ANGLO OPERATIONS PROPRIETARY LIMITED: GREENSIDE COLLIERY

Environmental Impact Assessment and Environmental Management Programme

Reference number: MP30/5/1/2/2/304MREA

Date: August 2015

SHANGONI
Management Services (Pty) Ltd

www.shangoni.co.za

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: ANGLO OPERATIONS PROPRIETARY LIMITED: GREENSIDE COLLIERY
TEL NO: (013) 690 4297
FAX NO: (013) 690 4355
POSTAL ADDRESS: PO BOX 2851, BLACKHILL, 1032

REFERENCE NUMBER: MP30/5/1/2/2/304MREA

AngloAmerican

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

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

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

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

(d) determine the—-

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

  (ii) degree to which these impacts—

    (aa) can be reversed;

    (bb) may cause irreplaceable loss of resources, and

    (cc) can be avoided, managed or mitigated;

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

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

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Disclaimer

Greenside Colliery's aligned Environmental Management Programme Report (EMPr) was compiled by WSP Environmental (Pty) Ltd and submitted to the Department of Mineral Resources (DMR) in April 2014 and approved in December 2014. Subsequently, Greenside Colliery identified the Thandeka Shaft and associated powerlines as additional proposed activities. An authorities meeting was held with DMR Mpumalanga Regional Office in July 2015 where the Department requested that Part 2 amendment in terms of Regulation 31 of the National Environmental Impact Assessment (EIA) Regulations GN. R.982 dated December 2014 in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998), be done. Subsequently Greenside Colliery appointed Shangoni Management Services (Pty) Ltd to amend the approved 2014 EMPr in accordance with Regulation 31 and submit the amended EMPr to the DMR with the inclusion of the Thandeka Shaft. It is hereby acknowledged that this report has been informed by the 2014 EMPr compiled by WSP Environmental (Pty) Ltd.

Introduction

Anglo Operations Proporietary Limited (AOPL): Greenside Colliery is located in the south-eastern portion of the Mpumalanga Province. The already operational mine was aquired by AOPL in 1999-2000 for which detailed Environmental Impact Assessments (EIAs) and Environmental Management Programmes Reports (EMPRs) were submitted and approved by the Mpumalanga Department of Minerals and Energy (now the Department of Mineral Resources; DMR) between 2000 and 2001. Subsequent to these authorisations, additional addendums and amendments to the original EMPRs have been submitted and approved by the DMR.

Shangoni Management Services (Pty) Ltd was appointed by Greenside Colliery as the independent Environmental Assessment Practitioner (EAP) to facilitate the amendment of the approved EMPr report dated 2014, to include the proposed activities identified during the meeting held between Greenside Colliery and DMR Mpumalanga Regional Office in July 2015 .

In terms of Regulation 31 of the EIA regulations, this amendment is a change to the scope of the existing environmental authorisation where the nature of the impact (associated with the ventilation shafts and powerlines) was not assessed and included and taken into consideration in the initial application for environmental authorisation as approved December 2014. The amendment to the authorisation as provided in this EMPr amendment does not change the nature of impact and scope associated with the approved activities, nor does it have a change to the existing impact management outcomes, environmental management objectives, financial provisioning and closure objectives contained in the approved EMPr of Greenside Colliery.

This EMPr amendment therefore includes information as contained in the approved EMPr and the new activities for which approval is sought during the amended process. These new activities are the proposed construction of the new ventilation shafts specific the Thandeka ventilation shaft and associated powerlines.

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. Details of Project Applicant and EAP

1.1 Details of the project applicant

The details of the applicant proposing the project are given in Table 1.

Table 1: Details of the applicant

Name of Mine	Greenside Colliery
Applicant	Anglo Operations Proprietary Limited
Postal Address	PO Box 2851 Blackhill 1032
Responsible Person	Frank Glaeser
Telephone Number	(013) 690 4297
Facsimile Number	(013) 690 4355
Cell Phone Number	082 611 7354
E-Mail Address	Frank.glaeser@angloamerican.com
Company Registration No.	1921/006730/07

1.2 Details of the environmental assessment practitioner

Shangoni Management Services (Pty) Ltd was appointed by AOPL to compile this EIA and EMP for the proposed project. Shangoni Management Services (Pty) Ltd details are provided in *Table **2*** below.

Table 2: 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

A summary of the CV of the EAP involved in the conducting of the EMP and EIA Process and compiling the EIR and EMP is given below:

Minnette Le Roux

Minnette completed a M.Sc. Environmental Management programme at the North West University (Potchefstroom). She also holds a Certificate in Implementing Environmental Management Systems (ISO 14001), Registered with the South African Council for Natural Scientific Professions and is a Founding member of the Environmental Assessment Practitioner Association of South Africa. Minnette has over 7 years' experience in completing the Environmental Assessment Processes for various projects, in the construction and large scale mining sectors, including amongst other; Environ**m**ental 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. Description of the property.

Table 3 below provides a summary of the description of the property.

Table 3: Description of the property

Farm Name:	*Mining Right Area of Greenside Colliery (approved EMPr):* Portion 1, 2, 3 and the RE of the farm Groenfontein 331 JS. Portion 1, 29 and the RE of the farm Blaauwkrans 323 JS. The RE of the farm Weltevreden 324 JS. Portion 3, 4, 7, 9, 10, 12, 13, 14, 15, 16 and 17 of the farm Vlaklaagte 330 JS. *Surface Right Area of Greenside Colliery (appoved EMPr):* Portion 1, 2, 3 and the RE of the farm Groenfontein 331 JS. Portion 29 and the RE of the farm Blaauwkrans 323 JS. *AOPL Coal Reserves (proposed Thandeka Shaft Project)* Portion -/2/ of the farm Blaauwkrans 323 JS *AOPL Surface Right Area (proposed Thandeka Shaft Project)* Portion 28 of the farm Blaauwkrans 323 JS
Application area (Ha)	*AOPL Surface Right Area (proposed Thandeka Shaft Project)* Portion 28 of the farm Blaauwkrans 323 JS - 427.8 Ha (existing AOPL rights) *AOPL Coal Reserves (proposed Thandeka Shaft Project)* Portion -/2/ of the farm Blaauwkrans 323 JS - 70.86 Ha (existing AOPL rights)

Magisterial district:	The mining site is situated within the Nkangala District Municipality with the regional services council being the eMalahleni Local Municipality in Mpumalanga Province South Africa.
Distance and direction from nearest town	The closet major town to Greenside Colliery is eMalahleni, located 15 km to the north east. Blackhill Siding and an associated village are situated 2 km northwest of the mine infrastructure area. The Landau Colliery village is situated 1 km east of Greenside Colliery. The town of Ogies is located 20 km southwest of Greenside Colliery. The N12 highway linking Johannesburg to eMalahleni runs northeast-southwest along the south eastern boundary of Greenside Colliery
21 digit Surveyor General Code for each farm portion	*AOPL Surface Right Area (proposed Thandeka Shaft Project)* TOJS00000000032300028

The new Thandeka Ventilation Shaft and associated infrastructure are proposed to be located on Portion 28 of the farm Blaauwkrans 323 JS. Portion 28 of the farm Blaauwkrans 323 JS falls within the surface rights and mineral reserve area of AOPL. Refer to Figure 1 which indicates the Greenside Colliery Mining Rights and AOPL Mineral Reserve.

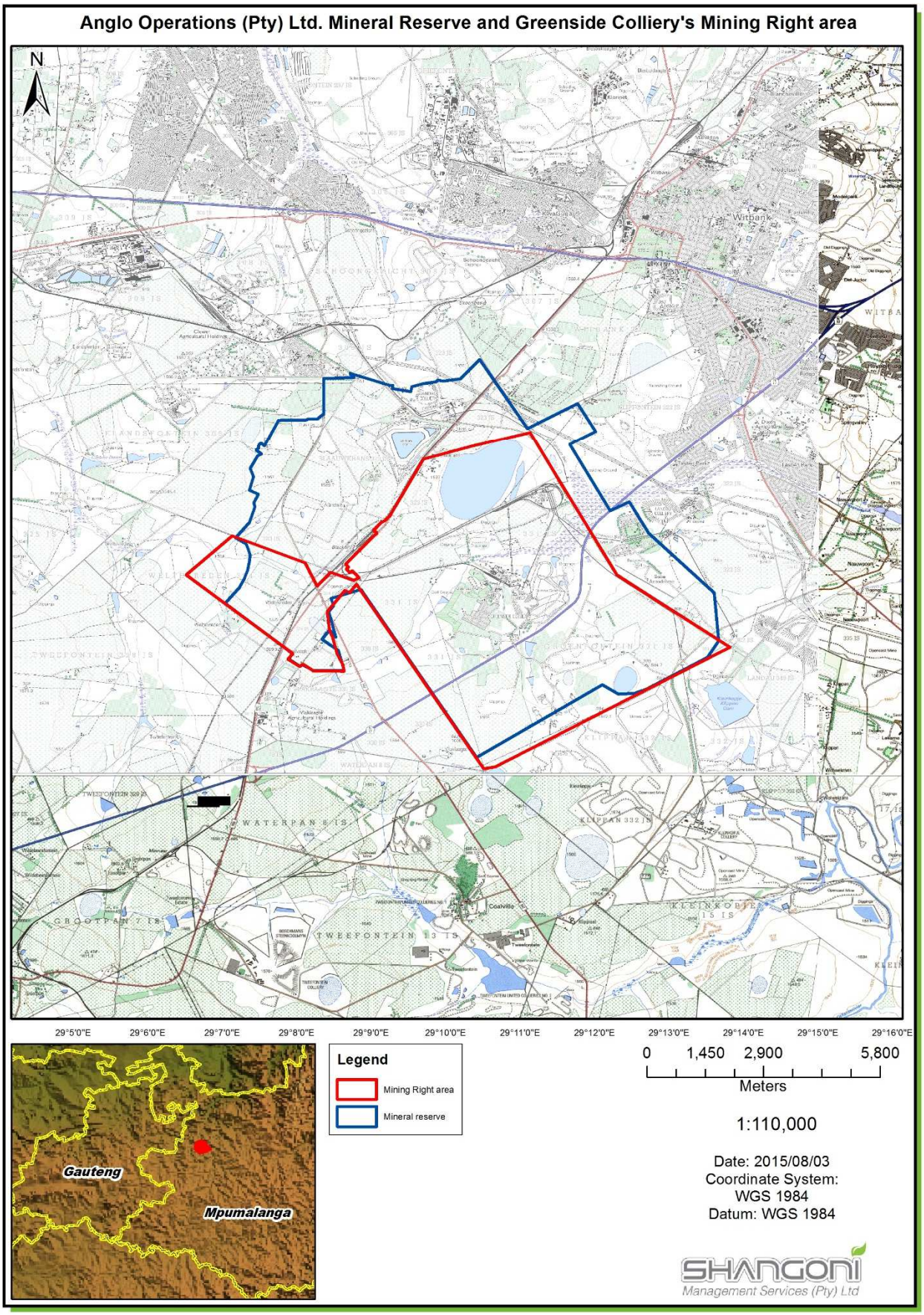

Figure 1: Mining Right area of Greenside Colliery and Mineral Reserve area of AOPL

Anglo Operations Proprietary Limited (formerly Anglo Operations Limited) is the mineral rights holder for the following properties, which are associated with Greenside Colliery (Refer to Figure 2):

- Portion 1, 2, 3 and the RE of the farm Groenfontein 331 JS.
- Portion 1, 29 and the RE of the farm Blaauwkrans 323 JS.
- The RE of the farm Weltevreden 324 JS.
- Portion 7, 9, 10, 12, 13, 14, 15, 16 and 17 of the farm Vlaklaagte 330 JS.

The mineral rights holder for the Greenside Colliery is listed in Table 4.

Table 4: Mineral rights owners to Greenside Colliery

Farm Name	Holder's Details
Portion 1, 2, 3 and the RE of the farm Groenfontein 331 JS	Anglo Operations Proprietary Limited
Portion 1, 29 and the RE of the farm Blaauwkrans 323 JS	
The RE of the farm Weltevreden 324 JS	
Portion 7, 9, 10, 12, 13, 14, 15, 16 and 17 of the farm Vlaklaagte 330 JS	

AOPL is the surface rights owner for the following properties, which are associated with Greenside Colliery (refer to Figure 2 and 3):

- Portion 1, 2, 3 and the RE of the farm Groenfontein 331 JS.
- Portion 29 and the RE of the farm Blaauwkrans 323 JS.

The surface rights owners in the mining right area for the Greenside Colliery are listed in Table 5.

Table 5: Surface rights owners to Greenside Colliery

Farm Name	Owners Details
Groenfontein 331 JS Portion RE,1,2,3	Anglo Operations Limited
Blaauwkrans 323 JS Portion RE, 29	Anglo Operations Limited
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

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

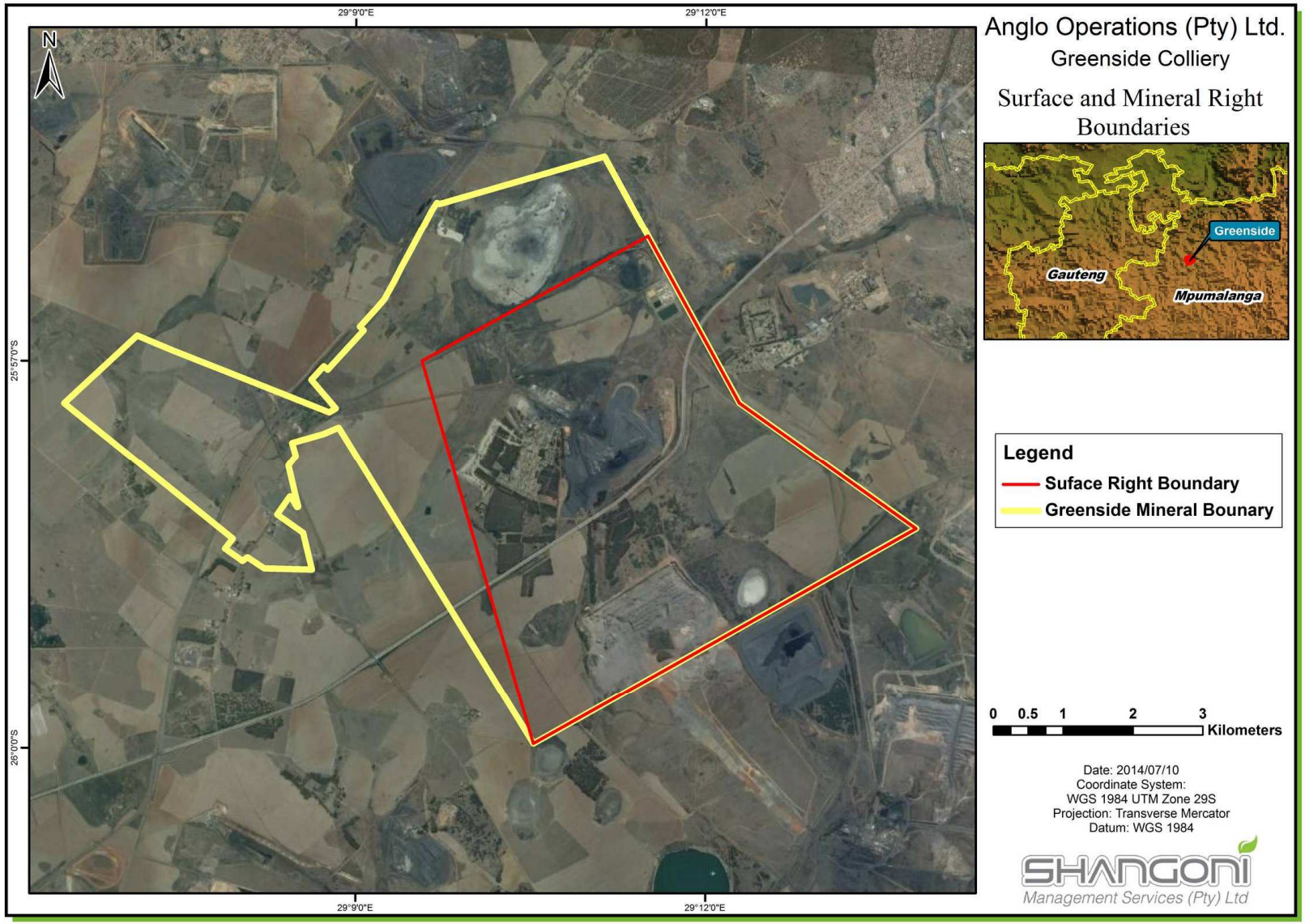

Figure 2: Mining and surface right areas for Greenside Colliery

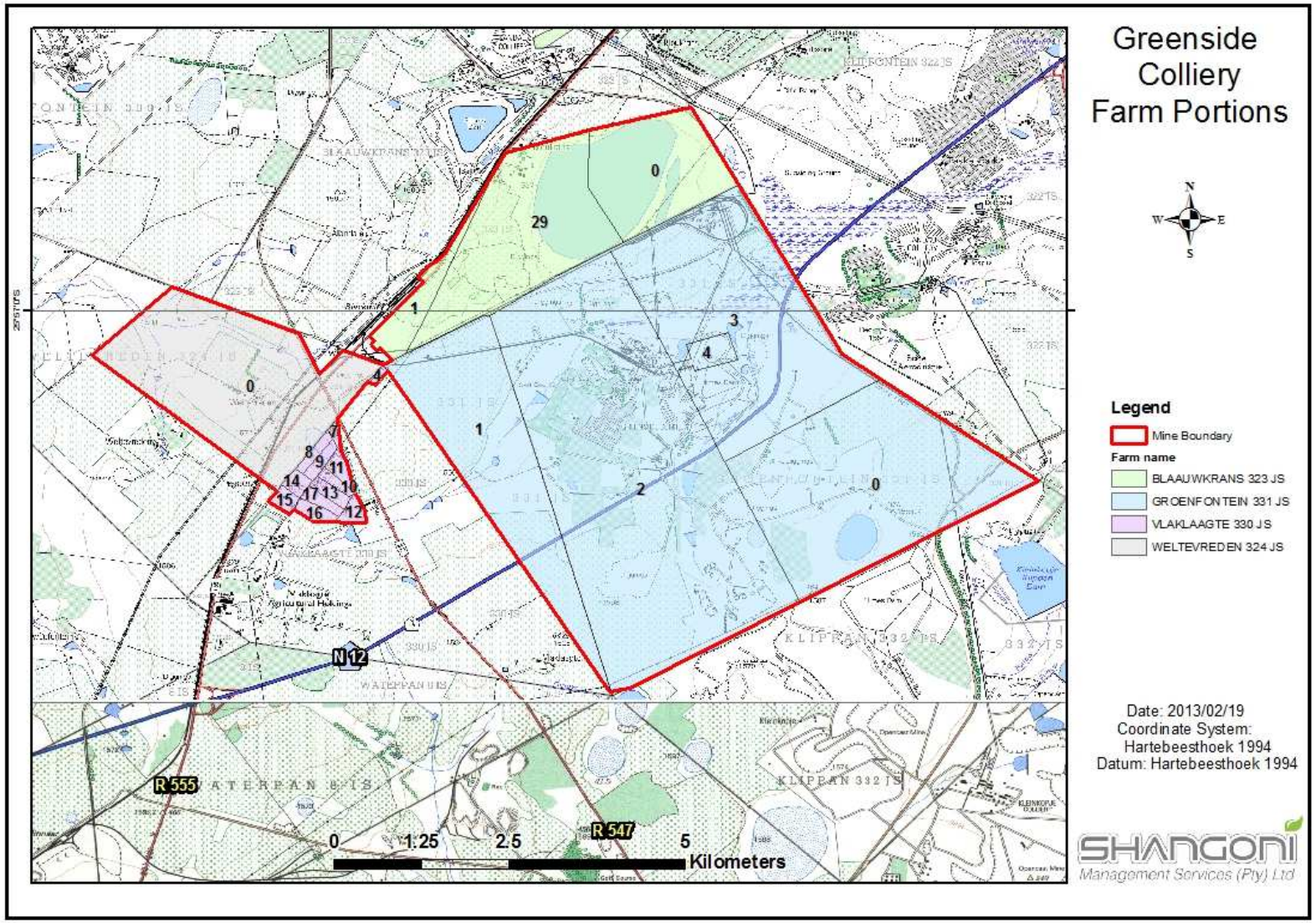

Figure 3: Greenside Colliery Farm Portions

Land use adjacent to the mining right area of the Greenside Colliery is predominantly agricultural and mining. The surface owners of all farm portions immediately adjacent to the Greenside Colliery are listed in Table 6 and indicated in Figure 4.

Table 6: Adjacent Surface Rights Owners to Greenside Colliery

Farm Name	Owners Details
Klippan 332 JS Portion 0, 2, 6, 7	Anglo Operations Limited
Klipfontein 323 JS Portion 0, 9, 145	Anglo Operations Limited
Blaauwkrans 323 JS Portion 0, 2, 7, 10, 14, 15	Anglo Operations Limited
Blaauwkrans 323 JS Portion 4, 17	Transnet Ltd.
Elandsfontein 209 JS Portion 2	Anglo Operations Limited
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.

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

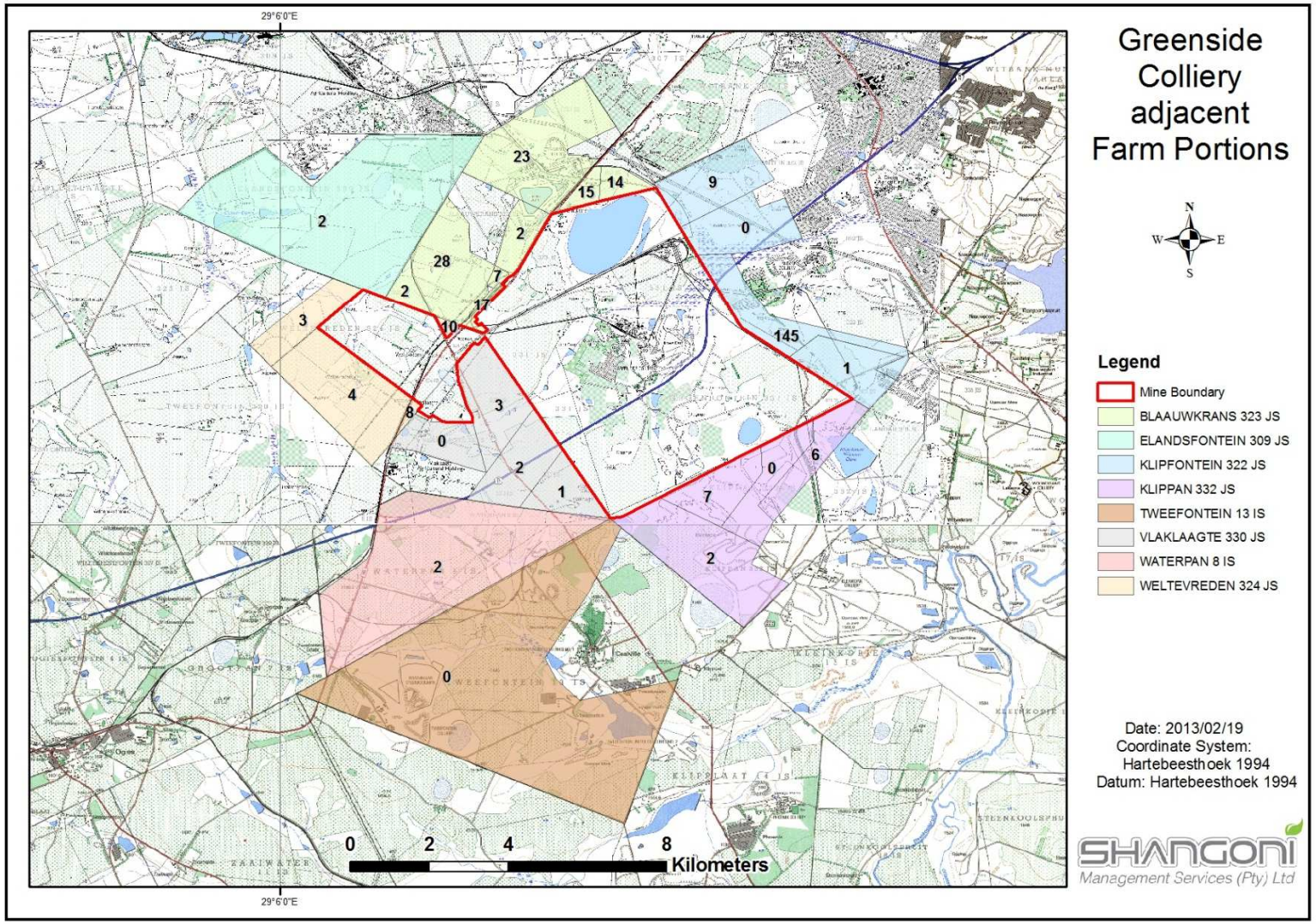

Figure 4: Adjacent Farm Portions to Greenside Colliery

3. Locality map

3.1 Magisterial District and Administrative boundaries

Greenside Colliery falls within the administrative boundaries presented in Table 7. Refer also to Figure 5, which indicates the regional setting of Greenside Colliery.

Table 7: Administrative boundaries of Greenside Colliery

Province	Mpumalanga Province
District Municipality	Nkangala District Municipality
Local Municipality	Emalahleni Local Municipality
Ward	30
Department of Mineral Resources (DMR) Local Office	DMR (Emalahleni)
Department of Water and Sanitation (DWS) Local Office	DWS (Bronkhorstspruit)
Department of Agriculture Rural Development Land and Environmental Affairs (DARDLEA) Local Office	DARDLEA (Mpumalanga)
Catchment Zone	Quaternary catchment s B20G, B11G and B11F
Rainfall Zone	B1A, B1C and B2C
Water Management Area	Olifants River Catchment area
Water Forums	Olifants River Catchment Forum

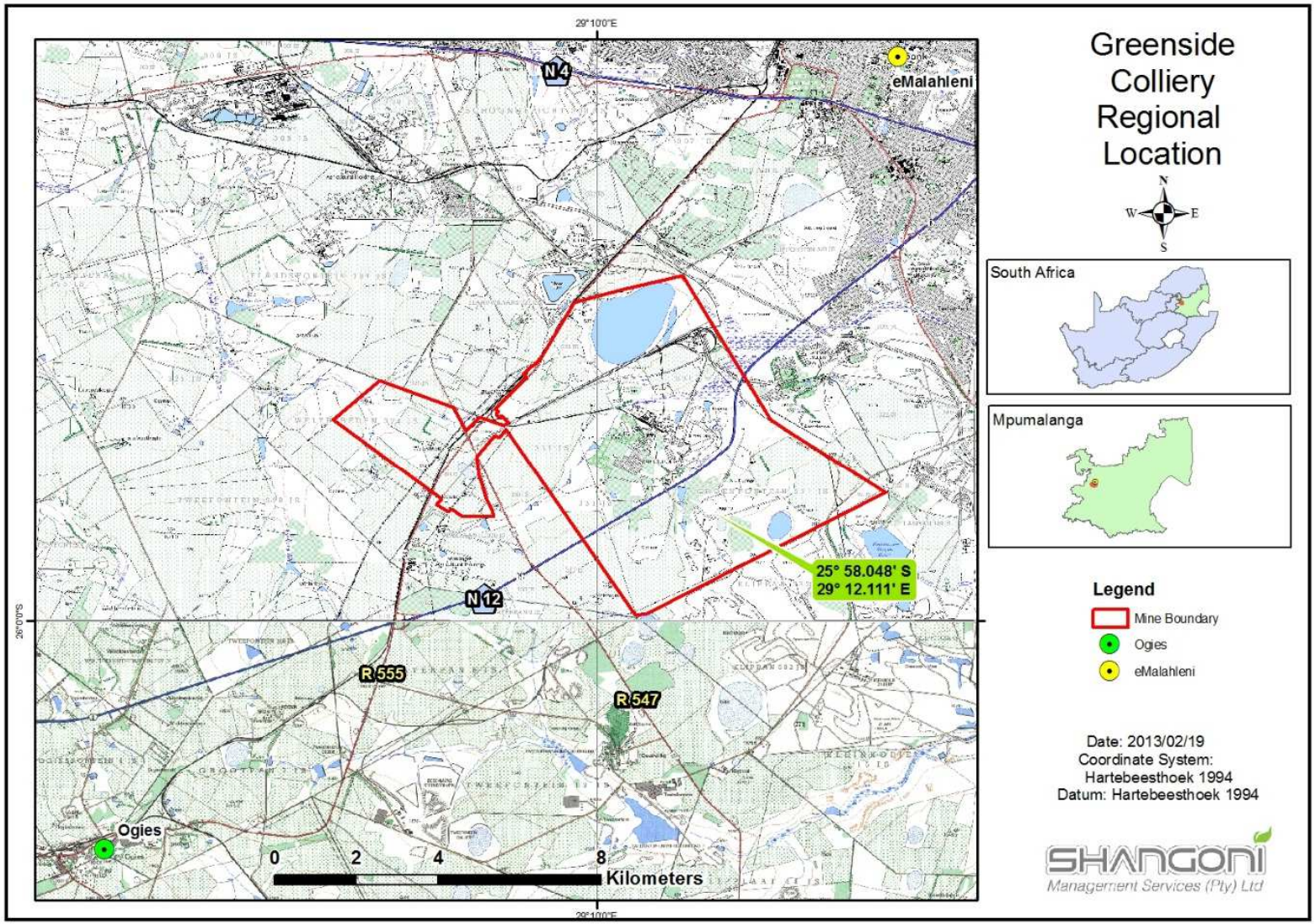

Figure 5: Regional Setting of Greenside Colliery

3.2 Location of the Mine

The closet major town to Greenside Colliery is eMalahleni, located 15 km to the north east. Blackhill Siding and an associated village are situated 2 km northwest of the mine infrastructure area. The Landau Colliery village is situated 1 km east of Greenside Colliery. The town of Ogies is located 20 km southwest of Greenside Colliery. The N12 highway linking Johannesburg to eMalahleni runs northeast-southwest along the south eastern boundary of Greenside Colliery. The regional setting of Greenside Colliery is indicated in Figure 5.

3.3 Location of the Site

The new Thandeka Ventilation Shaft and associated infrastructure is proposed to be located on Portion 28 of the farm Blaauwkrans 323 JS. Figure 6 indicates the location of the proposed project in relation to the AOPL mineral reserve and the Greenside Colliery Mining Right area.

Figure 6: Location of the proposed Thandeka Shaft and powerlines

4. Description of the scope of the proposed overall activity.

4.1 Listed and specified activities

Table 8: Activities and listed activities associated with the proposed development

Name of Activity	Aerial extent	Possible listed activity		Activity Assessment	
		Listing Notice and Activity	Description	Triggering of listed activity	Comment
Vegetation clearance of ventilation shaft footprint area (agricultural land)	1.4 ha	GNR 983 LN 1 08 Dec 2014 No. 27	The clearance of an area of 1 Hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) The undertaking of a linear activity. (ii) Maintenance purposes undertaken in accordance with the maintenance management plan.	No	The clearance of the vegetation for the construction of the ventilation shaft terrace does not trigger this listed activity as the land in question is currently utilised for agricultural purpose (maize production). Therefore the vegetation to be cleared does not constitute Indigenous vegetation.

Ventilation shaft and associated infrastructure	1.4 ha	GNR 984 LN 2 08 Dec 2014 No. 12	The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or	No	The wetland delineation and impact assessment study revealed that there are no wetlands on the ventilation shaft project area (refer to Appendix C7). However, the closest wetland to the shaft foot print area is located approximately 200 m to the south. As presented in Figure 7 below, the shaft footprint area and powerlines also fall outside of the 100 m wetland buffer zone(for Option 4).

Name of Activity	Aerial extent	Possible listed activity		Activity Assessment	
		Listing Notice and Activity	Description	Triggering of listed activity	Comment
			(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.		

Name of Activity	Aerial extent	Possible listed activity		Activity Assessment	
		Listing Notice and Activity	Description	Triggering of listed activity	Comment
Ventilation shaft and associated infrastructure	Not applicable	GNR 984 LN 2 08 Dec 2014 No. 17	Any Activity including the operation of that activity which requires a mining right as contemplated in Section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including the associated infrastructure, structures and earthworks, directly related to the extraction of mineral resources, including the activities for which an exemption has been issued in terms of Section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	No	Greenside Colliery is currently in possession of a Mining Right and the location of the Thandeka Ventilation Shaft will be located within the approved Mining Right area.
Fan foundation	0.00159 ha	-	-	No	The construction of the fan foundation does not trigger a listed activity.
Contractors yard	0.48 ha	-	-	No	The clearance of vegetation and construction of enclosure fence does not trigger a listed activity.
Outdoor yard / switch yard	0.05 ha	GNR 983 LN 1 08 Dec 2014 No. 11 -	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	No	The infrastructure to be developed for transmission and distribution of electricity, for the Thandeka ventilation shaft will not exceed 22 Kilovolts. Therefore the development of the infrastructure does not trigger a listed activity.
Electrical substation	0.014 ha			No	
Electrical transformer	0.005 ha			No	
22kV powerline from Blackhill substation	Length = 3 286 m			No	
22kV powerline from Umlalazi substation	Length = 3 352 m			No	

Name of Activity	Aerial extent	Possible listed activity		Activity Assessment	
		Listing Notice and Activity	Description	Triggering of listed activity	Comment
Tarred intersection with provincial road R547 to gravel access road (including new acceleration lane)	6 m wide road. Reserve of 14 m. Length = 16,3 m	GNR 983 LN 1 08 Dec 2014 No. 24(ii)	The development of- (i) a road for which environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18in government notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the roads is wider than 8 meters; but excluding- (a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) roads where the entire road falls within an urban area.	No	The activity is to upgrade the existing intersection of the gravel road with Provincial road R547, to include a deceleration and an acceleration lane. This activity does therefore not trigger a listed activity.
Gravel access road	6 m wide road.			No	The existing gravel road will be upgraded. This gravel road will be 6 m wide and does therefore not trigger a listed activity.
Storm water cut-off berm	Length = 155 m	-	-	No	The construction of the storm water cut-off berm does not trigger a listed activity.

4.2 Description of the activities to be undertaken

As described above, Greenside Colliery proposes to construct new ventilation shafts in the near furture The Thandeka ventilation shaft will be constructed on Portion 28 of the farm Blaauwkrans 323 JS. This shaft will be operated to service the underground workings and will be a vertical passage that connects the underground workings at Greenside Colliery with the surface atmosphere. The operation of the fans will remove stale air from underground to ensure a safe working environment for the underground mine workers. The shaft will be positioned at a specified location in the underground workings to optimise ventilation efficiency.

The Ventilation Shafts will include the following infrastructure:

- Ventilation shaft.
- Associated civil and structural installations.
- Fan foundation.
- Outdoor yard.
- Electrical installations.
- Contractor's yard.
- Tarred intersection with the Provincial road R547.
- Gravel access road.
- Storm water infrastructure.
- Powerlines.

The Thandeka ventilation shaft and associated civil structures and installations will be situated on Portion 28 of the farm Blaauwkrans 323 JS. Two (2) powerlines will be constructed to supply power to the ventilation shaft. One (1) powerline, approximately 3 352 m in length, will be constructed from the Umlalazi Substation to the ventilation shaft. The other powerline, approximately 3 286 m will be constructed from the Blackhill (Cairns) substation to the ventilation shaft. Two powerlines will be constructed, only one will be utilised at a time in order to supply secondary power in case of emergencies and / or power failures. The general layout of the Thandeka ventilation shaft and powerline routes are present in the Figure 7 below and described in detail in 9 below.

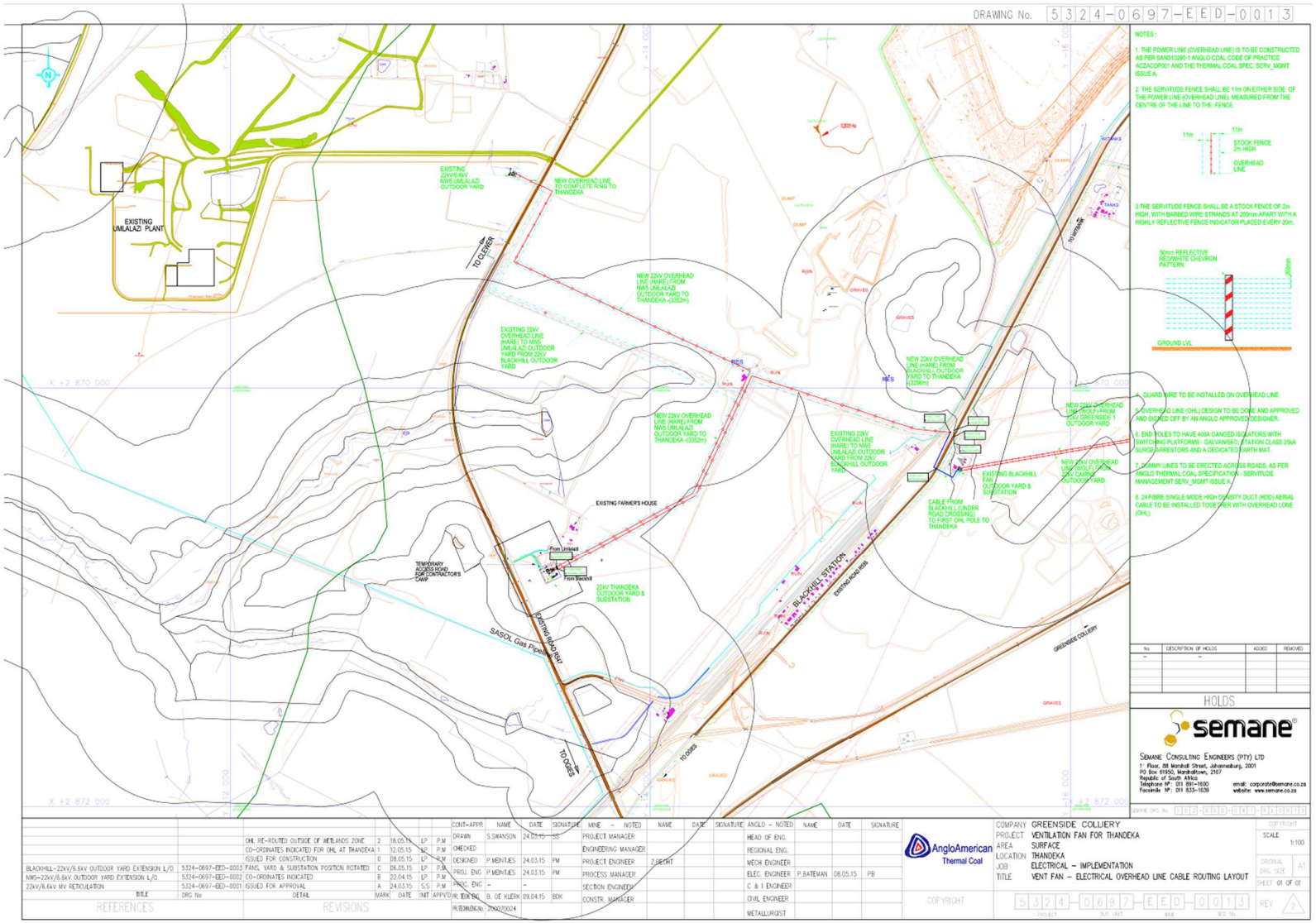

Figure 7: Thandeka ventilation shaft infrastructure locality

Table 9: Detailed description of the infrastructure associated with the Thandeka ventilation shaft

Reference No.	Infrastructure	Description
1	Ventilation shaft	A raised bore constructed ventilation shaft that will be drilled from a depth of approximately 60 m. The shaft diameter will be 4.5 m, which will supply fresh air to the underground workings.
2	Civil installations	The associated civil and structural installations on surface will incorporate a shaft footprint area of approximately 75 x 85 m (6 375 m²) including the concrete platform surrounding it. The shaft's outlet will be roughly 2.5 m high and have a diameter of 4.5 m. All civil and structural installations will be constructed on a terrace and enclosed by a high security fence.
3	Outdoor yard (switch yard)	The outdoor yard (or switch yard) is a fenced enclosure with an access gate in which the electrical infrastructure will be situated. The powerlines (see No. 11 and No. 12) will feed into the outdoor yard prior to distribution to the substation, transformer and ventilation shaft and fans.
4	Substation	A substation bay will be constructed adjacent to the outdoor / switch yard.
5	Transformer bay	A transformer bay will be constructed adjacent to the outdoor / switch yard and the substation.
6	Contractors yard	The contractors yard will be an enclosed area and only for the Construction Phase. Once the Construction Phase is complete and yard is no longer required, the fence will be removed and the footprint area rehabilitated.
7	Intersection with the R547	The existing gravel access road will be upgraded. Due to the possible increased use of the gravel access road and its intersection with the Provincial road R547, the intersection will be upgraded to include a deceleration and acceleration lane. The appropriate road signage will also be put in place.
8	Gravel access road	The existing gravel access road will be upgraded. This road will be 6 m wide and have an approximate length of 220 m. The gravel access road will branch off in two (2) directions, to the existing gravel access road (to the farmstead) and to the main access gate of the ventilation shaft.
9	Storm water infrastructure	Storm water infrastructure will be constructed to divert clean surface water runoff around the ventilation shaft area and includes: 1. A storm water diversion berm will be constructed upstream, to the east, to direct water around the ventilation shaft area. 2. A concrete storm water concrete culvert will be placed under the gravel access road.

Reference No.	Infrastructure	Description
		3. A concrete storm water culvert will be placed under the tarred intersection with the Provincial road R547.
10	Powerlines	Two (2) powerlines will be constructed to supply power to the Thandeka ventilation shaft; electricity will only be drawn from one (1) at a time. This is to supply secondary power in case of emergencies and / or power failures. The details of the two (2) powerlines are as follows: 1. A 22 kV powerline from the Blackhill (Cairns) substation to the Thandeka Shaft substation (Length = 3 286m). A 22 kV powerline from Umlalazi substation to the Thandeka Shaft substation (Length = 3 352m).

4.3 Descriptions of current activities at Greenside Colliery

The following information was extracted from the approved EMPr entitled:. "*Aligned Environmental Management Programme Report for Anglo American Thermal Coal: Greenside Colliery, DMR Reference: MP30/5/1/2/2/304MR*.", dated April 2014. and compiled by WSP Environmnetal (Pty) Ltd.

4.3.1 Mine Surface Infrastructure

Due to the fact that Greenside Colliery utilises underground mining methods, most surface infrastructure is associated with activities relating to the handling of coal thereafter.

Although Greenside Colliery has 18 shafts located within their mining rights area, only Cairns and No. 6 shafts are operational. Coal is extracted using the continuous miner method (previously bord and pillar) and is brought to the surface via conveyors to the coal beneficiation plants. The two beneficiation plants process coal from the No. 4 seam (Greenside Colliery) and the as-arising to produce a second project.

Once at the plants, the coal is crushed and washed using dense medium separation (DMS). Any discard and slurry from the process is sent to the coal discard dump. The processed coal is then transported by conveyor to the rapid loading terminal (RLT) from which the coal is transported by rail to international markets via the Richards Bay Coal Terminal (RBCT). Coal is also collected by truck from the beneficiation plant stockpile for sale to the local market.

Surface infrastructure located at Greenside Colliery is listed below and includes:

- Shaft Complexes 1-10 and 12-18;
- Anglo French Shaft Complex;
- C Block adit;
- Rescue shaft;

- Main explosives magazine;
- Main store;
- Surface workshops;
- Coal beneficiation plants including the froth filtration plant and coal stockpiles;
- Coal discard area;
- Village; and
- Offices.

Existing surface infrastructure pertaining to the Greenside Colliery is depicted in Figure 8 and the new project locations in Figure 9, as per the approved EMPr .

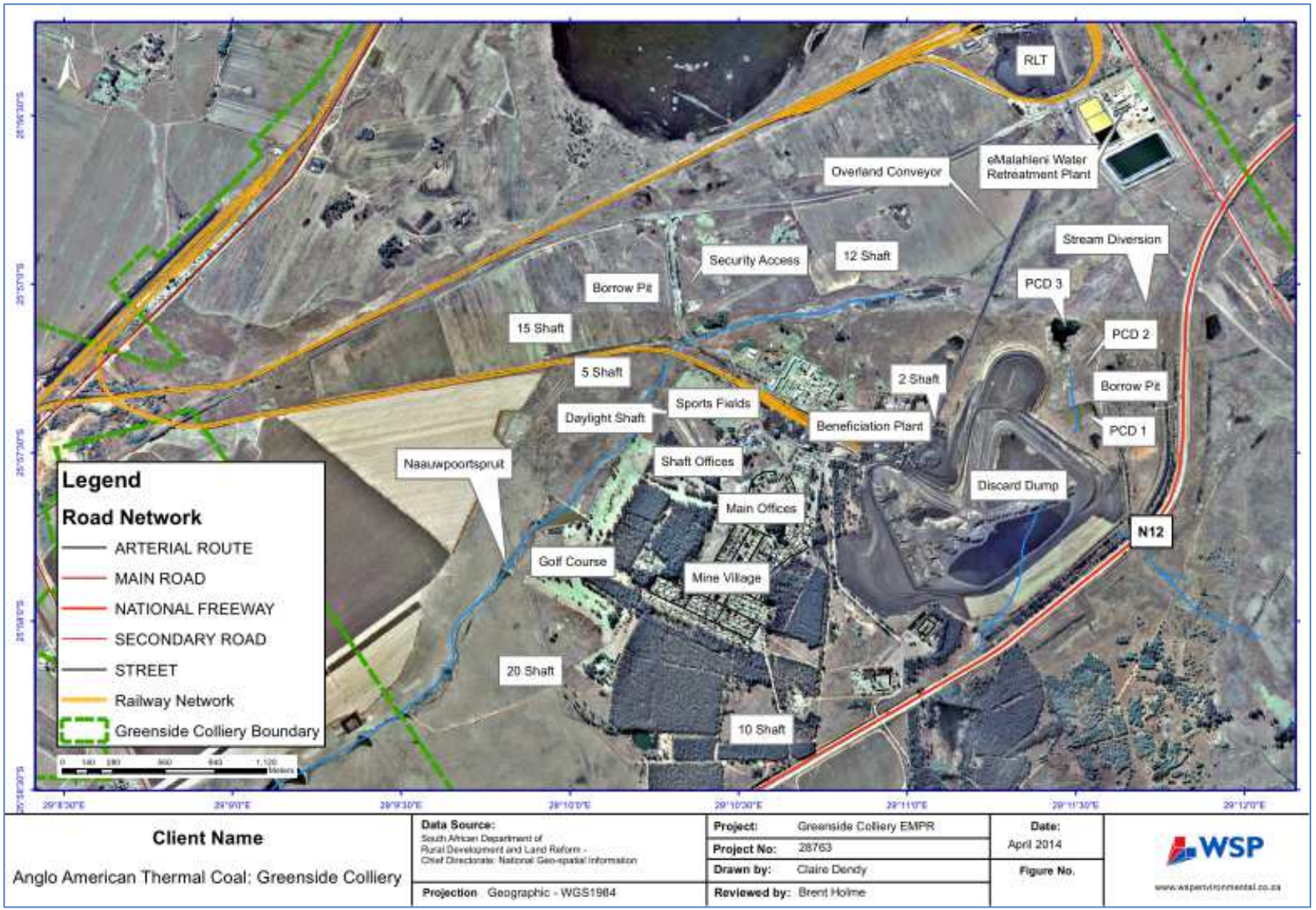

Figure 8: Greenside Colliery existing surface infrastructure

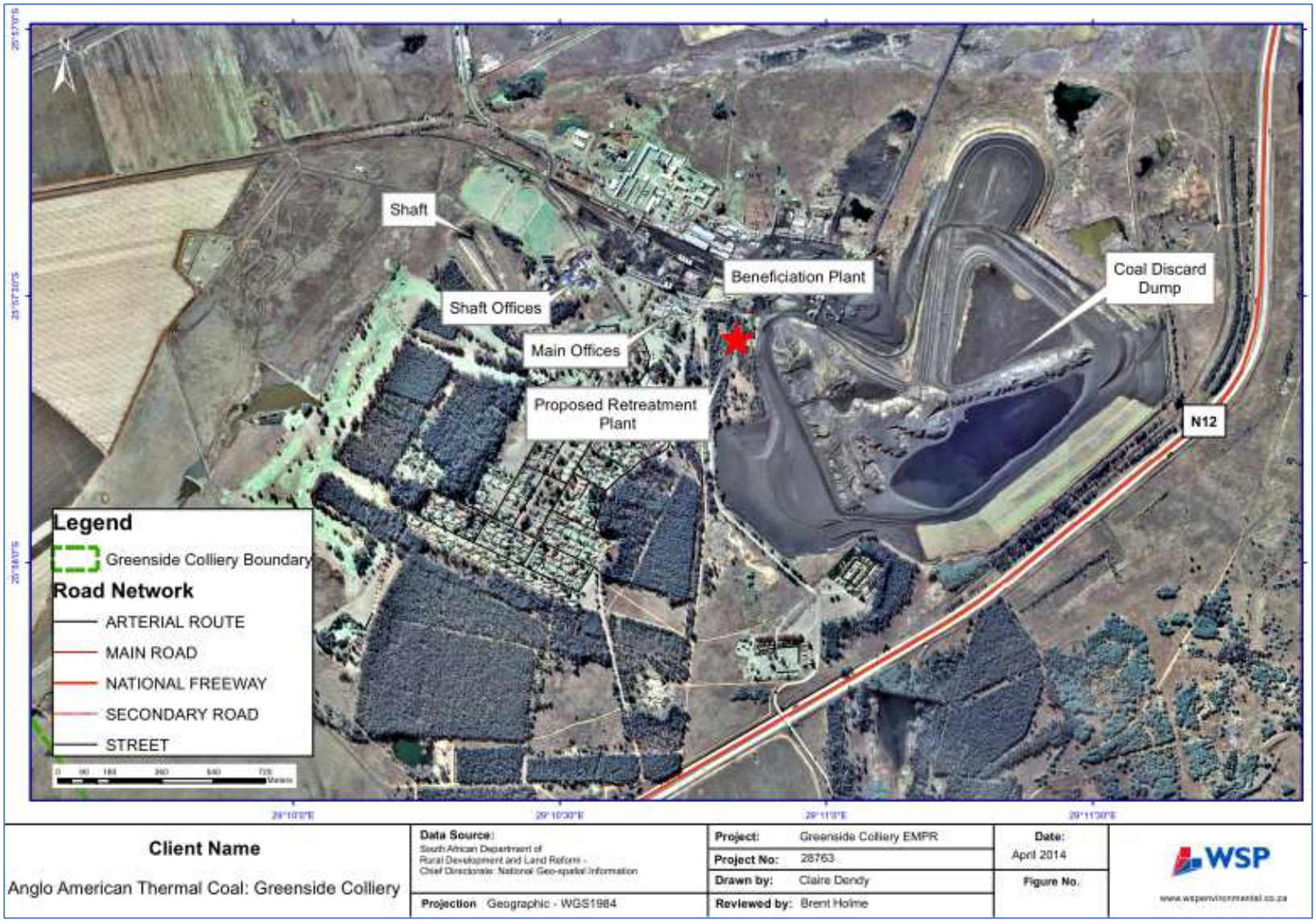

Figure 9: New approved project Locations at Greenside Colliery

The Greenside Colliery mine right area covers approximately 5 427 ha, of which the colliery currently owns only 1 010 ha; the current mine surface infrastructure covers about 365 ha. The mine layout and associated surface infrastructure, coal beneficiation plants and coal discard dumps are indicated in Figure 8 and 9. Table 10 lists the surface mining infrastructure located at Greenside Colliery and their surface extent.

Table 10: Mine Surface Infrastructure

Mine Surface Infrastructure	Area (ha)
1 Shaft Complex – in Plant area	2.7
2 Shaft Complex – rehabilitated in August 2010	1.9
3 Shaft Complex – used as downcast shaft	1.5
4 Shaft Complex – will be opencast mined by Kleinkopje Colliery	1.8
5 Shaft Complex – used as intake shaft	2.1
6 Shaft Complex – used as conveyor shaft	1.7
7 Shaft Complex – standby vent shaft at Cairn shaft	1.5
8 Shaft Complex – Cairns Shaft operational	4.2
9 Shaft Complex – rehabilitated June 2010	5.1
10 Shaft Complex – rehabilitated July 2010	1.8
12 Shaft Complex – used as vent shaft for Cairns shaft	1.3
13 Shaft Complex - will be opencast mined by Kleinkopje Colliery	Block 3A North
14 Shaft Complex – open material shaft	1.3
15 Shaft Complex – rehabilitated in 2009	1.5
16 Shaft Complex – will be opencast mined by Kleinkopje Colliery	Block 3A North
17 Shaft Complex – rehabilitated in 2009	Block 3A North
18 Shaft Complex – rehabilitated in 2009	1.5
Anglo French Shaft Complex – rehabilitated in August 2010	23.6
C Block adit	12.1
Rescue shaft	0.5
Main explosives magazine	2.9
Main store	2.5
Surface workshops	8.0
Coal beneficiation plants including froth filtration plant	5.5
Coal Stockpiles - 4 ROM stockpiles (4A, 4S1, 4S2, and 4S3) and 4 Product stockpiles (	150
D, E, R & Emergency)	0.01
Coal discard area	5
Ventilation shaft and associated fans and foundations	120
Village	4.5
Offices	
TOTAL	**364.51**

4.3.2 Transport Network

The N12 highway, which links the cities of Johannesburg and Witbank, runs approximately east-west along the southern boundary of the site. The R555 and parallel railway line (going through Blackhill Station) cross the site

diagonally from southwest to northeast. The R547 crosses through the western portion of the site in a north-south direction, linking the towns of Clewer and Coalville. The eastern boundary of the mine site is demarcated by the service railway line which runs from the Witbank Colliery to eMalahleni and Clewer. A public road and an overland conveyor run parallel to the service railway line, linking the Navigation Plant to the RLT and the RLT to Landau Colliery. Several powerlines also cross the site. An existing farm road, used initially for agricultural purposes, has been linked to the R555 provincial road to allow for access the ventilation shaft.

4.3.3 Solid Waste Management Facilities

Waste is generated at the Cairns shaft, underground workings, surface and plant workshops, as well as the beneficiation plants. Runoff from the workshop areas contains cleaning detergents, degreasers, fuels and lubricants. The contaminated run-off/ storm-water from the shaft area is collected in sumps and routed to Cairns shaft where the oil is skimmed from the water. The oil is collected in drums and removed off-site by specialist waste contractors. The water from which the oil is skimmed flows into the dirty water system for re-use.

Domestic waste from Greenside Colliery is collected by a contractor and disposed at the eMalahleni municipal waste disposal site. Garden refuse is collected by the mine and is disposed of in on-site compose heap, for future use in the gardens.

Beneficiation plant residue is disposed of at the Greenside Colliery coal discard and slurry disposal facility, which is continually being upgraded and extended. In this process, the original coal discard dump, compacted dump and slurry dam are consolidated into an integrated residue facility for coal discard and slurry.

Per month, between 80,000 and 132,000 tons of coal discard is generated at Greenside Colliery, while coal slurry generated is between 16,000 and 28,000 tons. Over the planned LOM, approximately 14 million tons of slurry and 35 million tons of discard will be generated.

The coal discard dump is managed in such a way as to maintain a whaleback shape with 1:5 gradient side slopes over most of the dump area, with localised areas where the slope angle may increase due to footprint space constraints. This coal discard dump handles discard produced by Beneficiation Plants.

Phased extensions to the coal discard dump have been and will be undertaken during the LOM. A new slurry dam was created and located within the coal discard dump, with slurry disposal commencing in 2002. The supernatant water associated with the slurry is decanted by penstock to the PCDs associated with the coal discard dump. The LOM of the mineral residue facility is that of 2017, if the WUL for the PC Dam is approved, the LOM will be extended until mid-2018. Total LOM tonnages are 29 030 830 tons of coarse discard, and 4 634 581 of dewatered slurry.

4.3.4 Dirty Water Management Facilities

Separation of the mine site into contaminated and uncontaminated areas is the basis for the dirty water management approach employed by Greenside Colliery and is shown on Figure 10.

As indicated above, domestic sewage from office buildings, residential areas and hostels is treated in a sewage treatment plant located to the north of the mine complex. The plant has a capacity to treat about 1 500 m3 per day but currently only treats an average of 600 m3 per day. The wet weather flow can be as high as 900 m3 per day.

The sewage plant comprises:

- Six sludge beds;
- Two primary settling tanks;
- Two bio-filters;
- Two humus tanks; and
- An anaerobic digester.
-

The treated effluent is chlorinated and contained in a maturation dam. This water is used to irrigate the sports fields and the golf course located adjacent to the Greenside Village. The treated sewage effluent is quality controlled by a Contractor and checked for compliance with the General Standard on a regular basis. PCDs in the Greenside Colliery mine area are located according to the clean and dirty water separation on site.

The following PCDs are present at Greenside Colliery:

- New PCD;
- PCD 3;
- Shaft Erickson Dam;
- Erickson Dam 1;
- Erickson Dam 2;
- Lake Lucy; AND
- Y2K.

Greenside Colliery has an approved EMPr amendment for a new PCD to be built to replace PCDs 1 which are currently in the coal discard dump's approved extension area. Due to the mine plan, the current PCD's location is at risk as the discard dump is extending over the PCD. As such, and in an effort to allow for continued mining operations, Greenside Colliery has constructed a new dam for the storage of mine water for the beneficiation process. The new PCD is 3.7 ha and will have the capacity to store 60,864 m3 of water, opposed to the current combined storage capacity of 59,022 m3. The proposed height of the dam wall will be 4.9 m, the same height of the existing dam walls.

The new PCD consist of two compartments with a sluice gate to transfer water between the compartments. The compartments have been designed to be unequal so that fine sediments can settle out of the first compartment and removed when required. The dam is lined with a 2 mm thick plastic liner. New pipes and submersible pumps have been installed; with each compartment containing a pump. Subsoil drainage has been incorporated under the liner to detect any potential leaks and will act as a barrier for groundwater that may permeate the water table. Existing road infrastructure will be utilised and as such, the existing road will be upgraded to accommodate the amount of traffic for the construction phase of the project. Excavation material from the dam has been stockpiled on the existing borrow pit, located 250 m south of the proposed new PCD. A 'Jacuzzi line' has been included in the design of the proposed dam which may be used for emergency overflow situations only.

The mine's existing dirty water trench has been extended to incorporate the proposed dam. The water overflow from the proposed PCD will be pumped to the Plant Erikson Dams, in accordance to the mines integrated water and waste plan. It has been noted that existing boreholes are correctly positioned to monitor any potential seepage that may occur. Furthermore, the proposed dam has been fenced with 1.8 m high security fencing, and safety equipment for will be included in the dam area. Greenside Colliery will employ a maintenance contractor to clean and maintain the silt traps. The new PCD is located to the northeast of the discard dump, approximately 200 m west of the N12 Highway. The new PCD has been constructed over a brownfields site that has been previously disturbed due to mining activities. Water has been transferred from the existing PCDs to the new PCD, prior to the discard dam enveloping the area.

PCDs 1 and 3 are located in series in the original river channel of the Greensidespruit adjacent to the coal discard disposal facility, while Lake Lucy is located downslope of the two coal beneficiation plants; Y2K is located to the northwest of the discard dump. The three Erickson Dams are used for above-ground dirty water storage. None of the above-mentioned dams are lined as they were constructed before the NWA regulations. There are measures in place to manage potential contamination of ground water resources as a result of non-lining of the dams.

4.3.5 Stormwater

The Greenside Colliery mine site is separated into "clean" and "dirty" areas, diverting uncontaminated and contaminated storm-water, respectively; as shown in Figure 10. Greenside Colliery appointed Shangoni Managemnt Services (Pty) Ltd to update the existing storm water managemnt plan conducted by Golder Associates in March 2012. The following describes the current storm-water management controls in place at Greenside Colliery as well as recommendations for updating the storm-water management plan:

- The following aspects of the existing storm-water management system are compliant with Regulation 704 of the NWA:
- The coal discard dump at Greenside Colliery acts as an integrated mine residue facility, in which both discard coal and slurry is stored. Polluted water from the facility is collected in diversion channels and discharged into PCDs located on the eastern and western sides of the dump. The runoff from the eastern

side of the dump is discharged into two PCDs (1 and 3). The runoff from the western side is discharged into a silt trap. The spill from the silt trap reports to Lake Lucy and Y2K dams.

- The trench running along the eastern boundary of the mine residue facility (to PCDs 1 and 3) collects runoff and seepage from the discard dump, water from the No. 2 seam underground workings (this water is pumped) and the penstock outflow.
- Lake Lucy and Y2K collects some polluted runoff from the plant area. This water is pumped from the Y2K dam to the Erickson dams for re-use.

The following aspects were not compliant with Regulation 704 and corrective measures listed further below will be implemented:

- There was no evidence of the design and construction of a proper clean water system in accordance with the specified design requirements i.e. clean water runoff generated from the Main Village area is currently collected in the same channel that diverts dirty water runoff from the Daylight Shaft area and the western side of the coal discard dump.
- The lack of implementation of adequate measures to contain the contaminated surface water runoff from Daylight Shaft area, Temporary Stockpile area (Railway Siding) as well as the Beneficiation Plant.
- The capacity of the storm-water system is also significantly reduced due to accumulation of coal fines and other sediment in the channels.

The proposed changes to the storm-water management plan are listed below:

- The clean water runoff generated from the Main Village area will be diverted by means of a new cut-off trench (CH9 and CH10) around the Daylight Shaft area and routed to discharge into the environment. This reduces the need for on-site water storage and, consequently, minimizes the risk of spillage into the dirty water system.
- The dirty water runoff generated from the Daylight Shaft area will be diverted by an existing channel (CH8) into the dirty water system where it will enter a borehole (BH1). It will then be contained in the underground workings and pumped to the plant for re-use.
- The dirty water runoff originating from the Temporary Stockpile area will be diverted into a proposed borehole (BH2) by an existing channel and contained underground for re-use. This will eliminate the dirty water runoff currently being discharged into the environment.
- A new dirty water diversion channel will be implemented on the western side of the coal discard dump (CH11). This will allow the dirty water runoff generated from the coal discard dump to be collected and conveyed to Lake Lucy where it will be contained for re-use.

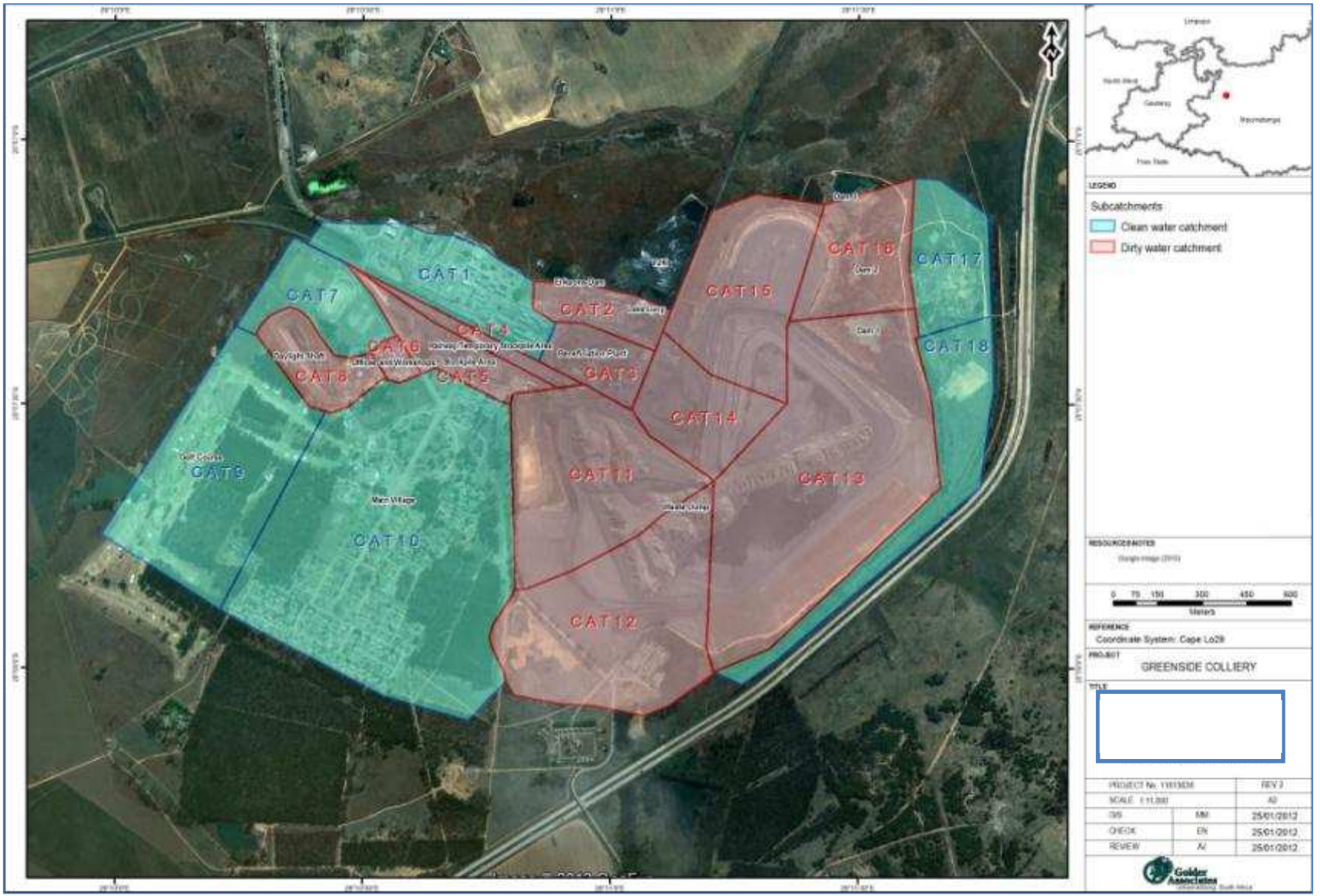

Figure 10: Location and extent of the clean and dirty water sub-catchments at Greenside Colliery

4.3.6 Water Supply

Greenside Colliery is currently supplied with potable water by the eMalahleni Water Reclamation Plant. The potable water is also used in the No.4 seam underground working for drinking water, and mining activities. The eMalahleni Water Reclamation Plant also supplies Greenside with process water, which is stored in the Plant Erickson dams. The process water is used for coal beneficiation, and washing down in the coal beneficiation plants.

4.3.7 Water balance

The extension of the current No.4 seam workings will not intersect other underground mined-out areas on Landau and Kleinkopje. A barrier pillar has been installed which surrounds the outer extent mining right area.
A generic decant model was used to simulate recharge and inter-compartmental flow for the extension of the No.4 seam workings. The results of the applied model are given in the sections below.

The main components of the mine water balance are summarised below (Figure 11). The figures are an average value.

- No.2 seam borehole and penstock: 2,840 m3/d of abstracted water is routed via the PCDs 1 and 3 to the coal beneficiation plants. This includes 1,258 m3/d of water from the No.2 seam borehole and 1,414 m3/d of return water from the penstock. The remainder is attributable to rainfall and run-off. Process water for the beneficiation plants is stored in two Erickson dams, each with a capacity of 860 m3.
- About 590 m3/d of water is incorporated into the discard dump and it is estimated that approximately 490 m3/d of water is lost to seepage from the discard dump.
- It is estimated that approximately 180 m3/d is lost to evaporation.
- Process water used in the beneficiation plants: Greenside Colliery No.4 seam: 1,827 m3/d. The No. 5 seam plant: 1,493 m3/d.
- Contaminated storm-water runoff from the designated contaminated areas: 540 m3/d.
- Potable water intake from eMalahleni Water Reclamation Plant for domestic and process water at a rate of 1,603m3/day.
- Treated sewage effluent of which a portion is irrigated on the golf course and sports fields. The treated sewage effluent amounts to about 490 m3/d.
- Various uses on the mine site such as dust suppression, watering of gardens and golf course, etc.

The mine water balance is currently maintained by discharging excess mine water to the No.2 seam workings from surface.

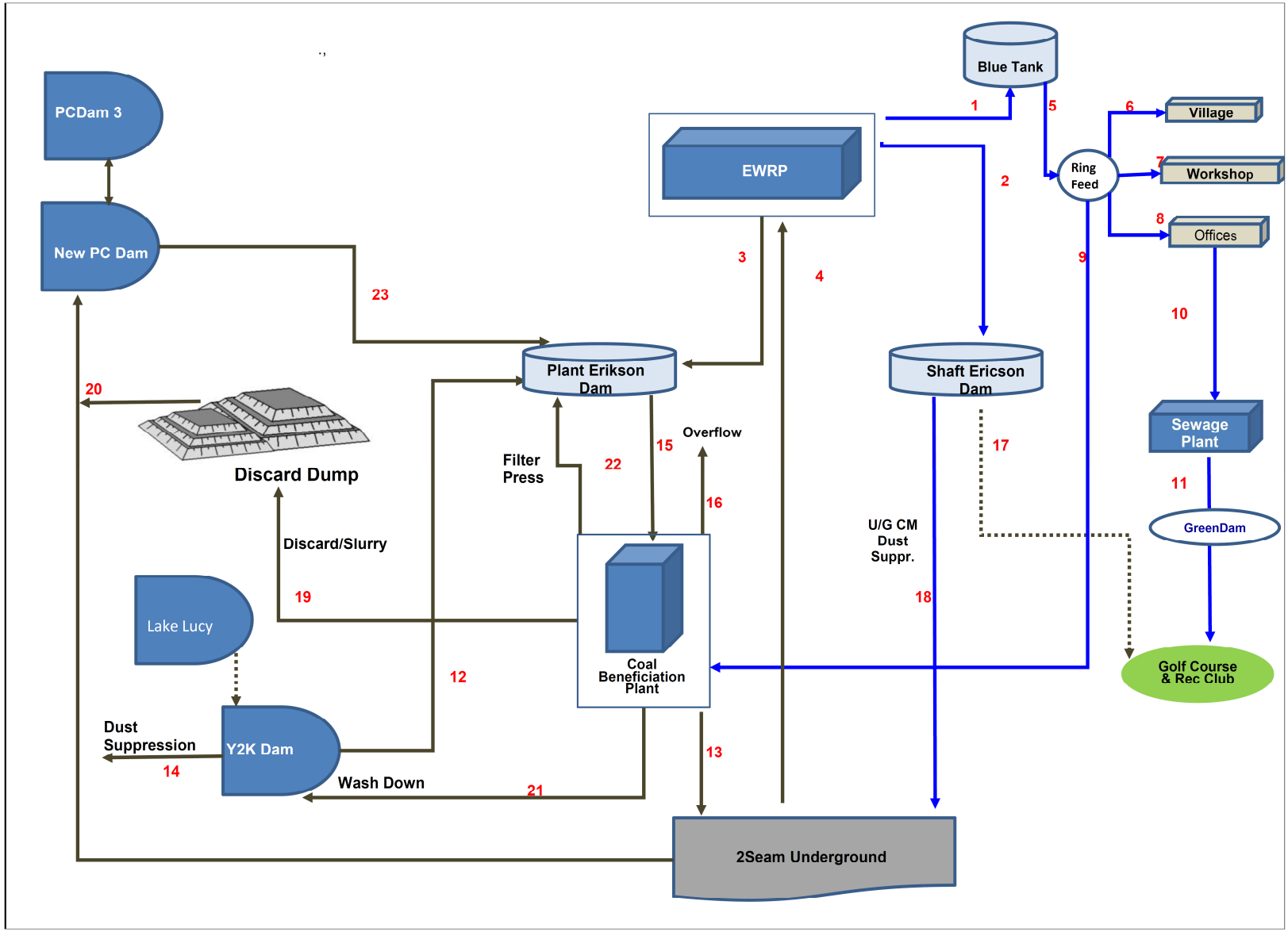

Figure 11: Water Balance for Greenside Colliery

4.3.8 Soil Utilisation

There are two main borrow pits on the mine site. The largest one, termed BP1, is situated on the eastern side of the coal discard dump.

Note: *Planning indicates that BP1 will be included in the coal discard dump footprint in future. At that time, all useable soil will have been removed from this borrow pit.*

Some of the material required for surface rehabilitation of the discard dump is obtained from this borrow pit. A second borrow pit (BP2) is located near No.13 shaft. Material from this borrow pit was used for road construction on the mine site, but is now also used for discard dump rehabilitation. A number of other borrow pits are located on the mine site and used mainly by provincial authorities for road construction. A summary of the borrow-pits present on the Greenside Colliery site is given in Table 11.

Table 11: Borrow-Pits

Borrow Pit Number	Description	Size	Status	Purpose / Use
BP1	Coal discard dump	15 ha	In use	Topsoil for consolidated discard dump
BP2	No.13 Shaft Borrow Pit	15 ha	Defunct	Topsoil for consolidated discard dump
BP3	TPA No.1	10 ha	Defunct	N12 Construction (TPA)
BP4	TPA No.2	5 ha	Defunct	N12 Bridge Construction (TPA)
BP5	Main Entrance	7 ha	Rehabilitated	Construction (TPA)
BP6	Ntshonalanga	2 ha	Act as a water storage dam	Road Construction (TPA)

Any soils that require stripping in the future will take place according to the soil survey plan that was conducted in 2006. Soils will be stockpiled in such a manner as to be free draining, stable and recoverable. The topsoil will be surveyed and grassed.

4.3.9 Coal Discard Dump Retreatment Plant

Anglo American Thermal Coal has entered in to a Coal Beneficiation Agreement with Blue Steam Investments (Pty) Ltd (Blue Steam). Blue Steam is a black owned and controlled company and was established as a joint venture with AATC. The Coal Beneficiation Agreement gives Blue Steam the exclusive right to reclaim and beneficiate Discard Coal from the mine dump situated at Greenside Colliery.

Blue Steam has obtained a SAMREC compliant resource statement, which indicates that there is approximately 25 million gross tons of low calorific coal within the dump. Blue Steam proposes to mine the dump from top to bottom in a series of 3 m high benches. The discard reclaimed from the dump will be removed by excavators and transported by articulated trucks to a Retreatment Plant, which Blue Steam plans to build on Greenside Colliery's property. The discard will be beneficiated to produce a saleable thermal coal suitable for Eskom power stations.

The Retreatment Plant ("Plant") will comprise of the following key equipment: material handling systems comprising conveyors, bins and a stacker; screens; dense medium separators; and centrifuge & filtration dewatering systems to recover water from the arising slimes in the Plant. The Plant is a closed circuit system. The water recovered will be re-circulated and dense medium magnetite will be recovered using a magnetic separator and reused in the process.

Process water for the Plant will be sourced from Greenside Colliery's new filtration facility and stored in a 3.2 Ml above ground reservoir situated inside the Plant. This water will be transferred to the Plant via two proposed pipelines (200 m in length and 110 mm in diameter each), with the Plant's anticipated water demand approximating 80 m3 per hour. Water will also be sourced from Greenside Colliery's existing reservoir and used for dust suppression and the prevention of spontaneous combustion on the dump.

A 9.2Ml storm water control dam will be constructed on the Plant site. The dam will cater for a 1:50 year event. Water released from the dam will report to Greenside Colliery's existing water handling system. The Plant site will be bounded by cut off drains and containment berms to channel dirty water from the site to two silt traps from which clean water will be pumped to the storm water control dam. It is expected that a 22 kilo volts (kV) underground power cable, connecting the Plant to Greenside Colliery's No 2 substation, will require installation. The proposed power cable will follow the existing overhead power line servitude. The estimated maximum demand is 5 mega volt amperes (MVA) with an estimated average monthly consumption of 1.7 gigawatt hours (GWh) per month at steady state operation.

A 2.5 km dual road will be constructed from the Plant site to the existing intersection on to the Provincial Road. Blue Steam has obtained way leave approval from the Mpumalanga Public Works Department to upgrade the intersection to accommodate trucks transporting product from the Plant to Blue Steam's customers. It is estimated that the proposed Plant will have a discard processing capacity of 500 tons per hour and will be operated for approximately 8 years from commissioning in 2014. The Plant and its associated infrastructure will be located adjacent to the dump and within the existing mining right area. The Plant and its associated infrastructure will be located adjacent the coal discard dump within Greenside Colliery's existing mining right area. The impact assessment relating to this activity is detailed in Section 7.

4.3.10 Extension of the Coal Discard Dump Footprint

As described above, the coal discard facility at Greenside Colliery is used to dispose coal discards emanating from the processing plant. The facility is constructed above old underground workings of the No. 1, 2, 4 and 5 seams. These workings were mostly mined at a minimum safety factor of 1.6 for normal production panels and 1.8 or more for secondary panels (Salamon's formulae). The risk assessment undertaken by Greenside Colliery indicated that failure of the underground pillars could result in surface subsidence or an inrush of water / air into the number 4 seam access ways and working

areas. Safety factors were reviewed and it was concluded that it is unsafe for further discard placement at the planned heights. Dumping was stopped in those areas in 2011.

The feasibility study of the extension of the facility done by the consulting engineers, Wates Meiring and Barnard, dated 2000, concluded that the site could not accommodate all discards for the full life of mine, and that therefore the best option would be to expand the existing facility as far as possible. The facility was recently expanded by a further 17.5906 ha, which has increased the co-disposal facility's capacity by 2.3 million m3.

A risk assessment done in 2011 indicated that the area below the coal discard dump possesses a high risk which could have result in the following:

- Loss of No. 4 seam access;
- Damage to equipment on No. 4 seam;
- Loss of life;
- Loss of ventilation;
- Production loss;
- Trapped workers; and
- Loss of reserves.

Expanding the coal discard dump into the surrounding area will benefit the workers on the mine directly by reducing hazards to the underground workings. Indirectly the loss of employment is avoided, which does not affect the economic value of the community in general. Society in general will not be affected as the risk of an emergency was avoided. The impact assessment relating to this activity is detailed in Section 7.

4.3.11 Mineral Extraction and Processing

4.3.11.1. Mineral processing method

Although historically the No.1, 2, 4 and 5 seams have been mined at Greenside Colliery, only the No.4 seam is currently mined within the Greenside Colliery minerals rights boundary. Greenside Colliery produces coal for both the export and local markets.

The bulk of the life of mine (LOM) tonnage is sourced from No.4 seam, which is laterally distributed over the whole mine right area. The estimated remaining in situ coal reserves associated with the No.4 seam are 201 million tons, with 124 million tons of Run of Mine (ROM) reserves. A further 47 million tons, 9.2 million tons and 16.2 million tons of mineable reserves are held in the No.1, 2 and 5 seams, respectively.

The projected LOM for Greenside Colliery is approximately 26 years with current planning indicating that the LOM will most likely extend to 2031. Depending on post-mining beneficial uses, selected portions of the mine surface infrastructure may be used after 2031.

The No.4 seam is mined using continuous mining methods. Historically, stooping (pillar extraction) and opencast mining methods were also practiced. At Greenside Colliery, the No.4 seam currently produces about 3.6 million tons of ROM coal per annum.

The only operational shafts on the mine site are the Cairns and No. 6 Shaft. Only ventilation shafts will be constructed for the Extended No.4 seam underground workings. As access will be obtained from existing underground operations, no additional access shafts will be required for the mining of the No.4. seam for the Landau and Kleinkopje coal reserves. As no blasting is conducted on the surface and blasting is only conducted underground as part of the Colliery Training College section (CTC) surface structures are not affected by blasting.

Surface subsidence could form within No. 5 seam stooped areas. Dry land cultivation is taking place over most of these areas. Localised surface subsidence, resulting in impaired surface drainage and associated ponding areas is very limited. Measures will be taken to remediate subsided areas and allow beneficial land use to proceed. A rock engineering study was undertaken to determine the adequate pillar safety levels to ensure that no surface subsidence will be incurred as a result of extended underground mining operations of the No.4 coal seam reserves. No surface structures are affected by the No. 5 seam stooped areas and as indicated above, surface drainage has largely been reinstated.

4.3.11.2. Mineral processing method

Two coal beneficiation plants are located on the Greenside Colliery mine site. The No. 4 seam plant currently processes an average of 435000 tons of coal per month from 4 seam 4A.
Short descriptions of the two coal beneficiation processes are provided below.

4.3.11.2.1 No.4 seam Plant

The ROM coal is conveyed via 4A conveyor to surface. The plant has 4 surface conical ROM stockpiles: 4A, 4S1, 4S2, and 4S3 with underground withdrawal conveyors and Nick Shaft stockpile with 2 surface reclaim conveyors fed by front end loaders.

Coal from 4A conveyor is fed to a flopper that diverts coal to the 4A stockpile or onto 4S1 conveyor. 4S1 conveyor discharges coal via a flopper onto 4S1 or onto 4S2 conveyor. 4S2 conveyor discharges coal onto 4S2 stockpile or 4S3 conveyor. 4S3 conveyor feeds coal to Nick shaft stockpile.

4S1 and 4S2 stockpile feed Module1&2 only. 4A stockpile feeds Module 3 & 4 but can also feed Module1 & 2 bypassing Module3&4. In the past Module4 is the tertiary crushing of ROM coal to minus 25mm for Rooiwal power station for the Tshwane City Council via a rail load out bin into rail trucks.

The nominally minus 300mm coal from the ROM stockpiles is crushed to minus 50mm for the DMS. The ROM crushing is done in a double stage open circuit crushing using linear screens and double roll

crushers in the case of Module1&2. Module3&4 uses a static grizzly for the primary screen instead of a linear screen.

The ore extracted during the extended No.4 seam underground operation will be processed as described above for all other Greenside No.4 seam ore.

The mining of the additional coal reserves acquired from Landau and Kleinkopje Collieries is scheduled to reduce capacity constraints. The existing plant and stockpile capacity is considered adequate to accommodate the mining of these coal reserves.

The DMS consists of 3 by 250 tons per hour (tph) washing modules. Module1&2 shares a common feed bin, fines circuit, discard and product belts and thickener. Module 3 is a stand-alone plant only sharing a feed bin to the Rooiwal crushing station / Module 4

The ROM coal is classified into three size fractions and treated separately. The ROM coal is fed at 250 tph onto each feed preparation screen cutting at 0.8 mm; the 50 x 0.8 mm coal is fed to a 900mm diameter DSM (Dutch State Mine) cyclone. The minus 0.8 mm coal is further classified in a hydro cyclone at 0.1mm. The 0.5 x 0.1 mm coal is fed to the spiral circuit. The minus 0.1mm feeds the thickener, which forms the feedstock for the Flotation plant that was commissioned in August 2004.

The 50 x 0.8mm coal is pump fed into a 900mm diameter DSM cyclone. The floats (product) and sinks (discard) report to drain and rinse (D&R) screens for the recovery of magnetite from the products for re-use. The medium recovered from the first stage of the D&R screen returns to the correct medium circuit for re-use. The dilute medium from the second part of the D&R screen is pumped to a magnetic separator for the recovery of medium, which is fed into the correct medium circuit. The discards from the discard D&R screen reports to the discard conveyor belt. The product from the product D&R screen is dewatered in a basket centrifuge to reduce the surface moisture of the coal.

The 0.5x0.1mm coal is fed in slurry form to large diameter coal spirals. The discards are dewatered using a dewatering hydro cyclone and dewatering linear screen before reporting to the discard conveyor. The product is dewatered using a hydro cyclone, dewatering screen and basket centrifuge before reporting to the product conveyor.

The flotation plant is fed from the DMS plant thickeners into a feed tank. The flotation feed will be diluted using water from the clarified tank to 6% solids before being fed into the Dual-Cell units. The flotation product reports to the product thickener. The underflow of the product thickener is then dewatered in the filter press. The dewatered product will report to the product belts. The effluent from the filter presses can be diverted to the flotation or tailings thickener.

The tailings from the float cells report to the tailings thickener. The underflow is pumped to the co-discard disposal facility. The water recovered from the tailings thickener that contains residual reagents is used in the flotation circuit. The flotation plant is designed to treat 6 to 7.5% feed to plant arising fines at a unit recovery of 55%, which equates to approximately 3% increase on plant yield.

A tailings filtration project was initiated as a result of limited volumetric airspace of the slimes compartment at the active discard dump. A tailings filtration plant were built with the specific function of dewatering the as-arising slimes from 4 seam (after flotation) and 5 seam processing plants. The tailings filter cake from the filtration plant will be co-disposed with the coarse discard. Initially the tailings cake will be temporarily stockpiled and loaded on the current facility and once the new discard facility is operational the cake will be deposited with the coarse discard from the main plant onto a common conveyor. The filtration plant will not expand the capacity of the existing plant.

4.3.11.2.2 No. 5 seam Plant

The coal is tipped into a bin and initially crushed to –150 mm prior to being conveyed to two 500 ton ROM silos. From here, it is fed to a secondary sizing screen and crusher to produce a –50 mm feedstock to the beneficiation plant.

A double deck feed preparation stage screens out the 50 x 6 mm fraction, which is washed in a Wemco Drum. A single drain and rinse screen is used for both product and discard. Product from here is stored in four 500 ton storage silos and then loaded onto rail or trucks for the inland market.

The 6 x 0.5 mm material is pump-fed to a 600 mm DSM cyclone to produce product. This product is fed to an open-air stockpile with 10,000 ton capacity. The –0.5 mm fraction is beneficiated in a double stage spiral plant. Spiral product is dewatered on a dewatering screen and then conveyed to a Premium storage stockpile for dispatching via trucks for road transport.

4.3.12 Product Transportation

The final coal products are transported by road for sale to both the domestic and overseas markets. Coal is transported by truck or conveyor to the RLT for transport by TFR to the export markets. Coal for the local market is also collected by truck at the stockpile area near the coal beneficiation plants on the Greenside Colliery mine site. Product stockpiles or any other stockpiles have not been covered.

The coal destined for the international markets is transported by overland conveyor to the RLT where the coal is loaded to rail cars for transport by TFR to RBCT.

4.3.13 eMalahleni Water Reclamation Plant

Activities associated with the construction phase of the EWRP have been completed.

Water is abstracted from the flooded underground workings at Greenside Colliery, Landau Colliery and Kleinkopje Colliery. The extracted water is stored within mine water storage dams at the EWRP construction site. This water is transferred to the treatment plant, where the water is treated to potable standards and reused by the ELM. Only available water is abstracted, and the ground water regime is not affected.

4.3.13.1 Mine Water Resources

The EWRP will eventually after completion of the second phase, receive, on average, a total of 50 mega litres (Ml) of mine water per day from neighbouring mines via a network of pumps and pipelines (see Table 12).

Table 12: Mine water sources for the EWRP (average Ml/day)

Source of Mine Water	Water Collected (Ml/day)
Kleinkopje Colliery	13
Navigation Section of Landau Colliery	2.5
Greenside Colliery	15
South Witbank Colliery	3.5
Kromdraai and Excelsior Sections of Landau Colliery	10
Navigation Section of Landau Colliery	8
Middelburg Steam and Station Collieries	2
Other	5
Total	**50**

4.3.13.2 Surface Infrastructure

4.3.13.2.1 Transport Network

There is a short road link-up from the treatment plant to the R47 for the collection and trucking of the gypsum waste to the Blaauwkrans dump. Approximately eight 30 ton truckloads are used per day.

4.3.13.2.2 Solid Waste Management Facilities

Any industrial and domestic waste produced at the EWRP is disposed of as part of the solid waste generated at Greenside Colliery.

During the first three years of operation, brine was disposed of in an on-site brine storage facility. The brine gravitated from the plant into the storage facility and no pump station was required. The brine is now pumped via a dedicated pipeline and pump station to the new facility at Landau Colliery. The brine material is pumped via a pipeline lined with high density polyethylene (HDPE) to this waste disposal facility.

4.3.13.2.3 Dirty Water Management Facilities

One mine water storage dam has been constructed at the EWRP for the storage of mine water from the contributing collieries. The mine water dam is split into two compartments for operational flexibility. It has a total storage capacity of 46 Ml, which equates to 2 days of retention time. The mine water storage dam is an earthworks construction with a plastic liner to prevent any seepage from the dam.

In addition, a brine storage facility has been constructed at the treatment plant. The brine storage facility is:

- Adequately lined to ensure pollution does not enter the environment;
- Constructed to evaporate water from the brine stream.

The brine storage facility will be rehabilitated after there is no longer a need for the facility.

4.3.13.2.4 Stormwater

In terms of the facilities associated with the treatment plant, the following storm water system will be in place:

- A small portion (6,000 m2) of the catchment area of the RLT drains to the east and the storm-water is collected at a central drainage point. From there it gravitates through a 450 mm diameter concrete pipe underneath the P555 provincial road. The Storage Dams at the plant site obstructs the flow in the existing storm-water channel. A new earth bypass channel was constructed on the south-western side of the dams which has a trapezoidal section 800 mm deep with a 500 mm wide base. The walls have a 1:1.5 side slope. The co-ordinates of the point where the storm-water is discharged into the existing wetlands are X: 2 870 292.968, Y: -19 368.666.
- All storm-water generated on the site of the works is separated from the process water. All process water that may be spilled on the site and chemical dosing facilities is contained in bunded areas from where it is pumped back into the treatment plant. The principle used to size the bund wall height is 110 % of any storage vessels and 50-year, 24 hour rainfall depth.
- The Storage Dams have been constructed to store the raw water entering the treatment plant. The height of the walls is 4.800 m high with an emergency overflow 500 mm below the top of the wall. All water entering the dams is pumped, as it has no catchment. It is operated at a maximum water level 800 mm below the top of the wall. Once the water level rises to 800 mm below the top of the wall, the level controls switch off the pumps feeding the dams. The dams are lined with a 1.0 mm thick HDPE lining with an under drain system for leakage detection.

4.3.13.2.5 Water Supply

The potable product water is stored on the site of the treatment plant in two separate 10 Ml concrete reservoirs. The potable water storage reservoirs are concrete constructions, which are constructed on surface with an approximate height of 13 m. These are circular structures with a domed concrete roof to protect the potable water against contamination. . The quality of the water stored in the reservoir is confirmed prior pumping it to the municipal reservoirs.

4.3.13.3 Water Treatment Process

The EWRP at Greenside Colliery has a capacity to treat 50 Ml/day of mine water, and has a footprint of 8 ha. The EWRP has been designed to produce water of a quality range specified by the SANS 241 Class 0 standard and has a current reclaimed water production rate of 20 Ml/day. The water treatment process is based on a number of steps, including:

- Neutralisation and metals removal;
- Desalination;
- Reverse Osmosis; and
- Disinfection (using chlorine).

The EWRP includes associated infrastructure and utilities to support the routine operation of the plant, including electrical power supply, water supply and sanitation, as well as a filter press for the dewatering of the sludge. The EWRP also caters for an office facility, laboratory, equipment stores and workshops. The mechanical equipment includes a wide variety of pumps, agitators, mixers and clarifier drivers. A key component of the water treatment process incorporates Ultra-filtration and Reverse Osmosis membranes which have been installed in a dedicated covered building with appropriate floor and drainage facilities.

The EWRP is supplied with a bulk electrical power supply transformer, which feeds an electrical motor control centre from which the individual motor drives are powered. The estimated total installed power on the plant is 2.7 Megawatt (MW). There is a back-up power supply.

An integral component of the plant design is the leak detection and reclamation system that ensures that spillage, leaks and stormwater arising on the site are intercepted and transferred to the lined mine water storage dam.

4.3.13.4 Treated Water Distribution

Water treated to potable standards at the EWRP is distributed to the municipal water reservoir, via a distribution pipeline where it is blended with the potable water produced by the Municipal Water Treatment Plant. The treated potable water is pumped from the storage reservoirs directly to the municipal water reservoirs via a buried 600 mm diameter HDPE pipeline.

5. Policy and Legislative Context

The following table is a summary of the policy and legislative context applicable to the proposed development.

Table 13: Policy and legislative context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)	REFERENCE WHERE APPLIED (i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT (E.g In terms of the National Water Act:-Water Use Licence has/has not been applied for).
The Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	Throughout this document.	The Greenside Colliery is in possession of a Mining Right to mine coal resources. The DMR requested Greenside Colliery to include the Thandeka Shaft project by amending the EMPr in terms of Regulation 31 of the EIA Regulations which states: "*An environmental authorisation may be amended by following the process prescribed in this Part if the amendment will result in a change to the scope of a valid environmental authorisation where such change*
The Mineral and Petroleum Resources Development Regulations, 2004, Regulations R.562 dated April 2004).		
The National Environmental Management Act, 1998 (Act No. 107 of 1998).		
The Environmental Impact Assessment Regulations, R. 982 dated December 2014.		

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)	REFERENCE WHERE APPLIED (i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT (E.g In terms of the National Water Act:-Water Use Licence has/has not been applied for).
		will result in an increased level or nature of impact where such level or nature of impact *was not-* *(a) assessed and included in the initial application for environmental authorisation; or* *(b) taken into consideration in the initial environmental authorisation;* *and the change does not, on its own, constitute a listed or specified activity."*
The Environmental Impact Assessment Regulations, R. 983 dated December 2014.	Refer to Part 4.1 above.	The proposed recommencement of the operations at the Greenside Colliery does not trigger any listed activities. It is also important to note that the Greenside Colliery mine is currently in the possession of a Mining Right to mine the coal resources.
The Environmental Impact Assessment Regulations, R. 984 dated December 2014.		
The Environmental Impact Assessment Regulations, R. 985 dated December 2014.		

The following information was extracted from the approved EMPr entitled:. "*Aligned Environmental Management Programme Report for Anglo American Thermal Coal: Greenside Colliery, DMR Reference: MP30/5/1/2/2/304MR*.", dated April 2014. and compiled by WSP Environmnetal (Pty) Ltd.

The environmental legislation applicable to the activities at Greenside Colliery includes the following:

- The Constitution of the Republic of South Africa (1996) (Constitution);
- Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA);
- National Environmental Management Act (No. 107 of 1998) (NEMA);
- National Water Act (No. 36 of 1998) (NWA);
- National Environmental Management Waste Act (No. 59 of 2008) (NEM:WA);
- National Environmental Management Air Quality Act (No. 39 of 2004) (NEM:AQA);
- National Environmental Management Biodiversity Act (No. 10 of 2004) (NEM:BA);
- Mine Health and Safety Act (No. 29 of 1996) (MHSA);
- Hazardous Substance Act (No. 15 of 1973) (HSA);
- The National Heritage Resources Act (No. 25 of 1999) (NHRA);
- Promotion of Access to Information Act (No. 2 of 2000) (PAIA); and
- Provincial ordinances and Municipal by-laws.

These statues are further detailed in the sections below.

5.1 Constitution of the Republic of South Africa (1996)

The Constitution of South Africa provides for an environmental right (contained in the Bill of Rights, Chapter 2). In terms of Section 24, a positive obligation is placed on the State to give effect to the environmental right. The environmental right states that:

"Everyone has the right -

- *To an environment that is not harmful to their health or well-being; and*
- *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
  - *Prevent pollution and ecological degradation;*
  - *Promote conservation; and*
  - *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."*

The needs of the environment, as well as affected parties, should thus be integrated into overall project management in order to fulfil the requirements of Section 24 of the Constitution. Consequently, the purpose of this report is to identify activities that may cause environmental and socio-economic damage from the associated impacts occurring as a result of the Greenside Colliery existing and new / proposed activities. Impacts are evaluated and mitigation measures developed to minimise the negative impacts. The mitigation measures are designed to promote positive impacts associated, thereby ensuring that activities are undertaken in a sustainable manner. This also ensures that the project proponent does not contravene Section 24 of the Constitution.

5.2 Minerals and Petroleum Resources Development Act (No. 28 of 2002)

The main aim of the MPRDA is to recognise the sovereignty of the State over all the mineral and petroleum resources in South Africa and to promote equitable access to the country's resources.
Sections 38 and 25(1)(e) of the MPRDA give effect to Chapter 5 of NEMA and describe the obligations of the holder of a right to consider, investigate, assess and communicate the impact of the operation on the environment as contemplated in NEMA; to manage their environmental impacts in accordance with their environmental management programme (EMP)/EMPr as an integral part of the operation; and to rehabilitate the environment affected by its operations to its natural or pre-mining state or, alternatively, to a land use which conforms to the accepted principle of sustainable development. As a result, the mining right holder is obliged to take reasonable measures to ensure that its mining activities do not cause harm to environment or people and where harm/damage is unavoidable to take reasonable measures mitigate or remediate the harm.

According to Section 102, "*Amendment of rights, permits, programmes and plans: A reconnaissance permission, prospecting right, mining right, mining permit, retention permit, technical corporation permit, reconnaissance permit, exploration right and production right work programme, mining work programme, environmental management programme, and environmental management plan may not be amended or varied (including by extension of the area covered by it or by the addition of minerals or a share or shares or seams, mineralised bodies, or strata, which are not at the time the subject thereof) without the written consent of the Minister.*" This aligned EMPr has been compiled in accordance with Section 102 of the MPRDA.

5.3 National Environmental Management Act (No. 107 of 1998)

NEMA is South Africa's overarching environmental legislation and has, as its primary objective, to provide for cooperative governance by establishing principles for decision making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for matters connected therewith.
As required by section 24 of NEMA, the Minister of Environmental Affairs, published EIA regulations on 4 December 2014 in Government Gazette No. 38282, GNR 982 and list of activities which cannot be commenced with without an environmental authorisation in GNR 983, 984 and 985. Should any new projects be proposed for Greenside Colliery that triggers any activities as stipulated in the above three listing notices, the mines are required to undertake the relevant environmental authorisation process.

5.4 National Water Act (No. 36 of 1998)

The National Water Act (No. 36 of 1998) (NWA) provides for fundamental reformation of legislation relating to water resources and use. The Act recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection

of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users.

The NWA states that a water use must be licensed unless it is listed in Schedule 1 (of the NWA); is an existing lawful use; is permissible under a general authorisation; or, if a responsible authority waives the requirement for a licence. Greenside Colliery received its approved integrated water use licence (IWUL), in terms of the NWA, on 19 July 2011 from the Department of Water and Sanitation (DWS) (licence number: 04/B11G/AEGJ/1197; file number: 16/2/7/B100/C80) for the water uses listed in Table 14 below.

Table 14: Authorised water uses at Greenside Colliery

NWA Section	Water Use Description	Description of Activity
S21 (a)	*Taking water from a water resource.*	Abstracting water from the underground workings at Greenside Colliery.
S21 (e)	*Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).*	Disposal of water containing waste for irrigation purposes on-site recreation areas.
S21 (g)	*Disposing of waste in a manner which may detrimentally impact on a water resource.*	The storage of water containing waste, derived from mining-related activities, in the following dams: • PCD 1; • PCD 3; • Erickson Dam 1; • Erickson Dam 2; • Shaft Erickson Dam; and • Lake Lucy.
S21 (j)	*Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.*	Removing water from the underground workings at Greenside Colliery.

Greenside Colliery also recently submitted two separate water use licence applications (WULAs) for the New PCD (submitted 30 July 2012) and the proposed Coal Discard Dump Retreatment Plant (Retreatment Plant) (submitted 4 October 2012), to the DWS, respectively. **Table 15** lists the water uses included in each WULA. The New PCD has in the meantime been approved while the Retreatment Plant WULA are currently under review with the DWS.

Table 15: Water uses included into the WULAs for the approved New PCD and proposed Retreatment Plant, respectively

NWA Section	Water Use Description	Description of Activity
Proposed New PCD		

NWA Section	Water Use Description	Description of Activity
S21 (g)	*Disposing of waste in a manner which may detrimentally impact on a water resource.*	The storage of water containing waste, derived from mining-related activities, from PCDs 1 and 3 into the proposed New PCD.
Proposed Retreatment Plant		
S21 (c)	*Impeding or diverting the flow of water in a water course*	Associated infrastructure (i.e. a road) may be constructed to cross a watercourse. As such, a WUL application may be required regarding the possible impeding or diverting the flow of the watercourse.
S21 (g)	*Disposing of waste in a manner which may detrimentally impact on a water resource.*	The proposed process water storage dam will store in excess of 500 m^3 (3,600 m^3) of water containing waste for re-use in the Retreatment Plant. As such, the general authorisation parameters do not apply in terms of the Schedule 1, Section 4.11(1) of Government Notice (GN) 1191: General Authorisations in terms of Section 39 of the NWA. Thus, a WUL application will be required.
S21 (i)	*Altering the bed, banks, course or characteristics of a watercourse*	Associated infrastructure (i.e. a road) may be constructed to cross a watercourse. As such, a WUL application may be required regarding the possible altering the bed, banks, course or characteristics of the watercourse.

The sewage plant at Greenside Colliery was registered the Department of Water Affairs and Forestry (now the DWS) on 21 October 2004 in terms of Section 12A and 26 of the Water Act (No. 54 of 1956).

5.5 The National Environmental Management: Waste Act (No. 59 of 2008)

The NEM: WA serves to reform the law regulating waste management in order to protect human health and the environment. This is managed by providing reasonable measures for the prevention of pollution and ecological degradation. The Act aims to secure ecologically sustainable development while promoting justifiable economic and social development. It also provides national norms and standards for regulating the management of waste by all spheres of government, for specific waste management measures and for matters incidental thereto.

The NEM: WA contains specific waste activities that require a waste management license in order to ensure compliance with the South African legislation. The activities are contained in GNR.718 of 2009 and detail two categories of activities – Category A activities require a BA process be undertaken, and Category B activities require that a full scoping and EIA process be undertaken in order to receive a waste management license.

Although the current operations are mining-related, Greenside Colliery will ensure that the relevant authorisations are sought for activities, such as the decommissioning of the sewage plants during the Decommissioning and Closure Phases.

5.6 The National Environmental Management: Air Quality Act (No. 39 of 2004)

The National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA) states the following as its primary objective: "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.

GNR 248 of the NEM: AQA is a list of activities which result in atmospheric emissions, which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. The activities listed in GNR248 require an Atmospheric Emission Licence (AEL) to be conducted. In terms of NEMA GNR 545 any new activity requiring an AEL must undergo an EIA process.

Greenside Colliery has recently appointed WSP to compile their air quality management plan (AQMP). It is anticipated that the AQMP will be implemented in the beginning of 2013. Should it be identified during the course of this study that an AEL is triggered, Greenside Colliery will ensure that such a licence will be applied for; however, this is not anticipated as the mine is an underground operation.

5.7 The National Environmental Management: Biodiversity Act (No. 10 of 2004)

In line with the Convention on Biological Diversity, the National Environmental Management Biodiversity Act (No. 10 of 2004) (NEM: BA) aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. Sections 52(1)(a) and 56(1) of the NEM: BA state that the Minister may publish national lists of species and ecosystems, respectively, that are threatened or are in need of protection. The national list of species that are threatened or are in need of protection was published in 2007 in GNR 151, with GNR 152 detailing the regulations relating to such species. These regulations are imposed where restricted activities involve specimens of listed threatened or protected species.

GNR 152 states the requirements of permitting and the process related thereto. GNR 1002, published in 2011, is the national list of ecosystems that are threatened or in need of protection, and was

developed as a phased approach, with the first national list deals with terrestrial ecosystems only (other environments will be addressed ion future lists). This list must be read in conjunction with the NEMA GNR 546 which lists activities that require environmental authorisation in terms of the NEMA.

Greenside Colliery has implemented a biodiversity action plan to ensure that mitigation measures are regularly updated and implemented in such a way as to both comply with the requirements stipulated in the NEM:BA and promote biodiversity.

5.8 Mine Health and Safety Act (No. 29 of 1996)

The Mine Health and Safety Act (No. 29 of 1996) (MHSA), as amended in 2008, aims to provide for the protection of the health and safety of employees and other persons at mines. Greenside Colliery and has implemented the internal procedures that have been developed from existing Anglo American standards, industry best practice and from internationally recognised occupational health and safety management system standards, such as the Occupational, Health and Safety Management System Standard (OHSAS) 18001. The internal procedures implemented at Greenside Colliery include the Anglo Occupational Health Way and the Anglo Safety Way.

5.9 Hazardous Substances Act (No. 15 of 1973)

The object of the Hazardous Substances Act (No. 15 of 1973) (HSA) is, *inter alia*, to '*provide for the control of substances which may cause injury or ill health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances; for the control of electronic products; for the division of such substances or products into groups in relation to the degree of danger; and for the prohibition and control of such substances*.'

The HSA gives effect to NEMA Section 24 and the NEMA Regulations (GNR 544, GNR 545 and GNR 546). NEMA lists activities relating to "dangerous goods" which require environmental authorisation through either a BA or an S&EIA.

5.10 The National Heritage Resources Act (No. 25 of 1999)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) established the South African Heritage Resources Agency (SAHRA) in 1999. SAHRA is tasked with protecting heritage resources of national significance (e.g. shipwrecks, ancient burial grounds, monuments, battle sites, etc.).

According to the NHRA, no person may damage, disfigure, alter, subdivide or in any other way develop any part of a protected area, as described above, unless he or she has consulted the heritage resources authority which designated such area in accordance with a procedure prescribed by that authority at least 60 days prior to the initiation of such changes. If there is reason to believe that heritage resources

will be affected by such a development, the person must submit a heritage impact assessment report to the authority. This assessment must be carried out by a heritage specialist approved by SAHRA to enable them to make an informed decision. Section 24(4) of the NEMA provides for the inclusion of such a heritage impact assessment into an environmental impact assessment. This is also provided for in Listing Notice 3 of the EIA Regulations (2010).

Should any such resources be identified to occur within the mining right areas of either Greenside Colliery the mines will report these to the relevant SAHRA office, obtain relevant licences or permits if any are required and implement management measures to mitigate any negative impacts.

5.11 Promotion of Access to Information Act (No. 2 of 2000)

The Promotion of Access to Information Act (No. 2 of 2000) (PAIA) recognises that everyone has a right of access to any information held by the State and by another person when that information is required to exercise or protect any right. The purpose of PAIA is to promote transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their right.

The environmental authorisation process and, particularly the stakeholder consultation component, must be aligned with the PAIA in the sense that all registered stakeholders must be provided a fair opportunity to review and comment on any reports submitted to the authorising authority for decision making.

All environmental and mining processes at Greenside Colliery undertaken, and particularly the stakeholder consultation component, have been aligned with the PAIA in the sense that all registered stakeholders will be provided a fair opportunity to review and comment on any reports submitted to the authorising authority for decision making.

5.12 Provincial Ordinances and Municipal By-laws

In addition to national legislation, some of South Africa's nine provinces have their own provincial legislation, as environmental management is a concurrent function of national and provincial government in terms of the Constitution of South Africa. In addition, the local and district municipalities have developed local bylaws and various policies relating to waste disposal, water, economic development, etc. Greenside Colliery will therefore ensure that such policies and bylaws are considered, as far as possible, during the establishment, operation and decommissioning of the any existing or new activities at Greenside Colliery.

6. Need and desirability of the proposed activities

6.1 Need and Desirability in terms of the Guideline on Need and Desirability, dated 20 October 2014.

On the 20th of October 2014, the Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014. The following table indicates on how the guideline requirement were considered in this EIAR specifically pertaining to the proposed Thandeka Shaft Project.

Table 16: Need and Desirability of the Proposed Project

Requirement		Part where requirement is addressed/response
1.	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?[1]	Part 7.
1.1	How were the following ecological integrity considerations taken into account?	
1.1.1	*Threatened Ecosystems.*[2]	
1.1.2	*Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.*[3]	
1.1.3	*Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").*	Refer background description as contained in Part 7.
1.1.4	*Conservation targets.*	
1.1.5	*Ecological drivers of the ecosystem.*	
1.1.6	*Environmental Management Framework.*	No EMF or SDF exists for the area.
1.1.7	*Spatial Development Framework.*	
1.1.8	*Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).*[4]	No impact.
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[5]	Refer to Part 7.

[1] Section 24 of the Constitution and section 2(4)(a)(vi) of NEMA refer.
[2] Must consider the latest information including the notice published on 9 December 2011 (Government Notice No. 1002 in Government Gazette No. 34809 of 9 December 2011 refers) listing threatened ecosystems in terms of Section 52 of National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
[3] Section 2(4)(r) of NEMA refers.
[4] Section 2(4)(n) of NEMA refers.
[5] Section 24 of the Constitution and Sections 2(4) (a) (i) and 2(4) (b) of NEMA refer.

Requirement		Part where requirement is addressed/response
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[6]	Refer risk table, Part 7.3
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?[7]	Types of non-mineral wastes, as typically expected to be generated are discussed in Part 4.3.3. Measures to avoid waste, minimise, reuse and/or recycle wastes are included as commitments for the mine.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[8]	Refer Part 7.
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[9]	Refer to the project description in Part 7.
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources	Refer to Part 7 .

[6] Section 24 of the Constitution and Sections 2(4)(a)(ii) and 2(4)(b) of NEMA refer.
[7] Section 24 of the Constitution and Sections 2(4)(a)(iv) and 2(4)(b) of NEMA refer.
[8] Section 24 of the Constitution and Sections 2(4)(a)(iii) and 2(4)(b) of NEMA refer.
[9] Section 24 of the Constitution and Sections 2(4)(a)(v) and 2(4)(b) of NEMA refer.

Requirement		Part where requirement is addressed/response
	and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?[10]	
1.7.1	*Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)*	Refer to Part 7.
1.7.2	*Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)*	Refer to Part 7.
1.7.3	*Do the proposed location, type and scale of development promote a reduced dependency on resources?*	Reefer to Part 7
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts?[11]	Refer to Part 7
1.8.1	*What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?*	Refer to Part 15
1.8.2	*What is the level of risk associated with the limits of current knowledge?*	Low risk due to knowledge gaps.

[10] Section 24 of the Constitution and Sections 2(4)(a)(vi) and 2(4)(b) of NEMA refer.
[11] Section 24 of the Constitution and Section 2(4)(a)(vii) of NEMA refer.

Requirement		Part where requirement is addressed/response
1.8.3	*Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?*	Refer to Part 15
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following:[12]	Part 4.7
1.9.1	*Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?*	Refer to Part 7
1.9.2	*Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?*	Refer to Part 7
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to Part 7
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	Refer to Part 7
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?[13]	Refer Part 7
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in	Refer to Part 7

[12] Section 24 of the Constitution and Sections 2(4)(a)(viii) and 2(4)(b) of NEMA refer.
[13] Section 2(4)(b) of NEMA refer.

Requirement		Part where requirement is addressed/response
	relation to its location and existing and other planned developments in the area?[14]	
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?:	
2.1.1	*The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,*	Refer to Part 7
2.1.2	*Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),*	Refer to Part 7
2.1.3	*Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and*	Refer to Part 7
2.1.4	*Municipal Economic Development Strategy ("LED Strategy").*	Refer to Part 7
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	Refer to Part 3 and Part 7.
2.2.1	*Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?*	Refer to Part 3 and Part 7.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?[15]	Refer to Part 3 and Part 7.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term?[16] Will the impact be socially and economically sustainable in the short- and long-term?	Refer to Part 3 and Part 7.

[14] Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.
[15] Section 2(2) of NEMA refers.
[16] Sections 2(2) and 2(4)(c) of NEMA refers.

Requirement		Part where requirement is addressed/response
2.5	In terms of location, describe how the placement of the proposed development will:[17]	Refer to Part 3 and Part 7.
2.5.1	*result in the creation of residential and employment opportunities in close proximity to or integrated with each other,*	Refer to Part 3 and Part 7.
2.5.2	*reduce the need for transport of people and goods,*	Refer to Part 3 and Part 7.
2.5.3	*result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),*	Refer to Part 3 and Part 7.
2.5.4	*compliment other uses in the area,*	Refer to Part 3 and Part 7.
2.5.5	*be in line with the planning for the area,*	Refer to Part 3 and Part 7.
2.5.6	*for urban related development, make use of underutilised land available with the urban edge,*	Refer to Part 3 and Part 7.
2.5.7	*optimise the use of existing resources and infrastructure,*	Refer to Part 3 and Part 7.
2.5.8	*opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),*	
2.5.9	*discourage "urban sprawl" and contribute to compaction/densification,*	Refer to Part 3 and Part 7.
2.5.10	*contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,*	Refer to Part 3 and Part 7.
2.5.11	*encourage environmentally sustainable land development practices and processes,*	Refer to Part 3 and Part 7.
2.5.12	*take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),*	Refer to Part 3 and Part 7.

[17] Section 3 of the Development Facilitation Act, 1995 (Act No. 67 of 1995) ("DFA") and the National Development Plan refer.

Requirement	Part where requirement is addressed/response
2.5.13 the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	Refer to Part 3 and Part 7.5.
2.5.14 impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Risk assessment table in part 7.5
2.5.15 in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Refer to socio economic impact in Part 7.5
2.6 How were a risk-averse and cautious approach applied in terms of socio-economic impacts?:	Refer to Part 5 and 7.
2.6.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?[18]	Refer to Part 15
2.6.2 What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	Refer to Part 7.
2.6.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Refer to Part 15.
2.7 How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	Refer to the socio-economic impacts in Part 7.
2.7.1 Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer risk assessment table in Part 7.
2.7.2 Positive impacts. What measures were taken to enhance positive impacts?	Refer mitigation as per risk assessment table in Part 7.
2.8 Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and	Refer to the socio-economic impacts in Part 7.

[18] Section 24(4) of NEMA refers.

Requirement		Part where requirement is addressed/response
	dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?[19]	Refer to alternative assessment in Part 7.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)?[20] Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to Part 7. I
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?[21]	Refer to the socio-economic impacts in Part 7.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?[22]	Specialist assessments, recommendations, risk assessments and proposed mitigation measures
2.13	What measures were taken to:	Refer to Part 7.
2.13.1	*ensure the participation of all interested and affected parties,*	
2.13.2	*provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,*[23]	

[19] Section 2(4)(b) of NEMA refers.
[20] Section 2(4)(c) of NEMA refers.
[21] Section 2(4)(d) of NEMA refers.
[22] Section 2(4)(e) of NEMA refers.
[23] Section 2(4)(f) of NEMA refers.

Requirement	Part where requirement is addressed/response
2.13.3 ensure participation by vulnerable and disadvantaged persons,[24]	
2.13.4 promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,[25]	
2.13.5 ensure openness and transparency, and access to information in terms of the process,[26]	
2.13.6 ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge[27]*, and*	
2.13.7 ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?[28]	Refer to Part 7
2.14 Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g.. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?[29]	Refer to the socio-economic impacts in Part 7.
2.15 What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?[30]	Refer to awareness programme in Part B.
2.16 Describe how the development will impact on job creation in terms of, amongst other aspects:	Refer to the socio-economic impacts in Part 7.

[24] Section 2(4)(f) of NEMA refers.
[25] Section 2(4)(h) of NEMA refers.
[26] Section 2(4)(k) of NEMA refers.
[27] Section 2(4)(g) of NEMA refers.
[28] Section 2(4)(q) of NEMA refers.
[29] Section 2(4)(g) of NEMA refers.
[30] Section 2(4)(j) of NEMA refers.

Requirement	Part where requirement is addressed/response
2.16.1 the number of temporary versus permanent jobs that will be created,	
2.16.2 whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.16.3 the distance from where labourers will have to travel,	
2.16.4 the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	
2.16.5 the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
2.17 What measures were taken to ensure:	
2.17.1 that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and	Continued consultation with all relevant departments, covering DMR, DARDLEA, DWS, SAHRA through authorities meetings, site visits and providing Reports. All registered as stakeholders and informed as per public participation chapter.
2.17.2 that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	No known conflict
2.18 What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?[31]	Refer to Part 7.
2.19 Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?[32]	Mitigation measures are realistic. However, not all will necessarily result in reversible impacts or in low significance. Rehabilitation strategies aimed at mine closure have been proposed but the effectiveness of implementation will determine long term environmental legacy. Refer to Part B.

[31] Section 2(4)(o) of NEMA refers.
[32] Section 240(1)(b)(iii) of NEMA and the National Development Plan refer.

Requirement		Part where requirement is addressed/response
2.20	What measures were taken to ensure that he costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?[33]	Closure cost assessment and financial provisioning in Part B.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?[34]	Refer to alternative assessment in Part 7.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?[35]	Refer to cumulative assessment in Appendix E.

[33] Section 2(4)(p) of NEMA refers.
[34] Section 2(4)(b) of NEMA refers.
[35] Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.

7. Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site.

7.1 Details of the development footprint alternatives considered

Four (4) options for the ventilation shaft were identified and assessed. The infrastructure required to be constructed for all four (4) of the options were identical, however differed in terms of locality. It is however important to note that the localities of the ventilation shaft, across all four (4) options, could not be varied in too large an extent. This is due to the fact that site selection for a ventilation shaft was largely based on the location and needs of the underground mine workings. The four (4) options were as follows:

- Option 1: Construct a ventilation shaft on the Remaining Extent of Portion 2 of the Farm Blaauwkrans 323 JS, right against the provincial road R547.
- Option 2: Construct a ventilation shaft on the Remaining Extent of Portion 2 of the Farm Blaauwkrans 323 JS, 20 m from the Provincial road R547.
- Option 3: Construct a drop bore ventilation shaft on portion 28 of the Farm Blaauwkrans 323 JS.
- Option 4: Construct a raise bore ventilation shaft on portion 28 of the Farm Blaauwkrans 323 JS.

Option 4 was selected for the Thandeka ventilation shaft and associated infrastructure.

7.2 Details of the Public Participation Process Followed

A detailed public participation process was undertaken, as contained in Appendix D. The Public Participation Process as followed includes:

- Stakeholder identification.
- Registration of Interested and Affected Parties (I&AP's) and key stakeholders.
- Methods of notification:
  - Newspaper advertisement.
  - Site notices.
  - Notification letter including BID.
  - Electronic (E-Mail) notifications including BID.
- Access and opportunity to comment by I&APs.

- Consultation with the relevant authorities.

7.3 Summary of issues raised by I&APs

Table 17 below provides a summary of the comments and issues raised and reaction to those responses as applicable to the Thandeka Ventilation Shaft project. This table will be completed based on the comments received during the public participation process.

Table 17: Issues and concerns raised by I&APs

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
AFFECTED PARTIES					
Landowner/s					
Lawful occupier/s of the land					
Landowners or lawful occupiers on adjacent properties					
Municipal councillor					
Municipality					
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA e					
Communities					
Dept. Land Affairs					

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
Traditional Leaders					
Dept. Environmental Affairs					
Other Competent Authorities affected					
OTHER AFFECTED PARTIES					
INTERESTED PARTIES					

7.4 The Environmental attributes associated with the development footprint alternatives. A baseline environment.

7.4.1 Type of environment affected by the proposed activity

Several specialist studies were conducted to aid in the environmental assessment in order to determine if any additional environmental authorisation are required in terms of the new environmental legislation. These studies were conducted in order to determine the baseline description (*status quo*) of environmental, social and cultural aspects as well obtain specialist input in terms of the possible impacts on the environment, as a result of the Thandeka Ventilation Shaft. The studies conducted are as follows:

- Phase 1 Heritage Impact Assessment.
- Paleontological Impact Assessment.
- Surface water study.
- Geohydrological study.
- Wetland delineation and functional assessment.
- Biodiversity assessment.
- Blasting and vibration study.
- Noise Impact study.

The above mentioned specialist assessments which have been conducted are summarised below and attached hereto in Appendix C. All of the specialist studies were conducted with the utilisation of the initial site layout plan for Option 3. Based on the findings of the specialist assessments a fourth option was considered that would result in the least environmental impacts. The selected option (Option 4) resulted in the following changes to the previous options:

- Re-routing of the powerlines to be located out of the 100m wetland buffer (reducing the impacts on the wetlands).
- Orientation of the ventilation shaft to connect to the new powerline routings (located out of the 100m wetland buffer).
- Drop bore shaft was changed to a raised bore shaft in order to eliminate blasting activities, therefore reducing the impact on noise and groundwater.

Refer to Figure 7 above for the final site layout plan.

7.4.2 Phase 1 Heritage Impact Assessment

Information in this section of the Technical assessment was obtained from the document titled: "*A Phase I Heritage Impact Assessment study for Greenside Colliery's Thandeka shaft and overhead power line project near eMalahleni (Witbank) on the Eastern Highveld in the Mpumalanga Province*" dated November 2014, compiled by Dr Julius Pistorius. The report is attached hereto in Appendix C1.

7.4.2.1 General description of assessment

The Phase 1 Heritage Impact Assessment was conducted through the means of:

- Field Survey:
  - The Project Area was assessed through vehicle and pedestrian surveys. The aim of the surveys was to photograph, describe and geo-reference heritage resources whenever they existed. A GPS track log was registered with a mounted GPS instrument. More detailed pedestrian surveys were conducted from this main track.
- Assessment of Databases, literature and maps:
  - Literature relating to the pre-historical and the historical unfolding of the Eastern Highveld was reviewed. This review focused primarily on the pre-history as well as the Historical Period on the Eastern Highveld. It also provided a broad outline of the coal mining history of the region as well as its indigenous architecture. The desktop study also involved consulting heritage data banks maintained at institutions such as the Mpumalanga Provincial Heritage Resources Agency in Barberton, the Archaeological Data Recording Centre at the National Flagship Institute (Museum Africa) in Pretoria and the national heritage resources register at the South African Heritage Resources Agency (SAHRIS) in Cape Town.

7.4.2.2 Site specific heritage resources

The Phase I Heritage Impact Assessment for the Thandeka ventilation shaft did not identify any of the types and ranges of heritage resources (refer to Appendix C1) as outlined in Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999).

No changes have occurred to the Heritage Impact Assessment as a result of the final preferred option (Option 4).

7.4.2 Paleontological Impact Assessment

The information contained in this section of the Technical Assessment document is obtained from the report titled: “Paleontological desktop report – Thandeka Greenside Colliery” dated January 2014 and compiled by Bruce Rubidge of The Evolutionary Studies Institute, University of the Witwatersrand. The report is attached hereto as Appendix C2.

7.4.2.1 General description of the assessment

The Paleontological Impact Assessment is a desktop assessment that was conducted for the Thandeka ventilation shaft project. The desktop assessment involved the assessment of the project locality and description against the geological setting and known paleontological heritage associated with the geology.

The assessment indicated that entire study area is underlain by rocks of the Karoo Supergroup comprising sedimentary rocks of the Carboniferous Dwyka Group and the Vryheid Formation of the Permian Ecca Group. The diamictites of the Dwyka Group were deposited in a grounded glacial setting

and the mudrocks, coals and sandstones of the Vryheid Formation were deposited in a delta plain depositional environment. The coarse grained diamictites of the Dwyka Group, which are positioned well below surface in the study area, are unlikely to contain fossils and in any case will not be exposed by the development. The overlying rocks of the Vryheid Formation of the Ecca Group are renowned for their wealth of plant fossils of the famous Gondwanan Glossopterus flora which has been described from Permian-aged rocks. This flora is the source of the coal which is mined from the Vryheid Formation in South Africa. Within the Vryheid Formation there are occurrences of well-preserved elements Glossopteris flora comprising wood and/or leaves.

7.4.2.2 Site specific paleontological heritage

The area in which the project is situated has largely been transformed for cultivation purposes, namely maize fields. The project area has also been scarred by open cast coal mining as well as underground coal mining activities. As the development of the Thandeka ventilation shaft will involve excavation of rocks of the Ecca Group, it is possible that paleontological heritage resources may be impacted on. There is a possibility that the rocks of the Vryheid Formation in the study area could contain fossil plant material of *Glossopteris* flora. As these fossils are not currently exposed, the development could enhance possibilities to discover plant fossils. If fossils are exposed in the course of the Thandeka development, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.

No changes have occurred to the Paleontological Impact Assessment as a result of the final preferred option (Option 4).

7.4.3 Surface water study

The information contained in this section of the technical assessment was obtained from the document titled: "*Anglo American Thermal Coal: Greenside Colliery Thandeka shaft project, surface water study*" dated December 2014 and compiled by Shangoni Management Services (Pty) Ltd. The report is attached hereto as Appendix C3.

7.4.3.1 General description of the assessment

A field investigation was conducted to familiarise with the site and to obtain a better understanding of the drainage regime in the vicinity of the Thandeka ventilation shaft. The field investigation was conducted to assess the current storm water measures on site and the site characteristics and to determine the baseline conditions of downstream surface water resources, which would aid in the development of a Storm Water Management Plan. It was also the objective of the field investigation to collect surface water samples for hydrochemical analysis. The hydrochemical analyses of these surface water samples will aid in the development of a conceptual model and risk assessment and will also be used as a baseline assessment of pre-development site conditions pertaining to the Thandeka Shaft. Samples were taken according to grab sampling methods according to guidelines as proposed by the

DWA (WRC, 2000). Samples taken were immediately cooled and taken to a SANAS accredited laboratory within 24 hrs. Hydrochemical analyses were performed by Aquatico Laboratories (Pty) Ltd, a SANAS (T0374) accredited water laboratory situated in Pretoria.

7.4.3.2 Baseline surface water quality

The baseline water quality determination indicated that two of the samples recorded *Poor (Class 3)* water quality based on the domestic colour coded classification system. The quality can be described as acidic, non-saline and hard with low nutrient levels, medium SO_4 and high to elevated levels of Al and Mn. The acidic pH, for both the samples, of 4.19 and 517 resulted in the high to elevated levels of Al and Mn. The Stiff diagrams indicate very similar water quality profiles dominated by Ca on the cation side and SO_4 on the anion side. This SO_4 domination together with the low pH are an indication of pyrite oxidation resulting in the formation of acid mine drainage.

According to the colour coded domestic classification system the one of the upstream localities (refer to Appendix B3) can be classified as *Good (class 1), exceeding Ideal* (*Class 0*) water quality due to the slightly raised SO_4 levels, while another upstream locality can be classified as *Poor* (*class 3)* due to the slightly elevated levels of Al. Both upstream localities recorded well within livestock watering guidelines.

7.4.3.3 Conceptual Storm water management plan

The conceptual storm water management plan has been designed to include the following:

- A proposed clean surface water cut-off berm has been included in the designs with the intended purpose of diverting clean storm water runoff away from the ventilation shaft to the surrounding clean water environment. Surface flow is expected to gradually flow towards the R547 from where runoff will pass underneath the provincial road via culverts towards the natural drainage line.
- A proposed trapezoidal drain has been included in the designs with the intended purpose of conveying upstream runoff along the proposed access roads towards an existing culvert underneath the R547 provincial road. Conveyed surface water runoff will flow through a hidden culvert and a temporary cross drain/drift towards an existing culvert underneath the R547.

No changes have occurred to the baseline information of the stormwater management plan as a result of the final preferred option (Option 4). It is however recommended that the stormwater is still managed in accordance to the principles and measures as contained in this report.

7.4.4 Geohydrological assessment

The information contained in this section of the technical assessment is obtained from the document titled: "*Anglo American Thermal Coal: Greenside Colliery Thandeka shaft project, Geohydrological investigation as input to the EMPr*" dated November 2014 and compiled by Shangoni AquiScience. The report is attached hereto as Appendix C4.

7.4.4.1 General description of the assessment

As part of the scope of work of the geohydrological study, the following methodology was adopted:

- Geohydrological desktop study.
- Hydrocensus and groundwater quality.
- Hydrochemistry.
- Groundwater recharge estimation.
- Aquifer classification.
- Aquifer vulnerability.
- Formulation of the conceptual model.
- Numerical groundwater model.
- Environmental impact assessment.

7.4.4.2 Results of the geohydrological study

7.4.4.2.1 Aquifer classification and vulnerability

Two types of aquifers were identified within the study area and are:

1. A shallow perched and weathered aquifer.
2. An intergranular and fractured aquifer.

The depths of these two aquifers vary between 0-8 m and 8-200 m respectively. The aquifer vulnerability was determined using the DRASTIC model, the final DRASTIC score of the aquifers associated with the study area is that of 120. Therefore the aquifers are said to have a medium to high susceptibility to pollution and a medium to high level of aquifer protection is therefore required.

7.4.4.2.2 Hydrocensus

A hydrocensus survey was undertaken during which a total of sixteen (16) localities (within a 3 km radius) was identified. Ten (10) of these boreholes are privately owned and the remaining six (6) are monitoring localities owned by Landau Navigation Colliery. The average depth to the water table ranges between 0 mbgl to 4.5 mbgl. Eight (8) of the hydrocensus boreholes were found to have a DWA classification of *Ideal (Class 0)*, two (2) were classified as *Good (Class 1)* and three (3) were classified as *Marginal (Class 2)* (refer to Appendix C4).

7.4.4.2.3 Results of the conceptual modelling

During the Construction Phase of the project, dewatering activities will occur to allow for drilling and blasting. A cone of depression will form as a result of the dewatering activities. This cone of depression will extend approximately 1 km north, 1,4 km south, 1.4 km to the east and 0.8 km to the west (refer to Appendix C4). The model also indicated that shaft dewatering may also have a significant impact on the wetland situated to the north of the study area (refer to Appendix C4).

7.4.4.2.4 Groundwater Impact Assessment

The Groundwater Impact Assessment revealed that, in terms of groundwater, the most significant impacts will result from drilling and blasting activities (groundwater quality) as well as dewatering activities (groundwater quantity) (refer to Appendix C4).

As previously indicated the ventilation shaft was changed from a drop bore shaft to a raised bore shaft (Option 4) in order to eliminate blasting activities, therefore reducing the impact on noise and groundwater quality and further to eliminate the need to dewater.

7.4.5 Blasting and vibration

The information contained in this section of the report was obtained from the document titled: "*Environmental Impact Assessment: Ground vibration and air blast study, Greenside Colliery, Thandeka Shaft*" dated January 2015 and compiled by Blast Management and Consulting. The report is attached hereto as Appendix C5.

7.4.5.1 General description of the vibration and air blast study

The object of the vibration and air blast study was to determine the impact that drilling and blasting activities (conducted during the Construction Phase of the project) would have on the surrounding environment. The study was conducted by adopting the following methodology:

- Site visit.
- Site structure profile.
  - Identification of all structures found within 3 500 m.
- Site evaluation.
  - Consists of an evaluation of mining operations and possible influences from blasting activities.
  - Modelling the expected impact based on expected drilling and blasting information.
  - Amplitude contours are modelled and overlain with the locations of the various receptors.
  - Evaluation of each receptor according to predicted levels.
- Reporting.

7.4.5.2 Vibration and blasting assessment findings

The ground vibrations predicted, ranged between 0.9 and 12.5 mm/s for all of the points of interest identified. One of the points of interest identified presented an expected level the same as the limit. Air blast levels expected ranged between 103.6 dB and 122.4 dB at the nearest point of interest. In general air blast showed no points where air blast is problematic. Most of the points of concern are structures / installations that are not specifically influenced by air blast. Only one POI were identified with concerns greater than possible complaints at POI 5 (refer to Appendix C5).

The Vibration and Blasting study was undertaken for the development of a drop bore shaft, although as indicated above the ventilation shaft construction method was changed from a drop bore shaft to a

raised bore shaft (Option 4) in order to eliminate blasting activities, therefore no blasting activities will be conducted.

7.4.6 Ecological assessment

The information contained in this section of the document was obtained from the report titled: "*Baseline ecological survey for the alignments/footprints of the 22kv powerlines and ventilation shaft proposed as part of the Anglo American Thermal Coal Greenside Colliery's Thandeka Shaft Project*" dated February 2015 and compiled by De Castro and Brits Ecological Consultants. The report is attached hereto as Appendix C6.

7.4.6.1 General description of the assessment

The scope of work of the baseline ecological assessment was as follows:

- Determination of the Vegetation Type/Types in accordance with existing national vegetation maps (Mucina & Rutherford, 2006) and local vegetation studies, as well as proximity and relationship to any Centre of Endemism (van Wyk and Smith 2001). The conservation status of each vegetation type present, as described by Mucina & Rutherford (2006) and the relevant Schedule (Government Gazette of December 2011a) of the Biodiversity Act (Act 10 of 2004) will also be provided. A description of the regional biodiversity context using all existing information (e.g. Mpumalanga Biodiversity Sector Plan (MBSP) 2013 and NPAES mapping) will be provided.
- Broad-scale structural classification of the vegetation into homogenous units following the approach of Edwards (1983). Brief descriptions of the dominant and characteristic species identified within the broad-scale plant communities comprising each of these units, will also be provided. These descriptions will be based on visual estimates of cover/abundance and density following established vegetation survey techniques (Kent & Coker 1993). The number of sites will be limited by the relatively short duration of the available time for fieldwork.
- Each identified vegetation unit / habitat will be briefly described in terms of its sensitivity, biodiversity value and conservation importance.
- Compilation of a species list (to provide an accurate indication of the floristic diversity) according to latest taxonomic treatments used by the National Herbarium (http://posa.sanbi.org). Alien invasive species, according to the Alien Invasive Species Regulation 2014 (under the Biodiversity Act of 2004), will be highlighted and discussed. Plant species that area protected in terms of provincial and national legislation, will also be highlighted.
- Determination of the occurrence, or possible occurrence, of plant 'species of conservation concern' (Raimondo et al., 2009 and http://redlist.sanbi.org) and plant communities, on the basis of field surveys, historical distribution records obtained from the PRECIS database of SANBI, the MTPA threatened species database, and available literature.
- Determination of the occurrence, or possible occurrence, of threatened and / or sensitive vertebrate fauna (mammals, birds, reptiles and amphibians), based on the MTPA threatened

vertebrate species database, habitat characteristics of the study area and coincidental observations compiled whilst conducting the vegetation surveys.

- Further botanical and zoological assessments regarded as necessary will also be identified and 'Terms of Reference' for these assessments will be recommended. Such further assessments may include additional searches for potentially occurring threatened plant species that were not in flower at the time of the field surveys conducted for this study.
- An assessment of envisaged impacts to biodiversity and habitats associated with the development will also be provided, as will appropriate mitigation measures for any identified plant or animal 'species of conservation importance' (sensu Raimondo et al., 2009) and sensitive habitats.

7.4.6.2 Ecological baseline assessment findings

The terrestrial habitats and vegetation of the study area and its immediate surrounds have been transformed by catastrophic anthropogenic impacts. The greatest habitat transformation has occurred as a result of cultivation. No significant fragments of untransformed mesophytic grassland were recorded within a 200m radius of the ventilation shaft site or along the powerlines. Neither the assed 1.08ha area within which the shaft footprint will be situated nor the areas of the powerlines from Umlalazi and Blackhill sub-stations, will affect any 'Critical Biodiversity Area' as defined by the corrected Mpumalanga Biodiversity Sector Plan of 2014.

The only untransformed vegetation (although significantly disturbed) found within the study area is found within the 'Valley-bottom wetland and hillslope seep communities' unit. The approximately 410m wide section of valley-bottom wetland and associated floodplain and hillslope seep habitat comprising this unit is traversed by the Umlalazi powerline.

The only plant species of '*conservation concern*' recorded within the study area was *Hypoxis hemerocallidea. Hypoxis hemerocallidea* is not a threatened species as defined by the IUCN criteria, but is categorised as Declining in the latest Red List of South African Plants as a result of suspected over-utilisation for the medicinal plant trade (refer to Appendix C6). Five other '*declining*' plant species and one '*endangered*' plant species have historically been recorded from the quarter degree grid within which the study area is situated (2529CC) and the grid directly to the south. The probability of any of these species occurring within the study area is, however, regarded as low to negligible, and they are certainly absent from the infrastructure footprints and the transformed habitats that comprise the vast majority of the study area.

The MTPA database lists four threatened or Near Threatened vertebrates (mammals, birds, reptiles and amphibians) for the quarter degree grid square within which the study area is situated (2529CC), as well as the grid immediately to the south (2629AA), namely the Serval (*Leptailurus serval*), African Grass-Owl (*Tyto capensis*), Transvaal Grass Lizard (*Chamaesaura aenea*) and Giant Bullfrog (*Pyxicephalus adspersus*). None of these species were recorded during the current survey and it is

considered unlikely that the study area, and in particular the construction footprints, provide any significant habitat for any of these species (refer to Appendix C6).

No changes have occurred to the Ecological Assessment as a result of the final preferred option (Option 4).

7.4.7 Wetland delineation and functional assessment

The information contained in this section of the Technical assessment document was obtained from the report titled: "*Wetland Delineation and Impact Assessment Report for the Greenside Thandeka Shaft & Powerline Project*" dated February 2015 and compiled by Wetland Consulting Services (Pty) Ltd. The report is attached hereto as Appendix C7.

7.4.7.1 General description of the assessment

The scope of work for the wetland delineation and impact assessment is as follows (refer to Appendix C7):

- Conduct a desktop and field investigation for the presence and extent of wetland areas within the study area.
- Delineate and map the wetland areas.
- Classify wetlands according to HGM (see SANBI, 2009).
- Update the functional assessment of the wetland systems on site (WET-EcoServices).
- Update the Present Ecological State (PES) and Ecological Importance and Sensitivity of any wetlands on site using the Wetland Index of Habitat Integrity and/or WET-Health methodologies as applicable.
- Review the layout plan and method statements.
- Identify and assess expected impacts to wetlands.
- Provide recommendations on suitable mitigation and management measures to avoid and minimize negative impacts.
- Recommendations on wetland rehabilitation.
- Provide a detailed wetland impact assessment report.

7.4.7.2 Wetland delineation findings

The delineated wetlands consist predominantly of hillslope seepage wetlands, but also include a single channelled valley bottom wetland to the north of the shaft footprint. The present ecological status of the wetlands varies from moderately modified to largely modified (refer to Appendix C7). Impacts to the valley bottom wetland related mostly to changes in hydrology, specifically the retention and distribution of flows within the wetland. In the case of the hillslope seepage wetlands, degradation is mostly related to vegetation and direct habitat disturbances.

The valley bottom wetland with associated hillslope seepage wetlands to the north of the ventilation shaft footprint area were considered to be of Moderate ecological importance and sensitivity, though the eroded reach of valley bottom wetland downstream of the road was considered to be of Low/Marginal importance give the level of degradation within this wetland (refer to Appendix C7). The hillslope seepage wetland to the south west of the ventilation shaft footprint area is considered of Low/Marginal importance and sensitivity given the extensive cultivation within the wetland and loss of natural habitat.

The wetland delineation and impact assessment study revealed that there are no wetlands on the ventilation shaft project area (refer to Appendix C7). However, the closest wetland to the shaft foot print area is located approximately 200 m to the south. As presented in Figure 12 below, the shaft footprint area and powerlines fall outside of the 100 m wetland buffer zone(for Option 4).

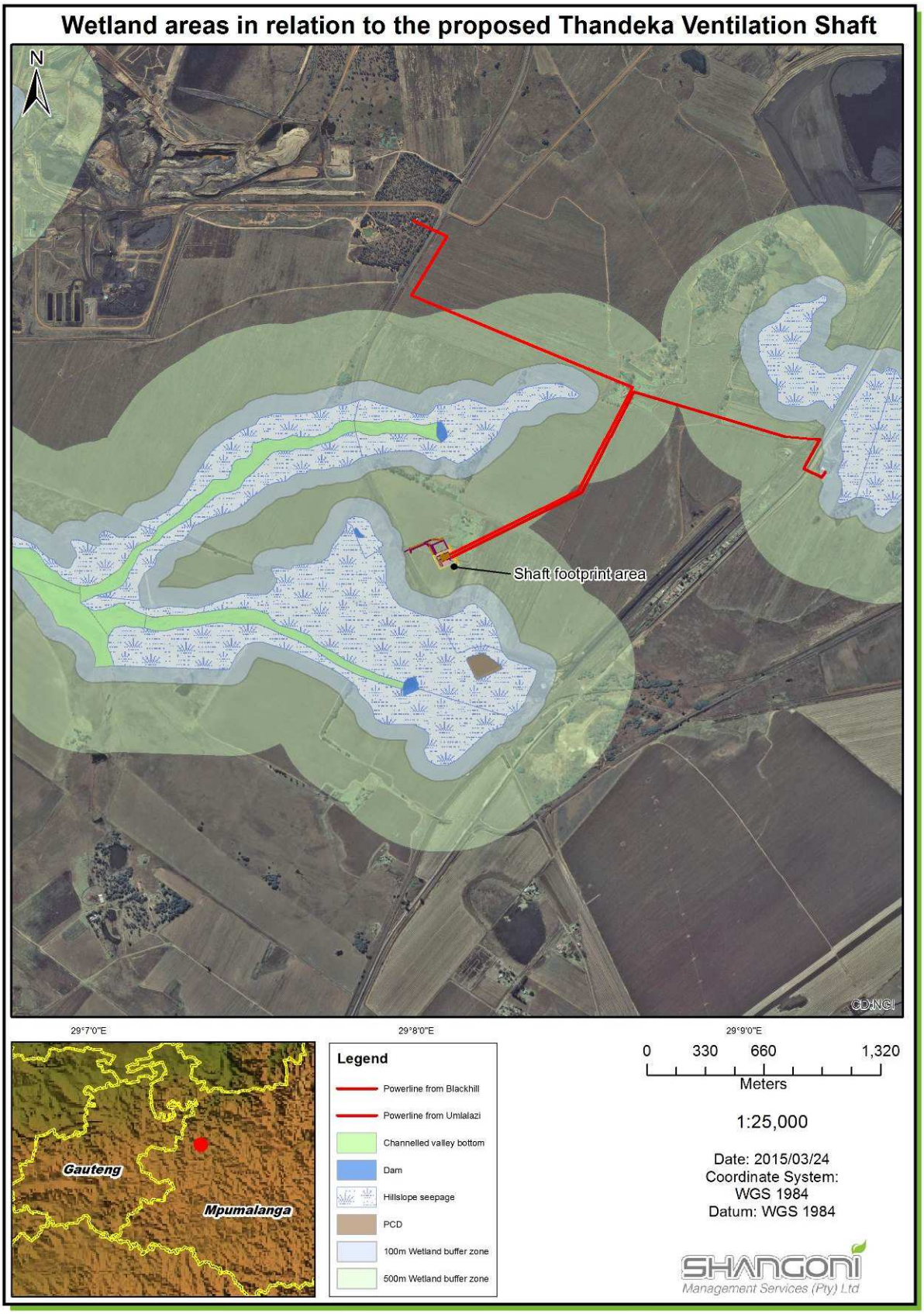

Figure 12: Wetlands and associated buffer zones in relation to the Thandeka Ventilation Shaft

7.4.8 Noise Impact Assessment

The information contained in this section of the Technical Assessment document was obtained from the report titled: "*Anglo American Thermal Coal Greenside Colliery Thandeka Shaft Project Noise Impact Assessment Study*" dated February 2015 and compiled by Francois Malherbe Acoustic Consulting cc.

7.4.8.1 Purpose of the Noise Impact Assessment

The purpose of the Noise Impact Assessment was to:

- Conduct baseline noise measurements in the environment of the Thandeka Ventilation Shaft during both the day and the night.
- Use the baseline noise measurement results to estimate the general ambient noise levels in the environment of these areas.
- Model the noise emissions that may result from the Thandeka Ventilation Shaft.
- Determine the impacts that these noise emissions will have on ambient noise levels in the environment.
- Assess the noise impacts in terms of the current regulatory framework.

7.4.8.2 Existing ambient noise levels

A site visit was conducted in order to select noise measurement points in order to take measurements both at during the day and at night. Five (5) measurement points were selected and the results of the ambient noise measurements are presented in Table ***18*** 18 below.

Table 18: Results of the ambient noise measurements

Point	Period	Start time	Duration	Noise level, dBA			Comments
				L_{Aeq}	L_{A90}	$L_{Aeq} - L_{A90}$	
MP1	Day	13:34:21	00:20:00	35.3	32.5	2.8	± 1 km away from coal mine operations, which include loading truck and mining machinery. Can hear the noise from loading trucks and machinery. Insect and bird noise. Maize foliage rustles when the wind blows. Can hear the traffic from the R547 ±1 km away. Aircraft fly-over, coal transport trucks driving past.
	Night	21:50:44	00:15:02	37.7	34.4	3.3	Can hear the noise from the loading trucks and machinery. Insect and bird noise. Maize foliage rustles when the wind blows. Can hear traffic from the R547.
MP2	Day	14:20:06	00:20:00	32.3	28.1	4.3	Insect and bird noise. Maize foliage rustles when the wind blows. Traffic can be heard from both R547 and the R555. Can hear machinery noise and loading trucks in the area. Aircraft fly-over, bird call, man walking past and talking.
	Night	22:35:18	00:15:02	42.7	37.5	5.3	Insect and bird noise. Maize foliage rustles when the wind blows. Traffic can be heard from both R547 and the R555. Can hear machinery noise and loading trucks in the area.
MP3	Day	14:57:34	00:20:00	35.7	30.4	5.3	Insect and bird noise. Maize foliage rustles when the wind blows. Traffic from both R547 (most noisy due to proximity) and the R555 audible. Car arriving at the house with people shouting. Car departing. Train on railway next to R555 starts locomotive engines.
	Night	22:58:39	00:15:03	42.4	33.8	8.6	Insect and bird noise. Maize foliage rustles when the wind blows. Traffic from both R547 and the R555 audible.
MP4	Day	15:38:49	00:20:00	36.8	32.7	4.2	Insect and bird noise. Some farm animals audible. Maize foliage rustles when the wind blows. Traffic can be heard from R555 (most noisy due to proximity). Cars driving over the bridge and turning east. Cow bellowing.
	Night	23:27:33	00:15:02	51.8	41.7	10.1	Insect and bird noise. Some farm animals audible. Maize foliage rustles when the wind blows. Traffic can be heard from R555. Train passes.
MP5	Day	16:21:39	00:20:00	32.1	25.3	6.8	Insect and bird noise. Some farm animals. Maize foliage rustles when the wind blows. Traffic can be heard from R555, which is ±1 km away. Person walking past. Aircraft fly-over.

Point	Period	Start time	Duration	Noise level, dBA			Comments
				L_{Aeq}	L_{A90}	$L_{Aeq} - L_{A90}$	
	Night	23:52:43	00:16:16	34.1	28.8	5.3	Insect and bird noise. Some farm animals. Maize foliage rustles when the wind blows. Traffic can be heard from R555.

7.4.8.3 Investigated scenarios

Four scenarios were investigated and the noise impacts assessed for each of the scenarios. These scenarios are described in detail in Table 19 below.

Table 19: Scenarios investigated

Scenario	Description	Main noise sources
1 Construction	• Site clearing and earthworks • Construction of platforms • Building of infrastructure • Drilling at shaft site • Assembly of equipment • Construction activities restricted to day-time, i.e. 06:00 to 18:00 • Typical summer-time meteorological conditions • **100% soft ground conditions**	• Articulated truck 40t • Bulldozer D9 • Vibrating roller • General construction noise
2 Construction	• As for scenario 1, except: • Typical winter-time meteorological conditions • **50% soft ground conditions**	• As for scenario 1
3 Operation	• 2x Ventilation fans are operational, on being on standby • 24 hour operation • Typical summer-time meteorological conditions • **100% soft ground conditions**	• Ventilation fans similar to the existing fans next to the R555
4 Operation	• As for scenario 3, except: • Typical winter-time meteorological conditions • **50% soft ground conditions**	• As for scenario 3

7.4.8.4 Conclusion

The following conclusions are drawn from the results of this noise study:

- Highly sound absorbing ground conditions had a significant effect on the samples taken of present ambient noise levels in the environment of the Thandeka Shaft. These conditions were due to the dense vegetation of crops the fields.
- Under highly sound absorbing ground conditions the severity of the noise impacts are rated as low during construction and low-medium during day-time operation (low during the night).
- However, it is very likely that during the dryer months the ground conditions will be substantially harder, causing an extension of the noise impact contours in the general wind directions.
- Under these conditions the most severe noise impact will occur during the night and it is rated as medium.

- If the height above ground of a planned storm water cut-off berm on the north-eastern border of the Thandeka site is sufficiently extended (a height of 5 m was assumed), the severity of the noise impact can be significantly reduced from high to low-medium.

No changes have occurred to the Noise Assessment as a result of the final preferred option (Option 4).

7.4.9 Description of the current land uses

The major land-use activity within the actual study area and its immediate surrounds is agriculture in the form of maize cultivation. Some livestock farming occurs by very little natural grazing remains as the vast majority of the landscape has been historically ploughed and is still under cultivation today.

Figure 13 below presents recent photograph of the current land use of the proposed site.

Figure 13: Photograph of the proposed site for the Thandeka Ventilation Shaft

7.4.10 Description of specific environmental features and infrastructure on the site

The topography of the study area is gently undulating, and both the proposed shaft site and the power line alignments are situated on the upper slopes and crests of this gently undulating landscape. The proposed infrastructure (shaft and power lines) is not situated within any wetland habitats.

The elevation ranges from approximately 1562m.a.s.l. at the power line crossing of the valley-bottom wetland to 1597m.a.s.l along the Cairns power line alignment. The proposed shaft site is situated at 1574m.a.s.l. The geology underlying the study area is dominated by sandstone of the Vryheid Formation, which forms part of the Ecca Group of the Karoo Sequence. The soils of the study area tend to be sandy soils, with clay soils (e.g. Katspruit) restricted to lower slopes and valley-bottoms along drainage lines. Rainfall in the study area is approximately 690 mm per annum and occurs almost exclusively in the summer, with winters being very dry (Dent *et al*. 1989). Severe frosts occur in winter.

Table 20: Broad-scale vegetation and land-cover type units identified within the study area.

Vegetation and land-cover type units	**Typical vegetation and variations**	**Surface area within 1.08ha area around shaft**	**Distance traversed by power line alignments**	**Ecological sensitivity and biodiversity value**
1. Valley-bottom wetland and hillslope seep communities	Untransformed but somewhat degraded hygrophilous grassland and rush, sedge and grass dominated marsh communities of a channelled valley-bottom wetland, floodplain and associated hillslope seeps. The valley-bottom wetland is a tributary of the Grootspruit. Parts of this vegetation have been historically cultivated for brief periods and various other anthropogenic impacts have degraded the vegetation so that it cannot be regarded as pristine.	-	411m (Option 1) (entirely attributable to Umlalazi power line)	High
2. Current cultivation	Currently cultivated maize fields and fields that have been fallow for two years or less and are dominated by ruderal weed communities. Soils are brown, sandy clay loams.	0.92ha	3225m	Low
3. Secondary grassland and ruderal weed communities	Secondary grassland of historically cultivated soils. Vegetation characterised by the dominance of indigenous pioneer grasses and grasses indicative of severe disturbance, low species richness of indigenous species and high species richness of alien ruderal weeds. Unit also includes secondary vegetation around homesteads and infrastructure such as roads and railway lines.	0.16ha	1132m	Low
4. Alien tree stands	Plantations of *Eucalyptus camaldulensis** and invasive stands of *Gleditsea triacanthos*, Acacia mearnsii** and *Acacia dealbata**.	-	578m	Low
TOTAL		1.08ha	5346m	

7.4.11 Environmental and current land use map

Refer to Figure 14 below for an indication of the current land use and environmental features present.

Figure 14: Land use and environmental map (Infrastructure reflect Option 1, not preferred Option 4)

7.5 Impacts and risks identified

A detailed risk assessment has been undertaken for the approved EMPr and is contained in Appendix E. The following table contains all the potential impacts identified for the activities described in the proposed site layout (Option 4).

Environmental component	Activity	Impact description	Duration	Pre-mitigation			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
Site of archaeological and cultural importance	Construction of the Ventilation Shaft	The area in which the project is situated has largely been transformed for cultivation purposes, namely maize fields. The project area has also been scarred by open cast coal mining as well as underground coal mining activities. As the development of the Thandeka ventilation shaft will involve excavation of rocks of the Ecca Group, it is possible that paleontological heritage resources may be impacted on. There is a possibility that the rocks of the Vryheid Formation in the study area could contain fossil plant material of *Glossopteris* flora. As these fossils are not currently exposed, the development could enhance possibilities to discover plant fossils. If fossils are exposed in the course of the Thandeka development, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.	Permanent	3	2	M	No	Yes	Avoided
Surface water	Erosion of access road	Ineffective erosion control on access roads may lead to siltation of downstream water resources, including adjacent wetland and downstream drainage line. The proposed Thandeka ventilation shaft will be located approximately 900 m upstream of the natural drainage line. The wetland area is situated downstream of the proposed Thandeka shaft and surface flow is expected to reach the area due to the nature of the contours. Croplands and natural veldt are situated between the proposed ventilation shaft the downstream drainage line/wetland area and will reduce velocity of surface flow and contain a portion of silt carried from the access roads at the proposed shaft.	The duration will be long term for the Life of Mine	2	**3**	M	Yes	No	Managed
	Inadequate storm water control	Inadequate clean storm water diversion will prevent clean storm water in the direct upstream catchment of the ventilation shaft from reporting to the surface water resource with subsequent impacts on the availability of water to downstream users and on the ecological reserve of the catchment. The nature of activities at the proposed Thandeka ventilation shaft do not pose significant risk by preventing surface water reporting to the natural downstream water resource (i.e. no water retention infrastructures are proposed on site).	Long term for the Life of Mine	2	2	L	Yes	No	Managed
	Construction and operational activities outside designated areas	Construction and operational activities in close proximity to the wetland area may impact on the sensitive ecological function of the wetlands system. The current designs illustrate that activities will take place approximately 500 metres from the closest identified wetland area.	Long term for the Life of Mine	3	4	H	No	Yes	Avoided
	Oil leakage from sub-station and transformer bay	Oil leakage at the sub-station and transformer bay may result in surface water pollution.	Long term for the Life of Mine	3	**3**	M	Yes	No	Avoided
	Spillage of hazardous chemicals	Spillages of hazardous chemicals at the contractor's laydown area during construction may result in surface water pollution.	Long term for the Life of Mine	3	2	M	Yes	No	Avoided
	Incorrect storage of domestic and hazardous waste	Incorrect storage of domestic and hazardous waste at the contractor's laydown area during the construction phase may result in surface water pollution.	Long term for the Life of Mine	3	2	M	Yes	No	Managed

Environmental component	Activity	Impact description	Duration	Pre-mitigation			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
Groundwater	Site clearance and removal of topsoil	Site clearing and removal of topsoil, may lead to ponding of surface water in the cleared areas during the wet season and could potentially lead to increased infiltration to aquifers. Groundwater quality impacts during the construction phase are expected to be insignificant if the proposed management measures are implemented. The stripping and stockpiling of topsoil and subsoil from the area is considered negligible since no chemical interaction is envisaged that could have an adverse impact on groundwater quality. The stripping of topsoil may result in a very slight increase in groundwater recharge, which is a slight positive effect on the groundwater environment. The duration of the activity is however so limited that the effect will not be measureable. The construction of the above mentioned infrastructure will cause a very small reduction in recharge to the aquifer due to the compaction of the surface area. This impact is countered by the fact that vegetation clearing may result in ponding and slight increases in recharge. Runoff water will contribute to the catchment yield. Carbonaceous material has the potential to generate acidic leachate, which means that any construction undertaken with carbonaceous material may be a potential source of poor quality leachate. Oil or fuel spillages from construction machinery may collect in the soils. During rainfall events, hydrocarbon compounds from oils and fuel in the soils may migrate to the subsurface water bodies with water infiltrating through these polluted areas. Due to the short exposure, duration of the acitivities and small scale of these possible spills, the impacts will be negligible during the construction phase of the shaft. A very limited geohydrological impact is expected in terms of site clearing and removal of topsoil given the small surface area involved and the short duration of the construction phase.	Months	2	2	L	Yes	No	Managed
	Impact on groundwater quality	The impacts on groundwater quality are primarily related to the management of materials, wastes and spills from drilling operations and unauthorised disposal of contaminated substances. Contamination of groundwater may also arise due to incorrect handling and disposal of waste materials, the physical drilling process (sludge contains oils and greases) and oil leaks from drill rigs. This risk is considered low. Groundwater quality impacts may also arise from seepage from the recycle dam underground, although this is considered as low impact since the dam will be lined. The general risk towards groundwater quality deterioration is also considered low.	Construction and Operational Phase.	2	2	L	Yes	No	Managed
Biodiversity	Construction and Utilisation of the shaft or power line.	No significant biodiversity impacts of more than Low significance (with the possible exception of bird mortalities caused by collision with, or electrocution by, power lines) are expected as a result of shaft or power line construction assuming standard construction management best practice, and the mitigation measures are adhered to.	Construction and Operational Phase.	2	1	L	No	No	Managed
Socio-economic aspects	The commencement of operations at Thandeka Ventilation Shaft.	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. The new Thandeka Shaft project will benefits the workers on the mine directly. Indirectly the loss of employment is avoided, which does not affect the economic value of the community in general. The products from the mining operations at Greenside Colliery are sold to the South African and international markets. SACE employs more than 900 people at Greenside Colliery. The existing education programme implemented at the mine comprises of the following elements:	Positive impact experienced over the long-term for the Life of Mine.	5	5	Positive	Yes	No	Enhancement of positive impact

Environmental component	Activity	Impact description	Duration	Pre-mitigation			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
		• New schools. • Adult education. • Vegetable garden. • Life skills inclusive of sewing, cooking, health, environmental awareness and entrepreneurial skills. • Community schools. The safe continuation of the mining and related activities at the Greenside Colliery continues employment of staff at the Greenside Colliery as well as the continued supply of coal to the local market. As a result of the multiplier effect, the continued operation of the existing Greenside Colliery will benefit the local, regional and national economy. Should Greenside Colliery not construct the new Thandeka Shaft they may be forced to cease operation. Should this have occurred, jobs of personnel currently employed will be lost and the local, regional and national economic benefits of the continuation of the mining and related activities would have been lost. Mine closure will raise unemployment levels in the region, and would increase significantly as more mines close down.								

7.6 Methodology used in determining and ranking potential environmental impacts and risks

The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

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).
- Specification of uncertainties.

After all impacts have been identified, the nature and scale 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 15 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – Impact Prediction.

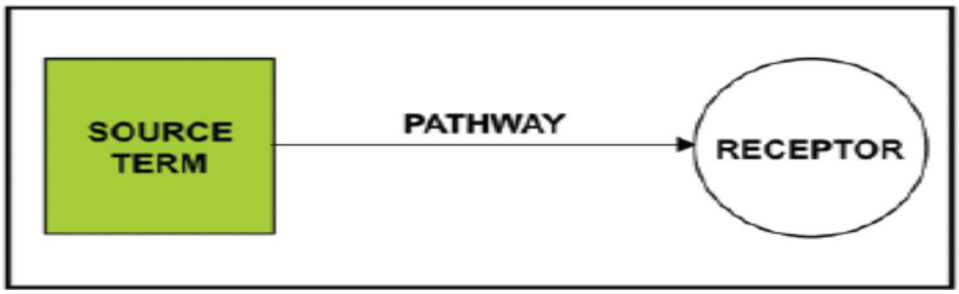

Figure 15: Impact prediction model

Table 21 and Table 22 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 23 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

Table 21: Determination of Probability of impact

SCORE	FREQUENCY OF ASPECT / UNWANTED EVENT	AVAILABILITY OF PATHWAY FROM THE SOURCE TO THE RECEPTOR	AVAILABILITY OF RECEPTOR
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

***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 22: Determination of Magnitude of impact

Score	SOURCE				RECEPTOR	
	Duration of impact	**Extent**	**Volume / Quantity / Intensity**	**Toxicity / Destruction Effect**	**Reversibility**	**Sensitivity of environmental component**
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes will remain unaltered.	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.
3	Lasting 1 – 5 years	Impacts on extended area beyond site boundary (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km's)	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha–12Ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).
5	Beyond life of Organisation / Permanent impacts	Extends widely (nationally or globally)	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	Highly toxic (e.g. arsenic or TCE)	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)

*Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors above.*

Table 23: Determination of Severity of impact

ENVIRONMENTAL IMPACT RATING / PRIORITY					
SEVERITY	**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*

The need to review the initial site layout

All of the specialist studies were conducted with the utilisation of the initial site layout plan for Option 3. Based on the findings of the specialist assessments a fourth option was considered that would result in the least environmental impacts. The selected option (Option 4) resulted in the following changes to the previous options:

- Re-routing of the powerlines to be located out of the 100m wetland buffer (reducing the impacts on the wetlands).
- Orientation of the ventilation shaft to connect to the new powerline routings (located out of the 100m wetland buffer).
- Drop bore shaft was changed to a raised bore shaft in order to eliminate blasting activities, therefore reducing the impact on noise and groundwater, and without the need for groundwater dewatering.

Refer to Figure 7 above for the final site layout plan.

7.7 Positive and negatives that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and community affected.

All of the specialist studies were conducted with the utilisation of the initial site layout plan for Option 3. Based on the findings of the specialist assessments a fourth option was considered that would result in the least environmental impacts. The selected option (Option 4) resulted in the following changes to the previous options:

- Re-routing of the powerlines to be located out of the 100m wetland buffer (reducing the impacts on the wetlands).
- Orientation of the ventilation shaft to connect to the new powerline routings (located out of the 100m wetland buffer).
- Drop bore shaft was changed to a raised bore shaft in order to eliminate blasting activities, therefore reducing the impact on noise and groundwater, and the need for groundwater dewatering

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

The 'No Project' alternative is not considered due to the anticipated benefits of the proposed new project. 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 Greenside Colliery may be compromised. In addition, the Greenside 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.

The 'No Project' option is not considered to be the preferred project alternative.

7.8 Possible mitigation measures that could be applied and the level of risk

The table below provides a summary of the issues and concerns as raised by affected parties and an assessment of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered.

No concerns have, to date, been raised by any I&AP's and stakeholders regarding the proposed project. It is however important to note that this Darft EMPr is made available for a period of thrity (30) days for I&AP's, stakeholders and members of the community to comment and raise any issues and concerns regarding the proposed project. Therefore, should any comments be received from the public comment period, they will be included in the Fanal EMPr, responses provided and the necessary mitigation measures identified.

Concerns as raised by affected parties	Mitigation measures or site alternative	Impact Post Mitigation		
		Probability	Magnitude	Severity

7.9 Motivation where no alternative sites were considered

Alternatives were considered as discussed under Section 7.4

7.10 Statement motivating the alternative development location within overall site

Evaluating the alternatives, through evaluating the risks pertaining to the various options, and the concerns as raised by the affected parties and the mitigation measures or site alternatives, the preferred option is previously discussed, is Option 4. Further consideration will be given based on comments received from the I&AP comments.

8. Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity.

All impacts and risks as identified are contained within Section 7.5 (Impacts and risks identified) and Appendix E. As further provided is an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures. The potential impacts and risks of the proposed activity were identified through consultation with the applicant regarding the proposed activities to be undertaken. Site visits were then conducted for orientation purposes and to understand the nature of the proposed activities off-set agaisnt the baseline environment of the area. Several internal workshops were held in order to determine the risks associated with the proposed project and to identify the knowledge gaps, information insufficiency as well as to identify the specialist studies that would be required to invesitgate these knowledge gaps and information insufficiencies.

The identiified specialist studies were initiated to investigate the various biophysical aspects and include:

- Phase 1 Heritage Impact Assessment.
- Paleontological Impact Assessment.
- Surface water study.
- Geohydrological study.
- Wetland delineation and functional assessment.
- Biodiversity assessment.
- Blasting and vibration study.
- Noise Impact study.

These specialist studies were initiated to assess the respective biophysical aspects, provide a baseline description of the environment as well as identify any risks and impacts on the biophysical aspects associated with the proposed project. Refer also to Section 7.6 (Methodology used in determining and ranking potential environmental impacts and risks) for the methodology applied in assessing and ranking the impacts and risks on the preferred site and associated preferred alternatives.

9. Assessment of each identified potentially significant impact and risk

Environmental component	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
Site of archaeological and cultural importance	Construction of the Ventilation Shaft	The area in which the project is situated has largely been transformed for cultivation purposes, namely maize fields. The project area has also been scarred by open cast coal mining as well as underground coal mining activities. As the development of the Thandeka ventilation shaft will involve excavation of rocks of the Ecca Group, it is possible that paleontological heritage resources may be impacted on. There is a possibility that the rocks of the Vryheid Formation in the study area could contain fossil plant material of *Glossopteris* flora. As these fossils are not currently exposed, the development could enhance possibilities to discover plant fossils. If fossils are exposed in the course of the Thandeka development, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.	Construction Phase	M	Remediation measures will be implemented	L
Surface water	Erosion of access road	Ineffective erosion control on access roads may lead to siltation of downstream water resources, including adjacent wetland and downstream drainage line. The proposed Thandeka ventilation shaft will be located approximately 900 m upstream of the natural drainage line. The wetland area is situated downstream of the proposed Thandeka shaft and surface flow is expected to reach the area due to the nature of the contours. Croplands and natural veldt are situated between the proposed ventilation shaft the downstream drainage line/wetland area and will reduce velocity of surface flow and contain a portion of silt carried from the access roads at the proposed shaft.	Construction and Operational Phase	M	Remediation measures will be implemented.	L
	Inadequate storm water control	Inadequate clean storm water diversion will prevent clean storm water in the direct upstream catchment of the ventilation shaft from reporting to the surface water resource with subsequent impacts on the availability of water to downstream users and on the ecological reserve of the catchment. The nature of activities at the proposed Thandeka ventilation shaft do not pose significant risk by preventing surface water reporting to the natural downstream water resource (i.e. no water retention infrastructures are proposed on site).	Construction and Operational Phase	L	Control measures will be implemented.	L
	Construction and operational activities outside designated areas	Construction and operational activities in close proximity to the wetland area may impact on the sensitive ecological function of the wetlands system. The current designs illustrate that activities will take place approximately 500 metres from the closest identified wetland area.	Construction and Operational Phase	H	Control measures will be implemented.	L
	Oil leakage from sub-station and transformer bay	Oil leakage at the sub-station and transformer bay may result in surface water pollution.	Construction and Operational Phase	M	Remediation measures will be implemented.	L
	Spillage of hazardous chemicals	Spillages of hazardous chemicals at the contractor's laydown area during construction may result in surface water pollution.	Construction and Operational Phase	M	Remediation measures will be implemented.	L
	Incorrect storage of domestic and hazardous waste	Incorrect storage of domestic and hazardous waste at the contractor's laydown area during the construction phase may result in surface water pollution.	Construction and Operational Phase	M	Control measures will be implemented.	L

Environmental component	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
Groundwater	Site clearance and removal of topsoil	Site clearing and removal of topsoil, may lead to ponding of surface water in the cleared areas during the wet season and could potentially lead to increased infiltration to aquifers. Groundwater quality impacts during the construction phase are expected to be insignificant if the proposed management measures are implemented. The stripping and stockpiling of topsoil and subsoil from the area is considered negligible since no chemical interaction is envisaged that could have an adverse impact on groundwater quality. The stripping of topsoil may result in a very slight increase in groundwater recharge, which is a slight positive effect on the groundwater environment. The duration of the activity is however so limited that the effect will not be measureable. The construction of the above mentioned infrastructure will cause a very small reduction in recharge to the aquifer due to the compaction of the surface area. This impact is countered by the fact that vegetation clearing may result in ponding and slight increases in recharge. Runoff water will contribute to the catchment yield. Carbonaceous material has the potential to generate acidic leachate, which means that any construction undertaken with carbonaceous material may be a potential source of poor quality leachate. Oil or fuel spillages from construction machinery may collect in the soils. During rainfall events, hydrocarbon compounds from oils and fuel in the soils may migrate to the subsurface water bodies with water infiltrating through these polluted areas. Due to the short exposure, duration of the acitivities and small scale of these possible spills, the impacts will be negligible during the construction phase of the shaft. A very limited geohydrological impact is expected in terms of site clearing and removal of topsoil given the small surface area involved and the short duration of the construction phase.	Construction Phase	L	Remediation measures will be implemented.	L
	Impact on groundwater quality	The impacts on groundwater quality are primarily related to the management of materials, wastes and spills from drilling operations and unauthorised disposal of contaminated substances. Contamination of groundwater may also arise due to incorrect handling and disposal of waste materials, the physical drilling process (sludge contains oils and greases) and oil leaks from drill rigs. This risk is considered low. Groundwater quality impacts may also arise from seepage from the recycle dam underground, although this is considered as low impact since the dam will be lined. The general risk towards groundwater quality deterioration is also considered low.	Construction and Operational Phase.	L	Control measures will be implemented	L

Environmental component	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
Biodiversity	Construction and Utilisation of the shaft or power line.	No significant biodiversity impacts of more than Low significance (with the possible exception of bird mortalities caused by collision with, or electrocution by, power lines) are expected as a result of shaft or power line construction assuming standard construction management best practice, and the mitigation measures are adhered to.	Construction and Operational Phase.	L	Control measures will be implemented	L
Socio-economic aspects	The commencement of operations at Thandeka Ventilation Shaft.	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. The new Thandeka Shaft project will benefits the workers on the mine directly. Indirectly the loss of employment is avoided, which does not affect the economic value of the community in general. The products from the mining operations at Greenside Colliery are sold to the South African and international markets. SACE employs more than 900 people at Greenside Colliery. The existing education programme implemented at the mine comprises of the following elements: • New schools. • Adult education. • Vegetable garden. • Life skills inclusive of sewing, cooking, health, environmental awareness and entrepreneurial skills. • Community schools. The safe continuation of the mining and related activities at the Greenside Colliery continues employment of staff at the Greenside Colliery as well as the continued supply of coal to the local market. As a result of the multiplier effect, the continued operation of the existing Greenside Colliery will benefit the local, regional and national economy. Should Greenside Colliery not construct the new Thandeka Shaft they may be forced to cease operation. Should this have occurred, jobs of personnel currently employed will be lost and the local, regional and national economic benefits of the continuation of the mining and related activities would have been lost. Mine closure will raise unemployment levels in the region, and would increase significantly as more mines close down.	Construction and Operational Phase	Positive	Control measures will be implemented	Positive

10. Summary of specialist reports

Table 24: Summary of recommendations in specialist reports

List of specialist studies	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (Mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
Heritage Impact Assessment	• If any heritage resources of significance are exposed during the Thandeka Project the South African Heritage Resources Authority (SAHRA) should be notified immediately, all development activities must be stopped and an archaeologist accredited with the Association for Southern African Professional Archaeologist (ASAPA) should be notify in order to determine appropriate mitigation measures for the discovered finds. This may include obtaining the necessary authorisation (permits) from SAHRA to conduct the mitigation measures.	**X**	Refer to the Risk Assessment Report attached hereto as Appendix C as Part 7.5 above.
Paleontological Impact Assessment	• If fossils are exposed in the course of the Thandeka development, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.	**X**	Refer to the Risk Assessment Report attached hereto as Appendix C as Part 7.5 above.
Surface water study	• A clean surface water cut-off berm is proposed to divert upstream surface runoff away from the ventilation shaft footprint area towards culverts underneath the R547 provincial road. • A clean surface water conveyance channel is proposed to channel upstream runoff on the north-western side of the proposed ventilation shaft towards existing culverts underneath the R547 provincial road.	**X**	Refer to the Risk Assessment Report attached hereto as Appendix C as Part 7.5 above.

List of specialist studies	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (Mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
	• Regular maintenance should be conducted on all diversion and conveyance infrastructures at the proposed Thandeka ventilation shaft to ensure optimal diversion of upstream clean surface runoff to reduce the impact on the catchment yield.		
Groundwater study	• No construction of any water management measures, such the stormwater control berm, water dam or the haul roads should be undertaken with carbonaceous material. • Any dirty water dams constructed should be lined where practically possible, in an effort to minimize the seepage of poor quality leachate. • Clean surface water should not come into contact with dirty water or coal bearing material. • Intercept drainage around the shaft with a stormwater control berm. • In the event that dewatering of the aquifer occurs (during construction), a monitoring programme for dewatering should be implemente, and if the users in the vicinity are impacted upon, they will need to be compensated for the loss. • Conduct regular inpsections on the stromwater control measures and dam liners. • Monthly inspections of the surface concrete work should be undertaken during the operational phase to ensure any ingress of rainwater into the ventilation shaft is prevented. • The underground recycling water dam used during construction should be lined with plastic.	**X**	Refer to the Risk Assessment Report attached hereto as Appendix C as Part 7.5 above.

List of specialist studies	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (Mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
Biodiversity Study	• In order to minimise potential impacts to wetland habitats (i.e. erection of gum poles at 50m intervals, construction of an access and maintenance track and introduction of alien plant species), the Umlalazi power line, which currently runs parallel to and 60m to the west of a tar road, should be realigned so that it is situated as close as possible to the road (ideally within 15m) and in the highly degraded habitats of the 'corridor of existing disturbance' along the road. • In the event that the development of the study area is approved, permission for the removal of *Hypoxis hemerocallidea*, as well as any additional Declining species recorded during any future environmental surveys, should be obtained from the Mpumalanga Tourism & Parks Agency, and if necessary appropriate *in situ* and / or *ex situ* conservation measures should be developed and implemented in conjunction with the Mpumalanga Tourism & Parks Agency. Where feasible, Declining species can be translocated to degraded or untransformed parts of the study area which provide potentially suitable habitat, but such translocations will have to be carried out in a way that ensures no ecological degradation of the host habitat occurs, and will have to be evaluated by an ecologist for each species and each potential translocation area. Alternatively Declining species can be rescued and donated to appropriate conservation and research institutions such as the Walter Sisulu Botanical Garden (Roodepoort) or the National Botanical Garden (Pretoria) of SANBI. Illegal harvesting of medicinal plants should be discouraged through control of access to the study area.	**X**	Refer to the Risk Assessment Report attached hereto as Appendix C as Part 7.5 above.

List of specialist studies	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (Mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
	• The landowner should develop an integrated alien plant control program, which considers all appropriate chemical, mechanical, biological and cultural control methods for the alien species listed in Appendix 1. Emphasis should be placed on controlling and eradicating the 10 recorded alien plant species listed as Category 1a and Category 2 species in the AIS regulations, and in particular *Acacia dealbata**, *Acacia mearnsii** and *Pennisetum clandestinum**. In the event that commercial premises development is approved on a portion of the site, the planting of any alien plant species should be prohibited, and only plant species that are indigenous to the area and are cultivated from locally obtained seeds and other propagules should be used for horticultural purposes. • Standard mitigation measures (as regularly used by Eskom) to prevent bird electrocution and collision should be included in the design of the power lines. As a precautionary measure, it is also recommended that the mine should monitor bird mortalities, from electrocution and collision with power lines (particularly along the Umlalazi power line). Measures to prevent electrocution include insulating of energised components, gap earthwires, fitting raptor protectors and moving switchgear. Measures to minimise collisions include marking of lines, re-routing of lines, burying of cables (not recommended for this project) and bundling of lines. These mitigation measure will also serve to minimise impacts to other threatened or Near Threatened birds that may be rare visitors to the study area (e.g. Secretary Bird, Blue Korhaan and Bald Ibis).		

The above mentioned specialist reports are attached hereto in Appendix C.

11. Environmental Impact Statement

11.1 Summary of the key findings of the environmental impact assessment

No high or medium impacts, post mitigation, have been identified associated with the construction and operation of the Thandeka Ventilation Shaft Project. It is the EAP's opinion that, given the already disturbed state of the environment in which the project will be located, these impacts can be mitigated to prevent the environmental integrity from being compromised. In terms of collectively considering ecological, social and economic impacts the economic development is justifiable, and also considering the social benefit, the EAP is of opinion that this project should be authorised.

11.2 Final Site Map

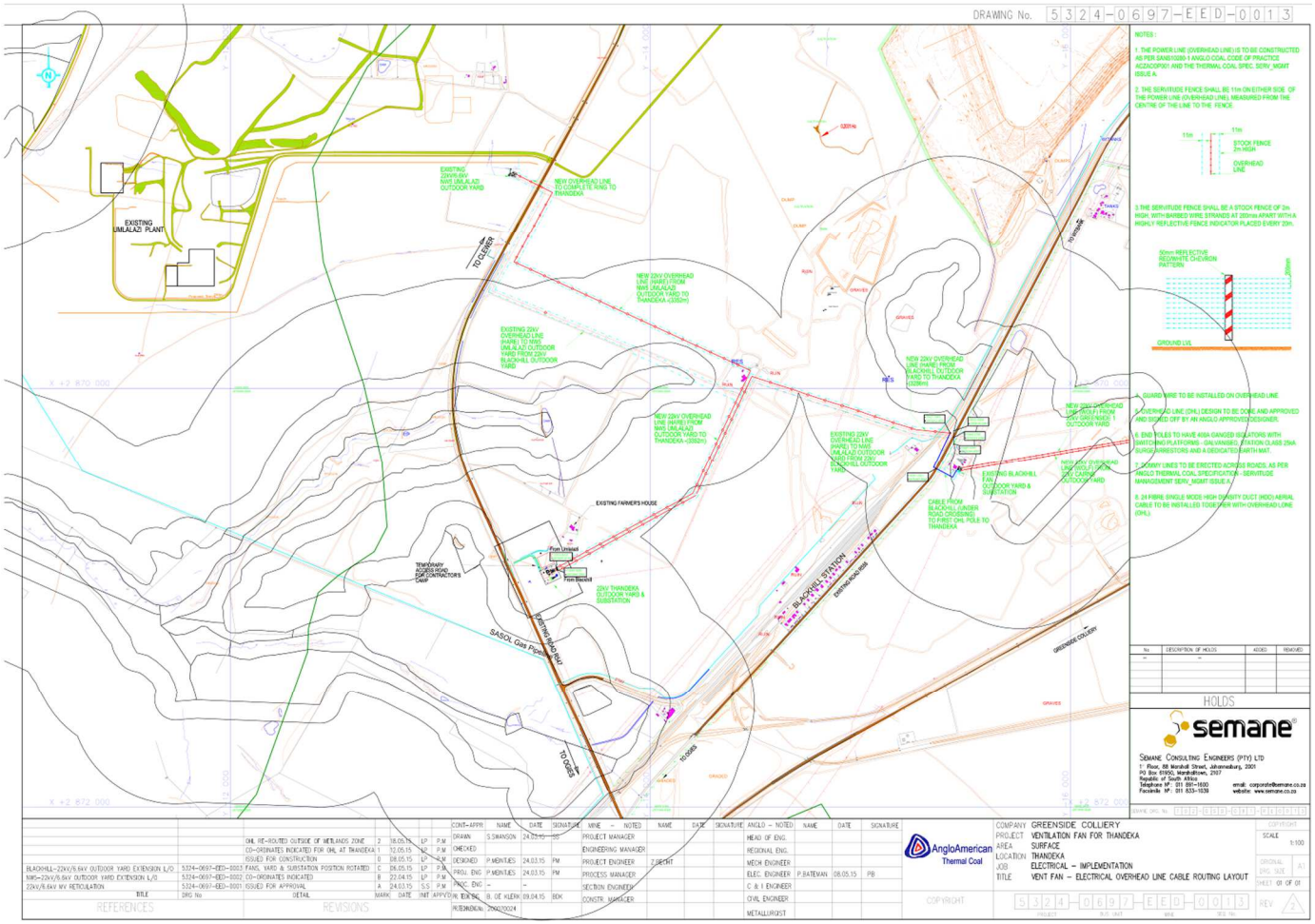

Figure 16: Final Site map

11.3 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Table 25: Summary of significant environmental impacts (negative), after mitigation.

No significant environmental impacts, after mitigation have been identified for this project.

Table 26: Summary of environmental impacts (positive), after mitigation.

SOCIO ECONOMIC	
The safe continuation of the mining and related activities at the Greenside Colliery continues employment of staff at the Greenside Colliery as well as the continued supply of coal to the local market. As a result of the multiplier effect, the continued operation of the existing Greenside Colliery will benefit the local, regional and national economy. Should Greenside Colliery not construct the new Thandeka Shaft they may be forced to cease operation. Should this have occurred, jobs of personnel currently employed will be lost and the local, regional and national economic benefits of the continuation of the mining and related activities would have been lost. Mine closure will raise unemployment levels in the region, and would increase significantly as more mines close down.	Absolutely Positive

12. Proposed impact management objectives and the impact management outcomes for inclusion into the EMPr

No changes to the managemnt objectives and impact managemnt outcomes for inclusion into the EMPr are required for the proposed Thandeka Shaft project.

13. Final proposed alternatives

The final proposed alternative is the preferred option discussed in part 7.4.

14. Aspects for inclusion as conditions of Authorisation

Should the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs. grant authorisation for this project, it should be subject to the following conditions:

- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements;

- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the EIA and the EMPr. Such persons must be issued with a written mandate by mine management to provide guidance and instructions to employees and contractors; and
- Stakeholder engagement must be maintained during the construction, operational and closure/rehabilitation phases of the project.

15. Description of any assumptions, uncertainties and gaps in knowledge

In terms of the EIA Regulations GN R543 31(2)(m), the Environmental Impact Assessment Practitioner (EAP) must provide a description of any assumptions, uncertainties and gaps in knowledge upon which the impact assessment has been based. The table below provides the assumptions and limitations applicable to the various specialist assessments.

Table 27: Specialist assumptions and limitations

Specialist	Assumptions and limitations
Heritage Impact Assessment	• It is possible that this Phase I HIA study may have missed heritage resources in the Project Area as heritage sites may occur in thick clumps of vegetation while others may lie below the surface of the earth and may only be exposed once development commences.Aquifer parameters assigned were sourced from historical data, however it should be noted that data variability is high and the model is a simplified representation of a complex aquifer system.
Surface water study	• Whilst all due care has been taken in reviewing the supplied information, the accuracy of the results and conclusions from the study are entirely reliant on the accuracy and completeness of the supplied data. • Flood peak calculations assume rainfall intensity is uniform throughout the duration of the storm. Analysis does not account for runoff retention or artificial acceleration within the catchment. • Calculations are done for complete catchment areas and should be distributed where there is more than one drainage point within the same built up catchment. • Storm water control recommendations are based on industry experience and best practice. Final designs for construction should be authorised by an approved engineer. • Contour and elevation data as provided during the analysis are assumed to be accurate and representative of the site and catchment areas. • Upstream catchment activities are interpreted according to common practices and no detailed insight is available on possible storm water measures beyond the site. The assessment does not guarantee the integrity of downstream infrastructure in the event of release or discharge from site.

Specialist	Assumptions and limitations
	• The study does not impose preference over existing or proposed measures as this is an operational document to assist in the complete management of surface water. • Recommendations represented in this report apply to the site conditions and features as they existed at the time of Shangoni's investigations, and those reasonable foreseeable. The recommendations do not necessarily apply to conditions and features that may arise after the date of this report, for which Shangoni had no prior knowledge nor had the opportunity to evaluate. • This study does not include a water and salt balance for the Thandeka Shaft Project as it is not required due to the nature of the activity. • The study does not include the delineation of sensitive areas and flood lines.

The impact assessments have assumed that all specialist assessments are essentially correct.

16. Reasoned opinion as to whether the proposed activity should or should not be authorised.

16.1 Reasons why the activity should be authorised or not

In accordance with the EIA Regulations GN R543 31 (2) (n), the Environmental Impact Assessment Practitioner (EAP) must provide an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation must be stated.

An impact assessment has been undertaken using qualified specialists, which has incorporated extensive consultation with and participation of interested and affected parties. Applying the hierarchical approach to impact management, alternatives were firstly considered to avoid negative impacts, but where avoidance was not possible, to better mitigate and manage negative impacts. Where impacts were found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed. As a final option, offset strategies were considered.

In terms of collectively considering ecological, social and economic impacts it is important to remember that while there might be some trade-offs between the considerations, in South Africa all development must in terms of Section 24 of the Constitution be ecologically sustainable, while economic and social development must be justifiable. There are therefore specific "trade-off" rules that apply. Environmental

integrity may never be compromised and the social and economic development must take a certain form and meet certain specific objectives in order for it to be considered justifiable.[36]

No medium or high impacts have been identified associated with the construction and operation of the Thandeka Ventilation Shaft project. It is the EAP's opinion that, given the already disturbed state of the environment in which the project will be located, these impacts can be mitigated to prevent the environmental integrity from being compromised. Should the ventilation shafts not be constructed mining at Greenside Colliery will cease. In terms of collectively considering ecological, social and economic impacts the economic development is justifiable, and also considering the social benefit, the EAP is of opinion that this project should be authorised.

16.2 Conditions that must be included in the authorisation

16.2.1 Specific conditions to be included into the compilation and approval of the EMPr

Should the DMR grant authorisation for this project, it should be subject to the following conditions:

- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements.
- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the EMPr. Such persons must be issued with a written mandate by Greenside Colliery management to provide guidance and instructions to employees and contractors.
- Stakeholder engagement must be maintained during the operational and closure/rehabilitation phases of the project, with the emphasis on the continuing provision of information.

16.2.2 Rehabilitation requirements

Refer to Appendix H for the attached Rehabilitation Plan.

17. Period for which the authorisation is required

The total period for which authorisation is required, is approximatley 12 years, with a breakdown as provided in the table below.

Stages of operation	Timeframe (Years)
Planning	N/A
Construction	N/A
Commissioning	0.5 years
Operation	10 years

[36] Guideline on need and desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010 (GN 891 of 20 October 2014);

Closure	1 year
TOTAL Period	11.5 years

18. Undertaking

The undertaking by the EAP is provided in Part 2 of Section B (Environmental Management Programme) below. This undertaking confirms: the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&APs, the inclusion of inputs and recommendations from the specialist reports where relevant and the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

19. Financial Provision

The financial provision for Greenside Colliery is attached hereto in Appendix I.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. Draft environmental management programme.

1.1 Details of the EAP.

The requirements for the provision of the detail and expertise of the EAP are included in PART A, Section 1.1.

1.2 Description of the Aspects of the Activity.

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, Section 8.

1.3 Composite Map.

Refer to Figure 4 for a map that superimposes the proposed activity, its associated structures and infrastructures on the environmental sensitivities of the preferred sites, also indicating any areas that should be avoided, including buffers.

1.4 Description of Impact management objectives including management statements.

No changes to the existing impact Management objectives and outcomes as provided for in the approved EMPr attached herto in Appendix F.

No changes to the exting Closure Objectives as provided in Appendix H.

1.5 Financial Provision

The financial provision for Greenside Colliery is attached hereto in Appendix I

1.6 Mechanisms for monitoring compliance with and performance assessments against the environmental management programme. This section provides information pertaining to the monitoring and auditing to be implemented as part of the project including proposed monitoring and auditing commitments.

The aim of environmental monitoring and auditing is to develop a cost-effective approach to monitoring the operations' environmental performance. Certain parameters (e.g. water quality) can be monitored through measurements, others can only be monitored through observation (e.g. maintenance effectiveness). However, in all cases anticipation of environmental problems through assessment of the environmental impact of the operations' working methods, followed by forward planning to prevent problems or at least limit their effects, is seen as the key to successful environmental management.
No changes to the Monitoring programmes as contained within the existing approved EMPr. Attached hereto in Appendix G.

1.7 Environmental Awareness Plan.

No changes to the Monitoring programmes as contained within the existing approved EMPr Attached hetero in Appendix G.

1.8 Specific information required by the Competent Authority.

No specific information has been requested by the Competent Authority.

2. Undertaking

The EAP herewith confirms

(a) the correctness of the information provided in the reports ☒

(b) the inclusion of comments and inputs from stakeholders and I&APs ; ☐

(c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

(d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Minnette Le Roux

-END-