BHP BILLITON ENERGY COAL SOUTH AFRICA PROPRIETARY LIMITED

MWRP CLEAN WATER PIPELINE
FINAL BASIC ASSESSMENT

Report No.: JW206/13/E159 – Rev 4
MDEDET Ref. No.: 17/2/3N-301

November 2014

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ABBREVIATIONS AND ACRONYMS

Acronym / Abbreviation	Meaning
BA	Basic Assessment
BAR	Basic Assessment Report
BECSA	BHP Billiton Energy Coal South Africa Propriety Limited
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DNWRP	Directorate National Water Resource Planning of the Department Water Affairs
DTJV	Douglas Tavistock Joint Venture
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMPR	Environmental Management Program Report (MPRDA)
EMPr	Environmental Management Program (NEMA)
GIS	Geographic Information Systems
Ha	Hectares
HDPE	High Density Polyethylene
I&APs	Interested and Affected Parties
IGS	Institute of Groundwater Studies of the University of the Free State
IWUL	Integrated Water Use License
IWULA	Integrated Water Use License Application
IWWMP	Integrated Water and Waste Management Plan
J&W	Jones & Wagener (Pty) Ltd
m	Metres
Mamsl	Metres above mean sea level
Mℓ	Mega litres (1000 cubic metres [m^3])
mm	Millimetres
Mya	Million Years ago
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MPRDA	Mineral and Petroleum Resources Development Act
MPRDAR	Mineral and Petroleum Resources Development Act Regulations

Acronym / Abbreviation	Meaning
MWRP	Middelburg Water Reclamation Project
NEMA	National Environmental Management Act
NEM:BA	National Environmental Management: Biodiversity Act
NEM:WA	National Environmental Management: Waste Act
NWA	National Water Act
PoS	Plan of Study
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
S&EIR	Scoping and Environmental Impact Report Process
TDS	Total Dissolved Solids
RWQO	Resource Water Quality Objectives

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BHP BILLITON ENERGY COAL SOUTH AFRICA (PTY) LIMITED

MWRP CLEAN WATER PIPELINE

FINAL BASIC ASSESSMENT REPORT NO: JW206/13/E159 – Rev 4

1. INTRODUCTION

1.1 Project description

BHP Billiton Energy Coal South Africa (Pty) Limited (BECSA) is currently planning the construction of a clean water pipeline between the Middleburg Water Reclamation Project (MWRP) plant and the Middleburg Colliery Reservoir. The MWRP plant will be treating impacted mine water from BECSA's coal mines near Middleburg in the Mpumalanga Province. The treated water can be released into the environment, however the Middleburg Colliery requires 4 Mℓ of this water per day for internal use.

The pipeline will have a nominal diameter of 315 millimetres (mm) and will be approximately 4 600 metres (m) in length. The pipeline will cross a conveyor, a railway line, service roads and possibly a wetland. Pre-cast concrete sleeves with reinforced concrete access chambers on both sides of the roads and conveyor crossings are foreseen through which the pipeline will be inserted.

Jones & Wagener (Pty) Ltd (J&W) was appointed to investigate alternative routes for the pipeline between the MWRP plant and Middleburg Colliery and obtain an Environmental Authorisation for the preferred route alternative.

1.2 What is the EIA process

The Environmental Impact Assessment (EIA) Regulations were promulgated in terms of the National Environmental Management Act (NEMA) in August 2010 (Government Notice No. R. 543). These regulations list a number of activities that may not commence prior to obtaining an Environmental Authorisation (EA). The listed activities that are relevant to this project, as well as the EIA requirements associated with these activities are described in more detail in **Section 2**. The regulations have set out the requirements for the assessment of these activities. The competent Environmental Authority, charged by NEMA with evaluating the EIA and subsequently granting or refusing the EA is, the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET). The Basic Assessment (BA) process is outlined below in **Figure 1-1.** The project is now in the final Basic Assessment Report (BAR) public review phase.

BECSA's Middleburg Colliery is in possession of an Environmental Management Program Report (EMPR) and the MWRP has a Water Use Licence (WUL), EA and a Waste licence.

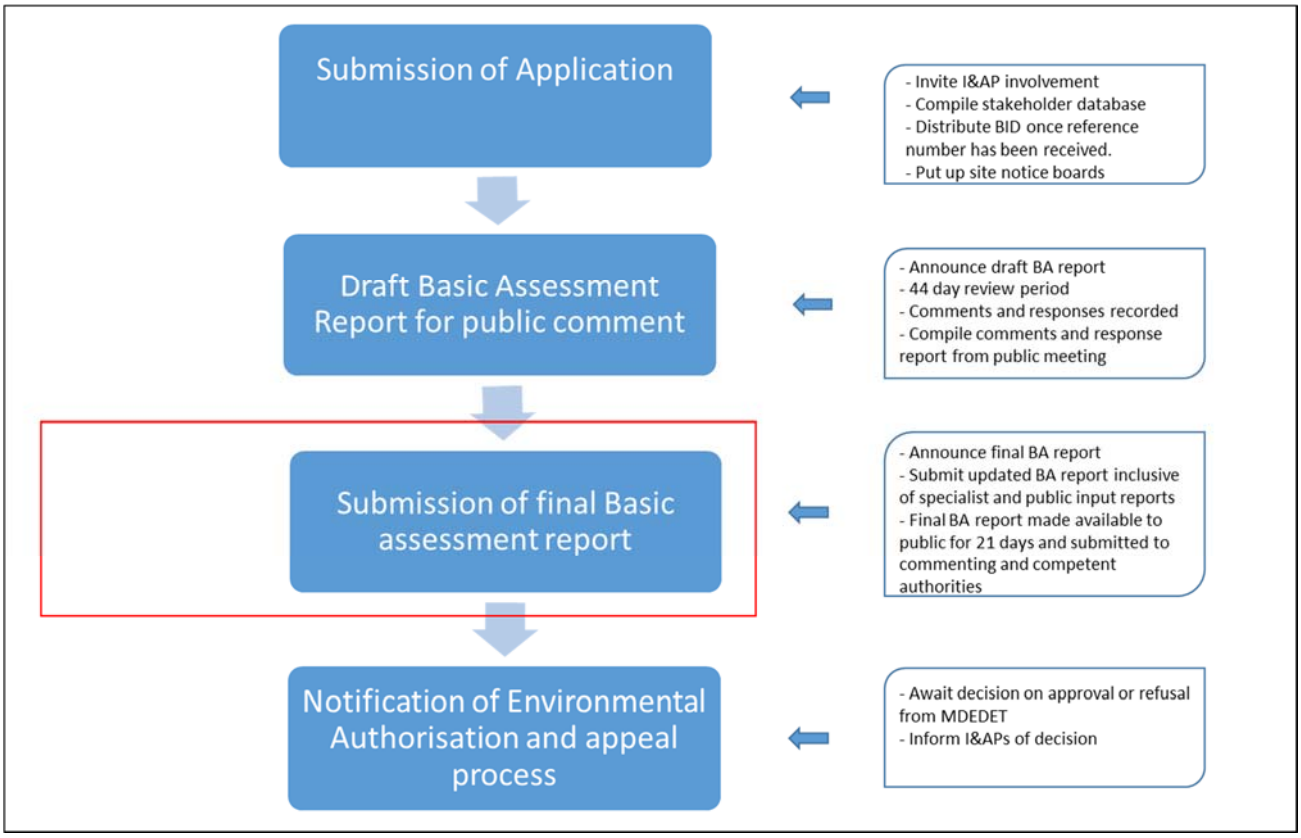

Figure 1-1 **Diagram of Basic assessment process (the red block indicates current phase of the project).**

1.3 Study objective

The purpose of this report is to present the findings of the Basic Environmental Assessment Study, including:

- A discussion of the routes identified for the pipeline between the MWRP plant and the Middleburg Colliery Reservoir;
- A discussion of the environmental and engineering considerations for the pipeline routes;
- A description of the baseline environment;
- An impact assessment of the project;
- A discussion and recommendations on the preferred pipeline route;
- An Environmental Management Programme.

This report has been compiled to meet the requirements of the MDEDET.

1.4 Report structure

This BA report will include the following information:

Section 1: Introduction

This section provides a background to the BAR and introduces the proposed project. This section also provides an overview of, and approach to the legal processes and sets

out the objectives of the BA process and report. Details of the Environmental Assessment Practitioner (EAP) and of the client are provided in this section.

Section 2: Regulatory Framework

Section 2 provides a summary and interpretation of the relevant legislation pertaining to the construction and operation of the proposed project.

Section 3: Project Description

This section provides an overview of the project area, the client's motivation for undertaking the project, and an overview process revolving around the pipeline and infrastructure.

Section 4: Project Alternatives

A description of the alternatives that are assessed, including the No-Go option will be provided in this section.

Section 5: Description of the Affected Environment

This section briefly describes the receiving environment in terms of the biophysical and socio–economic conditions.

Section 6: Public Participation Process (PPP)

This section describes the detailed approach that was adopted for the PPP, and the way forward in notifying the registered Interested and Affected Parties (I&AP's). A summary is provided detailing the issues and concerns raised by I&AP's.

Section 7: Need and Desirability

This section provides a motivation on the need and desirability of the proposed pipeline.

Section 8: Methodology for Impact Identification and Assessment

This section provides a description on the methodology used for the impact assessment relating to the proposed pipeline.

Section 9: Assumptions and Limitations

This section provides a description of any assumptions and limitations pertaining to the proposed project. The areas where assumptions are necessary are indicated here.

Section 10: Assessment of Environmental Impacts

This section identifies and assesses the potential biophysical and social impacts of the proposed project and its alternatives, taking into consideration the direct, indirect and cumulative impacts. Based on the identified impacts a preferred alternative is identified.

Section 11: Environmental Impact Statement

This section provides a summary of the key findings from the impact assessment, and highlights the most favourable alternative.

Section 12: Opinion and Conditions on Authorization

This section provides an opinion of the EAP on the authorization of the proposed project. Conditions which should be associated with the authorization are also explained in this section.

Section 13: Environmental Awareness Plan

This section provides details on the environmental awareness training that must be conducted during all phases of the pipeline construction, operation and decommissioning, including evaluation of personnel and re-training should it be necessary.

Section 14: Conclusion and Recommendations

This section summarizes the key findings and recommendations of the impact assessment, and provides a summary on the way forward of the remainder of the Impact assessment process, particularly the public review of the Final BA report.

1.5 Details of client

In the section below, the details of the client are listed. This is the institution that will be legally responsible for the MWRP pipeline project. Any environmental authorisations and licences associated with this project will be in the name of this legal institution.

Details of Applicant for Environmental Authorisation for the proposed pipeline:

BHP Billiton Energy Coal South Africa (Pty) Ltd

P.O. Box 61 075

Marshalltown

2107

Contact person for the pipeline

Mr Steve Brown

E-mail: steve.brown@bhpbilliton.com

1.6 Properties over which the proposed pipeline will be constructed

The properties over which the proposed pipeline will be constructed are listed below in **Table 1-1**.

Table 1-1: Property description and ownership

Registered Owner	Title Deed Number	Property Name	Portion Description	Province	Reg.Div.	Share Decimal
Ingwe Surface Holdings Ltd	Title Deed No: T76564/1999	HARTBEESTFONTEIN 339	REMAINING EXTENT OF PORTION 8	Mpumalanga	JS	0.6
Tavistock Collieries (Pty) Limited	Title Deed No: T89166/1992	HARTBEESTFONTEIN 339	REMAINING EXTENT OF PORTION 8	Mpumalanga	JS	0.4
Ingwe Surface Holdings Ltd	Title Deed No: T76564/1999	HARTBEESTFONTEIN 339	PORTION 9	Mpumalanga	JS	0.6
Tavistock Collieries (Pty) Limited	Title Deed No: T89166/1992	HARTBEESTFONTEIN 339	PORTION 9	Mpumalanga	JS	0.4
Ingwe Surface Holdings Ltd	Title Deed No: T76564/1999	HARTBEESTFONTEIN 339	REMAINING EXTENT OF PORTION 10	Mpumalanga	JS	0.6
Tavistock Collieries (Pty) Limited	T89166/1992	HARTBEESTFONTEIN 339	REMAINING EXTENT OF PORTION 10	Mpumalanga	JS	0.4

1.7 Details of Surface Rights Holders

Ingwe Surface Holdings limited (60%)
P.O. Box 61075
Marshalltown
2107
Contact person: Vikesh Dhanooklal
Contact number: (011) 376 2410

and

Tavistock Collieries (Pty) Ltd (40%)
1st Floor, Melrose Boulevard
Melrose Arch
Melrose
2196
Contact person: Barry Fourie
Contact number: (011) 772 0600

1.8 Details of Environmental Practitioner

BECSA has appointed J&W to undertake the BA process required to proceed with the proposed project. Where required, J&W has appointed specialist environmental consultants to conduct specialist studies as required to complete the environmental assessment process.

The address of the consulting firm is:

Jones & Wagener (Pty) Ltd

P.O. Box 1434

Rivonia

2128

Expertise of the Environmental Assessment Practitioner (EAP):

Table 1-2 summarises the expertise of the main J&W team members.

Table 1-2: EAP Team Members

NAME (ROLE)	ORGANISATION	HIGHEST QUALIFICATIONS	PROFESSIONAL REGISTRATIONS
Marius van Zyl (Project Director)	J&W	BSc Honours Biochemistry BSc Honours Environmental Management	Pr.Sci.Nat
Olivia Bamford (Environmental Scientist)	J&W	BSc Honours Ecology, Environment and Conservation	-
Sibongile Bambisa (Public Participation)	J&W	BA Honours Anthropology	Member of the International Association of Public Participation (IAP2)

2. REGULATORY FRAMEWORK

Environmental legislation in South Africa was promulgated with the aim of, at the very least, minimising and at the most preventing environmental degradation. The following Acts and Regulations have been identified as being applicable during the construction, operation and decommissioning of the proposed project:

2.1 The Constitution of the Republic of South Africa (Act 108 of 1996)

Section 24 of the Constitution states that: Everyone has the right to

(a) An environment that is not harmful to their health or well-being; and

(b) 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 current environmental laws in South Africa concentrate on protecting, promoting, and fulfilling the Nation's social, economic and environmental rights; while encouraging public participation, implementing cultural and traditional knowledge and benefiting previously disadvantaged communities.

2.2 National Environmental Management Act (Act 107 of 1998) as amended (NEMA)

The NEMA can be regarded as the most important piece of general environmental legislation. It provides a framework for environmental law reform and covers three areas, namely:

- Land, planning and development;
- Natural and cultural resources, use and conservation; and
- Pollution control and waste management.

The law is based on the concept of sustainable development. The objective of the NEMA is to provide for co-operative environmental governance through a series of principles relating to:

- The procedures for authority decision-making on the environment; and
- The institutions of state which make those decisions.

The NEMA principles serve as:

- A general framework for environmental planning;
- Guidelines according to which the state must exercise its environmental functions; and
- A guide to the interpretation of NEMA itself and of any other law relating to the environment.

Some of the most important principles contained in NEMA are that:

- Environmental management must put people and their needs first;
- Development must be socially, environmentally and economically sustainable;
- There should be equal access to environmental resources, benefits and services to meet basic human needs;
- Government should promote public participation when making decisions about the environment;
- Communities must be given environmental education;
- Workers have the right to refuse to do work that is harmful to their health or to the environment;
- Decisions must be taken in an open and transparent manner and there must be access to information;
- The role of youth and women in environmental management must be recognised;
- The person or company who pollutes the environment must pay to clean it up;
- The environment is held in trust by the state for the benefit of all South Africans; and
- The utmost caution should be used when permission for new developments is granted.

2.2.1 Environmental Impact Assessment (EIA) Regulations: 543-546 of 18 June 2010

The EIA Regulations (GNR 543) were promulgated in terms of Sections 24 of the NEMA, to manage the process, methodologies and requirements for the undertaking of an EIA.

Section 24 and 44 of the NEMA makes provision for the identification of activities which may not commence prior to obtaining an EA, and stipulates the requirements of such assessments to assist the decision making process. The EIA regulations (GNR 543) stipulate that the applicant for an activity listed under GNR 544, 545 or 546 must appoint an independent EAP to manage the EIA process.

Two broad categories of the EIA are defined in the EIA regulations, namely a BA process and a Scoping and EIA (S&EIR) process. A BA process is required for projects with less significant impacts or impacts that can be easily mitigated. The process is determined by the nature of the proposed development in terms of its potential impact on the environment, and this is reflected in the level of detail that information is collected in as well as the level of interaction with Interested and Affected Parties (I&APs).

A S&EIR process is only applicable to all projects likely to have significantly higher environmental impacts due to their nature or extent, activities associated with potentially high levels of environmental degradation, or activities for which the impacts cannot be easily predicted.

The listed activities relevant to this project are provided in Table 2-1. Based on the activities identified on a BA process is required for the construction and operation of the treated water pipeline.

Table 2-1: NEMA listed activities triggered by the proposed project

GN R544 of 18 June 2010	Listing Notice 1, Activity 11 (xi)	The construction of: (i) canals; (ii) channels (iii) bridges (iv) dams (v) weirs (vi) bulk storm water outlet structures (vii) marinas (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The pipeline may be closer to than 32 metres from a watercourse, which in this case is a wetland.
	Listing Notice 1, Activity 18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from; (i) a watercourse (ii) the sea; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving (i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or occurs behind the development setback line.	The proposed pipeline may cross a wetland which is part of a watercourse, and during construction more than 5m^3 of soil will be excavated in the wetland.

	Listing Notice 1, Activity 22	The construction of a road, outside urban areas, (i) where a reserve wider than 13.5 metres or (ii) where no reserve exists where the road is wider than 8 metres, for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010	The construction road, which will be located adjacent to the proposed pipeline route will be wider than 8 metres. The construction road and pipeline route will be approximately 30 metres wide.
	Listing Notice 1, Activity 47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (i) where the existing reserve is wider than 13.5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 meters excluding widening or lengthening inside urban areas	Where there is no reserve and the existing road is wider than 8 metres, some of the existing roads in the area may be widened by more than 6m, in order to accommodate the construction of the pipeline.
GNR 546 of 18 June 2010	Listing Notice 3, Activity 4	The construction of a road wider than 4 metres with a reserve less than 13.5 metres	A road is required alongside the pipeline route for construction purposes. The road is anticipated to be wider than 4 meters, with a reserve less than 13.5 metres, and it is located in a critical biodiversity and environmental sensitive area as identified in the Mpumalanga Biodiversity Conservation Plan.
	Listing Notice 3, Activity 12	The clearance of an area of 300 square metres or more of vegetation where 75% of the vegetative cover constitutes indigenous vegetation.	More than 300 square metres of land, containing indigenous vegetation will be cleared during construction of the proposed pipeline.
	Listing Notice 3, Activity 13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation, except where such removal of vegetation is required for: • The undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list. The undertaking of a linear activity falling below the threshold in Notice 544 of 2010.	One hectare or more of land may be cleared in an environmentally sensitive area, as identified in the Mpumalanga Biodiversity Conservation Plan, during the construction of the pipeline
	Listing Notice 3, Activity 19	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	Some of the existing roads in the area may be widened by more than four metres in order to accommodate the construction of the pipeline.

2.3 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

Alien invasive plant control is a legal requirement in terms of the Conservation of Agricultural Resources Act and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA).

The objectives of this act are to make provision for the conservation of the natural agricultural resources of South Africa, through the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or

destruction of the water sources, and by the protection of the vegetation and the eradication of weeds and invader plants.

2.4 Mpumalanga Nature Conservation (Act No. 10 of 1998)

The objectives of this Act are to consolidate the laws relating to nature conservation applicable in the Mpumalanga province and to provide for matters connected therewith. This Act focused on the protection of critically endangered to vulnerable fauna and flora within the province

2.5 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act (NWA) guides the management of water in South Africa as a common resource. The Act aims to regulate the use of water and activities which may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction, flow attenuation within catchments, as well as the potential contamination of water resources, where Department of Water Affairs (DWA) is the administering body in this regard. Should the activities associated with the proposed project impact on water resources e.g. cross through rivers, the applicant would be responsible to obtain a water use license from the DWA.

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

The National Heritage Resources Act (No. 25 of 1999) legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 ha. The Act makes provision for the potential destruction of existing heritage resources sites, pending the archaeologist's recommendations through permitting procedures.

Permits are administered by the South African Heritage Resources Agency (SAHRA). Should the proposed activities impact on heritage resources, application to SAHRA would be required to obtain the necessary permits. The requirements of the National Heritage Resources Act have thus been addressed as an element of the EIA process, specifically by the inclusion of a Heritage Assessment.

3. PROJECT DESCRIPTION

3.1 Background of project

Coal mining activities result in the generation of impacted mine water due to increased recharge associated with disturbing the natural environment in order to remove the coal seams. At Middelburg Colliery, where mining has been on-going for more than 20 years, the impacted mine water surplus is such that a water treatment facility, the MWRP, is being constructed to manage this water responsibly.

The aim of the MWRP is to treat excess impacted mine water to a standard that is suitable for discharge into the Spookspruit catchment. The MWRP will be treating 20 Mℓ of water per day and may treat up to 30 Mℓ of impacted water per day in future.

The proposed pipeline will transport a portion of the treated water from the MWRP back to the Middelburg Colliery Reservoir for use at the colliery.

3.2 Location of project

3.2.1 Regional setting and administrative boundaries

The proposed pipeline is situated between the MWRP and Middleburg Colliery Reservoir, which are located in Mpumalanga, within the Nkangala District Municipal area. The Steve Tshwete Local Municipality, which includes the town of Middelburg, is the responsible local municipality. The location of the MWRP falls within Wards 15 and 24 of the Steve Tshwete Local Municipality.

3.2.2 Directions and approximate distances to the towns near the proposed project

The mine property on which the pipeline will be located is approximately 20 km to the south of Middelburg. The distances to neighbouring towns, from the main office complex at North Section, are as follows:

- Witbank (North West) ± 30 km
- Middelburg (North East) ± 25 km
- Van Dyks Drift (South) ± 17 km
- Bethal (South) ± 70 km
- Pullenshope (South East) ± 70km
- Hendrina (South East) ± 70km

3.3 Presence of servitudes

The pipeline, which will be buried, will cross or encroach on Eskom servitudes. The proposed pipeline route will affect the existing Eskom Distribution services, Boesman Trac – Hartbees1 and Duvha Colliery (Hartbees 1 - 132 kV) and Eskom transmissions (Tx) Hendrina – Kriel (400 kV).

No specific actions are required as no power lines will be interfered with or relocated, but BECSA must comply with the required servitude conditions when constructing and operating the pipeline. The extent and width of the power line servitudes for the Hartbees 1 -132 kV and Hendrina – Kriel 400 kV lines are 15.5 m and 27.5 m respectively. BECSA will be required to ensure that compliance with the electricity provider's conditions are met.

3.4 Conceptual design

BECSA intends to construct a water pipeline, for treated water, from the MWRP to BECSA's Middelburg Colliery Reservoir –see **Figure 3-1**. The pipeline will have a nominal diameter of 315 mm with an approximate length of 4 600 m. The MWRP will treat impacted mine water to a standard for release to the environment and/or re-use by the mine once construction has been finalised. The proposed pipeline will carry the portion of treated water required for use at the Colliery instead of the Colliery needing to source additional water from elsewhere. The treated water will be taken directly from the reverse osmosis unit of the MWRP and will meet the Resource Water Quality Objectives (RWQOs) of the Spookspruit catchment – see **Table 3-1** (J&W, 2012).

Table 3-1: Water quality of treated mine water

Parameter	Unit	RWQO	MWRP: After Treatment (Average Flow)	MWRP: After Treatment (Maximum Flow)
pH		6.5-8	7.0	7.0
Sulphate (SO_4)	mg/ℓ	400	136.27	136.91
Iron (Fe)	mg/ℓ	1.0	0.01	0.01
Sodium (Na)	mg/ℓ	70	6.87	7.23
Magnesium (Mg)	mg/ℓ	100	18.5	18.45
Fluoride (F)	mg/ℓ	0.75	0.19	0.19
Chloride (Cl)	mg/ℓ	20	2.16	2.24
Total Dissolved Solids (TDS)	mg/ℓ	650	195	196
Potassium (K)	mg/ℓ	20	6.09	6.29
Calcium (Ca)	mg/ℓ	150	19.67	19.67
RWQO: Resource Water Quality Objectives for the Spookspruit Catchment				

The proposed pipeline will cross a conveyor, railway line, service roads and possibly a wetland. The pipeline will cross under railway line and service roads by means of horizontal drilling. The pipeline will include two scour valves and two air valves in access chambers at the lowest and highest points along the profile of the line respectively – **Appendix A**.

Once an environmental authorisation has been received, the project will include the following steps:

- Construction phase,
- Operating phase, and
- Decommissioning phase.

More specifically the construction phase consists of route demarcation and preparation according to engineering specifications. The activities associated with this phase are listed below:

Buried Sections:

- Peg out preferred pipeline route;
- Strip 30 m wide construction corridor;
- Stockpile topsoil and windrow adjacent to corridor;
- Dig pipe trench along length of pipeline with digger/back-actor;
- Stockpile material adjacent to the trench;
- Lay pipeline in trench;

- Weld pipeline sections using a high density polyethylene (HDPE) weld;
- Backfill trench.

Horizontal Drill Sections:

- Launching and receiving pits (typically 6 m long (sloped), 2 m wide and 0.8 m deeper than the pipe invert) are excavated on both sides of the road/railway line/conveyor system to be crossed by means of conventional earth construction equipment (typically an excavator).
- A pilot bore is drilled from the launching pit towards the receiving pit by means of a drilling rig stationed at the launching pit. The pilot bore drills a small reconnaissance tunnel at a pre-determined angle and along a prescribed path to form a guiding route to enable the follow-up reaming process. The drilling head is guided by means of a radio detection location system on surface. Steering adjustments are made continuously to ensure the pilot bore follows a predetermined surveyed route. The design depth of the tunnel will be at least four meters below the invert of the road or railway line (in soft materials) or two meters below the invert in hard rock materials.
- The tunnel is thereafter enlarged by reaming backwards to achieve the required pipe sleeve size.
- A flexible HDPE sleeve pipe together with the pressure pipe is inserted and towed through the reamed hole.
- Grouting of voids is carried out where unwanted voids may have occurred during the drilling process.
- Once installed, permanent isolating valves (in concrete valve chambers) will be installed at both ends of the pressure pipe (preferably in the location of the pits) to enable the isolation of the pressure pipe for maintenance purposes. The operational phase will consist of scouring the pipeline immediately after construction. Thereafter water and sediment may be removed in the event of a break in the pipe.

The pipeline will have the same initial operating time frame as the MWRP, which is estimated, as a minimum, until 2028. The pipeline will be decommissioned in the event that the MWRP will be decommissioned along with all associated infrastructure.

The pipeline is to be constructed over land that belongs to Ingwe Surface Holdings (60%) and Tavistock Collieries (40%) and both land owners have been informed of the project see **Appendix C.7.** Ingwe Surface Holdings is owned by BHP Billiton (Pty) Limited and Tavistock Collieries is owned by Glencore.

The pipeline will cross areas that have been identified as Critical Biodiversity Areas (CBAs) and Environmental Sensitive Areas in terms of the Mpumalanga Systematic Biodiversity Conservation Plan – therefore Listing 3 activities are also triggered as can be seen in **Table 2-1**

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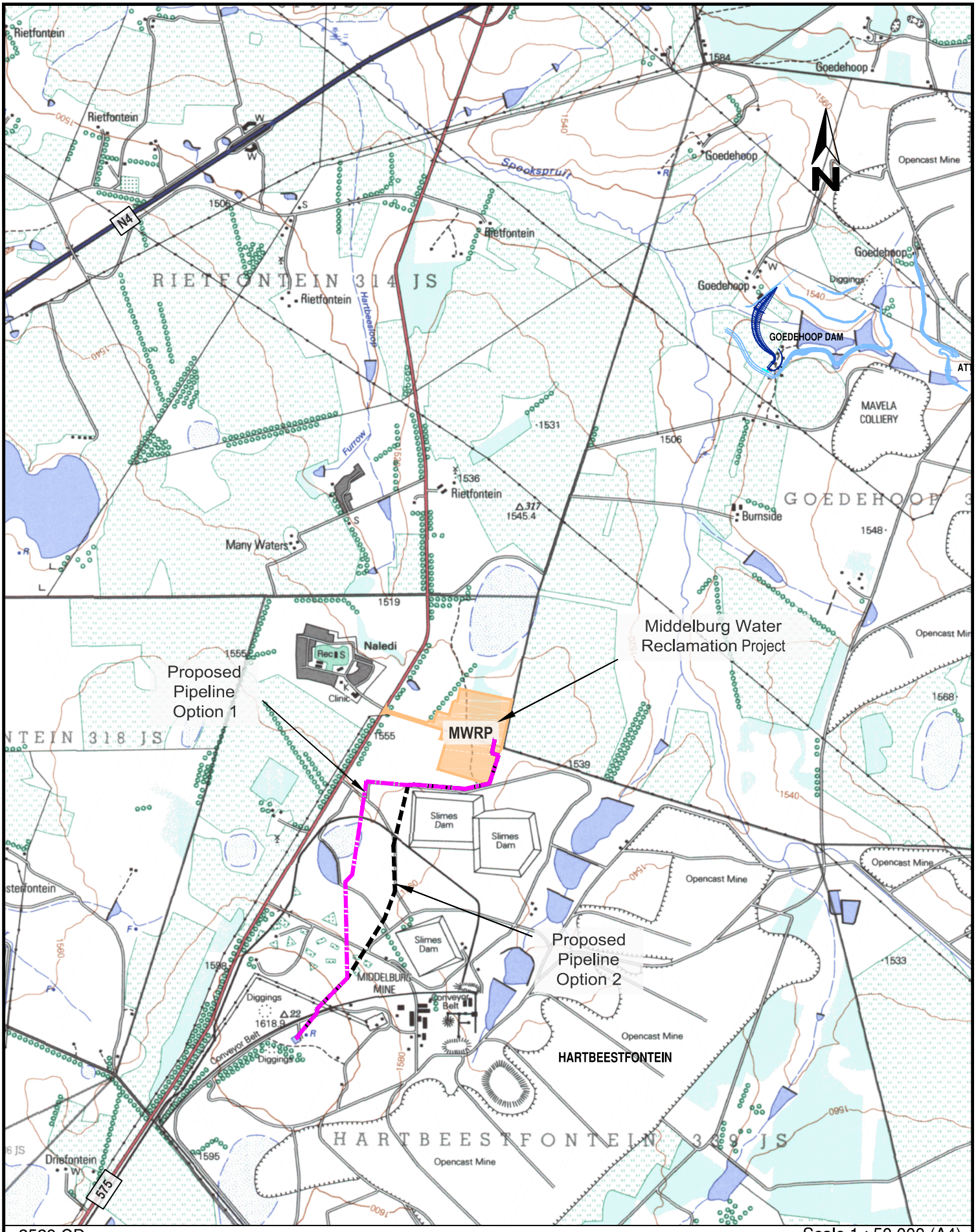

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BHP Billiton Energy Coal South Africa

LOCALITY MAP FOR MIDDELBURG WATER RECLAMATION PROJECT AND THE PROPOSED PIPELINE ALTERNATIVES

Job No: E159-05

Figure 3-1

3.5 Motivation for project

One of BECSA's strategic objectives is to own and operate large, long-life, low-cost, expandable, upstream mineral assets diversified by commodity, geography and market. Their strategy has remained unchanged for over a decade.

This proposed pipeline can be seen as a project that will achieve the goals of a long-life and low-cost project. No additional raw water will be required to be drawn from the government water scheme that also provides water to the Duvha Power Station. This re-use of a resource will ensure both sustainability and reduced operating costs. The 4 Mℓ will be used by Middelburg Colliery for mining associated operations.

The MWRP will be treating 20 Mℓ of water a day initially. A second phase of the project will be established when the need arises for additional treatment capacity where the MWRP will be able to treat 30 Mℓ of impacted water per day.

4. PROJECT ALTERNATIVES

The position of the proposed pipeline is largely constricted by the short distance and existing infrastructure located between the MWRP and the reservoir on Middelburg Colliery.

According to Section 21(h) of GNR 543, feasible and reasonable alternatives must be considered and assessed in the EIA process, along with the no – go alternative.

The project alternatives that have been identified for assessment are outlined in **Section 4.1** below.

4.1 Location alternatives

4.1.1 Alternative 1

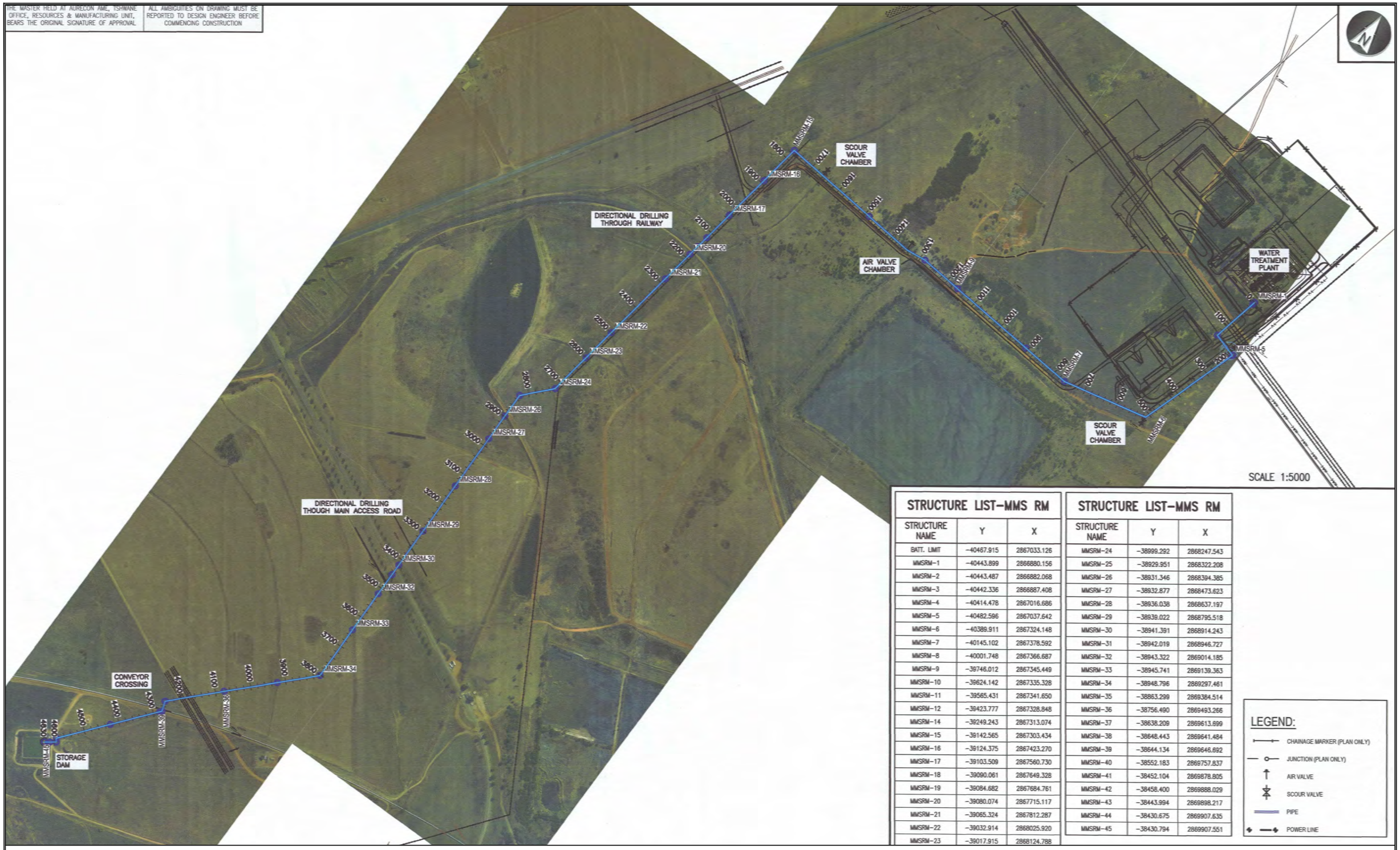
The proposed water pipeline route Alternative 1 will be installed at the MWRP situated on the farm Hartebeesfontein 339 JS. The pipeline will run in a southerly direction before changing direction to run west - **Figure 4-1**. The pipeline takes another turn to run south onto Hartebeesfontein Portion 10 where it crosses a railway line, some roads, a wetland and conveyor system before it reaches the Middleburg Colliery reservoir.

4.1.2 Alternative 2

The proposed second alternative for the pipeline is similar to Alternative 1 in that the first and last sections are the same as can be seen in **Figure 4-2**. From the MWRP, the Alternative 2 pipeline route runs in a southerly direction until close to a coal slimes disposal facility, where it redirects to the west. At the north-western corner of the slimes dam, the pipeline turns south and skirts the western boundary of the coal slimes dam. It then crosses a railway line by means of horizontal drilling beneath the track. The proposed pipeline will traverse a rehabilitated opencast mine area before curving to join an existing track. To the south of the opencast area it crosses a game reserve, then goes underneath the main access road to the Middelburg Colliery and finally transects old dry land crop fields and the conveyor system before it reaches the reservoir.

THE MASTER HELD AT AURECON AME, TSHWANE OFFICE, RESOURCES & MANUFACTURING UNIT, BEARS THE ORIGINAL SIGNATURE OF APPROVAL

ALL AMBIGUITIES ON DRAWING MUST BE REPORTED TO DESIGN ENGINEER BEFORE COMMENCING CONSTRUCTION



SCALE 1:5000

STRUCTURE LIST–MMS RM

STRUCTURE NAME	Y	X
BATT. LIMIT	–40467.915	2867033.126
MMSRM–1	–40443.899	2866880.156
MMSRM–2	–40443.487	2866882.068
MMSRM–3	–40442.336	2866887.408
MMSRM–4	–40414.478	2867016.686
MMSRM–5	–40482.596	2867037.642
MMSRM–6	–40389.911	2867324.148
MMSRM–7	–40145.102	2867378.592
MMSRM–8	–40001.748	2867366.687
MMSRM–9	–39746.012	2867345.449
MMSRM–10	–39624.142	2867335.328
MMSRM–11	–39565.431	2867341.650
MMSRM–12	–39423.777	2867328.848
MMSRM–14	–39249.243	2867313.074
MMSRM–15	–39142.565	2867303.434
MMSRM–16	–39124.375	2867423.270
MMSRM–17	–39103.509	2867560.730
MMSRM–18	–39090.061	2867649.328
MMSRM–19	–39084.682	2867684.761
MMSRM–20	–39080.074	2867715.117
MMSRM–21	–39065.324	2867812.287
MMSRM–22	–39032.914	2868025.920
MMSRM–23	–39017.915	2868124.788

STRUCTURE LIST–MMS RM

STRUCTURE NAME	Y	X
MMSRM–24	–38999.292	2868247.543
MMSRM–25	–38929.951	2868322.208
MMSRM–26	–38931.346	2868394.385
MMSRM–27	–38932.877	2868473.623
MMSRM–28	–38936.038	2868637.197
MMSRM–29	–38939.022	2868795.518
MMSRM–30	–38941.391	2868914.243
MMSRM–31	–38942.019	2868946.727
MMSRM–32	–38943.322	2869014.185
MMSRM–33	–38945.741	2869139.363
MMSRM–34	–38948.796	2869297.461
MMSRM–35	–38863.299	2869384.514
MMSRM–36	–38756.490	2869493.266
MMSRM–37	–38638.209	2869613.699
MMSRM–38	–38648.443	2869641.484
MMSRM–39	–38644.134	2869646.692
MMSRM–40	–38552.183	2869757.837
MMSRM–41	–38452.104	2869878.805
MMSRM–42	–38458.400	2869888.029
MMSRM–43	–38443.994	2869898.217
MMSRM–44	–38430.675	2869907.635
MMSRM–45	–38430.794	2869907.551

LEGEND:

- CHAINAGE MARKER (PLAN ONLY)
- JUNCTION (PLAN ONLY)
- AIR VALVE
- SCOUR VALVE
- PIPE
- POWER LINE

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Middelburg Water Reclamation Plant

PROPOSED PIPELINE ROUTE OPTION 1

Job No: E159-05

Figure 4-1

THE MASTER HELD AT AURECON AME, TSHWANE OFFICE, RESOURCES & MANUFACTURING UNIT, BEARS THE ORIGINAL SIGNATURE OF APPROVAL.

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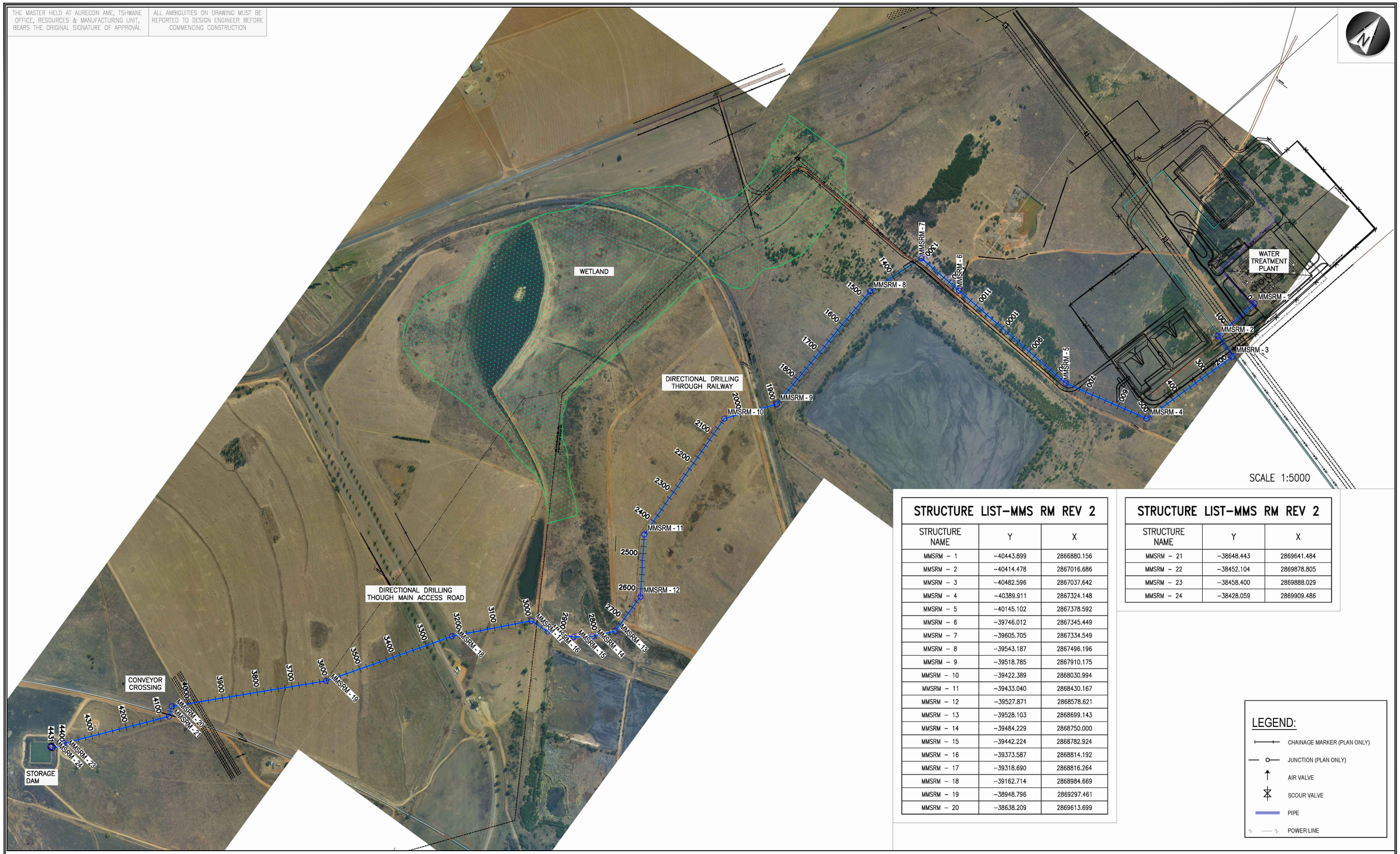

SCALE 1:5000

STRUCTURE LIST–MMS RM REV 2		
STRUCTURE NAME	Y	X
MMSRM – 1	–40443.899	2866880.156
MMSRM – 2	–40414.478	2867016.686
MMSRM – 3	–40482.596	2867037.642
MMSRM – 4	–40389.911	2867324.148
MMSRM – 5	–40145.102	2867378.592
MMSRM – 6	–39746.012	2867345.449
MMSRM – 7	–39605.705	2867334.549
MMSRM – 8	–39543.187	2867496.196
MMSRM – 9	–39518.785	2867910.175
MMSRM – 10	–39422.389	2868030.994
MMSRM – 11	–39433.040	2868430.167
MMSRM – 12	–39527.871	2868578.621
MMSRM – 13	–39528.103	2868699.143
MMSRM – 14	–39484.229	2868750.000
MMSRM – 15	–39442.224	2868782.924
MMSRM – 16	–39373.587	2868814.192
MMSRM – 17	–39318.690	2868816.264
MMSRM – 18	–39162.714	2868984.669
MMSRM – 19	–38948.796	2869297.461
MMSRM – 20	–38638.209	2869613.699

STRUCTURE LIST–MMS RM REV 2		
STRUCTURE NAME	Y	X
MMSRM – 21	–38648.443	2869641.484
MMSRM – 22	–38452.104	2869878.805
MMSRM – 23	–38458.400	2869888.029
MMSRM – 24	–38428.059	2869909.486

LEGEND:

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- AIR VALVE
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PROPOSED PIPELINE ROUTE OPTION 2

Job No: E159-05

Figure 4-2

4.2 No-go Alternative

The No-go Alternative will not entail any construction of a pipeline.

Should the no-go alternative be chosen, BECSA will need to investigate means of transporting water by means of tankers along existing infrastructure such as by service road, access road and district or provincial roads. Alternatively more water needs to be obtained from the Government Water Scheme, which may require new pipelines from the Government Water Scheme.

Should a road transport alternative be opted for, this poses a high risk on over utilizing current road structures resulting in increased maintenance costs of the R575 provincial and mine roads. It may also increase the carbon footprint of the mine as significant amounts of fuel will be required for transporting the water. Water tankers will have to be sourced that could transport a capacity of 4 Mℓ of water per day, which, with a tanker capacity of 30 m^3, will require 133 truckloads per day. Transport by road also poses increased safety risks. This no-go alternative may be both cumbersome and expensive should it be recommended, and is thus not the preferred option.

5. DESCRIPTION OF AFFECTED ENVIRONMENT

This section provides a general description of the environment in which the proposed pipeline will be located. The purpose of this section is to provide a perspective of the local environment within which the proposed infrastructure and plant will exist and operate, with a view to identify sensitive areas, such as wetlands and/or other ecological aspects. The above identified sensitivities need to be considered when conducting the impact assessment of the two alternatives and refining the design of the chosen alternative.

This information has been obtained from previous studies conducted in the surrounding areas and from specialist studies undertaken for the specific pipeline routes. These previous studies are listed below:

- Environmental Management Programme for Middelburg Mine North and South Sections. J&W Report No: JW147/02/8296, October 2002.
- Amendment to Environmental Management Programme for Middelburg Mine North and South Sections, Mpumalanga. J&W Report No: JW84/06/A591, May 2006.
- Middelburg Water Reclamation Project Environmental Impact Assessment. J&W Report No: JW 45/11/B478, October 2011.

Should any further information pertaining to the baseline environment come to light in the public review phase, it will be included in the final BAR.

5.1 Geology

The proposed pipeline will fall within the Witbank Coalfield, which consists of sedimentary rocks of the coal-bearing Ecca Group of the Karoo Sequence. Five coal seams are contained in a 70 m average thick succession in the coalfield, consisting primarily of sandstone with subordinate siltstone and mudstone. The succession is the Vryheid Formation of the lower Ecca group followed the deposition of the Dwyka. The latter is of glacial origin and comprises mainly tillite. A Volcanic pre-Karoo floor underlies this. This basement consists mainly of rhyolitic rocks of the Rooiberg Group, Pretoria (J&W Report No: JW 45/11/B478).

The geophysical investigations for the construction of the MWRP did not identify any prominent geological feature in the vicinity of the then proposed site. It was concluded that the area was deemed suitable for development of the MWRP and posed no problems in terms of the presence of major geological features that could influence the groundwater environment by forming preferential pathways to groundwater flow and contaminant migration. Due to the proximity of the pipeline to the MWRP, the same can be said for the Pipeline routes although no major excavation activities are anticipated.

Sensitivities

No sensitivities foreseen in terms of geology.

5.2 Climate

Middelburg Mines, the MWRP and proposed pipeline routes are located in the Highveld Climatic Region of South Africa. This is a summer rainfall area, with rainfall mainly occurring from October to March. Rainfall occurs mostly as showers and thunderstorms. The winter months are normally dry (J&W Report No: JW 45/11/B478).

The closest weather station to MWRP and the location of the proposed pipeline alternatives, with a long rainfall record is Vandyksdrift, South African Weather Service (SAWS) Station Number 0478546. The average annual rainfall at this station is approximately 682 mm. In addition, data has been obtained from rainfall records kept by Middelburg Mines South section and Vlaklaagte which is South West of the pipeline alternatives – see **Table 5-1**. Rainfall records have been kept at Middelburg Mines for a period of 20 years. Although the gauge is not registered with the SAWS, the rainfall figures recorded at Vlaklaagte and Schoonoord confirm that of the SAWS station.

The Highveld Climatic Region is characterised by hail storms with a recurrence frequency of between 4 and 7 per area per annum. This is the area with the highest hail storm frequency in South Africa (J&W Report No: JW147/02/8296).

The maximum rainfall with a 1:50 year return frequency is between 113 mm and 117 mm and the 1:100 year return event is between 127 mm and 132 mm for the area – see **Table 5-2** and **Table 5-3.**

Table 5-1: Rainfall figures for the MWRP area

Month	Twenty Year Average of Monthly Rainfall in millimetres (mm)	
	Middelburg Mines	Vlaklaagte
January	128	119
February	76	80
March	56	77
April	41	48
May	11	15
June	7	9
July	4	8
August	8	9
September	31	24
October	73	74

Month	Twenty Year Average of Monthly Rainfall in millimetres (mm)	
	Middelburg Mines	Vlaklaagte
November	129	111
December	118	109
Annual	682	683

Table 5-2: Rainfall depths (mm) during 24 hour period

Station	2 years	5 years	10 years	20 years	50 years	100 years	200 years
Vandyksdrift	54	72	85	99	117	132	148
Witbank	51	69	82	95	113	127	142

Table 5-3: Rainfall depths (mm) for 7 day period

Station	2 years	5 years	10 years	20 years	50 years	100 years	200 years
Vandyksdrift	102	132	152	171	197	216	235
Witbank	98	127	146	165	190	208	227

Sensitivities

No sensitivities are foreseen in terms of climate.

5.3 Soils

The soils are described by SEF in their wetlands report - see **Appendix B** and is summarised here. The soil forms along the proposed routes of the pipeline include Avalon (Av), Glencoe / Wasbank (Gc/Wa), Westleigh (We) and Katspruit (Ka) (SEF 2013).

The Avalon Form characterises most of the site and is defined by a thin topsoil (Orthic A) horizon overlying a yellow-brown silty sand (yellow brown Apedal B horizon) on a ferruginised silty sand (soft Plinthic B) horizon. The thickness of and depth to the soft plinthic B horizon is variable and can be encountered from as shallow as 600mm (i.e. above the effective rooting depths of soil). This could result in saturated conditions at this depth and adversely affecting crop. Consequently this soil form is only considered to exhibit a moderate potential for crops and arable requirements (SEF 2013).

The Glencoe Form is typically encountered in the side slopes of the drainage features (drainage channel in south west and pan in north east). This is typically characterised by thin topsoil (Orthic A horizon) on yellowish brown to brown hillwash of silty sand (yellow brown Apedal B horizon) on a very dense ferruginised hillwash to transition (Hard Plinthic B horizon). Locally the hillwash is limited and hard Plinthic B will occur and the soil form tends to the Wasbank Form.

The soil in the poorly defined drainage channel in the south west is represented by the Westleigh Form where a very moist to wet, silty sand to sandy silt (Orthic A horizon) overlies a clayey sand with poorly developed ferricrete nodules (Soft Plinthic B) horizon.

The pan deposit soils, to the north of the MWRP, in the north east comprises a very moist silty sand (Orthic A) overlying a very moist mottled orange brown sandy clay (G horizon). The Katspruit Form is associated mainly with the pan feature.

Sensitivities

Disturbance of soil horizons may occur with the excavation of the trenches and the clearing of any vegetation. Thin topsoil layers may erode away with disturbance and expose underlying soil layers. Another sensitivity may be the formation of dust during construction phase. The dust receptors in the area are primarily residential settlements and they are primarily disturbed by dust-fall from the construction of the MWRP and blasting from Middelburg Colliery. The access roads and service roads are already a part of the MWRP's management plan.

5.4 Biodiversity

Specialist Ecological and Wetland Assessments were undertaken for this project. For additional information please refer to the full Wetland Assessment and Ecological Statement, found in **Appendix B.1** and **Appendix B.2** respectfully. The reports are summarised here.

5.4.1 Fauna

The study area comprises of large patches of disturbed areas and mining areas, reducing the possible numbers of faunal habitats and making the area largely unsuitable for faunal species. Faunal habitats were, however, found in the disturbed grassland area and in some natural grassland clumps within the game camp north of the mine access road. Low faunal diversity was recorded for the overall area at the time of the survey.

On the study site a potential 15 IUCN Red List species can occur. At the time of the field survey *Alcelaphus buselaphus* (Red Hartebeest), *Antidorcas marsupialis* (Springbok), *Cynictis penicillata* (Yellow Mongoose), *Damaliscus pygargus* (Blesbok), *Equus burchelli* (Zebra) and *Lepus microtis* (African Savanna Hare) were confirmed. None of the above listed are listed as concerned species on the IUCN redlist database.

According to the IUCN, the study area falls within the distribution range of 15 bat species. Four of these species are of conservation concern, namely *Cleotis percivali* (Percival's Trident Bat), *Hipposideros caffer* (Sundevall's Roundleaf Bat), *Rhinolophus darlingi* (Darling's Horse Shoe Bat) and *Miniopterus natalensis* (Natal Long-fingered Bat). All of the above listed bats, although not confirmed to be present, are likely to use the study area for foraging.

In the study area, a potential 46 reptile species may be present in the general area around the study site. No reptile species were observed at the time of the survey but suitable habitat exists within the study area for many reptile species. The likelihood, however, of the reptiles being present in the area is low as a result of the high level of disturbance in the area.

Of the 13 amphibians that could be present in the study area According to the South African Frog Atlas Project, one species was found in the cement dam of the game camp north of the Colliery access road, namely *Amietophrynus gutturalis* (Guttural Toad). A temporary pool near the railway line was identified as suitable habitat for *Pyxicephalus adspersus* (Giant Bullfrog) – see **Figure 5-1**. The species was, however absent from the study area.

5.4.2 Flora

The MWRP falls within the Grassland Biome (Mucina *et al*. 2006). This area is characterised by grasses and plants with perennial underground storage organs. Trees are largely excluded from the vegetation as a result of high summer rainfall combined with dry winters and night frosts that create unfavourable tree growth conditions. Thickets in the biome are reduced through herbivory, frost and fire that affects the herbaceous grass and forb layer. Natural fires are also crucial to maintain the structure and biodiversity of the biome. However, if prevented due to activities such as agriculture and mining, alien species eventually dominate the natural vegetation and place an additional burden on already scarce resources such as water.

Grassland can be further divided into smaller units known as vegetation type. The three vegetation types found in the MWRP area are Eastern Highveld Grassland, Rand Highveld Grassland and Eastern Temperate Freshwater Wetlands.

The study site comprises both disturbed and natural grassland. On the natural grassland only the Eastern Highveld Grassland vegetation type was identified. Eastern Highveld Grassland is primarily found on undulating plains that include low hills and pan depressions. Dominant grassland species on the study site are *Themeda triandra* (Red Grass), *Aristida* -and *Eragrostis* species. The remaining area in the study site has been transformed by anthropogenic disturbances such as mining and the invasion of alien species.

Species found in the grasslands on the study site includes *Hypoxis rigidula (*Farmer's String or Silver-leaved Star-flower)*, Becium obovatum* (Cat's Whiskers)*, Indigofera* sp (Indigo), *Pelargonium luridum* (Wild Geranium or Storks bill)*, Dipcadi viride* (Dainty Green Bells) and *Ledebouria* sp (Common Squill) One species of conservation concern was found on the site, namely *Boophone disticha* (Bushman Poison bulb or Tumbleweed or Gifbol)*.*

A disturbed grassland was recorded between the newly constructed MWRP access road in the north up to the game camp in the south. This area consisted of dense stands of *Acacia mearnsii* (Black Wattle).

Rehabilitated grasslands in the game camp north of the MWRP access road had recently been burned at the time of assessment. However, re-sprouting graminoid species gave an indication of the floral species. Species diversity within these rehabilitated areas was considered very low.

The area around the MWRP has been highly transformed by vegetation clearing for construction of the MWRP. Search and rescue operations have been conducted to relocate protected species.

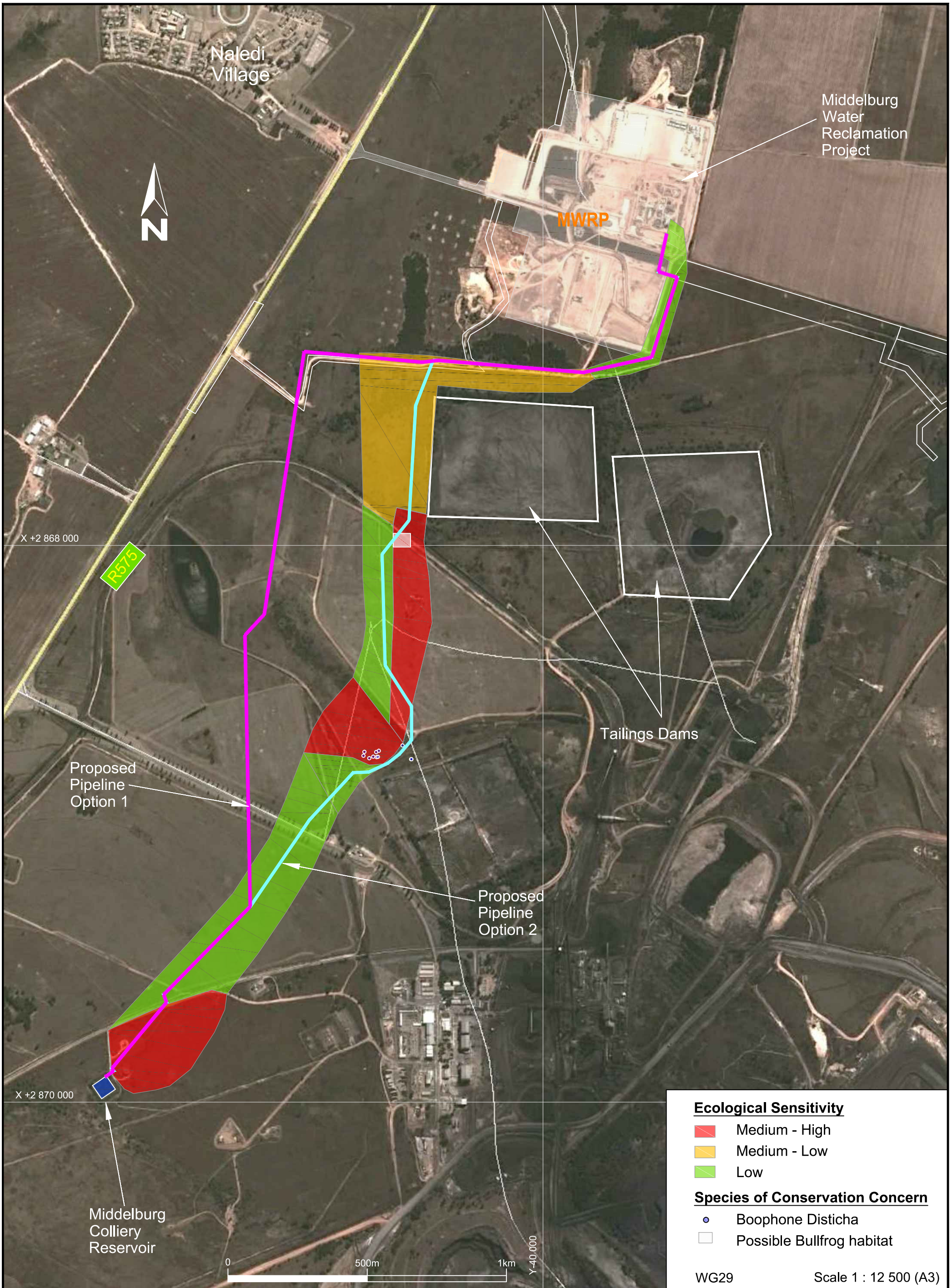
Sensitivities

In the area of the study site, eight plant species of conservation concern are listed in literature. One of these species was recorded namely *Boophone disticha (*Bushman Poison bulb or Tumbleweed or Gifbol). The same species was confirmed as present on the site as part of the list of provincially protected species. Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes. A provincially protected plant may not be removed, picked, pruned or destroyed by any activities in the study area and should be relocated prior to mining activities.

Ecological sensitivity and importance (EIS) was assessed along the proposed pipeline option 2 – see **Figure 5-1.** This sensitivity measure is based on the intactness and function of the vegetative structures supporting the faunal communities (ecological function) and how necessary it is to conserve the area based on the importance of the site on a national and/or provincial scale (conservation importance). Conservation importance is determined by the assessment of diversity, rare or endemic species and

by identifying areas that are protected by legislation. EIS is rated as low, medium to low or medium to high.

As can be seen in **Figure 5-1**, the pipeline option 2 is proposed to be located in low EIS areas around the MWRP, over the rehabilitated mine area and over the mine access road until just before the pipeline reaches Middleburg Colliery. The pipeline is located in low to medium EIS areas around the pair of tailings dams (**Figure 5-1**). The pipeline falls in medium to high EIS areas along the roads surrounding the southern tailing dam and at the Colliery reservoir (**Figure 5-1**). The confirmed sightings of the species of concern (*Boophone disticha*) are shown on **Figure 5-1**.



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BHP Billiton Energy Coal South Africa
Middelburg Water Reclamation Plant
ECOLOGICAL SENSITIVITY OF THE PREFERRED PROPOSED PIPELINE ROUTE

Job No: E159-01

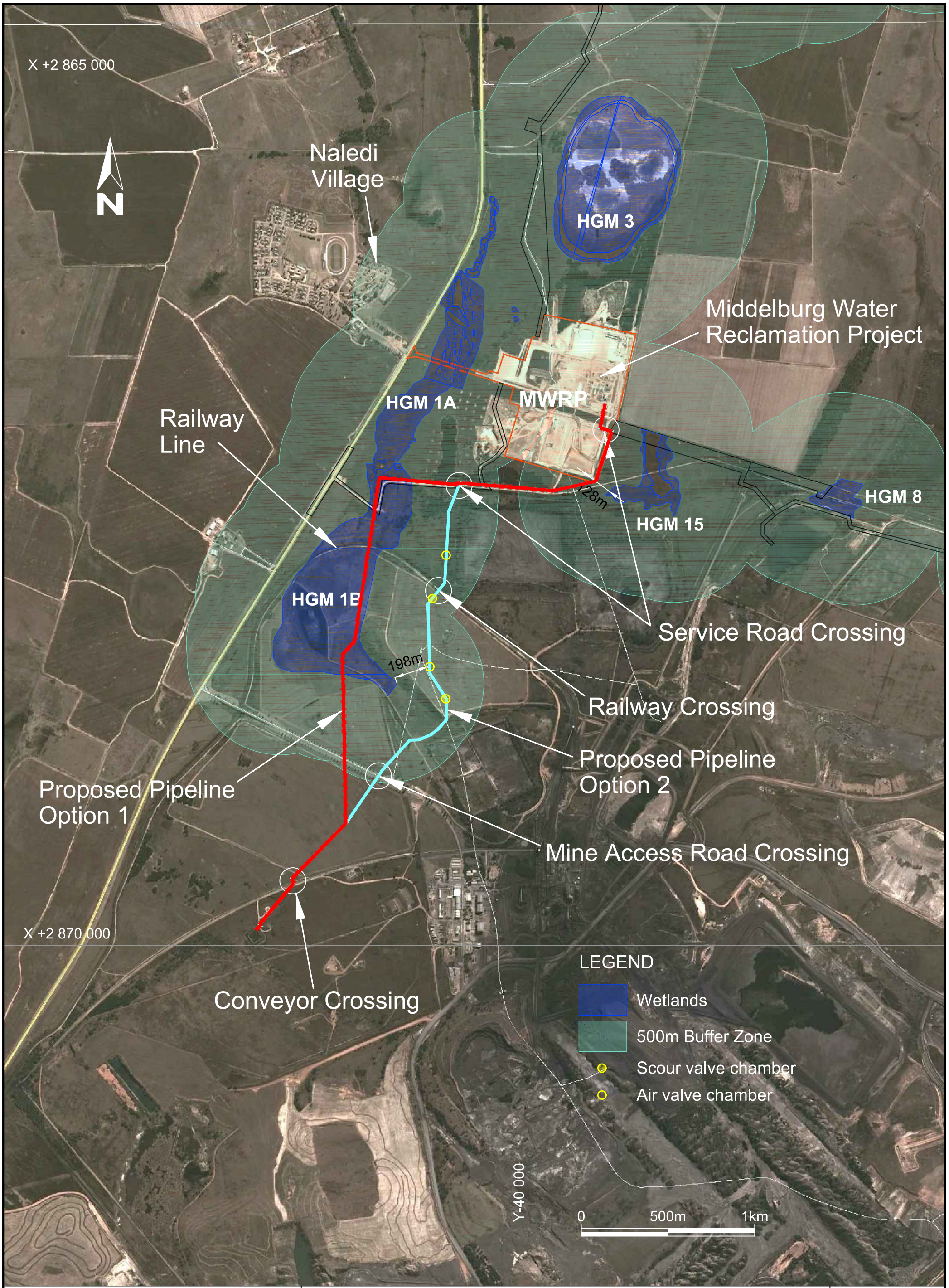
Figure 5.1

5.5 Wetlands

The wetlands along the pipeline route were delineated by SEF – see Appendix B. The wetland units applicable to the MWRP pipeline are detailed in **Figure 5-2**.

One hydro-geomorphic (HGM) type, a hillslope seepage wetland which is connected to a watercourse was delineated and classified into two different HGM units namely, HGM 1A and HGM 1B. Previously delineated wetlands are indicated on **Figure 5-2** as HGM 3, a pan, HGM 15 and HGM 8.

The HGM 1A and HGM 1B wetlands have a Present Ecological Status (PES) of E (SEF, 2013). They both feed into the head waters of the Hartbeesloop. The MWRP is located approximately 130 m from wetland HGM 15, with a PES of D (SEF, 2012). From an Ecological Importance and Sensitivity viewpoint, HGM 1B was given a low rating due to the many anthropological activities, especially mining, that have been taking place in the study area. HGM 15 also received a low rating for Ecological Importance and Sensitivity (SEF, 2012). The proposed pipeline is to be constructed within 500 m of these wetlands



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BHP Billiton Energy Coal South Africa
Middelburg Water Reclamation Project

PROPOSED CLEAN WATER PIPELINE ALTERNATIVES IN RELATION TO THE WETLANDS

Job No: E159-05

Figure 5.2

5.6 Surface water

The proposed pipeline will fall within the Steve Tshwete local municipal area, which has been increasing their demand for water in the upper Olifants River catchment. The MWRP is therefore seen as an important project to augment the water supply of the catchment.

In the Spookspruit itself, three surface water uses and requirements were identified during the compilation of the Middelburg Mines' EMPR in 2002. These are:

- Stock watering mostly for cattle and sheep, including dairy farming,
- Crop irrigation, mostly vegetables, which are sold to the public, and
- The aquatic environment.

The proposed pipeline falls within the Spookspruit catchment, a tributary of the Upper Olifants River catchment in the quaternary catchment B11H – See **Figure 5-3**. The Spookspruit is an important tributary of the Olifants River that flows into the Loskop Dam. Water from the Loskop Dam is used extensively for irrigation, domestic supply, industrial and stock watering. Aquaculture has also been identified as an important water use downstream of the Loskop Dam (DNWRP, 2009).

Although the project will reduce the amount of treated water to be discharged to the Spookspruit, the reduction is not considered significant. The maximum amount that would have been discharged without the water supply back to the mine would have been 30 Mℓ, which will now amount to 26 Mℓ.

In order to ensure that the water quality of the Loskop Dam is improved and protected for long term use, the DNWRP defined Interim RWQOs for the Spookspruit (DNWRP, 2009). These are summarised in **Table 5-4**.

Sensitivities

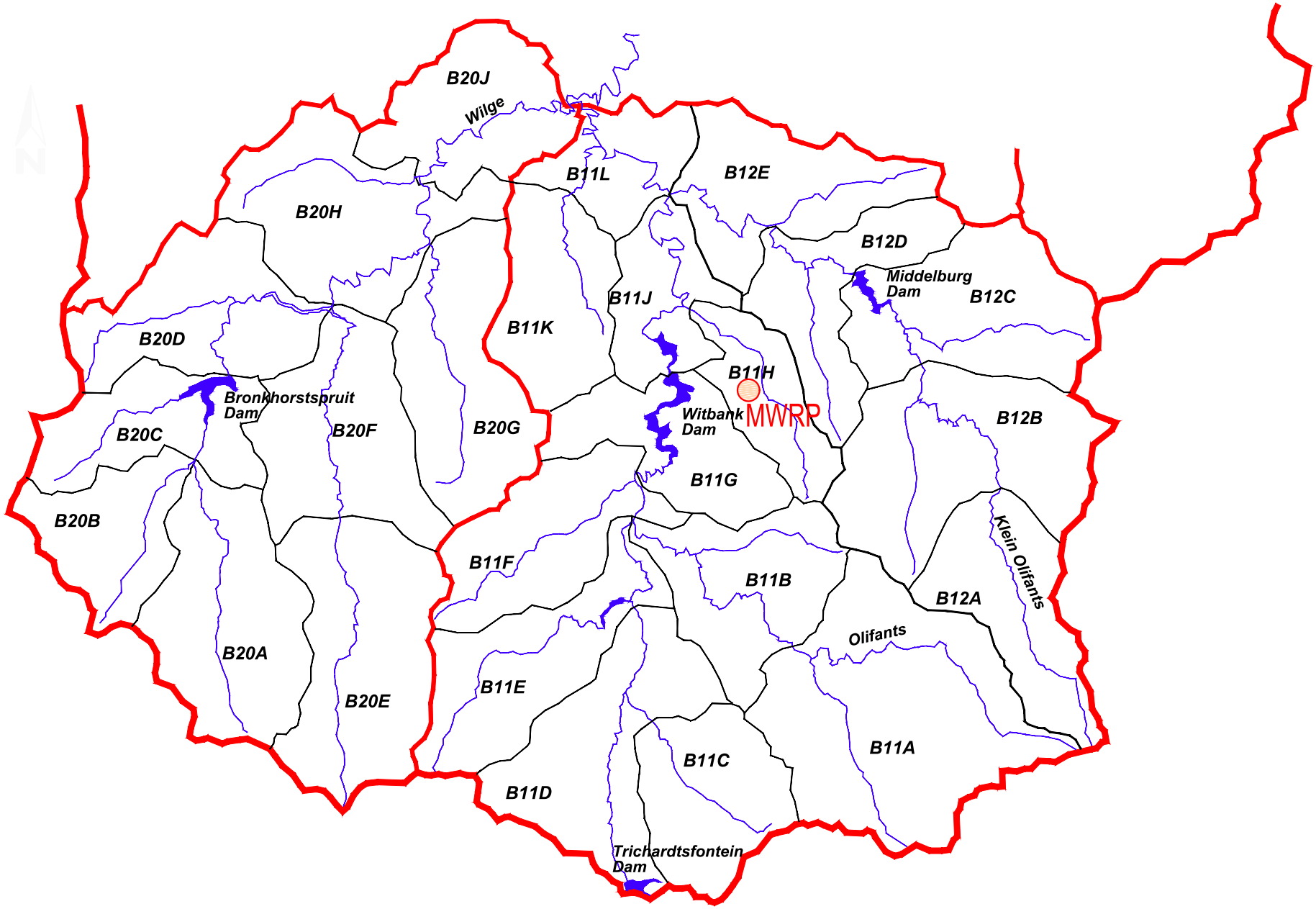
Wetlands, pans and other river bodies are considered sensitive areas that contribute to the upper Olifants River catchment. The applicable water bodies are, however, addressed above in **Section 5.5**.

Table 5-4: Interim RWQO for the Spookspruit

Water Quality Variable	Unit	Spookspruit: Management Unit 26
Conductivity	mS/m	90
Dissolved Oxygen	% Sat	70
pH		6.5 – 8.4
Suspended solids	mg/ℓ	-
Turbidity	NTU	-
Alkalinity	mg/ℓ	120
Boron	mg/ℓ	0.5
Calcium	mg/ℓ	150
Chloride	mg/ℓ	20
Fluoride	mg/ℓ	0.75
Magnesium	mg/ℓ	100
Potassium	mg/ℓ	20
Sodium	mg/ℓ	70
SAR	meq/$\ell^{0.5}$	2.0
Sulphate	mg/ℓ	400
Total Dissolved Salts	mg/ℓ	650
Iron	mg/ℓ	1.0

Water Quality Variable	Unit	Spookspruit: Management Unit 26
Manganese	mg/ℓ	0.4
Aluminium	mg/ℓ	0.02
Chromium (VI)	mg/ℓ	0.05
Dissolved Organic Carbon	mg/ℓ	10
Ammonia*	mg/ℓ as N	0.007
Nitrate	mg/ℓ as N	
Total Inorganic Nitrogen	mg/ℓ as N	2.5
Phosphate	mg/ℓ as P	0.05
Total Phosphorus	mg/ℓ as P	0.25
E. Coli	Counts/100 mℓ	130
Chlorophyll	mg/ℓ	0.02

Source: DNWRP, 2009



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BHP Billiton Energy Coal South Africa
Middelburg Water Reclamation Project

MWRP AND PIPELINES IN RELATION TO THE CATCHMENT AND RECEIVING WATER BODY

Job No: E159-01

Figure 5-3

5.7 Topography and drainage

The topography of the greater area surrounding the MWRP and proposed pipeline routes is gentle undulating areas with mostly northerly flowing drainage systems as is typical of the Transvaal Highveld Region – see **Figure 5-4**. The area has an elevation varying between 1 500 and 1 650 metres above mean sea level (mamsl) **Figure 5-4**. The drainage systems are often accompanied by hill seeps, which results in the development of wetlands.

The MWRP is in the Spookspruit catchment situated in the Upper Olifants River Catchment - **Figure 5-3**. The headwaters of the Upper Olifants River study area are located along the Highveld Ridge in the Secunda-Bethal area. The Highveld Ridge is the catchment divide between the Vaal River system, flowing to the west, and the Olifants River system, flowing in a northerly direction, then mostly easterly until discharging into the Indian Ocean. The Vaal River system discharges into the Orange River System, which again discharges into the Atlantic Ocean.

The Upper Olifants Catchment consists mainly of the Olifants River, fed by the Wilge River, Klein Olifants River, Klipspruit and Spookspruit, all of which join the Olifants River before discharging into the Loskop Dam. The Middelburg Mines' Hartbeesfontein -, Bankfontein - and Goedehoop Sections fall into the Spookspruit catchment, while the Klipfontein section falls within the Vaalbankspruit catchment. The Spookspruit discharges into the Olifants River approximately 8 km after crossing the N4 highway.

The pipeline options occur in an area that displays gentle slopes to the north-west. The larger portions of the two alternatives are located in the head waters of the Hartbeesloop, which is a tributary of the Spookspruit and joins the Spookspruit close to the N4.

These slopes of the area are generally smaller than 1:8. The average topographic elevation of the site is approximately 1 550 mamsl.

Sensitivities

Both the pipeline routes are located in the upper reaches of the Hartbeesloop and these head water areas are normally associated with wetlands, therefore care should be taken not to impact on wetlands or generate any silt during the construction phase, which may negatively impact wetlands.

In terms of topography, no sensitivities exist due to the gentle slopes.

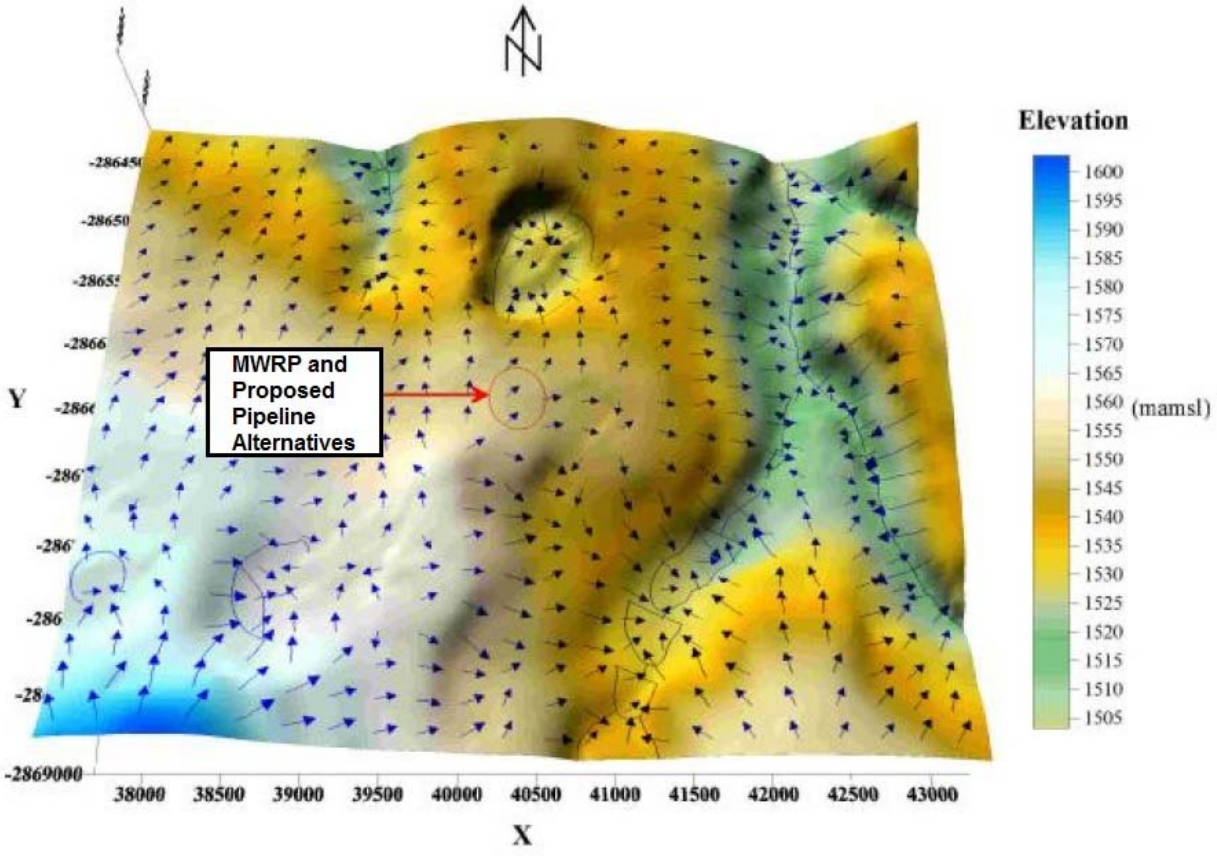


Figure 5-4: **Drainage and Surface Topography of the MWRP and the Proposed Pipeline Alternatives. Blue arrows indicate the direction and relative magnitude of surface runoff flow. (Orpheus Hydrogeophysics 2008)**

5.8 Land Use

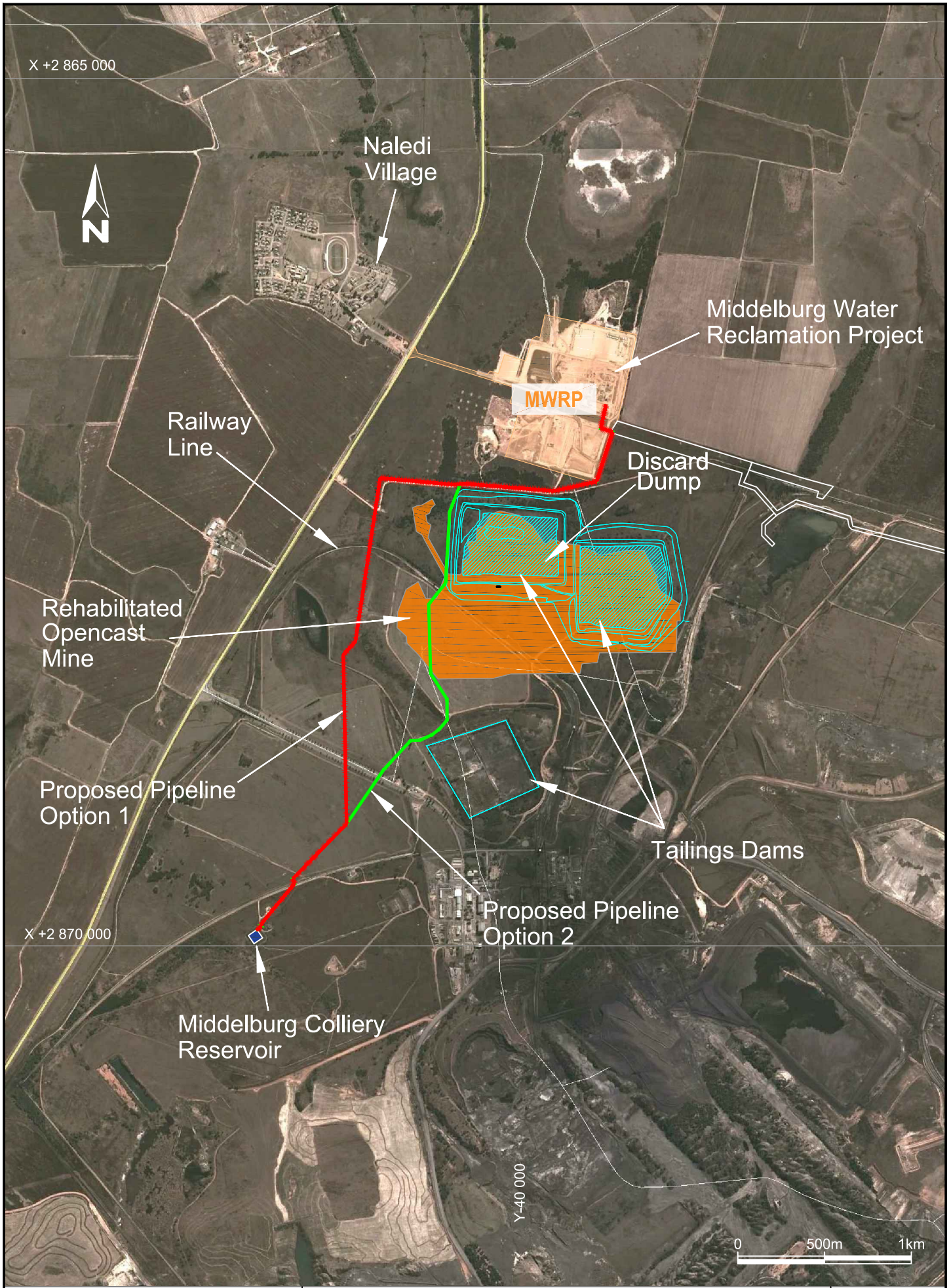
Land use in the Mpumalanga province is predominantly natural vegetation (71% of the total area), and cultivated lands (26%). Other land uses within the province include urbanisation, industry and mining.

The study area is dominated by mining areas and the pipeline is to be constructed on mine property. The pipelines are proposed to run in the vicinity of tailings dams, the MWRP plant area, and a rehabilitated open cast mine – see **Figure 5-5**. Other land uses that are intersected by the project are wetlands as seen in **Figure 5-2**.

Sensitivities

Wetlands, pans and other river bodies are considered sensitive areas, however these are addressed above in **Section 5.5**.

The pipeline will not have a significant impact on land uses, such as farming, as the area has been significantly impacted by mining activities.



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BHP Billiton Energy Coal South Africa
Middelburg Water Reclamation Project

PROPOSED CLEAN WATER PIPELINE ALTERNATIVES IN RELATION TO LAND USE

Job No: E159-05

Figure 5-5

5.9 Heritage

A specialist Heritage Assessment for this specific project was undertaken by Julius CC Pistorius, an Archaeologist and Heritage Consultant. For additional information please refer to the full Heritage Statement, found in **Appendix B.3**.

The heritage assessment indicates a wide range of cultural and historical factors in the greater Middleburg area. However it is suspected that as a result of the long history of coal mining, most of the evidence of heritage resources has been lost. Specifically on the MWRP site and area in-between the Middleburg Colliery and MWRP, where the proposed pipeline is to be constructed, no graves or heritage resources were identified.

Sensitivities

None were identified

5.10 Palaeontology

A paleontological study was undertaken by Marion Bamford of the Evolutionary Sciences Institute at the University of the Witwatersrand -see **Appendix B.4**

Middleburg area lies in the region where there are four geological Formations The three old Formations, the Loskop Formation and Selons River Formation of the Rooiberg Group, and the Wilge River Formation of the Waterberg Group do not contain fossils. However the Vryheid Formation, Ecca Group, is in the same general area and does contain fossils in some areas. These fossiliferous areas are aged at approximately 300-270 million years ago (mya).

Middleburg lies in the northern-most part of the main Karoo Basin. Fossil plants have been collected from the shales between the coal seams in some areas of Witbank (to the west-south-west of Middleburg) and from Belfast (to the east of Middleburg) by staff and students from the Bernard Price Institute in 2004 and 1985 respectively (BPI catalogue). It is however very rare to encounter outcrops of any fossils. There are no records of fossil plants or vertebrates from the Middleburg region. Fossil plants are extremely rare from the Dwyka deposits and fossil vertebrates are also very rare. Fossil vertebrates are almost never found associated with coal deposits.

The Middelburg Colliery and MWRP areas have been used extensively for mining and agriculture. The surface of the land is arable land rather than the coals or hard shales that allow the formation of fossils. If any shales underlie the wetlands identified in the MWRP reserve, any fossils would have been destroyed by the alternating wet-dry conditions. There may be deep underlying coal deposits and fossils.

Sensitivities

No sensitivities were identified as no deep excavations were proposed to take place.

5.11 Regional socio-economic status

The proposed pipeline will fall within the Steve Tshwete Local Municipality which forms part of the Nkangala District Municipality within Mpumalanga Province. Mpumalanga is occupies approximately 80 000 km^2 surface area and supports approximately 7% of the South African population (SERO, 2013). The provinces economy comprises of various contributors including: mining, agriculture and forestry, manufacturing, electricity generation, tourism, trade, finance and transport.

The total population recorded in the Steve Tshwete Local Municipality at the time of the 2011 census was approximately 229 831. The unemployment rate is 19.7% and the population growth rate is 4.8% annually (SERO, 2013).

The majority of the working population is employed, 19.7% is considered as unemployed and 29.3% is classified as economically inactive. Manufacturing, mining and wholesale are the biggest contributors to employment within the municipal area (SERO, 2013). This is due to the vast coal reserves found within the area.

Sensitivities

Some jobs may be created during the construction of the pipeline, which may impact the area in a positive way from an economic perspective.

6. PUBLIC PARTICIPATION (PP)

6.1 Introduction

Public participation is an essential and legislative requirement for any development or improvement that requires an environmental authorisation or licence. The principles that demand communication with society at large are best embodied in the principles of the National Environmental Management Act (Act No. 107 of 1998, Chapter 1) (NEMA), South Africa's overarching environmental law. In addition, Section 24 (5), Regulation 54-57 of GNR 543 under NEMA guides the public participation process that is required for either an Environmental Impact Assessment (EIA) process, or a Basic Assessment (BA) process.

6.1.1 Objectives of public participation in a BA process

The objectives of public participation in conducting a BA for the proposed project are to provide sufficient and accessible information to Interested & Affected Parties (I&APs) in an objective manner so as to:

- Assist the I&APs to identify issues of concern, and providing suggestions for enhanced benefits and alternatives;
- Ensuring that their issues have been considered either by the Specialist Studies, or elsewhere; and
- Comment on the findings of the BA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation is to ensure transparency throughout the process and to promote informed decision making.

6.1.2 Approach

The public participation process for the proposed construction of the water pipeline has been designed to satisfy the requirements laid down in the above mentioned legislation and guidelines.

Figure 6-1 below provides an overview of the processes/activities that are being undertaken as part of the BA and also illustrates how issues and concerns raised by the public are used to inform the technical investigations at various milestones during the process. This section of the report highlights the key elements of the public participation process to date.

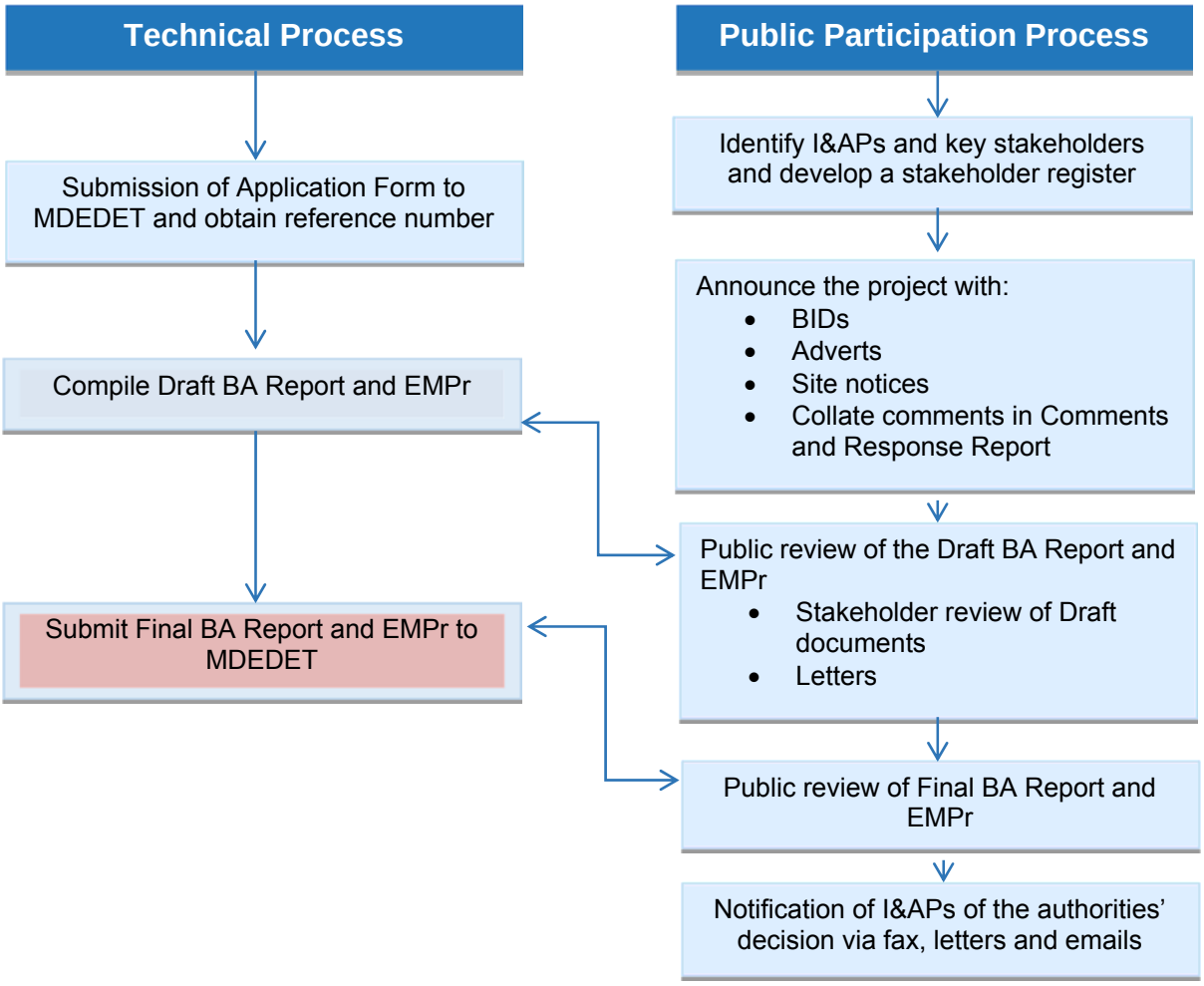

Figure 6-1: Steps undertaken in the BA study

6.2 PP Methodology

The following section provides an overview of the activities that were undertaken to facilitate effective stakeholder engagement.

6.2.1 Basic Assessment Application Form

The application form for conducting a BA was submitted to the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) on 16 September 2013 – see **Appendix C.7**. The application form was acknowledged by MDEDET on 25 September 2013 with the following reference number: **17/2/3N-301** see **Appendix C.7**.

6.2.2 Identification of Interested and Affected Parties

Various stakeholders were identified as part of the BA process. They included the following:

- Affected land owners, namely Tavistock Collieries and Ingwe Collieries Limited,
- Organs of State (national, provincial and local);

- Media;
- Non-governmental Organisation (NGOs); and
- Community Based Organisations (CBOs).

According to the NEMA EIA Regulations under Section 24(5) of NEMA, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and is being kept updated with the details of I&APs throughout the process, refer to **Appendix C-1** for the I&AP database.

The announcement of the BA process and notification that the Draft Basic Assessment Report (Draft BAR) is available for public review was distributed to the following organs of state:

- Department of Water Affairs (National and Regional);
- Department of Environmental Affairs;
- Department of Agriculture, Forestry and Fisheries;
- Department of Mineral Resources;
- Mpumalanga Department Public Works, Roads and Transport;
- Mpumalanga Department of Agriculture, Rural Development and Land Administration;
- Mpumalanga Tourism and Parks Agency; and
- Key officials from the Nkangala District Municipality and Steve Tshwete Local Municipality.

Copies of the Draft BAR were also submitted to the authorities listed above for their review and comment.

6.2.3 Announcement and opportunity to become involved

The opportunity to participate in the BA study was announced from 15 October 2013 as follows:

- Distribution of a Background Information Document (BID) which provided information regarding the proposed construction of a water pipeline. Stakeholders were also sent a map indicating the proposed pipeline route. BIDs were hand delivered at the clinic, church, and the Middelburg Mine Combined School at Naledi Village. Copies of the BID were also left at the security office at the MWRP. A copy of the BID is attached to this report as **Appendix C-2.**
- A media advertisement **(Appendix C-3)** describing the proposed project and listed activities which will be triggered by the proposed project was placed in the Middelburg Observer on 18 October 2013.The contents of the media advertisements were in accordance to the requirements as stipulated by NEMA.
- Notice Boards **(Appendix C-4)** were placed in conspicuous places within the vicinity of the proposed project site on 15 October 2013 to invite stakeholder participation, refer to **Figure 6-2** below for proof of placement of notice boards.

Figure 6-2: Proof of placement of site notices

6.3 Obtaining comment and contributions

The following opportunities were available for contribution from the I&APs:

- Completing and returning the registration/comment sheets on the BID and the Draft BAR on which space was provided for comment;
- Providing comments telephonically or by email to the public participation office;
- Providing comments when the BID was hand delivered to residents at Naledi Village; and
- Telephonic, fax or email response on the notice boards or media advertisements placed and published.

6.4 Draft Basic Assessment Report Availability

The Draft BAR was available for public review and comment from 21 July 2014 –29 August 2014 (40 days commenting period). All stakeholders on the database were forwarded a notification letter to inform them of the availability of the Draft BAR for public review and comment.

The Draft BAR was distributed for comment as follows:

- Placed at the Middelburg Public Library: Wanderers Avenue, Middelburg;
- Placed at the eMalahleni Public Library: Corner Hofmeyer and Elizabeth Street, Emalahleni;
- Published on the Jones and Wagener website;
- Mailed to key stakeholders; and those who requested to be sent a copy of the report.

I&APs were able to comment on the report in various ways, such as completing the comment sheet accompanying the report, and submitting individual comments in writing by fax or email.

6.5 Final Basic Assessment Report (FBAR)

The Draft BAR has been updated with additional issues raised by I&APs during the public review period. The Final BAR is available for public review and comment at the Middelburg and eMalahleni public libraries from 12 November to 2 December**.** All stakeholders have been notified of the availability of the Final BAR by means of a notification letter in the same manner as the Draft BAR.

6.6 Notification of the Environmental Authorisation

A notification on the decision on whether or not to grant an EA for the proposed project will be compiled and sent to stakeholders to inform them of the decision and the process to appeal against the decision. An advertisement will also be placed in the local newspaper to publish the decision by the competent authority

6.7 PP Conclusion

The public participation process for the proposed project was conducted in such a way that all I&APs were provided with a platform to raise their issues and concerns regarding the proposed project. To date, no comments have been received from I&APs.

Comments received from I&APs will be included in the Comments and Response Report which will be updated as the study progresses.

7. NEED AND DESIRABLITY FOR THE PIPELINE

Benefits to be fulfilled by the proposed pipeline construction are:

- Employment opportunities for the duration of the pipeline construction;
- The proposed project will allow for the optimisation of the re-use of treated impacted mining water at Middelburg Colliery. This will reduce the dependence on other water resources and is in line with the environmental principle of treatment and re-use. A shortage of local water resources for utilisation, in the future, can be expected with economic growth. Industrial, mining, agricultural growth and

development already exist as local towns and industries are growing steadily. If these local resources become increasingly saline additional water will have to be imported from other catchments, which may not be possible in the longer term, as these catchments are also over utilised.

J&W has undertaken a detailed assessment of this pipeline on the basis of impacts identified through the public participation in the programme, specialist investigation and the judgement of the J&W project team. It can therefore be concluded that the proposed project is essential to allow the use of treated water in the Middleburg Colliery without drawing water from other water resources, which is imported to the catchment from the Komati River catchment. This will ensure that the demand on external water supplies is lessened.

8. METHODOLOGY FOR IMPACT IDENTIFICATION AND IMPACT ASSESSMENT

The first stage of impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of resources and receiving environments, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change.

The other key stage of impact assessment is ensuring uniformity hence the use of a standard impact assessment methodology. This methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology has been used to describe the impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 8-1.

Table 8-1: Quantitative rating and equivalent descriptors for the impact assessment criteria.

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	Isolated sites / proposed corridor	Incidental
2	LOW	Study area	Short-term
3	MODERATE	Local	Medium-term
4	HIGH	Regional / Provincial	Long-term
5	VERY HIGH	Global / National	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

8.1 Description of the aspects and potential impacts

8.1.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 8-2 below.

Table 8-2: Description of the significance rating scale.

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

8.1.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 8-3**.

Table 8-3: Description of the spatial rating scale.

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed corridor.
3	Local	The impact will affect an area up to 5 km from the proposed corridor.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the corridor.
1	Isolated sites / proposed corridor	The impact will affect an area no bigger than the corridor.

8.1.3 Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 8-4**.

Table 8-4: Description of the temporal rating scale.

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

8.1.4 Degree of Probability

The probability or likelihood of an impact occurring is described as shown in **Table** 8-5 below.

Table 8-5: Description of the degree of probability of an impact occurring.

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

8.1.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 8-6**. The level of detail

for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 8-6: Description of the degree of certainty rating scale.

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

8.2 Determining the impact rating

Once the factors had been ranked for each impact, the environmental significance of each impact could be assessed by applying the Significance Points (SP) formula. The SP formula can be described as:

$$SP = (significance + duration + extent) \times probability$$

The maximum value of SP is 100. Environmental effects could therefore be rated as either very high (VH), high (H), moderate (M), low (L) or very low (VL) significance. Table below indicates the specific values and colour coding associated with significance rating.

Significance Rating	Value (SP)	Colour Code
Very low	0-20	
Low	20-30	
Moderate	30-60	
High	60-80	
Very high	80-100	

The tables below describe the impacts per activity, considering construction, operational, decommissioning and closure phases. These impacts have been rated prior to the application of mitigation measures and were then re-rated after mitigation is implemented.

8.3 Mitigation

In assessing the significance of an impact, natural and existing mitigation is taken into account. Natural and existing mitigation measures are defined as natural conditions,

conditions inherent to the development design and existing management measures that alleviate impacts.

The significance of impacts is assessed taking into account any mitigation measures that are proposed. An EMPr (**Appendix D**), specifying the methods and procedures for managing the environmental impacts of the proposed development, during all phases has been compiled and will be submitted to the competent authority following the final review period. Once approved this EMPr becomes a legal document that must be adhered to by BECSA.

Commissioning, operational and monitoring requirements, targets and responsibilities for those environmental aspects that give rise to potential environmental impacts will be incorporated into the EMPr.

9. ASSUMPTIONS AND LIMITATIONS

For this assessment, the following was assumed:

- Impacts on biota, such as removal of protected plants and disturbance/trapping of animals, have been addressed in the mine EMPR.
- The hunting of animals, and the harvesting and removal of protected plants are addressed in the approved mine EMPR.
- The cleared construction area will be rehabilitated in line with the Environmental Management Programme (EMPr) developed as part of the Basic Assessment environmental authorization process for the construction and operation of the rising main.

10. ASSESSMENT OF IMPACTS

10.1 Introduction

This section contains the assessment of potentially significant positive and negative environmental impacts associated with the project. Specific emphasis will be placed on any relevant environmental, social and economic impacts raised by the stakeholders as well as the significant impact identified from the specialist studies and professional judgement of the EAP team. The objectives of the specialist studies was to determine the significance of the impacts and to promote mitigation measures to reduce the impacts to an acceptable level where required.

All of the identified impacts are assessed below in **Table 10-1** and **Table 10-2**. This is intended to:

- Allow the comparison of the various alternatives of the proposed project, facilitate the comparison of the alternatives and to identify the preferred alternative during the decision making process of the MDEDET; and
- Enable stakeholders to understand the potential impact of the project in their specific area.

All potential environmental impacts have been addressed in this section, according to the adopted methodology for assessing impacts as described in **Section 8.**

10.2 Specialist studies undertaken

Four specialist studies were carried out to inform the EIA / EMP during the assessment of the proposed pipeline **(Appendix B).** The studies that were commissioned for the assessment were the following:

- Heritage Assessment — Dr Julius Pistorius
- Wetland Assessment — Strategic Environmental Focus (SEF)
- Ecological Assessment — Strategic Environmental Focus (SEF)
- Paleontological Assessment — Prof. Marion Bamford

Each of the specialist studies assessed the impacts of both the location alternatives. The recommendations from each of these studies have been extracted and are summarised below

10.3 Planning and design impacts: Alternative 1 and 2

The wetland areas have been assessed by SEF (see **Figure 5-2**). and the HGM 1A and HGM 1B wetlands both have a PES of E. the proposed pipeline Route Alternative 1 will run directly through these wetlands (North to South).

The clearing of the construction corridor may lead to the disturbance of riparian and wetland vegetation, which in turn will lead to habitat destruction. Soil erosion may also occur during this phase.

The dredging (or excavation) of the wetland banks and soils will lead to the removal of topsoil. Once stockpiled this topsoil may erode. Sedimentation may lead to an increase in surface water turbidity especially in the wetlands.

The activities associated with typical construction activities include dust and noise, as well as waste generation. The wetland buffer may be detrimentally impacted upon if the contractor camp is constructed within the buffer area.

Table 10-1 shows the assessment of the potential impacts identified for the proposed pipeline Route Alternative 1. Should Route Alternative 1 be used, the table displays the predicted impact it will have on the surrounding environment. Mitigation measures for each impact are identified and are then incorporated into the impact rating.

The proposed pipeline Route Alternative 2 shown in **Figure 4-2** starts and ends at the same points but as indicated in **Figure 5-2** and **Figure 5-1**, the route avoids the wetlands boundaries but is constructed closer to possible Giant Bullfrog habitat. Similar construction impacts are predicted for Route Alternative 2 as listed above, with the exception of the potentially significant impacts on the wetlands. **Table 10-2** shows the potential impacts for Route Alternative 2 of the proposed pipeline as well as the suggested mitigation measures.

Table 10-1: Assessment of the potential impacts identified for the proposed pipeline Option 1

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
Construction phase - route option 1										
Surface water	Trench excavation may temporarily divert surface water run-off away from wetland areas, especially when in the wetland	Wetland is deprived of surface water	Wetland may be negatively impacted due to lack of surface water which is required to maintain ecological systems.	Significance	2	21	After laying the pipeline, the trenches must be filled back as soon as possible.	Significance	2	12
				Impact/extent	3			Impact/extent	3	
				Duration scale	2			Duration scale	1	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Possible	
	Lay pipeline in drilled cavities at road/railway line and conveyor crossings	Concrete encasement for reinforcement is required for the road crossings	Concrete encasement can divert water away from the wetland which may also cause channelling and erosion.	Significance	2	30	Concrete encasement will only be used at the road crossings. No further mitigation is proposed.	Significance	1	24
				Impact/extent	3			Impact/extent	2	
				Duration scale	5			Duration scale	5	
				Probability scale	3			Probability scale	3	
				Degree of certainty	Possible			Degree of certainty	Possible	
	Mix concrete and pour. This will occur at the crossing points.	The cement in concrete has a high pH and may contain chromium VI	High pH and chromium contamination can alter the characteristics of watercourses	Significance	3	36	Store all building material, such as sand, stone and cement on a tarpaulin or the truck.	Significance	2	8
				Impact/extent	3		Mix concrete on a tarpaulin or plastic sheet outside the delineated watercourse or import ready mix concrete from an external batching plant as required.	Impact/extent	1	
				Duration scale	3		Take care not to spill any cement and concrete on watercourse buffer areas. Clean-up any spills immediately	Duration scale	1	
				Probability scale	4		Remove all excess building material	Probability scale	2	

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
				Degree of certainty	Probable			Degree of certainty	Unsure	
	Excavation of banks and soils of wetlands for pipeline trench	Excavation will lead to stockpiling of soils and loosening soils. Use of heavy machinery may be required.	Loose soils erode easily and can cause sedimentation in wetlands. Presence of machinery has potential to leak and pollute any surface water	Significance	3	36	As soon as the sections of pipeline have been laid, the disturbed areas must be stabilised to prevent erosion. The soil stockpiles should not be located within any drainage lines, i.e. place them on higher ground, near the catchment boundary, where possible. Flow diversion berms can be constructed around the stockpiles where necessary, in order to limit the potential for the erosion of these stockpiles. Heavy machinery must be serviced regularly (outside watercourses and wetland buffer zones) to prevent leakages. Any Spills are to be cleaned up immediately and reported.	Significance	2	18
				Impact/extent	3			Impact/extent	2	
				Duration scale	3			Duration scale	2	
				Probability scale	4			Probability scale	3	
				Degree of certainty	Probable			Degree of certainty		
Wetlands	Strip 30m wide construction corridor	The construction corridor will require removal of large patches of vegetation and disruption of topsoils in some cases within a wetland.	Construction corridor can divert surface water run-off away from a watercourse. Corridor can impede shallow seepage, which feeds the wetland. Silt can wash from corridor into wetland	Significance	3	36	Implement storm water management measures	Significance	2	18
				Impact/extent	3			Impact/extent	3	
				Duration scale	3			Duration scale	1	
				Probability scale	4			Probability scale	3	
				Degree of certainty	Possible			Degree of certainty	Possible	
	General construction activities on site	General waste created may be placed in the wetland	Waste may impede on flow of surface water and could alter the characteristics and water quality of a watercourse	Significance	4	33	The environmental induction training must address the use and management of sanitation facilities and general site management. All rubbish and rubble must be collected in separate, demarcated areas outside of Wetlands and wetland buffer zone. Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil. Oil-water separators will be constructed at the exit of each bunded area.	Significance	1	8
				Impact/extent	3			Impact/extent	2	
				Duration scale	4			Duration scale	1	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Vegetation				Significance	4	36		Significance	3	21

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
	Strip 30m wide construction corridor	Ecologically sensitive areas containing threatened species may be present within the corridor where large strips of vegetation are removed or damaged.	Construction of the pipeline may result in a loss of habitat and potential loss of red data species	Impact/extent	3		The footprint of vegetation clearance should be minimised as far as possible and the cleared or disturbed areas must be rehabilitated as soon as possible after clearing. This can be done by excavating the trenches in sections and rehabilitating as the construction progresses along the route. Any red data species encountered along the route must be relocated.	Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	4			Probability scale	3	
				Degree of certainty	Possible			Degree of certainty	Possible	
Palaeontology	Excavation of banks and soils for pipeline trench	Fossils may occur in that area despite it already being heavily transformed. Digging and drilling under roads may expose fossils.	Disturbance of paleontological resources due to digging of pipeline trenches	Significance	2	8	If fossils are excavated during construction of the proposed pipeline, it is recommended that the fossils be rescued and donated to a recognised research or storage facility acknowledged by SAHRA. If it is discovered that unusual fossils occur in the affected area (this can be determined by sending photographs of fossils to a professional palaeobotanist) then a site visit and rescue project will be necessary.	Significance	2	8
				Impact/extent	1			Impact/extent	1	
				Duration scale	1			Duration scale	1	
				Probability scale	2			Probability scale	2	
				Degree of certainty	Unsure			Degree of certainty	Can't know	
Socio-economic	General construction activities on site	Workers will be required to construct the pipeline	The construction of the pipeline will result in positive impact on livelihoods and the local economy due to the creation of jobs	Positive impact: Project workers should be sourced from local communities where possible and local business should be supported where possible.						
Fauna	General construction activities on site	Machinery and influx of workers on site for the pipeline construction	Increase in activity in the area may result in a decrease in fauna numbers along the pipeline route during construction	Significance	3	24	Disturbance to faunal species should be minimised by timing the construction phase to take place in winter. Most species are less active during this period and are not in breeding cycles. Where animals are encountered, they are to be left alone or reported to the environmental officer to be safely removed.	Significance	2	12
				Impact/extent	3			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
Heritage	Excavation of banks and soils for pipeline trench and general construction activities on site	Heritage resources may occur in that area despite it being largely disturbed mine land.	In the event heritage resources are found, removal of heritage artefacts due to influx of worker activity in the area may occur	Significance	2	8	SAHRA must be contacted in the event of any heritage findings, or if relocation or protection of resources is needed.	Significance	2	8
				Impact/extent	1			Impact/extent	1	
				Duration scale	1			Duration scale	1	
				Probability scale	2			Probability scale	2	
				Degree of certainty	Unsure			Degree of certainty	Unsure	
Dust and Noise	General construction activities on site	Trench digging and construction vehicles and machinery operating in road reserves and travelling on unpaved roads may stir up dust and may create noise.	Dust and noise created may disturb plants, wetlands, animals, workers and surrounding farms	Significance	4	27	The clearing of vegetation should take place immediately prior to construction in order to minimise the period of time the soil is bare for. As soon as the sections of pipeline have been laid, the disturbed areas must be stabilised to prevent dust. Vehicles driving on unpaved roads should drive cautiously to minimise dust generation. Equipment and machinery must be maintained and operational hours must be controlled. Site workers should undergo environmental induction training to address correct conduct and keeping noise levels minimal.	Significance	2	14
				Impact/extent	3			Impact/extent	3	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Possible	
Operational phase - route option 1										
Water quality	Pipe water released into the catchment:	General operation	If the pipes leak or burst, there will be no impact on surface runoff as the entire length of the pipeline will be buried. In addition, the water quality from the various sources will not negatively impact on the environment	Significance	3	21	No surface water mitigation measures are required as the water being piped does not pose a threat to the surface water quality if released. In case of a pipe burst during the operational phase of the pipeline the Operational Manager should be contacted. The Mine Engineer or Operational Manager will contact a contractor certified to handle pipeline repairs, who will undertake the repairs.	Significance	2	8
				Impact/extent	2			Impact/extent	1	
				Duration scale	2			Duration scale	1	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Socio economic		For monitoring of leaks and	Employment and related wage benefits for permanent	Significance			Positive impact therefore no mitigation required			
				Impact/extent						

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
	General operational activities on site	operational maintenance, workers may be required	workers and their associated communities	Duration scale						
			Potential education opportunities for skill transferral during employment	Probability scale						
				Degree of certainty						
Decommissioning phase - route option 1										
Vegetation	General decommissioning activities on site	Movement of any machinery or workers can damage rehabilitated vegetation. Any rubble generated may damage vegetation	Decommissioning of pipeline may result in a loss of habitat and potential loss of red data species	Significance	3	21	Any vegetation clearance should be minimised as far as possible and the cleared or disturbed areas must be rehabilitated as soon as possible. Any red data species encountered along the route must be treated with caution and may have to be relocated.	Significance	2	12
				Impact/extent	2			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Soils erosion	General decommissioning activities on site	Excavation, if required, will lead to displacement of soils and loosening soils.	Loose soils erode easily and can cause sedimentation.	Significance	3	14	The decommissioning activities should occur during the winter months, as far as possible, since this area is classified as a summer rainfall region. Any excavated soil should not be located within any drainage lines.	Significance	2	12
				Impact/extent	2			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	2			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Surface water	General decommissioning activities on site	Water from the pipeline may still be present in the pipe and in the event of excavating the	Spilled water near water courses may increase sedimentation and turbidity	Significance	3	14	Ensure the pipeline is empty before decommissioning. All activities should occur in the dry season to limit the effect of rainfall causing erosion and increased suspended solids in the watercourses.	Significance	1	6
				Impact/extent	2			Impact/extent	1	
				Duration scale	2			Duration scale	1	
				Probability scale	2			Probability scale	2	

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
		pipe, water may be spilled		Degree of certainty	Possible			Degree of certainty	Unsure	
Wetlands	General decommissioning activities on site	Movement of any machinery or workers can damage rehabilitated wetlands. Any rubble generated may damage wetland vegetation	Decommissioning of pipeline may result in a loss of habitat and wetland services	Significance	4	27	Any wetland vegetation clearance should be minimised as far as possible and the cleared or disturbed areas must be rehabilitated as soon as possible. Activities should occur in the dry season if possible.	Significance	3	14
				Impact/extent	3			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	

Table 10-2: Assessment of the potential impacts identified for the proposed pipeline option 2 should it be used

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
Construction phase - route option 2										
Surface water	Trench excavation may temporarily divert surface water run-off away from close by wetland areas	Wetland is deprived of surface water	Wetland may be negatively impacted due to lack of surface water which is required to maintain ecological systems.	Significance	2	24	After laying the pipeline, the trenches must be filled back as soon as possible.	Significance	2	14
				Impact/extent	3			Impact/extent	3	
				Duration scale	3			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Possible	
	Lay pipeline in drilled cavities at road/railway line and conveyor crossings	Concrete encasement for reinforcement is required for the road crossings	Concrete encasement can divert water away from the wetland which may also cause channelling and erosion.	Significance	2	18	Concrete encasement will only be used at the road crossings. No further mitigation is proposed.	Significance	2	18
				Impact/extent	2			Impact/extent	2	
				Duration scale	5			Duration scale	5	
				Probability scale	2			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty		
	Mix concrete and pour. This will occur at the crossing points.	The cement in concrete has a high pH and may contain chromium VI	High pH and chromium contamination can alter the characteristics and water quality of watercourses	Significance	3	24	Store all building material, such as sand, stone and cement on a tarpaulin or the truck.	Significance	1	6
				Impact/extent	3		Mix concrete on a tarpaulin or plastic sheet outside the delineated watercourse	Impact/extent	1	
				Duration scale	2		Take care not to spill any cement and concrete on watercourse buffer areas. Clean-up any spills immediately	Duration scale	1	

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
				Probability scale	3		Remove all excess building material	Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
	Excavation of banks and soils for pipeline trench	Excavation will lead to stockpiling of soils and loosening soils. Use of heavy machinery may be required.	Loose soils erode easily and can cause sedimentation. Presence of machinery has potential to leak and pollute any surface water	Significance	3	21	As soon as the sections of pipeline have been laid, the disturbed areas must be stabilised to prevent erosion. The soil stockpiles should not be located within any drainage lines, i.e. place them on higher ground, near the catchment boundary, where possible. Flow diversion berms can be constructed around the stockpiles where necessary, in order to limit the potential for the erosion of these stockpiles. Heavy machinery must be serviced regularly (outside watercourses and wetland buffer zones) to prevent leakages. Any Spills are to be cleaned up immediately and reported.	Significance	2	12
				Impact/extent	2			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Vegetation	Strip 30m wide construction corridor	Ecologically sensitive areas containing threatened species may be present within the corridor where large strips of vegetation are removed or damaged.	Construction of the pipeline may result in a loss of habitat and potential loss of red data species	Significance	3	21	The footprint of vegetation clearance should be minimised as far as possible and the cleared or disturbed areas must be rehabilitated as soon as possible after clearing. This can be done by excavating the trenches in sections and rehabilitating as the construction progresses along the route. Any red data species encountered along the route must be relocated.	Significance	2	12
				Impact/extent	2			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Palaeontology	Excavation of banks and soils for pipeline trench	Fossils may occur in that area despite it already being heavily	Disturbance of paleontological resources due to digging of pipeline trenches	Significance	2	8	If fossils are excavated during construction of the proposed pipeline, it is recommended that the fossils be rescued and donated to a recognised research or storage facility acknowledged by SAHRA. If it is discovered	Significance	2	8
				Impact/extent	1			Impact/extent	1	
				Duration scale	1			Duration scale	1	

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
		transformed. Digging and drilling under roads may expose any fossils.		Probability scale	2		that unusual fossils occur in the affected area (this can be determined by sending photographs of fossils to a professional palaeobotanist) then a site visit and rescue project will be necessary.	Probability scale	2	
				Degree of certainty	Unsure			Degree of certainty	Unsure	
Socio-economic	General construction activities on site	Workers will be required to construct the pipeline	The construction of the pipeline will result in positive impact on livelihoods and the local economy due to the creation of jobs	Positive impact: Project workers should be sourced from local communities where possible and local business should be supported where possible.						
Fauna	General construction activities on site	Machinery and influx of workers on site for the pipeline construction	Increase in activity in the area may result in a decrease in fauna numbers along the pipeline route during construction	Significance	3	24	Where animals are encountered, they are to be left alone or reported to the environmental officer to be safely removed. Where possible construction is to occur in lower breeding seasons.	Significance	2	12
				Impact/extent	3			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Fauna	Excavation of the pipeline trench and scour valves	Machinery and influx of workers on site for the pipeline construction in the vicinity of the possible bullfrog habitat.	Bullfrog habitat may be altered or destroyed with displacement of soils or altered surface water flow that may occur with construction activities.	Significance	3	30	A detailed study for the presence of *Pyxicephalus adspersus* (Giant Bullfrog) must be conducted in the possible bullfrog habitat, to ensure no bullfrogs are present. If they are present a bullfrog specialist needs to be consulted regarding a rescue and relocation plan.	Significance	2	12
				Impact/extent	3			Impact/extent	2	
				Duration scale	4			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Heritage	Excavation of banks and soils for pipeline	Heritage resources may	In the event heritage resources are found,	Significance	2	8		Significance	2	8
				Impact/extent	1			Impact/extent	1	

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
	trench and general construction activities on site	occur in that area despite it being largely disturbed mine land.	removal of heritage artefacts due to influx of worker activity in the area may occur	Duration scale	1		SAHRA must be contacted in the event of any heritage findings, or if relocation or protection of resources is needed.	Duration scale	1	
				Probability scale	2			Probability scale	2	
				Degree of certainty	Unsure			Degree of certainty	Unsure	
Dust and Noise	General construction activities on site	Trench digging and construction vehicles and machinery operating in road reserves and travelling on unpaved roads may stir up dust and may create noise.	Dust and noise created may disturb plants, animals, workers and surrounding farms	Significance	3	24	The clearing of vegetation should take place immediately prior to construction in order to minimise the period of time the soil is bare for. As soon as the sections of pipeline have been laid, the disturbed areas must be stabilised to prevent dust. Vehicles driving on unpaved roads should drive cautiously to minimise dust generation. Equipment and machinery must be maintained and operational hours must be controlled. Site workers should undergo environmental induction training to address correct conduct and keeping noise levels minimal.	Significance	2	12
				Impact/extent	3			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Possible	
Operational phase - route option 2										
Water quality	Pipe water released into the catchment:	General operation	If the pipes leak or burst, there will be no impact on surface runoff as the entire length of the pipeline will be buried. In addition, the water quality from the various sources will not negatively impact on the environment	Significance	2	18	No surface water mitigation measures are required as the water being piped does not pose a threat to the surface water quality if released. In case of a pipe burst during the operational phase of the pipeline the Operational Manager should be contacted. The Mine Engineer or Operational Manager will contact a contractor certified to handle pipeline repairs, who will undertake the repairs.	Significance	2	8
				Impact/extent	2			Impact/extent	1	
				Duration scale	2			Duration scale	1	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Socio economic	General operational activities on site	For monitoring of leaks and operational maintenance,	Employment and related wage benefits for permanent workers and their associated communities	Positive impact therefore no mitigation required						

Potential Risk	Cause	Aspect	Impact	Unmitigated impact rating			Mitigation category reference	Mitigated impact rating		
		workers may be required	Potential education opportunities for skill transferral during employment							
Decommissioning phase - route option 2										
Vegetation	General decommissioning activities on site	Movement of any machinery or workers can damage rehabilitated vegetation. Any rubble generated may damage vegetation	Decommissioning of pipeline may result in a loss of habitat and potential loss of red data species	Significance	3	27	Any vegetation clearance should be minimised as far as possible and the cleared or disturbed areas must be rehabilitated as soon as possible. Any red data species encountered along the route must be treated with caution and may have to be relocated.	Significance	2	12
				Impact/extent	3			Impact/extent	2	
				Duration scale	3			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Soils erosion	General decommissioning activities on site	Excavation, if required, will lead to displacement of soils and loosening soils.	Loose soils erode easily and can cause sedimentation.	Significance	3	14	Any excavated soil should not be located within any drainage lines.	Significance	2	12
				Impact/extent	2			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	2			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	
Surface water	General decommissioning activities on site	Water from the pipeline may still be present in the pipe and in the event of excavating the pipe, water may be spilled	Spilled water near water courses may increase sedimentation and turbidity	Significance	2	21	Ensure the pipeline is empty before decommissioning. All activities should occur in the dry season to limit the effect of rainfall causing erosion and increased suspended solids in the watercourses.	Significance	1	10
				Impact/extent	3			Impact/extent	2	
				Duration scale	2			Duration scale	2	
				Probability scale	3			Probability scale	2	
				Degree of certainty	Possible			Degree of certainty	Unsure	

10.4 No- Go Alternative

Should the pipeline route not be constructed, other means would have to be identified for the transportation of water required by Middelburg Colliery.

If the water is transported by truck the mine's carbon footprint may increase. There may be an increased safety risk to human health as more than 100 round trips will have to be conducted on a daily basis to transport the required 4 Mℓ water to the colliery reservoir.

The No-Go alternative may also increase the carbon footprint of the mine with the need for truck fuel. The socio-economic impact is moderate as jobs can be created such as truck drivers and personnel to maintain a truck fleet. **Table 10-3** shows the potential impacts for the no-go option.

Table 10-3: Assessment of the potential impacts identified for the no-go option of the proposed pipeline

No-go Option								
Potential Risk Nature	Cause	Impact	Significance	Impact Extent / Spatial Scale	Duration Scale	Probability	Degree of Certainty	Impact rating
Construction Phase								
Wetlands	No pipeline constructed	If the no-go alternative is pursued, there will be no construction related impacts on the wetlands. This will leave the wetland soils, vegetation and fauna in their current state.	1	1	3	2	Possible	10
Heritage	No pipeline constructed	If the no-go alternative is pursued, then the construction related impacts will not be realised. There will not be the potential for construction workers in the area to impact on any heritage resources.	1	1	1	2	Probable	6
Fauna and Flora	No pipeline constructed	If the no-go alternative is realised, then the construction-related impacts will not be realised. This will leave the soil, vegetation and fauna in their current state. However alien vegetation will not be controlled in the area.	1	1	2	3	Possible	12
Paleontological impacts	No pipeline constructed	If the pipeline is not constructed, then the construction-related impacts will not be realised. There will be no potential for any paleontological resources to be disturbed by the project, however the disturbance by other activities in the area is still possible. These alternate activities may not be as controlled as the proposed pipeline construction is scheduled to be and may not take the appropriate actions in light of paleontological discoveries.	1	1	1	2	Definite	6
Surface water	No pipeline constructed	If the no-go alternative is selected, then the construction-related impacts will not be realised. There will be no impacts on surface water related to increased erosion and the resultant water turbidity,	1	1	2	3	Probable	12
Socio-economic impacts	No pipeline constructed	Pursuing the no-go alternative in this case means that the positive socio-economic benefits that would come with the job creation, skills transfer and support of the local economy from the pipeline construction, would not be realised.	3	3	2	4	Probable	32
Operational Phase								
Socio-economic impacts	Trucking of water from the MWRP to the Colliery Reservoir	Pursuing the no-go alternative in this case means that positive socio-economic benefits that would come with the job creation (of truck drivers and fleet maintenance personal). Skills transfer and support of the local economy would occur.	Positive impact					

No-go Option								
Potential Risk Nature	Cause	Impact	Significance	Impact Extent / Spatial Scale	Duration Scale	Probability	Degree of Certainty	Impact rating
Human safety	Trucking of water from the MWRP to the Colliery Reservoir	There may be an elevated safety risk to human health as more than 100 round trips will need to be conducted between the MWRP and the Middleburg Colliery Reservoir in order to mobilise 4 Mℓ of clean water per day.	3	4	3	3	Probable	30
Usage of mineral fuels	Trucking of water from the MWRP to the Colliery Reservoir	Increased fuel consumption and fuel costs will be realised in order to power a fleet of trucks on a daily basis.	3	3	3	4	Definite	36
Air Quality	Trucking of water from the MWRP to the Colliery Reservoir	The usage of mineral fuelled trucks may add fumes and carbon to the surrounding air quality. Surrounding people and environments may experience detrimental resulting effects.	4	3	3	3	Probable	30
Decommissioning and Closure Phase								
As no pipeline would be constructed if the no-go option is followed, no decommissioning or closure activities would need to be undertaken.								

11. ENVIRONMENTAL IMPACT STATEMENT

11.1 Summary of key findings of EIA

Both proposed Route Alternatives 1 and 2 have largely low to very low impacts predicted. With mitigation most impacts can be further reduced to very low. Route Alternative 1, however, has moderate impacts on the wetlands and surface water prior to mitigation. Although the wetland that the proposed Route Alternative 1 will cross through, is heavily impacted, further disturbance and degradation should not be allowed. The proposed pipeline Route Alternative 2 does not infringe on the wetland boundary but is within the 500 m buffer zone of it. While the no-go option poses the smallest environmental impacts, it may not be cost effective, will be logistically difficult to manage and poses a significant safety risk to truck drivers due to the large number of trips that will have to be made.

11.2 Inputs and Recommendations by Specialists

11.2.1 Wetland

Recommendations with respect to the wetland assessment and delineation are as follows:

- Avoid all natural wetland habitats delineated in the study area as far as possible. This involves avoiding proposed pipeline route Alternative 1.
- The pipeline design should allow for a continued sub-surface flow of water through use of applicable permeable materials such as gravel.
- Construction should be phased to include rehabilitation of soils and indigenous plants immediately after each excavation. Soils must be removed, stored and replaced in the same sequence as excavated.
- Implement sound storm water management measures and where possible time construction so that construction takes place outside the rainy seasons, thus reducing opportunities for erosion from rainfall events.
- Do not leave soil surfaces open to erosion for lengthy time periods. Sods must be stored and placed back into the trench after sub-soils have been backfilled
- Re-vegetation of disturbed areas must be undertaken with site indigenous species and in accordance with the instructions issued by the Environmental Control Officer (ECO).
- Avoid construction activities in wetlands by properly demarcating areas of no-access.
- All construction materials should be stored outside of wetlands and wetland buffer zones, preferable the MWRP construction camp.
- Backfill must be compacted to form a stabilised and durable blanket; and the current load above the sewer lines must at no time be exceeded.

Based on the proposed activity and taking into consideration the present state of the wetlands and their associated functionality and biodiversity, several potential impacts and mitigation measures were identified. Should the proposed pipeline Route Alternative 2 be utilized with the above identified mitigation measures, the delineated wetlands will be minimally impacted.

11.2.2 Ecological

While the pipeline routes are both situated on largely transformed areas, there are patches of natural grassland that can be conserved. The pipeline routes do traverse areas of high EIS values as well as areas of low concern. At least one species of conservation concern, *Boophone disticha* (Bushman Poison bulb or Tumbleweed or Gifbol), was confirmed in the area and a possible *Pyxicephalus adspersus* (Giant Bullfrog) habitat was identified. Recommendations with respect to the above are:

- Where possible, the pipeline should not traverse areas identified as medium to high sensitivity, but should aim to follow disturbed areas such as roads;
- Where the above is not possible, plant species of conservation concern should be moved from the affected area by a qualified botanist with proven experience before commencement of construction activities;
- Areas of natural vegetation surrounding the construction area of the pipeline should be cordoned off to prevent any vehicles or people from impacting on these areas; and
- It is recommended that the lower laying areas of the game camp is avoided by moving the pipeline onto the higher lying rehabilitated grassland north of the current route. The lower lying areas are likely to support higher diversity. In addition to this, small pools which could be suitable for various amphibian species have been recorded in these low lying areas and although the protected species, *Pyxicephalus adspersus* (Giant Bullfrog) has not been confirmed from the study area, it is preferable that this area is avoided.
- It is further recommended that before any construction commences, a detailed study for the presence of *Pyxicephalus adspersus* (Giant Bullfrog) be conducted in the possible bullfrog habitat, to ensure no bullfrogs are present. If they are indeed present a bullfrog specialist needs to be consulted regarding a rescue and relocation plan.

11.2.3 Heritage

No items classified in the range of heritage artefacts were found along the proposed pipeline routes. There was, consequently no reason from a heritage point of view, for the proposed pipeline routes not to be constructed. If, however, any artefacts are identified during construction, these must be recorded and SAHRA informed.

11.2.4 Palaeontology

After the palaeontological study of the area, it was found that the possibility of fossils occurring in the deep coal deposits in the MWRP area is relatively high. However, as the excavations required for the construction of a pipeline will be shallow (an average of 1 m deep), fossils are unlikely to be encountered. It is highly unlikely that any fossils occur in either of the proposed routes for the pipeline, therefore as far as the paleontological record is concerned, the development may continue. If fossils are encountered during the construction of the pipeline, the environmental management personnel must contact a palaeontologist to collect and remove the fossils to be housed in a SAHRA recognised facility. In this instance a collection permit will have to be obtained from SAHRA.

11.3 Mitigating measures

All mitigation measures included in the above listed **Table 10-1**, **Table 10-2**, **Table 10-3** as well as the below listed mitigation measures form part of the required management required for the construction of the selected alternative. All mitigation measures must be provided to the construction team during the construction phase and the MWRP operating team once the chosen pipeline becomes operative.

Construction Phase

Mitigation measures for the construction phase will include the following:

- Prior to construction, the protection of the wetlands will be discussed with the construction team at a safety toolbox talk;
- The construction area will be demarcated clearly and wetland boundaries closest to construction areas to be marked as 'no access' areas;
- For the clearing of land for the construction road, topsoil stockpiles to be placed down slope side of cleared area to act as berm for intercepting surface water run-off from cleared area. One windrow for topsoil and one for sub-soils must be used.
- No stockpile areas (such as topsoil) will be located outside of the cleared areas along the route. 128 m is the closest distance of the proposed pipeline to a wetland, where the stockpiling must happen outside of the 128 m boundary.
- Operation of equipment will only be allowed within the boundaries of the construction road and pipeline route, which is to be 30 m wide maximum.
- No construction or equipment to cross or enter wetland boundaries at any times. Contractor to be provided with a wetland demarcation drawing;
- No vehicles or equipment will be serviced within the wetland or within 500 m from the edge of the wetland. This is to be done at the MWRP construction yard;
- Storage of construction equipment and material is to be kept as far from wetland boundaries as possible and may not be closer than 128 m from the wetland. Ideally all construction material should be stored at the MWRP construction lay-down area;
- Fuel spillages should be cleaned immediately by removing the source of the spill and then removing the hydrocarbon contaminated soil for disposal at an appropriately licenced waste disposal facility. Hydrocarbon spill kits must be available during the construction period;
- Only fuel bowsers to be used for re-fuelling equipment. No storage of fuel in drums or tanks closer than 500 m from any wetlands;
- All vehicles will use existing service roads (to be widened to 30 m where required) as far as possible and disturbance and trampling of the vegetation in the 128 m buffer zone should be avoided beyond that cleared for construction purposes;
- The trench and other excavations should be backfilled by firstly using the sub-soils and lastly the topsoil layer;
- Where applicable, disturbed zones (i.e. for those areas that will not form part of the operational footprint but which were disturbed as part of the construction activities) will be rehabilitated and re-vegetated using site-appropriate endemic vegetation and/or seed mixes. Plant species of conservation concern should be moved from the affected area by a qualified botanist with proven experience before

commencement of construction activities and should be kept in a nursery and then replanted after construction has been completed;

- Alien vegetation may not be allowed to (re)colonize in any of the disturbed areas. Follow-up inspections and remediation should be carried out if required;
- Rehabilitation of disturbed habitat will commence during and immediately after construction has been completed;
- Vegetation regrowth and cover to be monitored for three growth seasons after construction has taken place. If required, re-vegetation must be carried out at areas where cover is not sufficient;
- No construction camps will be allowed in or within 500 m of the edge of the wetland. The MWRP construction camp must be used;
- Concrete mixing will not take place in or within a minimum of 500 m from the edge of the wetland. Ideally pre-mixed concrete should be brought to the construction site where required from a commercial batch plant Dissipating structures should be built at scour valve chamber outlets to prevent erosion of topsoils;
- Chemical toilets will be provided for employees at the point of construction activity during the construction phase of the pipeline. These must be serviced at regular intervals;
- All species of concern/heritage artefacts/fossils will be made clear to the construction team for easy identification; and
- Should the species Boophane disticha be encountered during construction, they are to be transplanted in a suitable habitat out of the line of the construction path.

Operating Phase

Mitigation activities during the operational phase will include the following:

- The pipeline is to be inspected periodically for leaks;
- Should a significant leak be detected, the alarm will be raised and the line repaired immediately;
- Sufficient spares of the correct specifications must be available in order to repair the line in the shortest space of time possible;
- The areas rehabilitated after construction will be monitored for first three seasons after rehabilitation, while control of alien and invasive vegetation will be done within the overall programme of the Middelburg Colliery EMPR.

Closure phase mitigation measures

The infrastructure associated with the proposed pipeline will be constructed of inert material. At a time that decommissioning is considered, a decision will need to be made on whether the infrastructure will be removed or left in situ. The infrastructure may however be decommissioned and removed, whereby the same the mitigation and management measures provided for during the construction phase will be implemented.

12. OPINIONS AND CONDITIONS ON AUTHORIZATIONS

The opinion of the EAP is based on the alternatives investigated, the baseline environmental conditions, and potential impacts of a water pipeline. It is the opinion of the EAP that the potential impacts from the pipeline, range from very low to moderate

during construction, are very temporary in nature and they can be easily mitigated with the use of pipeline Route Alternative 2, in which case they become impacts of low significance, and post construction and operation rehabilitation as specified.

It is therefore recommended that the proposed pipeline Route Alternative 2 be approved subject to the recommendations of this report.

13. ENVIRONMENTAL AWARENESS PLAN

13.1 Introduction

An Environmental Awareness Plan has been developed for the proposed pipeline in accordance with Regulation 51(b)(vi) of the Mineral and Petroleum Resources Development Regulations (MPRDA) of 2004 and the Environmental Impact Assessment (EIA) Regulations under Government Notice 543, Regulation 33 (j) in terms of the Section 20 of the NEMA.

According to the EIA regulations and Section 39(3)(c) of the MPRDA (2002) any applicant that prepares an Environmental Management Program (EMPR/r), must include with it, an Environmental Awareness Plan. This awareness plan must:

- Outline the manner in which the applicant intends to educate and inform the employees of any potential harm that can be done on the environment or environmental risk by the workings at the proposed operation; and
- Include the way in which pollution and degradation is to be avoided or indicate how the risk must be dealt with in order to avoid the pollution or degradation

13.2 Legal Requirements

The following legislation forms the basis for an Environmental Awareness Plan:

- The Constitution of the Republic of South Africa (Act 108 of 1996);
- National Water Act (Act 36 of 1998);
- Employment Equity Act, 1998 (Act 55 of 1998);
- National Environmental Management Act (Act 107 of 1998);
- Mineral and Petroleum Resources Development Act (Act 28 of 2002);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004);
- National Environmental Management: Air Quality Act (Act 39 of 2004); and
- National Environmental Management Waste Act (Act 59 of 2008).

13.3 Objectives of the Environmental Awareness Plan

The objectives of this Environmental Awareness Plan are to inform employees and contractors of any environmental risks that may result from their work and indicate how they should deal with such risks should they materialise.

The overall purpose of implementing an Environmental Awareness Plan is to optimise the awareness of those partaking in the activities which have the potential to negatively impact on the environment and in doing so, promote the global goal of sustainable development.

13.4 Implementation of the Environmental Awareness Plan and other Training Programmes

BECSA is to ensure that any additional principles derived from the addition of the pipeline are included in any basic induction processes and must be followed by all employees and contractors working on site, including visitors. This induction process must form part of the Environmental Awareness Plan. This induction process should include a brief video or presentation on "Environmental and Community awareness at the Middelburg Water Reclamation Project plant". The video or presentation must be made available on entry to the MWRP (during both construction and operation), upon request and will form the awareness part of the induction procedure for all staff and guests to the MWRP. The subject of the Environmental Awareness Plan is also to be addressed at orientation sessions held on site.

Environmental principles must be communicated effectively to newly appointed employees, employees returning from annual leave, as well as to contractors and visitors upon entering the MWRP. This must be done in conjunction with any other induction or safety awareness education.

The Environmental Awareness Plan/induction process/video presented must include the following concepts:

- Why we need an awareness plan?
- What is the environment?
- Why the environment needs protecting?
- How do we protect and manage our environment?
- Working area management
- Water management
- Floral and faunal management
- Fire management
- Air quality management
- Waste systems
- Incident reporting

A brief outline of what each of the above should entail is provided below.

Why we need an awareness plan?

An EMPr contains various measures to protect the environment. Legally, BECSA must make employees and contractors aware of the commitments made in the EMPr in order for all parties to work towards fulfilling these obligations and thus protecting the environment.

What is the environment?

The environment can be separated into the natural and built environment. The natural environment includes the air, water, soil, plants, animals and people. The built environment in this instance includes the buildings, roads and machinery. Controlling the

environment we are in and in which we interact, forms the basis of environmental management.

Why does the environment need protecting?

We need to be mindful of, and protect the environment for four reasons:

- it provides us with food, water and air to breathe;
- it is our right to a healthy environment;
- the next generation has a right to a healthy environment; and
- the law demands that we protect the environment.

If we fail to protect the environment,

- BECSA may be subjected to a fine; and/or
- Individuals may be removed from site; and/or
- Construction may be stopped.

How can we protect and manage our environment?

To protect our environment; we must:

- report all incidents to a superior,
- work together; and
- follow rules and management measures discussed below.

Working area management

All personnel must stay within demarcated working areas on site. Areas marked as 'no go' must be adhered to. The reason for this is that the sites may be chosen based on having the smallest impact or based on not destroying sensitive landscapes. If these rules are not adhered to, unnecessary damage may be done to the environment and disciplinary action may be taken.

Water management

Water must be saved on site by ensuring taps are closed, ensuring pipes are checked for leaks. Prevention of water pollution needs to be undertaken by preventing spillage of oils and diesel. This is crucial as water is a scarce resource and a non-renewable resource.

Floral and faunal management

Any animals on site must not harmed or killed but rather should be removed safely when found. Similarly no trees, shrubs or grasses may be removed or killed without permission. Animals and plants play a role in the environment even they are deemed pests to humans. It is part of the promise to protect the environment that protects plants and animals too.

Fire management

Matches and cigarette butts must be disposed of in demarcated areas and bins provided. No fire including matches are allowed near fuels such as diesel. Rubbish must not burned and personnel must be aware of the location of the nearest fire safety equipment. Fires can be difficult to control and may cause explosions that can burn people, damage equipment and reduce the safety of the surrounding areas.

Air quality management

Dust creation should be prevented or minimised as far as possible. Dust can be suppressed by watering of roads. Dust causes irritation to lungs and eyes. It also reduces visibility on site which can be dangerous to drivers and pedestrians. This may cause result in damage to the surrounding people and environment.

Waste systems

Any waste generated must be stored properly and disposed of in the correct manner. This includes hazardous wastes such as sewage and by products or non-hazardous wastes such as food packaging, litter. Waste that is not disposed of correctly can cause pollution or harm to people and the natural environment.

All incidents must be reported.

Any problem such as water leaks, oil spilled, waste leaked must be reported to a manager or the responsible officer. Always report incidents with date, time, location and brief descriptions.

The awareness training of employees, contractors and visitors will help to ensure that co-operation in terms of environmental management will occur. In addition, it will ensure the success of the pipeline regarding compliance with legislation, and avoid possible future disciplinary and legal action from a lack of awareness on the site.

14. CONCLUSIONS

The MWRP is treating impacted mine water for discharge back into the surrounding catchment of Middelburg. The requirement of Middelburg Colliery of 4 Mℓ per day of the treated water for use in the colliery is an example of sustainable use of resources. BECSA intends to construct a water pipeline from MWRP to Middelburg Colliery Reservoir. A pipeline with an approximate length of 4600 meters and diameter of 315 mm will be run between the two entities crossing land containing wetlands, railway line, power lines, rehabilitated land and conveyors.

Following the Screening phases and the subsequent DBAR, it has come to light that from an ecological perspective Alternative 2 is the most preferable after mitigation. However, from an environmental perspective prior to mitigation there is no material difference between Alternative 1 and 2. The impact assessment conducted in Section 10 details construction, operational and decommissioning impacts associated with all pipeline activities. Using other means of transport for the required quantity of water, besides the proposed pipeline, may not be viable from a financial perspective and human safety perspective.

Two potential alternatives were outlined and assessed for the extent of potential impacts. Impacts that have been identified will require careful mitigation and management. These impacts include the following:

- Impacts on fauna and flora;

- Impacts on surface water quality as a result from the proposed activities;
- Noise levels during the construction; and
- Impact on the wetland areas.

The most critical of these impacts remains the ecological impact on the delineated wetland areas and vegetation. Given the size of the disturbance along with the rehabilitation and re-vegetation measures, the impact will be short-lived and normal functioning can largely be restored provided the listed mitigation measures are carried out. The two location alternatives have been discussed and assessed and second Alternative 2, which avoids the wetland boundaries has been selected as the preferred route for authorization.

Given the information provided, it is recommended that the Alternative 2 pipeline route be approved.

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Appendix A

ENGINEERING DESIGNS

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Appendix B

SPECIALIST STUDIES

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Appendix C

PUBLIC PARTICIPATION DOCUMENTS

APPENDIX C – Public Participation

C.1 I&AP Database

C.2 Background Information Document

C.3 Media Advert

C.4 Proof of placement of site Notices

C.5 Comments from Stakeholders: Middelburg Chamber of Commerce & Industry

C.6 Comments from Stakeholders: Johan Muller

C.7 Project registration form and notification to land owners

C.8 Comments from stakeholders: Eskom

C.9 Comments and response report

Appendix D

ENVIRONMENTAL MANAGEMENT PROGRAM