%)	Water Elevation (mamsl) June 2005	Water Elevation (mamsl) June 2006	Change (metres)
Navigation 5 Seam (Clydesdale)	2.58	48.6	1 533.93	1 535.49	1.56
Navigation 5 Seam (Blackstone)	2.72	99.5	1 516.27	1 517.31	1.04
Total	**31.53**	**79.2**			

3.7.2.5 Presence of boreholes and springs

Figure 28 and Plan 28 in Appendix A shows the positions of the groundwater monitoring boreholes at Landau Colliery: Navigation Section.

3.7.2.6 Groundwater quality

A groundwater monitoring system has been established at the Navigation Section of Landau Colliery in order to gain a more complete understanding of the potential pollution problems associated with the mining operations.

Groundwater levels are monitored around the fringe of the Blaauwkrans Co-disposal facility and the Smith Brothers property adjacent to the Blaauwkrans Co-disposal facility (to evaluate the effect of diffuse pollution from stored water bodies or discard dumps). The locations of the groundwater monitoring boreholes are illustrated in Figure 28 and Plan 28 in Appendix A. Groundwater monitoring sites are regularly reviewed for relevance.

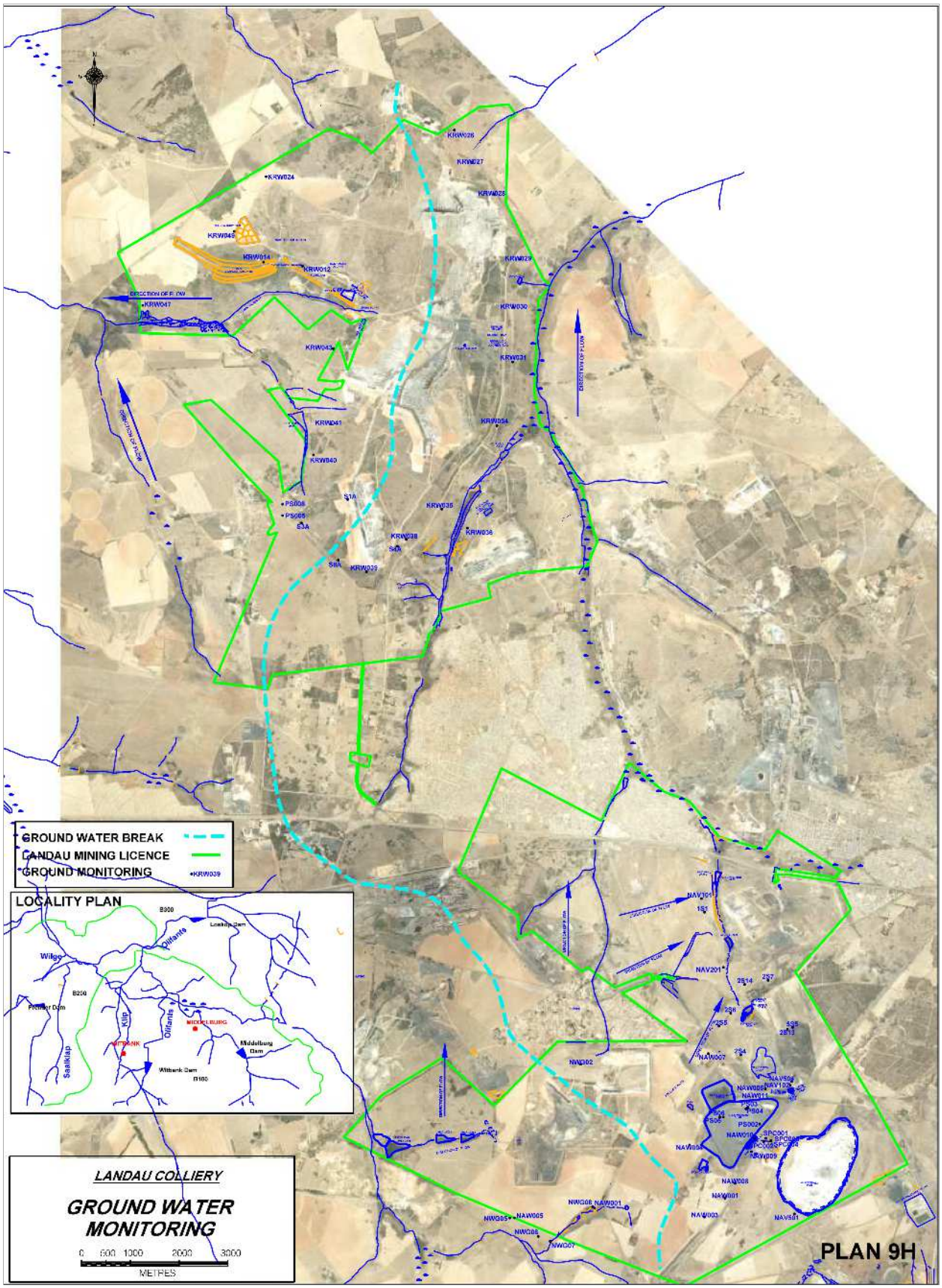


Figure 28: Groundwater monitoring localities

3.7.2.7 Underground water bodies and qualities

The total stored water in the old Schoongezicht and Navigation underground workings is 31.53 million m^3, which has increased by 0.58 million m^3 due to water in the Clydesdale Pan. The Life of Mine Water Balance presented by Professor Frank Hodgson (November 2009) shows that the Navigation Section of Landau Colliery will have excess water until approximately 2018, when mining ceases, followed by 22 years where the underground mines and backfilled opencast areas will refill with groundwater before decanting in approximately 2040. Where recycling or use of the excess water removed from these underground storage areas is not possible, the mine utilises water from these sources for process water and dust suppression, while the remaining excess water is transferred to the Emalahleni Water Treatment Project for treatment.

The water from the Navigation underground workings seeps through a barrier pillar between the Navigation and Schoongezicht underground workings and then with recharge into the Schoongezicht underground workings decants into the Schoongezicht Pollution Control Dam (PCD). Any water collected here is pumped up via a pipeline system to the Acid Water Dam (located at the Navigation Beneficiation Plant area), before treatment in the Navigation Liming Plant or Sulphate Reduction Plant, or alternatively at the Emalahleni Water Treatment Plant.

3.7.2.8 Potential pollution source identification

The major sources of pollution of coal mining operations on the surrounding water environment include acid water found in underground aquifers, storm water runoff high in suspended solid concentrations and process- and mine water contained within the dirty water containment facilities and from within the dirty water management areas around Beneficiation Plants, etc.

According to the pre-mining geohydrological study that was conducted for the Navigation West Section, dated February 2007 the four main factors usually influencing groundwater quality are:

- Annual recharge to the groundwater system.
- Type of bedrock where ion exchange may impact on the hydro geochemistry.
- Flow dynamics within the aquifer(s), determining the water age.
- Source(s) of pollution with their associated leachates or contaminant streams.

Where no specific source of groundwater pollution is present upgradient of the borehole, only the other three factors (mentioned above) play a role.

The potential radius of influence on the groundwater regime around a coal mine in Karoo sediments is usually accepted as 1 km (refer to the geohydrological study, dated February 2007). This is subjective, because the radius of influence depends strongly on geological structures such as faults and dykes (preferred groundwater flow paths), groundwater gradients, nearby mining operations and the presence of other groundwater production boreholes in the area.

As mentioned previously, the total stored water in the old Schoongezicht and Navigation underground workings is 31.53 million m^3, which has increased by 0.58 million m^3 due to water in the Clydesdale Pan. Where recycling or use of polluted surface water is not possible the mine utilise water from these sources for process water and dust suppression.

Generally, the stored water in the underground workings is acidic and saline. Due to the fact that underground water has remained in the Navigation old underground workings for long periods it has had time to react with the pyrite in the pillars and become acidic. This in turn has increased the salinity levels in the water due to the presence of neutralising agents such as calcium and magnesium carbonates.

The water contained within the old underground workings is currently being pumped to the Navigation Neutralisation Plants (Navigation Liming Plant and Sulphate Reduction Plant) respectively for treatment before being re-used in the process, and excess water is transferred to the Emalahleni Water Treatment Plant for treatment.

Preliminary groundwater balance modelling was done in 2009 for the Navigation Section of Landau Colliery by Professor Hodgson. Results of the modelling show that once mining has ceased, there will be a 'filling up' period during which recharge to the groundwater will infiltrate and accumulate in the underground and mined out opencast workings. It is estimated that the groundwater will start decanting from these workings in approximately 2040. Depending on the quality of the decant water, this may be a potential source of future pollution in the post-closure phase of the mine.

3.7.2.9 Groundwater model

Prof. F.D.I. Hodgson developed an extensive model for the continuous measurement of the SACE underground workings water bodies. The model also represents the surface water use and storage for water management purposes. This model calculates the amount of excess water on the mines, which is related to the Life of Mine for each of the SACE mines.

3.8 Air Quality

As part of the pre-mining EIA for the proposed Navigation West Section, an air quality study was conducted by Environmental and Health Risk Consulting (Pty) Ltd. Refer to the report titled, *"Report on ambient air quality measurements performed near the town of Clewer in Mpumalanga",* dated September 2006.

Key findings from ambient particulate sampling performed during June and August 2005 in the Navigation West Section study area included the following:

- An average total suspended particulate concentration of 142.3 µg/m^3 was measured during the air quality assessment. The then DEAT standard of 300 µg/m^3 was exceeded once in the town of KwaMthunzi Vilakazi.
- The average PM10 concentration measured during the study was 80.1 µg/m^3. Although this is not above the present ambient standard of 180 µg/m^3, it is above the SANS guideline and future ambient standard of 75 µg/m^3. The SANS guideline was exceeded at two separate monitoring sites on two separate days in the town of KwaMthunzi Vilakazi and once at the farmstead of Mr Scheffer approximately 3.5 km south west of the proposed development.
- The average rate of dust deposition in the study area was 318.30 mg/m^2/day. The action level prescribed for residential areas was exceeded once in the town of KwaMthunzi Vilakazi.
- Sources of particulate pollution are likely to be mining and industrial operations. Sources north-west of the development are dominant contributors of pollution in the study area, based on available meteorological data.
- Although apportionment of dust deposition to mining and transport sources close to the site was without reasonable doubt, the sources of suspended particulate matter may have extended further than the immediate industrial and mining operations, up to a distance of 10 km.

3.9 Noise

The pre-mining noise related information contained within this part document was summarised from the report titled, *"Environmental noise impact for the proposed Navigation West Colliery near Witbank",* dated September 2006, compiled by Environmental and Health Risk Consulting (Pty) Ltd.

The objective of the above-mentioned investigation was to determine the acoustical impact of the [then planned] mining development on the surrounding agricultural and residential communities. The field investigation for the mentioned assessment was performed during August 2006.

For the purpose of the noise assessment, short-duration measurements of not less than 3 hours were obtained from the following locations:

a. Clewer, corner of Eton and Boundary Streets
   S25˚54.680', E29˚08.113', 1 549m AMSL.
b. Clewer, corner of Ascot, Boundary, West and Kimberley Streets
   S25˚54.680', E29˚07.270', 1 551m AMSL.
c. Elandsfontein Mine
   S25˚54.953', E29˚06.550', 1 564m AMSL.
d. Entrance to Mr Scheffer's farmstead
   S25˚56.358', E29˚06.009', 1 550m AMSL.
e. Proposed site of the crusher and tip area
   S25˚55.936', E29˚07.798', 1 585m AMSL.

The measurement locations were selected to provide ambient sound exposures that would be representative of worst-case impact assessment conditions for the [proposed] mining development, also providing a good representation of acoustic conditions for the area without an unbalanced contribution of local specific noises. Other aspects which were considered during site selection were security and the potential noise caused by close examination of the monitor by pedestrians and other spurious noise events (Environmental and Health Risk Consulting, 2005).

The equipment and protocol used were documented in Section 3.2 of the above-mentioned noise assessment report. The ambient measurement results are documented in Section 4.1

Ambient noise is normally expressed as the average sound pressure level over a specific period. This implies that the same average level over a chosen time can either consist of a large number of events with a relatively low, barely audible level, or a few events with a high level. This concept does not agree with common experience on how environmental noise is experienced, or with the neurophysiological characteristics of the human receptor system. Human perception of the audible environment is characterised by a good discrimination of stimulus intensity and a decaying sensitivity to a continuous stimulus.
Single events can only be discriminated up to a certain threshold, where after the exposure is interpreted as continuous. These characteristics are linked to conditions for survival in terms of discrimination of new and different stimuli with low probability and high information value indicating warnings. Thus, it is relevant to consider the importance of the background level, the number of events (or maximum sound pressure events) superimposed on that level as well as the intensity and frequency of the events independently when assessing the effects of environmental noise.

The most important factors that govern noise propagation outdoors and that are applicable to the pre-mining environment at the Navigation West Section are discussed briefly below:

a. Geometric spreading:
   Providing the effect of other factors, the sound level from a specific source will reduce by 6 dB for every doubling in distance.
b. Atmospheric reduction:
   A sound wave passing through air loses some of its energy in overcoming intermolecular friction. The further the sound wave travels the more energy is lost. However, this effect depends on the frequency of the sound and is negligible at frequencies below 1 000 Hz. At distances in excess of 1 kilometre atmospheric absorption cuts out the high frequencies so that only the frequencies below 1 000 Hz are left.

c. Ground effects:
When the noise source and the receiving point are less than 5 m above the ground, reflected sound waves can cause unexpected effects under certain conditions. This effect results in an extra reduction in the sound pressure level at mid-frequencies over and above that due to geometrical spreading and atmospheric absorption.

d. Refraction:
Wind and temperature gradients cause paths of sound waves to bend, an effect called refraction. This effect is typically evident when the receiver is downwind of the noise source as well as during periods of inversion (air temperature near the ground is lower than that in the upper layers).

e. Atmospheric turbulence:
Turbulence in the atmosphere consists of air pockets which starts at several metres in diameter and gradually breaks down until they are a few millimetres in size. In conjunction with wind and temperature gradients this effect causes the sound level at the receiving point to fluctuate. The noise fluctuation from an aircraft flying at a distance is a good example of this.

f. State of topography:
Natural screens such as trees, hills or generally uneven terrain will reduce sound propagation in varying degrees, depending mainly on the frequency of the sound source.

All the factors mentioned above influenced the ambient noise measurement performed during the pre-mining noise study to a greater or lesser extent (Environmental and Health Risk Consulting, 2005). Important findings of the mentioned noise related study are the following:

- The residual sound level near the Navigation West Section mining development in all likelihood exceeded the SANS ambient noise rating limit for suburban districts. Ambient noise levels ranging from 45 dBA during the night to 55 dBA during the day are expected based on preliminary assessments. Fluctuating noise from heavy vehicle traffic, superimposed on steady noise from industrial activities dominated the noise character in the study area at the time of the assessment.
- It was estimated that noise emitted by mining operations such as blasting, drilling and heavy vehicle operations, both on site and during the transport of finished product, could evoke sporadic complaints from members of the surrounding community. However, no significant long term acoustical impact from these activities on the community was expected, provided that proper noise control tactics are applied throughout the operational life of the mine.
- Any mining or industrial activity in the study area which causes impulsive noise or that produces sound with a specific tonal character that markedly varies from that of residual noises, would cause annoyance.
- The implementation of noise control measures during the design and construction phases of the Navigation West Section, and through proper occupational hygiene principles during the Operational Phase (Environmental and Health Risk Consulting, 2005), would ensure that the noise impacts would be appropriately managed.

3.10 Sensitive Landscapes

Several sensitive landscapes were identified to occur within, or within close proximity to, the Navigation West Section mining area during the pre-mining environmental specialist studies, the most noteworthy being the wetland areas.

As summarised previously a pre-mining study was conducted within the Navigation West Section mining area to delineate the wetland areas, and to determine their ecological status. The study was undertaken by Wetland Consulting Services, and a report was compiled titled, *"Wetland Delineation Report: Navigation West on the farm Elandsfontein 309JS, near Clewer, Mpumalanga"*, dated November 2005. A summary of the report is included here.

In addition to the wetlands, a graveyard was identified in close proximity to the Navigation West Section. This has been discussed in Part 3.12.

The Navigation West Section: South Block is situated within 100 m of the unnamed tributary of the Grootspruit located to the south-east of the planned mining area, which was identified as a sensitive habitat for aquatic biota. The location of the floodlines of the spruit are discussed in detail in Part 3.10.1 of this report. The sensitivity of the wetland associated with the spruit is discussed below. The sensitivity of the aquatic habitat will be ascertained through an appropriate specialist study prior to the commencement of mining in the Navigation West Section: South Block.

3.10.1 Wetlands

3.10.1.1 General Wetland Description

The presence of the wetlands in the pre-mining study area was linked to both perched groundwater and surface water.

Of the possible wetland types likely to be encountered on the Highveld, only three types were recorded in the pre-mining study area namely:

- Valley bottom wetlands with a channel.
- Hillslope seepage wetlands feeding a watercourse.
- A Pan.

The surface area of the different wetland types within the pre-mining study area and a description of their hydro-geomorphic features are given in Table 35 and Table 36 respectively.

Table 35: Area of the different HGM wetland types within the study area

Wetland type	Area of wetland within the study area (ha)
Valley bottom wetland with a channel	102.3

Wetland type	Area of wetland within the study area (ha)
Hillslope seepage wetland feeding a watercourse	276.62
Pan	18.91
Total	**397.56**

Dams occupy 1.09 ha of the area and these form the main artificial wetland type within the study area.

Table 36: The definition of the different HGM wetland types occurring in the study area

Wetland type	Topographic setting	Description	Hydrological components		
			Inputs	Through puts	Outputs
Valley bottom wetlands with channels	Occur in the steeper headward parts of the streams and in the shallow valleys that drain the slopes.	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. Are gently or steeply sloped and characterised by erosion as opposed to depositional processes.	Receive water inputs from the main channel (when channel bank overspill) and from adjacent slopes, as well as from hillslope seepage wetlands if these are present.	Surface flow and interflow.	Variable but predominantly stream flow.
Hillslope seepage wetlands connected to watercourses	Hill slopes.	Slope on hillsides, which are characterised by the colluvial (transported by gravity) movements of material. Water inputs mainly from sub-surface flow and outflow through diffuse sub-surface and / or surface flow.	Predominantly groundwater from perched aquifers and interflow.	Interflow and diffuse surface flow.	Variable, including interflow, diffuse surface flow and stream flow.
Pans	In depressions and basins usually in drainage divides on top of the hills.	A basin shaped area with a closed elevation contour that allows for the non-permanent (seasonal or temporary) accumulation of	Runoff from the surrounding catchment area and lateral seepage from adjacent hillslope seepage wetlands.	None.	Evapo-transpiration and groundwater discharge from leakage.

Wetland type	Topographic setting	Description	Hydrological components		
			Inputs	Through puts	Outputs
		surface water. An outlet is usually absent.			

3.10.1.2 General Description of the Soil Forms associated with the Wetlands

The wetlands in the study area could be distinguished based on two broad groups of soils, namely clays and sands. Based on experience, the following soil forms are generally associated with the hillslope seepage wetlands in the mining area; Avalon, Katspruit, Kroonstad, Longlands and Glencoe soil forms and it was not expected that soils at the Navigation West Section would differ from this generalisation. The soil forms associated with the valley bottom wetlands in the study site were likely to include Rensburgs and Katspruit soil forms.

3.10.1.3 Description of the Wetland Types

3.10.1.3.1 Valley bottom wetlands

The HGM (Hydro-geomorphic) type wetland, under the heading of “valley bottom wetlands” that occurs on the study site is a “valley bottom wetland with a channel”. The presence of a channelled system is indicative of high flow rates resulting from the slope of the drainage line as well as rainfall and runoff characteristics. This particular valley bottom system had been dammed. In the process of dam building the system had been heavily disturbed with substantial quantities of soil having been moved. The resultant environment was a patchwork of deposited sediments associated with runoff from the adjacent slopes and exposed subsoil. This, together with the presence of standing water in the dams had created a mosaic of habitats which at the time of the pre-mining wetland study supported a high avifaunal diversity, including the Grass Owl.

3.10.1.3.2 Hillslope seepage wetlands

The HGM (Hydro-geomorphic) type wetland, under the heading of “hillslope seepage wetlands” that occurs on the study site is a “hillslope seepage wetland feeding a watercourse”. These systems are normally associated with groundwater discharges, either perched or that associated with deeper aquifers. These subsurface flows may be supplemented by surface water. The soil forms associated with the general watershed supporting this wetland type are predominantly the sandy soil forms (Avalon and Glencoe) underlain by sandstones, while the soil form, Katspruit, is the dominant form in the wetland itself.

Typically, the orthic horizon in all these soils forms remains saturated during the summer months, while the boundaries of these systems often extend well away from the easily recognizable saturated zones,

thus forming a gradual ecotone. This ecotone can extend tens of metres as the depth to the perched water table increases with distance away from the unconfined seep front. The resulting vegetation in these areas comprises a mixture of wetland and grassland species reflecting the spatially and temporal variable moisture gradient. Extensive marginally wet zones make accurate boundary delineation of some of these systems very difficult.

Typical hillslope seepage wetland species are such as *Themeda triandra, Hypoxis rigidula, Eragrostis chloromelas, Setaria sphacelata* and the forbs *Vernonia oligocephala and Acalypha caperonioides.* These tall grass systems provide good habitat for faunal species like rodents and birds associated with wetland systems, including both the Grass and Marsh Owl, with the latter possibly breeding on the site reflected by the observation of a fledged chick.

3.10.1.3.3 Pans

One perennial grass pan occurred within the study area and had a total surface area of 18.91 ha. This pan had a hillslope seepage wetland on the slopes of the pan basin. These hillslope seeps were characteristically seasonally saturated and served as perched aquifers that fed groundwater into the pan via interflow. Water also entered the pan from surface runoff from the slopes of the pan basin which essentially formed the pan catchment area. The pan had neither inlet nor outlet. An impoundment on the south eastern slope of the pan's perimeter probably intercepted a portion of the water that would have contributed to the maintenance of the pan. It was also likely that the Eucalyptus plantation situated on the crest to the east of the pan had likewise reduced the perched flows that otherwise would have fed the pan.

Pans in the south-eastern Highveld range from 1 – 871 ha, with an average size of 22 ha. According to Allan (1985), 70.5 % of pans in the south-eastern Highveld are non-perennial pans. The plant species composition, richness, abundance and distribution in pans is generally related to the hydrological regime and water quality, with plant species tolerant of changes in water availability being more abundant in non-perennial pans.

Pans are also the most important wetland type in the region in terms of providing habitat for Red Data bird species such as Greater and Lesser Flamingos and Painted Snipes. They are also an important habitat for owls. The seasonal changes in water levels expose a gently sloping open shoreline which is often rich in invertebrates, especially in recently exposed areas. Exposed shorelines also provide habitat for waterfowl such as Yellowbilled Ducks and Egyptian Geese. The shoreline immediately around the water's edge provides a foraging habitat for waders such as Little Stint, Threebanded and Kittlitz's Plovers, and shallow water areas are frequented by species such as Wood Sandpipers, Ruff and Avocet.

Slightly deeper water provides a niche for wading birds such as herons and egrets. Large shallow and relatively saline pans provide suitable habitat for Greater or Lesser Flamingos, which, when they do

occur, often do so in substantial numbers. Large freshwater pans which include a deeper open water area may also provide suitable habitat for several waterfowl species.

Emergent vegetation such as reeds and bulrushes attract a number of passerine species such as Red Bishops and warblers, while fringing sedge marshes and rank grasses attract species such as Ethiopian and Painted Snipes as well as Marsh and Grass Owls. .

3.10.1.4 Fauna and flora associated with the wetlands

Small mammals such as yellow mongoose, grey duiker and rodents, naturally occurred in the pre-mining Navigation West Section study area.

In terms of avifauna, the grasslands associated with the hillslope seepage wetlands and mixed grass–sedge meadows of the valley bottom wetlands are important in that they provide a habitat for numerous bird species including the Grass and Marsh Owls.

No Red Data plant species were recorded in the study area although *Nerine gracilis*, as well as *Gladiolus robersoniae* and *Kniphofia typhoides* might occur. A number of orchids (*Habenaria* sp) were recorded in the hillslope seepages associated with the stream flowing towards the Brugspruit.

In terms of fauna, the Grass Owl *Tyto capensis* which is regarded as 'vulnerable' (Barnes, 2000) occurs in the area and is likely to occur in the wetlands given the type of habitat present. Both the Painted Snipe (*Rostratula benghalensis*) and Blackwinged Pratincole (*Glareola pratincola*), which are considered Near-Threatened species, are also likely to occur.

3.10.1.5 Functional Values

Despite the widely held notions about wetland functionality, extensive literature searches have revealed that very few practitioners have actually quantified these benefits. Moreover, it appears that these functions are highly variable depending on the characteristics of the wetlands and the landscape.

In the pre-mining assessment undertaken pertaining to the Navigation West Section study area, it was not possible to perform the types of investigations necessary for determining functionality such as nutrient balance studies or flood attenuation quantifications. This was due both to the complexity of the task as well as the costs and time that would have been involved. It is therefore difficult to speculate on the functional values of the wetlands on site. Nevertheless, some general discussion is possible based on anecdotal evidence on site and experience from projects undertaken in the region. These are discussed for each of the main wetland types found within the pre-mining study area.

Hillslope seepage wetlands are commonly considered to be valuable in that they perform a number of beneficial functions such as removing excess nutrients and inorganic pollutants produced by agriculture,

industry and domestic waste. In so doing they perform a purification service that saves on purification costs of downstream water supplies, and prevent damage caused by polluted water. Besides their contribution to biodiversity, this is likely to be their main function in the landscape. They may also play a role in replenishing or recharging groundwater supplies. This would occur when water percolates through the topsoil to the underlying aquifer. The significance of this contribution in the pre-mining study area is however not known. Since the hillslope seepage wetlands really represent the expression of ground water at or near the soil surface, it is more likely that the sandy soil landscape around the wetlands is more important (in terms of extent and depth of the soil profile) in terms of groundwater recharge than the wetlands themselves.

The functions the valley bottom wetlands perform in the landscape are likely to be a combination of the functions performed by hillslope seepage wetlands and floodplains. These systems probably contribute towards flood attenuation, as a result of both their topographic form and general resistance to flow. Their function in relation to enhancing water quality however is less clear. This will largely depend on the volume of water flowing over the surface compared to that moving in the soil.
Retention time which influences the length of time that there is contact between the bulk of the water and the sediments is the main determinant that affects the opportunity for the removal of certain nutrients. One exception to this is suspended solids, the concentration of which will vary depending on the gradient (slope) of the valley bottom wetlands and the sources of sediment (e.g. adjacent agricultural lands). Where flows permit, there may be selective deposition of particles that are deposited along the valley bottom systems. Due to the nature of the systems in the pre-mining study area, this is predominantly confined to finer particles due to the slower flows.

Some nutrient removal, for example phosphates and ammonia bound to clay minerals and soil particles, is likely to occur coincidentally with the deposition of these sediments. Sedimentation will thus tend to reduce phosphate loads in the short term. This is however, likely to be recycled through plant and animal uptake and possibly re-released into the system at some later stage. Re-release may also occur if the sediments are submerged for periods long enough to result in the formation of anaerobic conditions, such as would occur in depressions and pools.

During the drying out phase, similar processes to those documented in pans can be expected, with progressive concentrating of solutes until their solubility products are exceeded. The actual mass of these precipitates is however unlikely to represent a significant proportion of the mass of elements transported during high-flow events. In addition to removal, inundation can also result in the release of salts and nutrients into the water column through mineral exchange. During the initial wetting phase for example, previously deposited salts and nutrients may be dissolved and leached from the sediments into the water column.

Another effect that inundation in these systems may have on sediments is a change in the redox potential. Typically the redox potential would decrease as a function of time after inundation. The

change in redox increases the solubility of a number metals such as manganese and iron and can result in the release of these and previously bound phosphates. The converse also holds when the system dries out and the sediments are re-aerated.

3.10.1.6 Pre-mining Ecological Status (PES) of the Wetlands and their relative Ecological Importance and Sensitivity (EIS)

3.10.1.6.1 Pre-mining ecological status

The wetlands and pan in the study area have all been anthropogenically impacted to a lesser or greater extent. For example, according to the assessment previously mentioned, a portion of the flow feeding the stream draining north towards the Brugspruit appears to originate from a sinkhole possibly from old underground mining, while flows from largely undisturbed areas in the west also contribute to the stream.

Similarly perched flows to the pan are intercepted by the impoundment east of the pan as have surface flows in the stream draining south west in the southern portion of the property.

The calculated PES scores as percentages for the wetlands are as follows:

- 80 % were largely natural with few modifications.
- 14 % were moderately modified.
- 6 % were largely modified.

The pre-mining state of 80 % of the wetlands in the study area had a good resemblance to the natural state with only 6 % of the wetlands showing impacts that have largely modified the systems. These modifications / impacts were limited to agricultural practises, cultivation and livestock farming. The cultivation of lands occurred adjacent to the hillslope systems which impacted on the sediment load to the valley bottom wetlands. The dams in the study area occurred in the hillslope seepage wetland adjacent to the pan as well as in the valley bottom wetland on the southern side of the study area. Relative to the entire system, these dams had a very small impact.

Despite the modifications, the systems were mostly still hydrologically intact, implying that they would be likely to return to their former state if the pre-mining land use activities had been discontinued. Their rehabilitation potential was thus high.

3.10.1.6.2 Ecological importance and sensitivity

Approximately a quarter (26 %) of the wetland systems in the study area had a high to very high ecological importance and sensitivity (EIS) score possibility attributed to the anthropogenic alterations to the systems. Certainly in the impounded drainage line, both the removal and replacement of soil in the earth walls of the impoundments, as well as the impoundments themselves, had resulted in the development of a mosaic of habitats that would otherwise not have been present.

Similarly, the area surrounding and flows from what was considered to be a sinkhole has resulted in the development of an environment that is not frequently encountered. As a result of these attributes, the wetlands comprising a mixture of hillslope seepage and valley bottom wetlands had a high EIS. The EIS assessment findings are summarised as follows:

- 26 % had a very high status (with an EIS of A); These systems were considered to be ecologically important at a national as well as international scale and were sensitive to flow and habitat medications and which played a role in moderating the quality and quantity of water of major rivers.
- 60 % had a high status (with an EIS of B); These were systems that were considered to be ecologically important at a regional scale and were sensitive to flow and habitat modifications and which played a role in moderating the quantity and quality of water of major rivers.
- 14 % had a moderately high status (with an EIS of C); These were systems that were considered to be ecologically important and sensitive on a more local scale and which played a role in moderating the quantity and quality of water of major rivers.

The Ecological Importance and Sensitivity of 26 % of the wetlands in the study area was therefore high to very high, with the other 60 % with a marginal to low score, when compared with what would be expected for reference conditions.

It was speculated whether the planned mining activities could be managed in such a way that the 26 % of the wetlands that scored high to very high could be separated from the 60 % that scored moderate to low. This was, however, considered unlikely given the hydrological interdependence of the wetlands, particularly in terms of perched groundwater linkages which was controlled by the underlying stratigraphy.

Considering the presence of seepage areas in the pan basin, the likely presence of endangered plants could not be ruled out. Seepage wetlands are known to provide suitable habitat for species of conservation importance such as the Snapdragon *Nemesia fruticans* (considered 'Non-Threatened'), and the bulb *Nerine gracilis* (considered 'Rare'). Orchids are also common in these types of systems, and the seepage wetlands and slopes adjacent to the pans were surveyed between October and December in order to identify these species when they were in flower.

3.11 Visual Aspects

The visual quality of the pre-mining environment in the study area had already been altered due to the presence of existing infrastructure such as the adjacent R547 provincial road and gravel access roads traversing the Navigation West Section mining area, the power lines crossing the site, the nearby residential area of KwaMthunzi Vilakazi, as well as the nearby industrial activities such as Highveld Steel and Vanadium Corporation, Transalloys and also the existing mining activities in the surrounding areas such as Landau and Greenside Collieries of Anglo Operations Ltd, Hayford Colliery of BHP Billiton - Ingwe Closure Operations, Elandsfontein Colliery of Anker Kohlen, and Clewer Sand. Other aspects that influenced the visual aspects of the pre-mining site and thus the "sense of place" included the Navigation

West - Training Centre and Clewer Nature Reserve as well as the pre-mining agricultural land utilisation practised on site.

3.12 Sites of Archaeological and Cultural importance

A pre-mining study of the Navigation West Section was undertaken by Dr. Julius Pistorius, to assess the archaeological and cultural value of the proposed mining area. A report titled, "*A Phase 1 Heritage Impact Assessment (HIA) Study for the New Proposed Navigation West Coal Mine on the farm Elandsfontein 309JS in the Mpumalanga Province of South Africa*", dated July 2005, and was compiled.

The Navigation West Section is located in the midst of a cultural landscape that is marked by heritage remains dating from the pre-historical into the historical (colonial) period. Stone Age sites, Iron Age remains and colonial remains therefore do occur in the Eastern Highveld.

In short, the pre-mining HIA study in the Navigation West Section study area revealed none of the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (Act 25 of 1999).

The HIA study revealed the presence of an informal graveyard (GY01) in the peripheral area of the Navigation West Section mining area. This graveyard was mapped and its coordinates were determined.

The informal graveyard (GY01) was undoubtedly of high significance. Legislation with regard to graveyards includes the National Heritage Resources Act, 1999 (Act 25 of 1999), the Ordinance on Exhumations, 1980 (Ordinance No. 12 of 1980) and the Human Tissues Act, 1983 (Act 65 of 1983, as amended). Various categories of graves and burial grounds were acknowledged in Section 2(g) of the National Heritage Resources Act, 1999 (Act 25 of 1999) and measures for the protection, exhumation and relocation of graves and graveyards are outlined in Section 36 of the National Heritage Resources Act, 1999 (Act 25 of 1999). Various laws, provincial regulations and administrative procedures also regulate the exhumation and relocation of graves and graveyards.

3.13 Regional Socio-economic aspects

The socio-economic structure of the study area within which Landau Colliery is situated, was discussed in the Integrated Development Plan (IDP), titled "Integrated Development Plan", dated March 2007, specifically developed for the Emalahleni Local Municipality. The relevant information from the above-mentioned report as well as relevant information obtained from Census, 2005 data are included in this part of this document.

3.13.1 Population density, growth and location

According to the IDP, dated March 2007, the total population of the Emalahleni Local Municipality amounts to 276 412 persons (Census, 2001), which constitutes 27 % of the total Nkangala District Municipality's population (1 020 589 persons) and 9 % of the population of the Mpumalanga Province (3 122 988 persons).

The population density for the Emalahleni Local Municipality is 103.2 persons per km². When comparing the above Census (2001) data to the Census (1996) data, which reflected a population of 236 665 persons in the municipal area, a population growth of 3.15 % growth per annum (39 747 persons) occurred during this period.

Witbank acts as the service centre for the region and has had a steadily increasing population since the 1920's.

3.13.2 Major economic activities and sources of employment

The major economic activities and sources of employment in the Mpumalanga Province are the mining and quarrying sector (23.9 %), service sector (23.7 %), manufacturing sector (14.3 %) and agricultural sector (13.9 %).

According to the IDP, dated March 2007, the primary business centre in Emalahleni is the Emalahleni Central Business District (CBD), which includes offices, retail, general business and commercial uses. Decentralised nodes are also present in the Emalahleni area with mainly retail uses. Nine major industrial areas occur within the Emalahleni Local Municipality area, mostly concentrated in and around Emalahleni Town. This also represents the largest concentration of industrial activity in the Nkangala District.

In addition to the industrial areas, mining occurs throughout the central and southern portions of the Emalahleni Local Municipality area, with large sections of the municipal area affected by shallow undermining and / or mineral rights. Approximately 82 % of the country's primary energy requirements are provided with by coal mining. Coal therefore forms the corner stone of the South African energy industry. Furthermore, the value of domestic coal sales amounts to an estimated 50 % of all mineral sales. Coal exports are the biggest earner of foreign exchange next to gold and platinum.

3.13.3 Unemployment estimate for the area

The main source of employment in the Emalahleni Local Municipality is the agricultural sector as well as the mining sector. According to the IDP, dated March 2007, approximately 45 % of the population within the Municipal area is economically active. According to the 2001 statistics, 20 594 males are unemployed and 27 109 females. Compared to the 43 310 females, 25 204 males are not economically active in the Municipal area. The economically inactive would include those underage and the pensioners.

The highest number of unemployed people resides in Hlalanikahle (23.5 %), followed by Lynnville (22.6 %), Phola (22.1 %), and Kwa-Guqa (20.9 %).

In addition to the above-mentioned areas, the Department of Manpower in Witbank registered 15 000 people in the Witbank / Middelburg area as unemployed during 1994. Approximately 1 300 of these unemployed people reside within the Witbank Municipal District.

3.13.4 Housing

One of the most prominent challenges facing the Emalahleni Local Municipality is the housing backlog in the area. According to the IDP, dated March 2003, the Emalahleni Local Municipality has the highest number of informal settlements in the Nkangala District, with an estimated housing backlog of approximately 40 000 units. The largest housing backlogs occur in the western and north-western parts of the Emalahleni Town. Table 37 indicates the housing backlog in the Emalahleni Local Municipality for August 2004.

Table 37: Housing backlog in the Emalahleni Local Municipality (August 2004)

Housing type	Number of families
Informal Settlements	24 084
Backyard Dwellings	9 180
Multiple Family Accommodation	4 500
Hostel Conversions	700
Families on farms	874
Total	**39 338**

The rapid urbanisation in Emalahleni due to the high influx of people from rural areas moving to Emalahleni, contribute to the housing backlog.

Two new upmarket residential developments have been initiated namely the Bankenfeld Security Estate and the Buckingham Estate. Other upmarket residential developments are being expanded such as Wild Side. Various residential projects aimed at the low-income bracket are underway e.g. in Tasbet Park X 6 (3 000 units). A RDP housing development project for 1 500 houses is taking place between Pine Ridge and Klarinet on the Verena Road. The Emalahleni Municipality is furthermore busy with an upgrading and housing programme in the Emsagweni squatter camp with the development of 780 stands. Approximately 32 000 families require housing in the Emalahleni Municipal Area.

3.13.5 Social infrastructure

The social infrastructure in the Emalahleni Local Municipality is well developed and can be summarised as consisting of the following (during 2002):

- Five tertiary institutions (e.g. universities and colleges), including the satellite campuses of the University of Pretoria and Pretoria Technikon.

- 23 High schools.
- 36 Primary schools.
- 2 Hospitals.
- 18 Clinics.
- 5 Police stations.
- 1 Emergency service.
- 3 Post offices.
- 8 Libraries.
- ± 9 existing shopping centres.
- Various hotels.
- ± 36 mines (mainly sand and clay quarries, as well as coal mines) are operated in a 45 km radius from Emalahleni.

3.13.6 Water supply

Approximately 92 % of the population in Emalahleni has access to piped water, and about 41 % of households have piped water inside their house or yard. The municipality provides potable water to the formal residential areas, townships and light industrial areas as well as water tanks in the informal settlements. The mine villages located within the Emalahleni Local Municipality have their own water supply systems.

3.13.7 Power supply

The municipality provides most of the electricity in the formal townships and residential areas, while Eskom provides electricity to the rural areas. Table 38 below indicates the use of energy by households within the Emalahleni Local Municipal area.

Table 38: Energy use within the Emalahleni Local Municipal area

Energy use	Number
Electricity	57 815
Gas	163
Paraffin	2 232
Candles	21 740
Solar	134
Other	208

4. PUBLIC PARTICIPATION PROCESS

Section 24 of the Constitution of the Republic of South Africa of 1996 guarantees everyone the right to an environment that is not harmful to their health and well-being and to have the environment protected for the benefit of present and future generations. In order to give effect to this right, the NEMA, 2008 came into effect in May, 2009.

In terms of Section 24 (4) of the NEMA, 2008, procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment must, *inter alia*, ensure, with respect to every application:

- Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state.
- That the findings and recommendations flowing from an investigation, the general objective of integrated management laid down in NEMA, 2008 and the principles of environmental management set out in Section 2 of NEMA, 2008 are taken into account in any decision made by the organ state in relation to any proposed policy, programme, process, plan or projects, consequences or impacts.
- Public information and participation procedures which provide all integrated and affected parties, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures.

One of the general objectives of integrated environmental management laid down in Section 23(2) (d) of NEMA, 2008 is to: “ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment.”

The National Environmental Management Principles as stipulated in NEMA, 2008 say;

- “Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- The participation of all interested and affected parties in environmental governance must be promoted, and all people must have an opportunity to develop the understanding, skills and capacity necessary to achieve equitable and effective participation, and participation by vulnerable and disadvantage persons must be ensured”.

The EIA Regulations of 2010 require that public participation must be done after submission of an application for a Scoping and Environmental Impact Assessment Report (S&EIR).

The public participation process for this project has been conducted in terms of the procedures and provisions of the public participation process in terms of the NEMA, 2008 and Chapter 6 of the EIA Regulations of 2010, as well as other relevant legislation such as the PAJA, 2000 and the PAIA, 2000.

4.1 Method of Notification

4.1.1 Press advertising

The proposed project was advertised in English in a local newspaper, Witbank News, on 07 November 2014. The Witbank News was found to be the most appropriate newspaper in terms of its accessibility and language. A copy of the advertisement and proof of the placement thereof is attached in Appendix D1.

4.1.2 On-site advertising

Notice was also given to Interested and Affected Parties (I&APs) by notice boards. Notice boards were placed at three different, noticeable and conspicuous places (the entrance gate to the mine and two other locations surrounding the Landau Colliery) on 06 November 2014. A copy of the site notice and photographs of the site notices are attached in Appendix D2.

4.1.3 Background Information Document

The Background Information Document (BID) developed for the proposed project provides background information pertaining to the project and is intended to inform I&APs of the proposed project. The BID also includes a registration form which I&APs, stakeholders and organs of state are encouraged to complete in order to register as an I&AP for the proposed project.

The BID was made available to all landowners within and surrounding the mine boundary area of the proposed project, as well as to all organs of state that may have jurisdiction over any aspect of the activity on 06 and 07 of November 2014. The BID will also be made available to any other person who becomes involved in the on-going Public Participation Process.

Copies of the BID and proof of distribution of the BID to the adjacent landowners and organs of state have been attached as Appendix D3.

4.2 List of I&APs and stakeholders identified

All landowners within and surrounding the mine boundary area of the proposed project are considered to be registered I&APs.

Table 39 below, indicates the list landowners and adjacent landowners identified and notified (by means of e-mail, telephone, fax and/or post) of the proposed project. Copies of the notifications to the I&APs have been included in Appendix D4.

Table 39: List of I&APs notified

Farm Name	Owners Details
Blaauwkrans 323 JS Portion 1	Transnet Ltd.
Weltevreden 324 JS Portion RE	Truter Boerdery Trust
Vlaklaagte 330 JS Portion 16, 17	Uitspan Uitbreidings
Vlaklaagte 330 JS Portion 7, 14	Rudolf Martinus Botha
Vlaklaagte 330 JS Portion 9	Madeleine Louw
Vlaklaagte 330 JS Portion 10	Morne Stander
Vlaklaagte 330 JS Portion 12	Stephanus Johannes Petrus Duvenhage
Vlaklaagte 330 JS Portion 13	Adistra 96 CC
Vlaklaagte 330 JS Portion 15	Marie Liebenberg
Blaauwkrans 323 JS Portion 4, 17	Transnet Ltd.
Weltevreden 324 JS Portion 3, 4	National Department of Land Affairs
Vlaklaagte 330 JS Portion 0, 1, 3, 4	Uitspan Uitbreidings Pty Ltd.
Vlaklaagte 330 JS Portion 2	Jacobus Theodorus du Preez
Vlaklaagte 330 JS Portion 5, 6	Republic of South Africa
Vlaklaagte 330 JS Portion 8	Barend Johannes Venter
Vlaklaagte 330 JS Portion 11	Ludwig Paul van Schalkwyk
Waterpan 8 IS Portion 0	Duiker Mining Pty Ltd.
Tweefontein 13 IS Portion	Duiker Mining Pty Ltd.
Other adjacent landowners and lessees	Andrew Serelane
	Kleinkopje Colliery
	Landau Colliery
	Johan Oelofse
	Mr. Engelbrecht
	Mr. Bezuidenhout
	Mr. Jan Lauschagne
	Mr. PH Venter
	Neels Smith
	Paula Duvenhage
	Pierre Liebenberg
	Stefanus Johannes van Jaarsveld
	Truter Boerdery Trust
	Blackhill Primary School
	Mr. Babu Jiyane
	Mr. Fanie van Jaarsveld
	Mr. RM Botha
	Mr. Tielman Roux
	Sophia van Schalkwyk

4.3 List of organs of state identified

All organs of state who may have jurisdiction in respect of the proposed project is considered to be registered I&APs.

Table 40 below indicates the list of organs of state notified of the proposed project. Copies of the notifications to the organs of state have been included in Appendix D4.

Table 40: List of organs of state notified

Company Name
Department of Water Affairs
Mpumalanga Department of Economic Development, Environment and Tourism.
Department of Public Works
Department of Agriculture
Department of Minerals Resources.
Green Trust
Wildlife Society.
Mpumalanga Tourism and Part Agency
Mpumalanga Working for Wetlands (SANBI)
eMalahleni Local Municipality
Mpumalanga Parks Board
Nkangala District Municipality
Olifants Catchment Environmental Protection Group
South African Heritage Resource Agency
Transnet
Spoornet
Witbank Framers Association
Witbank Tourism Board
Sasol Gas Limiited
South African National Roads Agency Limited

4.4 I&AP register

All organs of state and landowners within and surrounding the mine boundary area of the proposed project is considered registered I&APs.

Table 41: List of all registered I&APs

No.	Name	Interest
1.	Transnet Ltd.	I&AP
2.	Truter Boerdery Trust	I&AP

No.	Name	Interest
3.	Uitspan Uitbreidings	I&AP
4.	Rudolf Martinus Botha	I&AP
5.	Madeleine Louw	I&AP
6.	Morne Stander	I&AP
7.	Stephanus Johannes Petrus Duvenhage	I&AP
8.	Adistra 96 CC	I&AP
9.	Marie Liebenberg	I&AP
10.	National Department of Land Affairs	I&AP
11.	Jacobus Theodorus du Preez	I&AP
12.	Republic of South Africa	I&AP
13.	Barend Johannes Venter	I&AP
14.	Ludwig Paul van Schalkwyk	I&AP
15.	Duiker Mining Pty Ltd.	I&AP
16.	Andrew Serelane	I&AP
17.	Kleinkopje Colliery	I&AP
18.	Landau Colliery	I&AP
19.	Johan Oelofse	I&AP
20.	Mr. Engelbrecht	I&AP
21.	Mr. Bezuidenhout	I&AP
22.	Mr. Jan Lauschagne	I&AP
23.	Mr. PH Venter	I&AP
24.	Neels Smith	I&AP
25.	Paula Duvenhage	I&AP
26.	Pierre Liebenberg	I&AP
27.	Stefanus Johannes van Jaarsveld	I&AP
28.	Truter Boerdery Trust	I&AP
29.	Blackhill Primary School	I&AP
30.	Mr. Babu Jiyane	I&AP
31.	Mr. Fanie van Jaarsveld	I&AP
32.	Mr. RM Botha	I&AP
33.	Mr. Tielman Roux	I&AP
34.	Sophia van Schalkwyk	I&AP
35.	Allen Mhlambi	I&AP
36.	Clean Stream Environmental Consultants	I&AP
37.	P Raphael (on behalf of the Schoongezicht Community)	I&AP
38.	Department of Agriculture, Rural Development, Land and Environmental Affairs.	Organ of State
39.	Department of Water and Sanitation	Organ of State

No.	Name	Interest
40.	Department of Economic Development, Environment and Tourism.	Organ of State
41.	Department of Public Works	Organ of State
42.	Department of Agriculture	Organ of State
43.	Department of Minerals Resources.	Organ of State
44.	Green Trust	Organ of State
45.	Wildlife Society.	Organ of State
46.	Mpumalanga Tourism and Part Agency	Organ of State
47.	Mpumalanga Working for Wetlands (SANBI)	Organ of State
48.	eMalahleni Local Municipality	Organ of State
49.	Mpumalanga Parks Board	Organ of State
50.	Nkangala District Municipality	Organ of State
51.	Olifants Catchment Environmental Protection Group	Organ of State
52.	South African Heritage Resource Agency	Organ of State
53.	Transnet	Organ of State
54.	Spoornet	Organ of State
55.	Witbank Framers Association	Organ of State
56.	Witbank Tourism Board	Organ of State
57.	South African National Roads Agency Limited	Organ of State
58.	Sasol Gas Limited	Organ of State
59.	Trans African Concessions (Pty) Ltd	Organ of State

4.5 Scoping Phase Public meeting

A public meeting was held on the 21 November 2014. Stakeholders were notified of this meeting via the newspaper advertisements, on-site notices and telephonically (refer to Part 4.1), as well as in the BID.

Minutes of the public meeting, the attendance register and presentation are attached hereto in Appendix D5.

4.6 Access and opportunity to comment on all written submissions

The draft Scoping Report was made available to the public for review for a period of forty (40) days, from 14 November 2014 to 05 January 2015. Hard copies of the mentioned draft document was made available at the Emalahleni Public Library, at Clewer Primary School and at the Navigation Offices of Landau Colliery. An electronic copy of the draft Scoping Report was also be posted on the Shangoni's website (www.shangoni.co.za) for public comment for the same period of forty days. All comments received were recorded in the comments and responses report in Part 4.9 and also attached hereto in Appendix D6.

4.7 Consultation with relevant authorities

4.7.1 Application Form in Terms of the NEMA, 1998

The Application for Environmental Authorisation for activities associated with the Navigation West - South Block Extension project has been done in terms of the requirements of the NEMA, 1998. The applicable application for authorisation in terms of the NEMA, as amended and the Environmental Impact Assessment Regulations, 2010 was submitted on 21 May 2014 to the then Mpumalanga Department of Economic Development Environment and Tourism (MDEDET). The application was accepted by the then MDEDET on the 30th of May 2014 and subsequently the reference number 17/2/3N-363 was assigned to the application. The letter of acknowledgement indicating the above mentioned reference number is attached as Appendix B1.

4.7.2 Scoping Phase Authorities meeting

A pre-application meeting was held with the DWS was held on 09 September 2014 to gain their input into the process to be followed for the compilation of the IWULA for the proposed project, and the mintues of the meeting is attached hereto in Appendix B..

An authorities meetings will also be held with the DMR to gain input on the way forward with regards to the EMP Amendment under the MPRDA, 2002 and to gain input on the project.

4.7.3 Further consultation with relevant Authorities

Once the Scoping phase has been completed another meeting will be held with DWA to gain input on the IWULA. Once the EMP, IWULA and EIA for the proposed project have been finalised for submission another authorities meeting will be held with DMR and DWA respectively. The purpose of this authorities meeting will be to present the findings of the EIA process to the authorities to assist them in the decision making process.

4.8 Comments and responses

All issues, comments and questions received from I&APs and stakeholders up to date, are presented in Table 42 below and are attached hereto in Appendix D6**.**

Table 42: Comment and response table

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
P. Raphael	Community of Schoongezicht representative	Letter dated 21 November 2014, received 09 February 2015.	P Raphael	Letter.	We the community of Schoongezicht we have the following issues around Emalahleni Schoongezicht: 1. Unemployment. 2. Cracking houses due to coal mine blasting. 3. No job creation. 4. No high school at Schoongezicht for our children. 5. Most people are ill due to air pollution. 6. Mobile clinic for our elderly people. 7. Community Hall. 8. We are not informed about Schoongezicht Sponsors. We hope the above are in order. Your urgent response will be highly appreciated. Please contact a community member of	The Schoongezicht area does not form part of this project, but forms part of the overall Landau Colliery community issues. The mine's community liaison officer will respond to the Schoongezicht community issues and the response will be included as part of the EIR.

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					Schoongezicht for any assistance Mr P Raphael.	
Rachael Mphofu	Sasol Satellite Operations	19 November 2014	Rachael Mphofu	Email	Sasol is affected by the proposal of extending or expanding the colliery mine as it has a high pressure gas pipe line which is running along the path of the expansion.	Thank you for your response. Landau Colliery is currently into contact with the relevant parties at Sasol in order to make arrangements with regards to the gas pipeline. Also refer to Appendix B3 for minutes of the meetings held with Sasol thus far.
B van den Heuvel	Sasol Satellite Operations	20 November 2014	B van den Heuvel	Email	We refer to your letter dated 06 November 2014 whereby drawings were included. Sasol Pipeline Operations is affected by your proposed work. Please take note that the following steps need to be followed for the Official Wayleave. 1. Set up kick-off meeting or a pre-signature meeting. Sasol Satellite Operations will then indicate the gas pipeline and issue conditions to be complied with. 2. At the second meeting Sasol	Thank you for your response. Landau Colliery is currently into contact with the relevant parties at Sasol in order to make arrangements with regards to the gas pipeline. Also refer to Appendix B3 for minutes of the meetings held with Sasol thus far.

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					Satellite Operations will then issue the official way leave if all the conditions are met. If any work starts on or close to our pipeline without an official way leave, legal action will be taken against the perpetrators. Damage to the pipeline may result in the following: 1. Fatality, even multiple fatalities. 2. Loss of livestock an environmental impact. 3. Damage to property. 4. Cost of loss of Production or financial loss could be as high as 1 Billion Rand.	
Sonja van de Giessen	Clean Stream Environmental Consultants	12 November 2014	Sonja van de Giessen	Email	Registration of Clean Stream Environmental Consultants (CSEC) as an Interested and Affected Party (I&AP) for the proposed Navigation West South	Thank you for your response. CSEC will be included in the I&AP register.

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					Block Extension Project. The above project (Reference number 17/2/3N-363) has reference. In response to the advertisement placed in the e “Witbank Nuus” dated 07 November 2014, CSEC hereby requests to be registered as an I&AP for the above project, since, as you area aware, CSEC is the appointed EAP for the adjacent Landau Colliery Life Extension Project.	
Johan Botha	Sasol Mining (Pty) Ltd	19 December 2014	Johan Botha	Email	Sasol Gas/Satellite operations has a gas pipeline running on the affected property and area.	Thank you for your response. Landau Colliery is currently into contact with the relevant parties at Sasol in order to make arrangements with regards to the gas pipeline. Also refer to Appendix B3 for minutes of the meetings held with Sasol thus far.
Carla Davis	Trans African Concessions (Pty) Ltd	22 December 2014	Carla Davis	Email	Your correspondence dated 10 November 2014 received by post refers.	TRAC has been registered as an I&AP. The restrictions with regards to mining 100m from a road and

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					No registration form was attached. I have checked the website and it seems that the N4 is affected by this application as the land seem to be adjacent to the N4 National Road. We would like to register as an interested and affected party. Please send me a registration for to enable us to complete that as well as a detailed location map to identify the area affected. In terms of the SANRAL, Act 7 of 1998, no mining may be done closer to 100m from the road reserve or fence. Furthermore no blasting may be done within 500m form the N4 in accordance with the Explosives Act.	blasting 500m from a national road is taken into account with the design of this project. A registration form and the locality map was sent to TRAC, any further correspondence received from TRAC will be included as part of the EIR.
Allen Mhlambi	Private	10 November 2014	Allen Mhlambi	Email	My name is Allen Mhlambi, I am sending this email for RSVP of public meeting on the 21st November 2014 at Clewer Primary School for Environmental	Mr Allen Mhlambi is registered as an I&AP and a comment sheet was sent to him via email. No response has yet been received. Any further correspondence will be included as

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					Authorisation Application for the proposed Navigation West South Block Extension project of Landau Collier. And also requesting the application form of I&AP(soft copy) so that I can apply electronically or e-mail it back to you. I hope and trust that my request will be granted. And looking forward to fruitful engagements.	part of the EIR.
Ms AM Rambuda	Department of Water and Sanitation	20 November 2014	Ms AM Rambuda	Email/Letter	DRAFT SCOPING REPORT FOR ANGLO OPERATIONS PROPRIETARY LIMITED: LANDAU COLLIERY: PROPOSED NAVIGATION WEST - SOUTH BLOCK EXTENSION PROJECT The above-mentioned report prepared by Shangoni Management Services (Pty) Ltd dated November 2014 has relevance.	The Water Use Licence will be applied for and will be submitted to the Regional DWS. The Water Use Licence will includea preliminary legal assessment to identify all the water use activities associated with the proposed project that will require authorisation by the DWS and the applicant is hereby referred to Section 22(1) of the National Water Act , 1998 (Act 36 of 1998). Flood-lines: The map of location of

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					The Department of Water and Sanitation (DWS) has evaluated the above-mentioned report and wish to comment as follows: 1. The Applicant shall conduct a preliminary legal assessment to identify all the water use activities associated with the proposed project that will require authorisation by the DWS and the applicant is hereby referred to Section 22(1) of the National Water Act , 1998 (Act 36 of 1998). 2. Therefore any other water use related activities associated with this project that are not permissible as indicated on Section 22(1) of the National Water Act, 1998 (Act 36 of 1998) shall have to be authorized by the DWS prior to such water use activities taking place and the applicant is requested to liaise	the proposed project showing the 1:100 year flood-line in terms of section 144 of the National Water Act, 1998 (Act No. 36 of 1998) shall be submitted as part of the WULA and EIR. Streams and Wetlands: An indication shall also be provided on the availability of any wetlands, rivers and drainage lines within the area surrounding the proposed project as part of the wetland study to be submitted together with the WULA and EIR. Section 21 (c) and (i) forms in terms of the National Water Act, (Act 36 of 1998) and supplementary forms will be submitted; Stormwater Management: A Stormwater management plan will be implemented to prevent pollution on run-off. Separation of clean and dirty water will be implemented. The

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					with the DWS for guidance on the requirements for such an authorisation.	storm water management plan will be submitted together with the EIR and WULA
					3. Flood-lines: The map of location of the proposed project showing the 1:100 year flood-line in terms of section 144 of the National Water Act, 1998 (Act No. 36 of 1998) shall be submitted to the DWS.	Details with regards to the Sewage Management will be included as part of the WULA and EIR. Details with regards to the potable water supply will be included as part of the WULA and EIR.
					4. Streams and Wetlands: An indication shall also be provided on the availability of any wetlands, rivers and drainage lines within the area surrounding the proposed project. If wetlands will be affected section 21 (c) and (i) forms in terms of the National Water Act, (Act 36 of 1998) and supplementary forms should be submitted;	The Civil designs of the PCD which are signed by the Professional engineer and reflecting the ECSA registration number of the engineer will be submitted for assessment as part of the WULA and EIR Section 21(j) and (a) forms will be submitted together with the WULA for the dewatering of the pit. Section 21(g) forms will be

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					5. Stormwater Management: Stormwater management plan must be implemented to prevent pollution on run-off. Separation of clean and dirty water should be implemented. 6. Sewage Management: It is indicated that the waste is treated at an on-site, standalone sewage treatment plant; and the plant is operated by an external contractor. The final effluent is discharged into the Navigation West PCD. Draft Scoping Report in respect of Landau Colliery: Proposed Navigation West - South Block Extension Project Portion 2 of Farm Elandsfontein 309 JS. 7. Potable water supply: It is indicated that potable water for	submitted for the waste rock dumps. The existing ROM and coal stockpile demarcated areas have been licenced in terms of licence number 04/B20G/ABCGIJ/1498. The relevant 21 (c) and (i) forms for the construction of infrastructure within the wetlands will be submitted together with the WULA. Backfilling using carbonaceous materials is already motivated in terms of the GN 704 in licence number 04/B20G/ABCGIJ/1498. The capacity of the existing slurry dam and the volume of the slurry will be submitted as part of the WULA and EIR in order to check if the capacity will be sufficient for the extra load. The water balance has been updated including all the water uses

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					domestic use is obtained from Emalahleni Water Reclamation Plant via a pipeline to the potable water tank at Navigation Plant. Service agreement should be submitted to the Department. 8. Water uses: It is indicated that the existing Navigation West Pollution Control Dam will be expanded. In terms of the National Water Act, 1998 (Act 36 of 1998) section 21(g) forms and supplementary forms should be completed and submitted to this Department. Civil designs which are signed by the Professional engineer and reflecting the ECSA registration number of the engineer should be submitted for assessment. • It is also indicated that water will be pumped from the pits to enable mining to continue safely	to be applied for Dust suppression will be applied for as part of the WULA. All agreements with regards to waste management will be submitted as part of the EIR and WULA. Mitigation measures to prevent the pollution to the ground and surface water resources will be addressed as part of the EIR and WULA. Pollution incidents originating from the proposed project will be reported to the Regional Office of DWS within 24 hours. A pre-application meeting was held with the DWS on 9 September 2014, attached hereto in Appendix B.

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					and efficient. In terms of the National Water Act, 1998 (Act 36 of 1998) section 21J) forms should be completed and submitted to this Department; • Overburden stockpile, coal stockpile and ROM is regarded as a water use in terms of section 21 (g) of the National Water Act, 1998 (Act 36 of 1998) relevant forms should be completed and submitted to this Department; • If the construction of haul roads is going to impact on the wetlands or rivers, in terms section 21 (c) and (i) of the National Water Act, 1998 (Act 36 of 1998) relevant forms should be completed and submitted to this Department; • Backfilling using	

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					carbonaceous materials should be motivated in terms of the GN704; • It is indicated that the slurry will be pumped to the existing slurry dams; the capacity of the existing slurry dam and the volume of the slurry should be submitted in order to check if the capacity will be sufficient for the extra load. • A water balance should be updated including all the water uses to be applied for. 9. Dust: If dust suppression using water is the measure to be taken. the applicant should note that using water for dust suppression is regarded as a water use in terms of Section 21 (g) of the National Water Act 1998 (Act 36 of 1998) and supplementary forms	

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					must be completed and submitted to this Department. 10. Waste Management: It is indicated that waste will be removed by a contractor and disposed in a registered waste disposal site. An agreement between the applicant and land owner should be submitted to the Department. 11. Storage of oil, diesel, hydraulic fluids and grease: It is recommended that the storage areas for these fluids be bunded with cement and in such a manner that any spillages can be contained and reclaimed without causing any pollution to the ground and surface water resources. 12. Pollution Incidents: The	

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					Applicant is referred to Section 19(1) of the National Water Act, 1998 (Act No. 36 of 1998), and to report any pollution incidents originating from the proposed project to the Regional Office of DWS within 24 hours. Please refer to external guideline for guidance on which information is required when applying for a Water Use Licence. The applicant is advised to arrange for a pre-consultation meeting with the Department before submitting a Water Use Licence Application. Therefore the Applicant shall provide clarity on the above-mentioned issues of concern prior to any recommendations from the DWS. Please do not hesitate to contact	

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					the DWS Regional Office should you have any queries.	
Ms Dineo Tswai	Department of Agriculture, Rural Development, Land and Environmental Affairs	06 February 2015	Fakude Okwethu-kuhle	Letter	APPLICATION FOR ENVIRONMENTAL AUTHORISATION: THE PROPOSED LANDAU COLLIERY; NAVIGATION SECTION, UMLALAZI SOUTH BLOCK EXTENSION PROJECT WITHIN EMALAHLENILOCAL MUNICIPALITY, MPUMALANGA PROVINCE. The draft Scoping Report and plan of study for environmental authorization which was submitted by you in respect *of* the above mentioned application and received by the Department on the 17°1 November 2014 has been accepted by the Department. You may proceed with undertaking the final Scoping	Noted.

Name	Company	Date	Contact Person	Method of comment	Issue raised	Response
					Report In accordance with the tasks that are outlined in the plan of study for environmental Impact report Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.	

5. DESCRIPTION OF ALTERNATIVES

As required in term of the requirements of Regulation 28 (j) (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998 the identified potential alternatives as well as the advantages and disadvantages that they may have on the environment and the community that may be affected have been discussed in this part of the Scoping Report. Also included here is the advantage and disadvantage the proposed project may have on the environment and the community that may be affected.

5.1 Alternatives considered during the Scoping phase

5.1.1 Alternatives in terms of the design and layout of the activity

5.1.1.1 Pit layout options

The following alternatives were identified with regard to the options for the pit layout options (refer to Table 42):

- Continue mining the existing approved South Block open-pit.
- Reduced size of the existing approved South Block open-pit to move further away from wetland area.
- Expansion of the South Block open-pit area including reduced size of existing approved South Block open-pit (preferred option).

Table 43: Alternative in terms of the pit layout options

Option	Advantage	Disadvantage
Continue mining the existing approved South Block open-pit.	No need for additional environmental authorisations.	Landau Colliery will not be able to continue to supply coal to the existing markets at the current rate of demand.
	No additional costs.	No additional work will be created.
Reduced size of the existing approved South Block open-pit to move further away from wetland area.	The impact on the wetland area will be reduced, therefore maintaining the functionality of the wetland.	Less coal will be mined, which will have an impact on the production of the mine.
Expansion of the South Block open-pit area including reduced size of existing approved South Block open-pit (preferred option).	Impact on the wetland areas will be reduced.	Additional infrastructure is required which will have an additional environmental impact and the capital cost for the mine will increase.

	Landau Colliery will be able to continue to supply coal to the existing markets at the current rate of demand.	Additional authorisations is required which will have an impact on the timeline of the project.
		High capital cost.

5.1.2 Alternatives in terms of the technology to be used in the activity

5.1.2.1 Crusher options

The following alternatives were identified with regard to the options for the crusher to be utilised (refer to Table 43):

- Upgrade of existing tip with new secondary, reversible 1800 feeder (preferred option).
- Upgrade of existing tip with existing secondary, scalping screen.
- In-pit crusher.
- Upgrade of existing tip with direct capacity proportioning at secondary sizer.
- Upgrade of existing tip with shuttle feeder, dogleg screen feeder.
- New tip for South Block.

Table 44: Alternative in terms of the crusher

Option	Advantage	Disadvantage
Upgrade of existing tip with new secondary, reversible 1800 feeder (preferred option).	Complexity is simple.	Production interruption during change over during implementation.
	Implementation is simple.	
	Low capital cost.	
	Select and non-select seam from both the North and South Block can be processed as batched feed through different circuits.	
Upgrade of existing tip with existing secondary, scalping screen.	Select and non-select seam from both the North and South Block can be processed as batched feed through different circuits or proportioned.	High in complexity as more equipment is required.
		Implementation is difficult.
		Implementation will interfere with existing tip access.
		High capital cost.
In-pit crusher.	Implementation is simple.	Complexity is medium as duplicate systems are run.
	Implementation will not affect operations at existing tip.	
	Low capital cost.	

	Continues process, select and non-select seam as mixed product but separate operations at North and South Block.	
Upgrade of existing tip with direct capacity proportioning at secondary sizer.	Complexity is low.	Production interruption during change over during implementation.
	Implementation is simple.	
	Very low capital cost.	
	Continuous process, select and non-select from North and South Blocks as mixed product.	
Upgrade of existing tip with shuttle feeder, dogleg screen feeder.	Select and non-select seam from both the North and South Block can be processed as batched feed through different circuits.	Complexity is high as more equipment is required.
		Implementation is difficult.
		Major disruption during implementation.
		High capital cost.
New tip for South Block.		Complexity is high as much more equipment is required.
		Major project.
		Very high capital cost.

The upgrade of existing tip with new secondary, reversible 1800 feeder will be the preferred option subject to the mine's acceptance of the 1800 revisable feeder. In terms of the advantages and disadvantages of this option, it can be concluded that this option is the most viable.

The upgrade of the existing tip with existing secondary, scalping screen is not a viable options as there are many disadvantages associated with this option. There are also footprint constraints associated with this option and if desired by the mine it would be possible to design conveyor crossings but at high cost.

Constructing an in-pit crusher would be a viable option as this option would be a trade-off for hauling. A study on the total operating expenses would be required. There would be double operations for crushing on site.

The upgrading of the existing tip with direct capacity proportioning at secondary sizer would be a viable option, but is subject to the mining/metallurgy. No belt upgrades are required and the existing system capacity is adequate.

The upgrading of the existing tip with shuttle feeder, dogleg screen feeder is not a viable option as major disruptions will be a result. The toll wash feed pile will need to be relocated and the existing infrastructure will be duplicated and cannot be re-used.

The construction of a new tip for South Block is not a viable option as it will provide for a poor return on the capital invested. There will be duplicate systems to operate and maintain at the same time.

5.1.3 Alternatives in terms of the operational aspects of the activity

5.1.3.1 Pollution Control Dam options

The following alternatives were identified with regard to the options for the pollution control dam (refer to Table 44):

- Upgrade of existing pollution control dam by increasing the size.
- Upgrade of the existing pollution control dam by removing the dam wall (preferred option).
- Construction of a new pollution control dam.

Table 45: Alternative in terms of the crusher

Option	Advantage	Disadvantage
Upgrade of existing pollution control dam by increasing the size.	Complexity is simple. Implementation is simple. Low capital cost.	Production interruption during change over during implementation.
Construction of a new pollution control dam.	Additional storage capacity for polluted water is created.	High in complexity as more equipment is required. Implementation is difficult. Implementation will interfere with existing water storage. High capital cost.
Upgrade of the existing pollution control dam by removing the dam wall (preferred option).	Implementation is simple. Implementation will not affect operations. Low capital cost.	Production interruption during change over during implementation.

5.1.4 Land use or development alternatives

The following land use alternatives have been identified and were investigated as part of the Scoping process, and are briefly compared in Table 45 below:

- Utilisation of the surface area for the Navigation West - South Block Extension.
- Utilise the surface area for grazing of livestock.
- Utilise the surface area for crop production.
- None of the above (No-go option) (refer also to Part 5.2).

Table 46: Assessment of land use alternatives

Environmental component	Opencast mining	Grazing	Crop production	No-go
Geology	Drilling and blasting of the hard overburden to expose the underlying coal seams will permanently destroy or disrupt the geological sequence of the coal seams to be mined.	No impact.	No impact.	Some geological strata may be permanently altered by future underground mining activities to be done by Landau Colliery.
Topography	Topography will be permanently altered by the Navigation West - South Block Extension.	No impact.	Topography will be levelled.	Topography has already been altered by previous mining and burrow pits.
Soil	Soil structure and functioning will be permanently altered.	Soils will be eroded.	Soils will be chemically and physically modified.	Soils have already been altered by previous mining and minor erosion exists in cultivated areas.
Land use	Land use will change from derelict land to mining and related activities.	Land use will be altered to agriculture.	Land use will be altered to agriculture.	Land use remains derelict.
Land capability	Land capability will be permanently altered.	Land capability may be lowered if overgrazing occurs.	Land capability may be impacted on if poor farming techniques are employed.	Land capability has already been impacted on by previous mining and related activities.
Flora	Natural vegetation will be destroyed in the land use area.	Natural vegetation will be impacted on if overgrazing occurs.	Natural vegetation will be destroyed in all crop areas.	Natural vegetation has already been disturbed by mining and related activities and alien infestation.
Fauna	Fauna will be impacted on as habitats are destroyed.	No impact.	Fauna will be impacted on as habitats are destroyed.	Fauna has already been impacted on as habitats have

Environmental component	Opencast mining	Grazing	Crop production	No-go
				been destroyed by past mining activities.
Surface water	Surface water quantity and quality may be compromised.	No impact.	Surface and groundwater may be used for irrigation.	Surface water has already been polluted by previous mining, and will continue to be polluted until such time as mining areas are rehabilitated.
Groundwater	Groundwater quantity and quality may be compromised.	No impact.	Groundwater may be used for irrigation.	Groundwater has already been polluted by previous underground and opencast mining activities, and will continue to be polluted until such time as the mining areas are closed and rehabilitated.
Air quality	Dust will be generated.	Dust will be generated if overgrazing occurs.	Dust will be generated after the harvest season.	Dust from the surrounding mining activities will continue to be generated.
Noise	Noise will be slightly increased.	No impact.	Noise will be generated during planting and harvesting seasons.	Noise will continue to be generated by the surrounding mining and related activities, as well as the N12 and R547. .
Visual	The visual environment will be altered by changes in topography.	No impact.	The planting of crops will alter the visual	No impact.

Environmental component	Opencast mining	Grazing	Crop production	No-go
			environment.	
Sensitive landscapes	Sensitive landscapes will be altered.	Sensitive landscapes will be altered or destroyed if overgrazing occurs.	Sensitive landscapes will be altered or destroyed.	No further impact.
Sites of archaeological and cultural interest	No impact.	No impact.	No impact.	No further impact.
Socio-economic	Loss of jobs will be avoided.	No impact.	Some jobs may be created.	No further impact.
Interested and affected parties	Surrounding landowners may be further impacted upon as a result of impacts listed above.	No impact.	No impact.	No further impact.
Cumulative impacts	Large mining complexes already exist in the vicinity of the Landau Colliery. Impacts of mining (as described above) may be slightly increased.	Destruction of the natural environment will be compounded if overgrazing takes place.	Destruction of the natural environment will be compounded if over- fertilisation occurs or poor farming techniques are employed.	Large mining complexes already exist in the vicinity of the Landau Colliery. Impacts of mining (as described above) will be compounded.

Major impacts associated with each land use alternative have been summarised for comparative purposes. Each proposed land use alternative will impact on the natural environment at the proposed site.

5.2 Consequences of not proceeding with the proposed project (no project alternative)

The 'No Project' alternative has been investigated in terms of the above-mentioned alternatives.

The 'No Project' alternative is not yet considered due to the anticipated benefits of the proposed Navigation West - South Block Extension. Expected indirect benefits of the proposed project include:

- Continued employment of staff.
- Potential for the creation of additional jobs.

- Continued upliftment of the surrounding communities.
- Rehabilitation of environmental issues within the wetland areas.
- Continued supply of coal to the local, national, and international markets, and therefore contribution to local, provincial and national economy.

Should the 'No Project' option be implemented, jobs of workers that are currently employed at the Landau Colliery may be compromised. In addition, the Landau Colliery will not be able to continue to supply coal to the existing markets at the current rate of demand. Positive impacts of the proposed project would also be lost if the no-project option is carried out.

While the 'No Project' option is not yet considered to be the preferred alternative, it will not be discarded. The 'No Project' option will be further assessed as part of the EIA process for the proposed project.

6. IDENTIFICATION OF ANTICIPATED ENVIRONMENTAL IMPACTS

This part of the Scoping Report document focuses on the identification of the major potential impacts the activities, processes and actions may have on the surrounding environment. Furthermore it indicates the major impacts the aspects of these activities have on the environmental components associated with the site, as required in terms of Regulation 28 (g) (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998.

6.1 Project Phases and Activities to be undertaken

For the purposes of this impact assessment, the project timeframe will be subdivided into the following four phases:

- Construction Phase.
- Operational Phase.
- Decommissioning Phase.
- Post Closure Phase.

The main impacts identified for the Navigation West - South Block Extension Project are listed below. Potential cumulative impacts were also identified, where applicable. The environmental impact assessment report will include a full risk assessment of all environmental impacts. The Environmental Management Programme (EMP) will set out mitigation measures to be implemented during the Construction, Operational, Decommissioning and Post Closure Phases. Refer to Part 7.2 of this Scoping Report for the Impact Assessment methodology that will be followed as part of the EIA process.

6.1.1 Construction Phase

The following mining and related activities, which are expected to impact on the surrounding environmental aspects during the construction phase of the proposed Navigation West –South Block Extension project include, but are not limited to the following:

- The construction of haul roads and the upgrading of the existing Navigation West access road to accommodate the additional trucks.
- The development of the initial box-cut with ramp.
- Stripping and separate stockpiling of topsoil, subsoil and overburden of the initial box-cut at the opencast area.
- Construction of storm water management measures such as berms for the separation of clean and dirty water management areas.

- Erection of the tip and potentially in-pit crushers for the separate processing of the No. 4 Top Seam and No. 4 Select Seam ROM coal.
- The expansion of the existing Navigation West Pollution Control Dam.
- The construction of ablution facilities.
- The construction of pipelines for the removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.
- The internal relocation of 22kV powerline.
- Diversion of the Sasol gas pipeline as mining away from the proposed mining area.

The following anticipated impacts have been identified to be undertaken during the Construction Phase of the project:

Table 47: Major anticipated impacts identifies during the construction phase

Construction Phase		
1.	**Geology**	Drilling and blasting of the hard overburden to expose the underlying coal seams will permanently destroy the geological sequence of the coal seams to be mined.
2.	**Topography**	The temporary stockpiling of topsoil and imported material will impact on the topography of the area.
3.	**Soil**	The stripping of topsoil and excavation of soil will impact on the soil and soil characteristics (e.g. fertility).
4.	**Land capability**	The land capability of the areas associated with the openpit and associated infrastructure will be permanently altered.
5.	**Land use**	The land use of the area will be impacted on as it was derelict land and will now change to mining related.
6.	**Vegetation**	The vegetation on the areas associated with the opencast-pit and associated infrastructure will be impacted on by the stripping and clearing of vegetation.
7.	**Animal life**	The animal life in the area has already been impacted upon by mining activities in the area; however the removal of vegetation will decrease the size of the habitat available for animal life.
8.	**Surface water**	The construction of the opencast pit, associated infrastructure and the removal of vegetation may cause an increase in the amount of suspended solids in the surface water runoff.

9.		Ponding of water on the surface may occur during the construction phase.
10.		Contamination of the clean water system may occur.
11.	**Groundwater**	Generation of acid mine drainage and spontaneous combustion may occur due to the exposure of carbonaceous material to oxygen.
		Oil leaks from construction vehicles and contaminated material may enter the groundwater trough seepage.
12.	**Air Quality**	During the construction phase of the project, dust will be generated due to the stripping and removal of vegetation.
13.	**Noise**	Noise levels are expected to increase during the construction phase due to the stripping and removal of vegetation, trucks conveying material and the construction of infrastructure.
14.	**Sensitive landscapes**	Some of the infrastructure will be constructed within the 500 meter buffer zone of the wetland areas. The wetland areas could therefore be impacted upon, and indirectly affect the natural water resources on the site.
15.	**Visual**	The construction of the opencast pit and associated infrastructure, moving of vehicles at night and the removal of vegetation will increase the visual impact in the area.
16.	**Socio-Economic**	The opencast pit will benefit the local economy in a sense that the facility will ensure job security as well create possible job opportunities.

6.1.2 Operational Phase

This phase will commence when the first truck load of coal is removed from the opencast pit and will include the period during which the opencast mining and related activities such as crushing and hauling of ROM coal, management of clean and dirty water separation systems and infrastructure, progressive pit development and progressive rehabilitation, etc. are conducted and continues until the last truck load of coal has been removed from the final opencast pit, and all other Operational Phase activities have ceased, and the Decommissioning Phase commences.

The following mining and related activities, which are expected to impact on the surrounding environmental aspects during the operation phase of the proposed Navigation West –South Block project include, but are not limited to the following:

- Progressive development of the box-cut(s), including continues stripping and stockpiling or direct placing of topsoil, subsoil and overburden.
- Construction of haul roads and ramps as mining progresses.
- Blasting followed by extraction of the No. 5 and No. 4 Top Seam coal and subsequently extraction of No. 4 Seam Select coal.
- Concurrent rehabilitation of the opencast pit areas will be undertaken as the pit advances. Carbonaceous material will be placed back into the open voids up to the coal level, followed by the sequential replacing and compaction of overburden and subsoil layers, followed by the replacement of topsoil prior to the re-vegetation of the surface as part of the rehabilitation strategy that will be implemented by the Navigation West Section.
- Hauling of ROM coal to the tip and potentially in-pit crushers, with separate crushing and stockpiling of crushed ROM coal from the No. 4 Top Seam, the No. 4 Select Seam and the No.5 Seam.
- The lower No. 4 Select Seam is to be hauled to either the Ngwenya Plant or the plant at Navigation Plant for processing.
- The No. 4 Top Seam is transported to Eskom, or one of the municipalities generating their own power e.g. Rooiwal.
- Discards are to be returned to the tip from the plant using return trip of ROM haulers.
- Discards required to fill up the mining void to avoid the formation of post-mining depressions.
- Utilisation of water management measures including pollution control measures such as the pollution control dam and the construction of additional water management measures as required in the development of the Navigation West - South Block opencast area.
- Utilisation of the existing Ngwenya Plant to wash the No.4 Select Seam coal.
- Utilisation of the existing infrastructure at Navigation West such as:
    - Site offices.
    - Ablution facilities
    - Workshops.
    - Security facilities (access boom and guard hut).
    - A fuel depot.
    - Wash-bay.
    - Storage areas.
    - Waste accumulation areas.
    - Pipelines for the transportation of potable water (for domestic use) and process water (for dust suppression and process use).
    - Transportation of sewage sludge from the onsite sewage facilities to the sewage treatment plant at Navigation Section.

- Slurry will be pumped to the existing slurry dams to dry and from the slurry dams disposed of in the pits.
- The tip and in-pit crushers for the separate processing of the No.4 Top Seam and No.4 Select Seam ROM coal.
    - Pipelines for the transportation of excess contaminated water from the proposed pollution control dam to the Navigation Dam.
    - Water pumped to the Navigation West PCD is re-used at the Ngwenya Plant and also for dust suppression
    - Removal of groundwater influx and mine process water from the open pits to enable mining to continue safely and efficiently.

The following anticipated impacts have been identified to be undertaken during the Construction Phase of the project:

Table 48: Anticipated impacts identified during the operational phase

Operational Phase		
1	**Geology**	It is not anticipated that the operation of the opencast pit or the associated infrastructure will have any impact on the geology.
2	**Topography**	The topography will be negatively impacted upon due to the progressive development of the opencast pit.
3	**Soil**	The soil will become sterile due to the deposition of mine residue on the surface.
4	**Land capability**	The land capability of the site will continue to be permanently altered.
5	**Land use**	The land use of the area will now change to mining related.
6	**Vegetation**	The vegetation will be suppressed in the area of the opencast pit due to the activities conducted on and around the facility.
7	**Animal life**	Animal life in the area has been and still is affected by previous and current mining activities of the Landau Colliery and surrounding mines.
8	**Surface water**	The clean water system may be contaminated through the runoff of surface water from dirty areas.
9		An increase of suspended sediment in surface water runoff may occur.

10	**Groundwater**	Groundwater contamination may occur due to the seepage from the opencast pit.
		Generation of acid mine drainage and spontaneous combustion may continue to occur due to the exposure of carbonaceous material to oxygen.
11	**Air Quality**	Vehicle emissions and dust will be generated in the operational phase at Navigation West - South Block.
12	**Noise**	The impacts of noise will be compounded and an increase of noise will occur towards the south of the Landau mining area, as there will be an increase of activity at the Navigation West Section.
13	**Sites of cultural and archaeological interest**	No sites of archaeological and cultural importance have been identified on or in the vicinity of the proposed site and will therefore not be impacted on.
14	**Sensitive landscapes**	Some of the infrastructure will be located within the 500 meter buffer zone of the wetland areas. This could therefore be impacted upon, and indirectly affect the natural water resources on the site.
15	**Visual**	The opencast pit and associated infrastructure, moving of vehicles at night and the removal of vegetation will increase the visual impact in the area, especially from the R547.
16	**Socio-Economic**	The opencast pit will benefit the local economy in a sense that the facility will ensure job security as well create possible job opportunities.

17	**I&APs**	The opencast pit will benefit the local economy in a sense that the facility will ensure job security as well create possible job opportunities.
18		The opencast pit and associated infrastructure, moving of vehicles at night and the removal of vegetation will increase the visual impact in the area.
19		The impacts of noise will be compounded and an increase of noise will occur towards the south of the Landau mining area, as there will be an increase of activity at the Navigation West Section.
20		Vehicle emissions and dust will be generated in the Navigation West South Block.

6.1.3 Decommissioning Phase

This phase will commence when the mining of coal ceases and the crusher plants and other surface infrastructure such as haul roads become redundant. This phase will continue until Closure is obtained, at which point in time the Post-Closure Phase will commence.

The following mining and related activities, which are expected to impact on the surrounding environmental aspects during the decommissioning phase of the proposed Navigation West –South Block project include, but are not limited to the following:.

- Backfilling of the final void(s).
- Removal of carbonaceous material from areas such as footprints of ROM coal stockpiles, crusher plant areas, along haul roads, and disposal in the final voids prior to final rehabilitation.
- Levelling of remaining in-pit spoils, and shaping and landscaping of rehabilitated open voids.
- Removal of infrastructure at the tip area as well as ripping of tip area and haul roads.
- Removal of redundant surface infrastructure (depending on the agreed end land use), and rehabilitation of the remaining footprint areas.
- Monitoring and maintenance of rehabilitated surface land use areas, as well as surface water and groundwater.
- Utilisation and management of the water balance to reflect the actual situation during the Decommissioning Phase.

Table 49: Anticipated impacts identified during the decommissioning phase

Decommissioning Phase		
1.	**Geology**	It is not anticipated that the opencast pit or the associated infrastructure will have any impact on the geology
2.	**Topography**	Depending on the agreed upon end land use for the area, site may be levelled and rehabilitated in the future.
3.	**Soil**	Soils may be compacted by the use of vehicles and machinery for the rehabilitation of disturbed areas.
4.		Once natural vegetation has become established in rehabilitated soils, the soils will be able to begin to return to their pre-mining status.
5.		There will be an increase in soil erosion by water and wind as soils will be exposed. Soils will be exposed from the time that they are placed on rehabilitated areas until such time as vegetation has been established.
6.		Soil in other areas may be impacted if the quantity of soil at the Landau Colliery is insufficient for rehabilitation activities. In such a case, soil will need to be imported to the mine boundary area for rehabilitation.
7.		Compacted soils on the rehabilitated site will be ripped and seeded, improving the soil structure and functioning.
8.	**Land capability**	As a result of the rehabilitation activities, the land capability in some surface land use areas will be altered. Land capability will be altered by the placing of soils and establishment of vegetation for grazing. The final land capability will depend on the agreed end land use.
9.	**Land use**	As a result of the rehabilitation activities, the land use in some surface land use areas will be altered. Rehabilitation activities will be undertaken to allow for the agreed upon end land use for the area.
10.		In some of the areas the land use will return to Pre-mining conditions.
11.		The land use of the disturbed areas will be returned to agricultural land use (mostly grazing), even though the production potential will be decreased due to loss of land capability.
12.	**Vegetation**	Premature grazing of livestock on rehabilitated areas may affect the re-establishment of vegetation on disturbed areas.

13.		Re-establishment of vegetation on rehabilitated infrastructure areas.
14.		
15.		
16.	**Animal life**	The re-establishment of vegetation after the removal of redundant surface water management infrastructure will allow for animal life to return to the rehabilitated sites.
17.		Initially the rehabilitation activities may frighten or result in injury of animal life if not prevented / mitigated. However, the resettlement of animal life in the rehabilitated areas is anticipated due to the re-establishment of suitable habitats when rehabilitation is completed.
18.	**Surface water**	The rehabilitation activities associated with the decommissioning of opencast pit may temporary result in the blocking of surface water runoff resulting in ponding and reduction of surface water run off quantity, if not prevented.
19.		Initially, the ripped up and rehabilitated surface water management areas will be exposed and erosion may take place. This could lead to an increase in suspended particles in surface water runoff, if not mitigated.
20.		The opencast pit poses a significant liability with the risk of future impacts on water quality.
21.	**Groundwater**	Generation of acid mine drainage and spontaneous combustion may continue to occur due to the exposure of carbonaceous material to oxygen.
22.	**Air Quality**	The ripping of compacted areas during rehabilitation will increase the amount of dust generated.
23.	**Noise**	Noise levels are expected to decrease during the decommissioning phase due to decrease in vehicles movement.
24.	**Sensitive landscapes**	Acid mine drainage will impact negatively on sensitive landscapes to the east and west of the Navigation West - South Block.
25.		Erosion on and around the Navigation West - South block will result in increased sedimentation.

26.		The rehabilitation of the wetland areas will have a positive impact on the wetlands.
27.	**Visual**	The re-establishment of vegetation on the rehabilitated infrastructure areas, and the removal of haul roads as well as stockpile areas as part of the rehabilitation of infrastructure will allow the sense of place to return to an agricultural sense.
28.		The removal of redundant infrastructure and the re-establishment of vegetation on the rehabilitated areas will allow the sense of place to return to an agricultural sense.
29.		The visual landscape will be impacted by the rehabilitation of the disturbed land use surfaces. The visual landscape in such areas will return to close to its pre-mining state.
30.	**Socio-Economic**	Jobs will be lost, commencing during the Decommissioning Phase as the mining and related activities will have ceased.
31.		Since jobs will be lost, the families and communities previously supported by the workers at the mine will be detrimentally affected.
32.		The supply of coal from Landau Colliery to local and national markets will cease, this may impact on the energy production in the region.
33.	**I&AP's**	Rehabilitation activities will result in the removal of most of the mining and related infrastructure. This will result in an alteration in the landscape visually. I&APs will be impacted positively by the changes, as the sense of the place will be altered back to its original state.
34.		Some impacts previously impacting on I&APs throughout the LOM will decrease and/or cease completely. This includes impacts on air quality by the generation of dust and noise impacts.
35.		Surface water quality will be improved by rehabilitation activities. This will decrease the impact on surface water of downstream users.

36.		Groundwater may be impacted on if a pollution plume develops during the Decommissioning Phase. This will impact the groundwater quality of downstream groundwater users.

6.1.4 Post Closure Phase

The Post-closure Phase will commence once the mine has obtained a Closure Certificate from the DMR.

The following anticipated impacts have been identified to be undertaken during the Construction Phase of the project:

Table 50: Anticipated impacts identified during the Post Closure phase

Post Closure Impacts		
1	**Geology**	No additional impacts are anticipated on the geology of the mine boundary area.
2	**Topography**	No additional impacts are anticipated on the topography of the mine boundary area.
3	**Soil**	No additional impacts are anticipated on the soils of the rehabilitated sites. The rehabilitation of the soils on the site should be conducted in such a manner that the highest possible agricultural potential is attained post closure.
4	**Land capability**	No additional impacts are anticipated on the land capability of the rehabilitated sites.
5	**Land use**	No additional impacts are anticipated on the land use of the rehabilitated sites. Agricultural land use is anticipated to continue post Closure.
6	**Vegetation**	No additional impacts are anticipated on the vegetation of the rehabilitated sites.
7	**Animal life**	No additional impacts area anticipated on the animal life of the study area. Species previously present on site will in all probability return if suitable habitat is re-established .
8	**Surface water**	Acid mine drainage could lead to water of poor quality (high acidity, high levels of metals, especially iron and aluminium, etc.) entering the surface water (either directly through overflowing, decanting or seepage into groundwater that reaches surface water ecosystems. This will have a negative impact on especially biota intolerant to water

		quality alterations, but depending on the severity may be detrimental to the entire aquatic ecosystem.
16	**Groundwater**	Contaminated pollution plume may develop and expand in the groundwater flow direction
17	**Air quality**	Impacts are anticipated to decrease and the air quality of the area is to be improved.
18	**Noise**	Impacts on ambient noise levels are anticipated to decrease.
19	**Sensitive landscapes**	No additional impacts are anticipated on the sensitive landscapes (wetlands) associated with the project. The permanent impacts associated with the Construction and Operational Phase will remain applicable.
20	**Visual**	No additional impacts are anticipated on the visual aspects associated with the project.
21	**Socio-Economic**	No additional impacts are anticipated on the socio-economic aspects associated with the project.
22	**I&APs**	The long term surface water and groundwater impacts described above will also affect the I&APs.

6.1.5 Cumulative Impacts

The following anticipated impacts have been identified to be undertaken during the Construction Phase of the project:

Table 51: Anticipated cumulative impacts

Cumulative Impacts

1	**Geology**	The Witbank Coal Field, located mostly within the Mpumalanga Highveld region between Bethal and Springs in Gauteng, generally contains five seams of coal most of which is good quality and high calorific value. As such, coal is extracted from numerous mines located near eMalahleni, in the eMalahleni Local Council's area of jurisdiction. Due to the existing surrounding coal mining operations (Xstrata South Africa (Pty) Ltd., Anglo Operations Ltd., etc.) in the surrounding area, the geological strata in the region will be permanently altered.	The contribution of the mine to this cumulative impact will increase progressively as mining advances.
2	**Geology and Socio-economic conditions**	The extraction of coal from the Witbank Coal Field has occurred over a period spanning more than a century, and modern day opencast mining techniques enable coal extraction to be maximised. This has led to the systematic depletion of the coal reserves in the region, increasing significantly in the last several decades due to improvements in mining technology. Since coal is a fossil fuel it is a non-renewable resource, and as the remaining coal reserves decrease, the value of the coal will increase because of supply and demand principles. This will lead to an increase in income generation and positive contributions to the regional socio-economic conditions during the Operational Phase of the mine, but will ultimately result in the complete exhaustion of the coal reserves, leaving no coal for future generations.	Coal reserves currently being mined at the Landau Colliery will be exhausted by 2035.

3	**Topography, Land use and Visual aspects**	The Landau Colliery is located in a region where opencast coal mining is common place. The large number of opencast coal mines in the region, together with the historical nature of the mining in the Witbank region (over 100 years of mining history) will most likely have desensitised local residents and frequent travellers through the area. On the contrary, the visibility of the mining areas from the surrounding areas could be of interest to passers-by, especially since coal mining is an important part of Mpumalanga's history, and visits to coal mines are even cited as being of interest to tourists.	Visual impacts of the opencast pit would result from the removal of vegetation and the, stockpiling of soil and spoils, changes in topography and the general sense of place associated with the pre-mining landscape. In addition, much of the surface infrastructure at Landau Colliery has resulted in topographical elevations within the surface land use area, thereby altering the visual 'sense of place' from that associated with the pre-mining agricultural land use.
4			*In situ* rehabilitation of opencast pit and the continued utilisation of some water management infrastructure mean that the resultant permanent change in topography will also result in permanent changes to the visual aspects of the study area.
5	**Topography, Land use and Visual aspects**	The Landau Colliery is located in a region where opencast coal mining is common place. The large number of opencast coal mines in the region, together with the historical nature of the mining in the Witbank region (over 100 years of mining history) will most likely have desensitised local residents and frequent travellers through the area. On the contrary, the visibility of the mining areas from the surrounding areas could be of interest to passers-by, especially since coal mining is an important part of Mpumalanga's history, and visits to coal mines are even cited as being of interest to tourists.	Rehabilitation of opencast pit and footprint areas remaining once infrastructure has been removed to agricultural land capability and grazing land use will contribute to the restoration of the pre-mining 'sense of place' associated with the agricultural areas in the Mpumalanga Highveld region.

6	**Topography**	Large sections of the Emalahleni Municipal area affected by shallow undermining, which has had a significant impact on the environment, resulting in sinkhole formation, subsidence and seepage of water from underground workings (ELM IDP, 2009-2010), amongst others.	Restoration and improvement of the topography at Landau Colliery will have consequent impacts on surface water, visual aspects, and safety of future land users, amongst others.
8	**Soil, land capability and Socio-economic conditions**	Agriculture is one of the largest economic sectors in Mpumalanga, producing 15% of total output in South Africa (South Africa Yearbook, 2001/02). The number of opencast mines in Mpumalanga, particularly large operations, has led to a significant loss of high agricultural potential soils that would otherwise continue to be capable of supporting crop cultivation. Loss of high potential agricultural land due to opencast mining activities in the area will reduce the food production capability of the region.	The contribution of the mine to this cumulative impact will increase progressively as mining advances.
9	**Soil, land capability, biodiversity and sensitive landscapes**	In addition, large areas of the surface have been affected by agriculture and opencast mining, which has led to loss of soil structure and function, and ultimately to loss of biodiversity due to the transformation and fragmentation of natural habitats and ecosystems.	
10	**Land use and Socio-economic conditions**	Mining is an important sector in Mpumalanga providing jobs and contributing to over one fifth of Mpumalanga's Gross Geographic Product (Mpumalanga SoE, 2003).	The temporary change in land use to mining will result in a much higher income per hectare of land over the short-term in comparison with agriculture.

11	**Biodiversity - Alien species**	Invading alien plants are the single biggest threat to plant and animal biodiversity through the effects of predation, alteration of habitat or disruption of ecosystem process and services. Invading alien plants have become established in over 10 million hectares of land in South Africa. If left uncontrolled, the problem will double within 15 years. Invading alien plants waste 7% of our water resources, reduce farming productivity, intensity flooding and fires, cause erosion, degrade river systems, increase rate of siltation of dams and estuaries, reduce water quality and can cause extinction of indigenous plants and animals (Mpumalanga SoE, 2003).	Alien and invasive species tend to establish in disturbed surface areas at Landau Colliery, which will be abundant during opencast mining. Unless appropriately managed, it is likely that alien and invasive species will encroach into natural vegetation areas, and especially into areas that are newly disturbed or rehabilitated.
12	**Biodiversity - Threatened species**	Numerous species in Mpumalanga face the risk of extinction due to factors such as habitat loss, environmental degradation and fragmentation of landscapes (Mpumalanga SoE, 2003).	Grass owls (*Tyto capensis*), with a Red Data status of 'Vulnerable', occur within the mine boundary area. The impacts of mining, in terms of noise, ground vibrations, surface water and groundwater impacts will severely affect the habitat of the Grass owls, and may lead to the loss of life of the owls. Furthermore, the increase in human presence on site will contribute to the migration of this species but the lack of suitable habitat in the surrounding areas may further contribute to loss of animal life.

13	**Surface water**	The bulk (65%) of water resources available in Mpumalanga comes from surface water resources, water transfers into the province provide 19% of total water availability, groundwater contributes 6% of available water and return flows from mining, industrial, irrigation and urban sectors contribute 10%. Water use in South Africa is dominated by irrigation and Mpumalanga province is no exception with 46% of its water being used for irrigation. The second largest requirement for water is for water transfers to neighbouring catchments and Water Management Areas(WMAs) which accounts for 16% of water use in the province, while water use in the urban sector is slightly less (8%) and requirements for the industrial, forestry and mining sectors each account for 9% of the provinces water use (Mpumalanga SoE, 2003).	The containment of contaminated water in pollution control facilities at Landau Colliery will lead to a decrease in the MAR available to the affected catchments. This applies to both the Operational and Post Closure Phases for containment and decants management respectively.
14		Water quality indicators have shown a general decrease in water quality over time. Median levels of surface water nutrients have increased and indicate a potential for enrichment. The consequences of these elevated levels are: * A greater potential for algal blooms; * An impact on riverine ecosystems; and * Impairment of human health. High (and increasing) total dissolved solids (TDS) levels in the Olifants Water Management Area (WMA) have the potential for decreasing the aesthetic value of the water. Exceedance of the guideline levels for certain metals in the Olifants WMA may be attributed to the numerous industrial and mining activities taking place in that area. At the WMA scale, high exceedance above water quality guideline levels exist for pH levels in the province.	If contaminated surface water (including decanting acid mine water) is discharged, or allowed to flow to the receiving environment, the water quality in the receiving environment would further deteriorate. Downstream users and aquatic habitats would be negatively affected by such discharge, and the wetlands in downstream receiving areas would also be negatively impacted.
15	**Groundwater**	Groundwater contributes 6% of available water in Mpumalanga (Mpumalanga SoE, 2003).	The extent and quality of pollution plumes emanating from mining areas will affect the overall groundwater quality in the area. This could impact on the water users in the area.

16		Groundwater is used for irrigation and domestic consumption in the surrounding agricultural region. Groundwater levels are drawn down at all operational mines in the region, leading to an overall impact on groundwater levels but have also lead to a complicated flow of groundwater between mines.	Development of draw down cones during the Operational Phase will occur due to the dewatering of mining operations. This will affect the regional groundwater level during the Operational Phase, but once dewatering ceased, groundwater levels are expected to recover.
17	**Air quality**	Air quality is an issue of concern in Mpumalanga, as it is in many other parts of South Africa. A wide variety of air pollution exist in Mpumalanga, ranging from veld fires to industrial processes, agriculture, mining activities, power generation, paper and pulp processing, vehicle use and domestic use of fossil fuels (Mpumalanga Province, 2002).	Dust generated by drilling and blasting activities as well as the transport of coal along gravel roads will cause an increase in the fugitive dust in the area.
18			Emission of carbon dioxide in exhaust fumes and smoke is generally of little consequence in isolation, but contributes to the regional air quality problems in Mpumalanga, and also to the larger, global issue of climate change.
19	**Noise**	Noise generated by mining activities is related to blasting and use of equipment and vehicles. However, noise is directional, and dissipates with distance. The spatial distribution of mines and related operations in the region reduces noise impacts inherently. However, when the noise is generated near residential areas, the location of the I&APs within the noise transmission paths together with the actual generation of noise cumulatively increases the significance of the impact.	Noise impacts on nearby residential locations.
20	**Socio-Economic**	The annual household income for Mpumalanga remains fairly low, with most households earning less than R18 000 per annum. Adult literacy has improved in the past two decades, but still remains below the national average and many scholars do not complete their matriculation exams. Approximately 33% of the provinces population is unemployed.	Landau Colliery currently provides jobs for 914 people and funds and participates in community projects. The positive impacts of Landau Colliery on the regional socio-economic conditions during the Operational Phase are discussed in Part 5.

21		Mine closure will raise unemployment levels in the region, and would increase significantly as more mines close down.	All positive impacts of the mine on the socio-economy that will have taken place during the Operational Phase will wane during the Decommissioning Phase until they cease, mainly due to the reduction or cessation of jobs and the cessation of demand for goods and services.
22			Rehabilitation of the surface to support 90% of the pre-mining land capability means that future land use of the site will be sustainable over the long-term. Use of the land for agricultural purposes such as crop cultivation or grazing will enable the contribution of future land users to the local and regional socio-economy through food production and agricultural job creation.
23	**I&APs**	The use of provincial roads by heavy duty vehicles for the haulage of coal from the mines in the region leads to the deterioration of the public roads and increased safety hazards for all road users, particularly in poor visibility conditions which occur frequently on the Mpumalanga Highveld due to the weather (mist).	Heavy goods vehicles are used to transport coal from the Landau Colliery to the domestic market. Coal is mainly transported by rail and conveyor, and so Landau Colliery does not contribute significantly to the increased road hazards in the region.
24		I&APs are generally affected indirectly by direct impacts of mining and related activities on environmental aspects. The location of I&APs in relation to the mining and related activities strongly influences the severity of the impacts.	Impacts on air quality, noise, vibrations, surface water, groundwater and visual impacts will cumulatively impact on I&APs

6.2 Conclusion and recommendations

The nature and extent of further investigations that have been identified during the scoping process will be undertaken as part of the EIA, and have been highlighted in Part 7 of this Scoping Report. The significance of the impacts will be quantified as part of the EIA.

Many of the potential negative consequences that have been identified as possibly occurring as a result of the infrastructure / activities associated with the proposed Navigation West - South Block Extension project can be mitigated successfully. It is, however, necessary to thoroughly assess all possible impacts (prior to mitigation) in order to ensure that environmental considerations are taken into account, in a balanced way, as far as possible, supporting the aim of creating a healthy and pleasant environment.

The impacts that are expected to occur as result of the infrastructure / activities associated with the proposed Navigation West - South Block Extension may combine with those resulting from surrounding activities and land uses to form cumulative impacts, or to contribute to cumulative impacts that already exist.

Cumulative impacts can be defined as *"changes to the environment that are caused by an action in combination with other past, present and future human actions"* (DEAT, 2004).

Although individual impacts may be small and insignificant, accumulation of small effects can result in a cumulative impact of significance. The identification of cumulative impacts is therefore important, and has been included in this Scoping Report.

In general the expected environmental impacts from the construction and operation phase of the proposed expansion of the Navigation West - South Block Extension do not indicate that the proposed activities would have irreversible detrimental effects on the receiving environment, although the most significant Post-Closure Phase impact would be the contamination of groundwater through AMD and possible consequent decanting of acid water to the receiving water environment. The reduction and capture of decant as well as the treatment thereof at the EWRP would be addressed through the development of a long-term groundwater strategy.

7. IDENTIFICATION OF KNOWLEDGE GAPS AND PLAN OF STUDY FOR EIA

In accordance with of Regulation 28 (of Regulation 543) of the EIA Regulations (2010), under the NEMA, 1998, the knowledge gaps identified and a description of the tasks that will be undertaken as part of the EIA process, including any specialist reports or specialised processes (including the manner in which such tasks will be undertaken), are discussed in this part of the Scoping Report.

7.1 Knowledge Gaps

The following knowledge gaps and uncertainties have been identified during the scoping process of the proposed Navigation West - South Block Extension and require further investigations that will be comprehensively carried out as part of the EIA process for the proposed project:

- All relevant specialist studies need to be conducted for the area associated with the proposed Navigation West - South Block Extension. The studies identified during the Scoping Phase include a Geohydrological Study, Fauna and Flora Study, Wetland Study, Soil, land-use and land capability Study, Hydrology Study, Blasting and Vibration Study and Heritage Impact Assessment.
- While impacts have been identified as part of the scoping process, it is required as part of the EIA Phase to fully quantify impacts to all aspects of the environment.
- High level designs are being developed for the proposed Navigation West - South Block Extension and the associated infrastructure; these designs will be presented as part of the final EIR.

7.2 Plan of Study

7.2.1 Tasks to be undertaken as part of the EIA process

The EIA process, which will be undertaken subsequent to the Scoping Process, will be conducted in accordance with Regulations 31 of the EIA Regulations R.543 (2010), under the NEMA (1998). The EIR document for the proposed project will include detailed information pertaining to anticipated or potential impacts that may be associated with the proposed project.

The EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will reflect amongst other, the following:

- Details and expertise of the independent EAP.
- A detailed description of the proposed activity and its location.
- An assessment of the environment likely to be affected by the proposed activity.
- Details of the Public Participation Process followed.

- An assessment of the need and desirability of the proposed activity including potential alternatives and their advantages and disadvantages.
- A description of the methodology in determining the significance of the potential environmental impacts.
- An assessment of the identified alternatives and their impacts of the proposed activity on the environment, including cumulative impacts on the environment.
- A summary of the findings of all specialist reports generated (No specific requests have been received from the competent authorities to date).
- A description of environmental issues and potentially significant impacts including a description of the nature, extent, duration, probability, reversibility, loss of irreplaceable resources and degree of mitigation of impacts. Cumulative impacts will also be assessed.
- Identification of knowledge gaps, assumptions and uncertainties.
- An environmental impact statement as well as an opinion whether the activity should be authorised or not.
- A Environmental Management Programme including, amongst other, environmental management objectives and goals, mitigation measures and management of significant impacts, description of persons responsible for mitigation implementation, description of time periods applicable to mitigation implementation, and monitoring and performance assessment.
- Inclusion of technical and supporting information.

The process of undertaken to compile the EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will include amongst other, the following:

- Commence with the compilation of the EIA under the NEMA (1998) as per the EIA Regulations R.543 (2010) [Regulation 543 (31)]
- Provide the draft EIA (including a draft EMP) to the client for input prior to public and authority comment.
- Conduct a Public Participation Process in accordance to EIA Regulations R.543 (2010), including providing the draft EIA Report to the competent authority as well as for public comment for a period of 40 days [Regulation 543(56)].
- Consider all objections and representations received during the Public Participation Process and finalise the EIA.
- Provide the final EIA (including a draft EMP) to the client for input.
- Prior to the submission of the final report to the DARDLEA, the I&APs will be provided opportunity to comment on the final EIA Report in terms of the requirement of Regulation 543(56)(6).
- Comments on the final EIA report by I&APs should be submitted directly to the DARDLEA and copied to the applicant and EAP.

- The final EIA will be submitted to the DARDLEA after which they have 60 days, after acknowledging receipt of the final EIA Report to consider it and in writing accept or reject the report or request additional information or amendments to the document [Regulation 543(34)(2)].
- A final Authorities meeting will be scheduled to present the submitted documentation and verify progress with the approval process of previously submitted documentation.
- Continued consultation with the relevant authority until issuing of the decision.

7.2.2 Stages at which the competent authority will be consulted

The stages at which the DARDLEA will be consulted in the process of compiling the EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will include amongst other, the following:

- During the Public Participation Process in accordance to EIA Regulations R.543 (2010), the draft EIR will be provided to the competent authority as well as for public comment for a period of 40 days [Regulation 543(56)].
- The final EIR will be submitted to the DARDLEA after which they have 60 days, after acknowledging receipt of the final EIR to consider it and in writing accept or reject the report or request additional information or amendments to the document [Regulation 543(34)(2)].
- A final Authorities meeting will be scheduled to present the submitted documentation and verify progress with the approval process of previously submitted documentation.
- Continued consultation with the relevant authority until issuing of the decision.

7.2.3 Methodology of assessing the environmental issues

It is required by Regulation 28 (g) of R.543 of the EIA Regulations, 2010, that major potential impacts on the surrounding environment, as a result of the proposed activity, are identified during the Scoping Phase

Regulation 31 of R.543 of the EIA Regulations (2010), under the NEMA (1998), requires that an EIR includes an assessment of the status, extent, duration, probability, reversibility, replaceability of resources and mitigatory potential of the major potential environmental impacts of the proposed activity.

A baseline identification of the major potential impacts has therefore only been included in this Scoping Report. The prediction of the nature of each impact, the evaluation of each impact by rating its significance and the management and mitigation measures adopted to address each impact, will be assessed during the EIR.

Impact assessments should be conducted based on a methodology that includes the following:

- Clear processes for impact identification, predication and evaluation;
- Specification of the impact identification techniques;
- Criteria to evaluate the significance of impacts;
- Design of mitigation measures to lessen impacts;
- Definition of the different types of impacts (indirect, direct or cumulative); and
- Specification of uncertainties.

In broad terms, the impact assessment for this project will include the following:

- All potential impacts of the proposed activity will be identified and assessed;
- The nature, extent, magnitude and duration of all potentially significant impacts will be predicted;
- A range of mitigation measures that could diminish the impacts will be identified; and
- The significant of residual impacts that remain, after the proposed mitigation measures are implemented, will be evaluated.

The construction, operational and decommissioning phases of the project will be considered whilst identifying impacts. A detailed understanding of the proposed activity will be obtained to ensure that all the potential impacts are identified. The following process will be followed to identify and assess the potential impacts of the proposed activity:

- The current environmental conditions will be determined in detail. This will act as a baseline against which impacts can be identified and measured;
- The changes that will occur in future, should the proposed activity not occur, will be identified;
- A detailed understanding of the activity will be obtained in order to fully understand its consequences; and
- The significant impacts that will occur as a result of the proposed activity will be identified (should the activity be authorised).

After all impacts have been identified, the nature of each impact can be predicted. The impact prediction will take into account physical, biological, socio-economic and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim to provide a basis from which the significance of each impact can be determined and appropriate mitigation measures can be developed.

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to Figure 29 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – *Impact Prediction.*

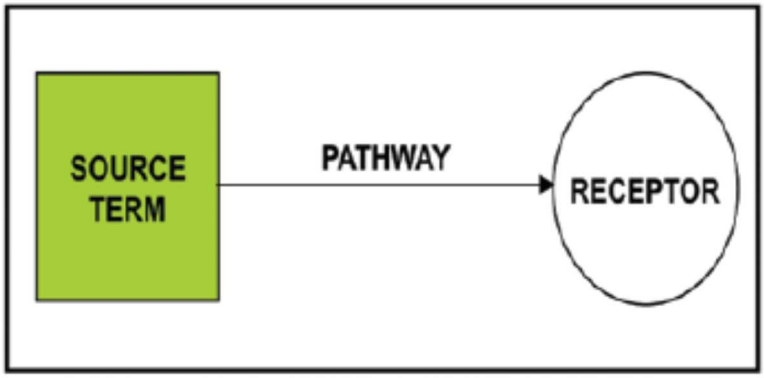


Figure 29: DWA's model for impact prediction (risk assessments)

Tables 51 and 52 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 53 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

PROBABILITY of the impact is determined by calculating the average between the frequency of the aspect and the availability of a pathway to the receptor and the availability of receptor.

Table 52: Determination of Probability of impact

Frequency of Aspect / Unwanted Event	Score	Availability of Pathway from the Source to the Receptor	Score	Availability of Receptor	Score
Never known to have happened, but may happen	1	A pathway to allow for the impact to occur is never available	1	The receptor is never available	1
Known to happen in industry	2	A pathway to allow for the impact to occur is almost never available	2	The receptor is almost never available	2
< once a year	3	A pathway to allow for the impact to occur is sometimes available	3	The receptor is sometimes available	3
Once per year to up to once per month	4	A pathway to allow for the impact to occur is almost always available	4	The receptor is almost always available	4
Once a month - Continuous	5	A pathway to allow for the impact to occur is always available	5	The receptor is always available	5

Step 1: ***Determine the** PROBABILITY **of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor***

Table 53: Determination of Magnitude of impact

Source								Receptor			
Duration of impact	**Score**	**Extent**	**Score**	**Volume / Quantity / Intensity**	**Score**	**Toxicity / Destruction Effect**	**Score**	**Reversibility**	**Score**	**Sensitivity of environmental component**	**Score**
Lasting days to a month	1	Effect limited to the site. (metres);	1	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	1	Nontoxic (e.g. water) / Very low potential to create damage or destruction to the environment	1	Bio-physical and/or social functions and/or processes will remain unaltered.	1	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity	1
Lasting 1 month to 1 year	2	Effect limited to the activity and its immediate surroundings. (tens of metres)	2	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	2	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	2	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	2	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.	2
Lasting 1 – 5 years	3	Impacts on extended area beyond site boundary (hundreds of metres)	3	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	3	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	3	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	3	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).	3
Lasting 5 years to Life of Organisation	4	Impact on local scale / adjacent sites (km's)	4	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha–12Ha)	4	Toxic (e.g. diesel & Sodium Hydroxide)	4	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	4	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).	4
Beyond life of Organisation / Permanent impacts	5	Extends widely (nationally or globally)	5	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	5	Highly toxic (e.g. arsenic or TCE)	5	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	5	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, wetlands, protected habitats etc.)	5

Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors above.

Table 54: Determination of Severity of impact

Environmental Impact Rating / Priority					
	Magnitude				
Probability	**1 Minor**	**2 Low**	**3 Medium**	**4 High**	**5 Major**
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Step 3: Determine the SEVERITY of the impact by plotting the averages that were obtained above for Probability and Magnitude

7.2.4 Public participation during the EIA process

The process of undertaken to compile the EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will include amongst other, the following public participation:

- The draft EIR (including a draft EMP) will be provided to the Client for input prior to public and authority comment.
- The Public Participation Process be conducted in accordance to EIA Regulations R.543 (2010), including providing the draft EIA Report to the competent authority as well as for public comment for a period of 40 days [Regulation 543(56)].
- Hereafter all objections and representations received during the Public Participation Process will be considered for finalising the EIA.
- Prior to the submission of the final report to the DARDLEA, the I&APs will be provided opportunity to comment on the final EIA Report in terms of the requirement of Regulation 543(56)(6).
- Comments on the final EIA report by I&APs will be submitted directly to the DARDLEA and copied to the applicant and EAP.

I&APs will include land owners / users, adjacent land owners / users, regulatory authorities, key stakeholders, and any I&APs registering as part of the Public Participation Process for the project.

7.2.5 Alternatives

Alternatives will continue to be investigated by discussion with Authorities, I&APs, and the client, and the 'No Project Option' will be included in the assessment. The EIA (including EMP) document will include the alternatives identified and investigated for the mentioned project as well as the advantages and disadvantages of each. Refer also to Part 5 for more details pertaining to alternatives being considered, including the 'No Project' Option.

8. DISCUSSION AND CONCLUSION

It is the purpose of this part of this Scoping Report to summarise the potentially significant findings of the scoping process. A short description of the key aspects relating to the Public Participation Process, the significant impacts on the various aspects of the environment, the knowledge gaps identified as part of the EIA process of the proposed project are included below.

The details pertaining to the proposed project have been fully described in Part 2 of this report. The current state of the environment has been described in Part 3 of this document.

8.1 Public Participation Process

A full Public Participation Process in terms of the requirements of the NEMA, 1998 has been undertaken as part of the Scoping Process. Issues of concern raised during this process will be used to focus the specialist studies of the EIA on the potentially significant impacts associated with the proposed project. Part of this process is also to identify project alternatives, and to determine the feasibility of these alternatives, in the context of financial, practical and environmental aspects.

Part 4 of this Scoping Report explains in detail the process that has been undertaken thus far to involve the I&APs in the Scoping Process of project. The following tasks have already been performed as part of the Public Participation Process:

- The project has been advertised in the Witbank News newspaper.
- The project has been advertised with the use of on-site notices.
- Background Information Documents have been distributed.
- Scoping Report has been for public review.

8.2 Alternatives identified

The following feasible and reasonable alternatives were identified as part of the Scoping Process for the proposed project:

- Alternatives in terms of crusher options.
- Alternative in terms of the pollution control dam.
- Alternative in terms of pit layout.

Part 5 of this Scoping Report includes a description of the feasible and reasonable alternatives that have been identified more detail pertaining to the identified possible impacts that will be assessed and quantified during the EIA phase of the project.

8.3 Identified potentially significant impacts

A number of potentially significant impacts have been identified during the scoping process. Specialist studies are in the process of being completed, and additional potentially significant impacts may be highlighted at a later stage. The extent of the identified potentially significant impacts will be quantified, and will be reported on as part of the EIA document.

Part 6 of this Scoping Report includes more detail pertaining to the identified possible impacts that will be assessed and quantified during the EIA phase of the project.

8.4 Further investigations

The EIA Regulations dated 2010, under the NEMA, 1998, states that a Scoping Report, must, amongst others, describe the nature and extent of further investigations required in the EIA Report. Consequently, in compliance with the mentioned Regulations, the following specialist studies have been identified and are in the process of being completed (refer also to Part 6):

The following specialist studies will be conducted and have been initiated as part of the proposed Navigation West - South Block Extension:

- Geohydrological Study.
- Fauna and Flora Study.
- Wetland Study.
- Soil, land-use and land capability Study.
- Hydrology Study.
- Blasting and Vibration Study.
- Heritage Impact Assessment.

8.5 Conclusion

This scoping process has been carried out in accordance with the NEMA, 1998, and the Regulations there under.

The potential impacts due to the proposed Navigation West - South Block Extension and associated infrastructure and their expected significance have been identified in Part 6 of this Scoping Report. Mitigation measures to address possible environmental impacts of the mining and related activities of the project will be included in the EIA document that will be submitted to the DARDLEA in the near future.

I&APs have been identified and will be involved in the Scoping process to provide their input with regards to the identification of potential impacts and alternatives for the proposed project. This input as well as any additional input received during the EIA Phase will be used to focus the EIA process on the important issues, and to ensure that proper planning takes place in order to promote sustainable development. The concerns raised by I&APs will be addressed in the EIA as required by the relevant Regulations under NEMA, 1998.

Based on the findings of the Scoping Phase, it is recommended that the “No-Project” option not be considered yet for the proposed project, and that the project viability be assessed further.

The EIA process, which will subsequently follow, will be conducted in accordance with the EIA Regulations, under the NEMA, 1998.