mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Basic Assessment Report
and
Environmental Management Programme

for decommissioning of an access road, conveyor belt servitude and the rehabilitation of a quarry at Twistdraai East Shaft, Twistdraai Colliery, Mpumalanga

DRAFT REPORT FOR PUBLIC REVIEW

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 (ACT NO. 59 OF 2008) (NEM:WA) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 OF 2002) (MPRDA) (AS AMENDED).

Name of Applicant:	Sasol Mining (Pty) Ltd
Tel no:	+27 16 970 6491
Fax no:	+27 11 522 0001
Physical Address:	Sigma Colliery, 137 Saltberry Plain, Sasolburg, 9570
File Reference Number SAMRAD:	MP 30/5/1/2/3/2/1(138) EM

Digby Wells and Associates (South Africa) (Pty) Ltd. Co. Reg. No. 2010/008577/07. Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191. Private Bag X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax: +27 11 069 6801, info@digbywells.com, www.digbywells.com

Directors: GE Trusler (C.E.O), LF Stevens, J Leaver (Chairman)*, NA Mehlomakulu*, DJ Otto

*Non-Executive

This document has been prepared by Digby Wells Environmental.

Report Type:	**BAR and EMP**
Project Name:	**Basic Assessment Report for the Decommissioning of an Access Road, Conveyor Belt Servitude and the Rehabilitation of a Quarry at Twistdraai East Shaft, Mpumalanga Province**
Project Code:	**SAS5544**

Name	Responsibility	Signature	Date
Anela Sotashe	Report Compiler		June 2019
Claire Wannenburgh	Project Manager		July 2019
Barbara Wessels	Project Reviewer		July 2019

IMPORTANT NOTICE

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

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

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

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

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

OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

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

- determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- identify the alternatives considered, including the activity, location, and technology alternatives;
- describe the need and desirability of the proposed alternatives,
- through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
- the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
- the degree to which these impacts—
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be managed, avoided or mitigated;
- through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
  - identify and motivate a preferred site, activity and technology alternative;
  - identify suitable measures to manage, avoid or mitigate identified impacts; and
  - identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Sasol Mining (Pty) Ltd (hereinafter Sasol Mining), is the holder of a mining right for coal with Department of Mineral Resources (DMR) reference number MP 30/5/1/2/2/138 MR (known as the Secunda Complex) over various farms and collieries, which include the Twistdraai Colliery where mining activities have ceased and rehabilitation is being attended to

Sasol Mining currently operates six coal mines that supply feedstock (coal) for their Secunda (Sasol Synfuels) and Sasolburg (Sasolburg Operations) complexes in South Africa.

As part of daily management of the different shaft areas, the Secunda Complex has been subdivided, with each of the shaft areas having its own separate Environmental Management Programme (EMPR). The Twistdraai Colliery's EMPR with DMR reference number: MP 30/5/1/2/3/2/1(138) EM was amended and submitted to the DMR in 2010. The DMR approved the EMPR amendment on 29 February 2012.

The Twistdraai Colliery is made up of three separate shafts namely:

- Twistdraai West Shaft;
- Twistdraai East Shaft; and
- Twistdraai Central Shaft.

Of these three shafts two (namely Central and West Shaft) have been decommissioned, partially rehabilitated or renovated for alternative purposes. The Twistdraai East shaft is the last shaft to be decommissioned with most of the infrastructure already being decommissioned. The decommissioning of the infrastructure located at all of these shafts was undertaken in accordance with its approved Amended EMPR, approved in 2012 (Ref No. MP 30/5/1/2/3/2/1(138) EM).

This application relates specifically to the decommissioning activities (access road, conveyor belt servitude and quarry) to be undertaken at Twistdraai East Shaft which triggers listing activities under the Environmental Impact Assessment (EIA) Regulation 2014 (as amended) Government Notice No. R982 of 4 December 2014 as amended by Government Notice No. 326 of 7 April 2017) referred to now as the EIA Regulations, 2014 (as amended) and therefore requires both an Environmental Authorisation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and a General Authorisation in accordance with the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

Project Applicant

The details of the Project applicant are included in the table below.

Company name:	Sasol Mining (Pty) Ltd
Contact person:	Jacques du Plessis
Physical address:	Twistdraai Colliery, Twistdraai, Trichardt, 2300
Telephone:	+27 17 614 7063
Cell phone:	+27 79 505 7602
Email:	jacques.duplessis@sasol.com

Environmental Consultants

Contact details for the independent EAP are provided in the table below.

Company name:	Digby Wells and Associates (South Africa) (Pty) Ltd (trading as Digby Wells Environmental)
Contact person:	Claire Wannenburgh
Physical address:	Digby Wells House, Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191
Telephone:	011 789 9495
Email:	Claire.Wannenburgh@digbywells.com

Project Overview

The Twistdraai East Shaft has been demolished and sealed with most of the ancillary infrastructure removed and areas rehabilitated. However, the removal of the remaining infrastructure requires Environmental Authorisation before the infrastructure can be decommissioned. The activities to be undertaken which may require Environmental Authorisation are listed below:

- Decommissioning and rehabilitation of an access road and associated culverts which was constructed between Mynpad Road and the Twistdraai East Shaft which permits access to the Shaft;

- Decommissioning and rehabilitation of the conveyer belt servitude including access/service road, water supply pipeline[1] and culverts which was previously utilised as supporting secondary infrastructure to convey coal from Twistdraai Colliery to Twistdraai Export Plant; and
- Infilling and rehabilitation of a quarry located near the conveyer belt servitude.

Approach and Methodology for the Public Participation Process

The Public Participation Process (PPP) was developed to ensure compliance with the environmental regulatory requirements and to provide Interested and Affected Parties (I&APs) with an opportunity to evaluate the Project. During this process stakeholders can provide input and to receive feedback from the environmental specialists and/or proponent.

This Draft Basic Assessment Report (BAR) is available for public comment for a period of 30 days and all comments or concerns raised will be recorded and responded to in the Comments and Reponses Report (CRR). The 30-day period is from **Wednesday, 24 July 2019** to **Friday, 23 August 2019.**

The following activities were undertaken to announce the Project and initiate the Basic Assessment Phase:

- A Background Information Document (BID) was distributed on 24 July 2019 via Email;
- Newspaper advertisement was placed in the Ridge Times on 24 July 2019**;**
- An announcement letter including a registration form was distributed to identified I&APs via email on 24 July 2019;
- Site notices were placed around the site on 23 July 2019; and
- Two hard copies of the Draft BAR were made available at the Trichardt Public Library and Secunda Public Library from the 23 July 2019. An electronic copy was made available on the Digby Wells website www.digbywells.com (under Public Documents).

Once the commenting period is reached the Draft BAR will be updated and submitted to the DMR for consideration. Simultaneously, the Final BAR will be made available to I&APs on the Digby Wells website and I&APs will be informed of such by means of a letter (email and post). This enables I&APs to verify that their comments have been captured and responded to accordingly.

[1] It must be noted that the decommissioning of the water supply pipelines will only take place where it daylights over various tributaries. The remaining pipelines which are located beneath ground level will not be disturbed or removed during the decommissioning process.

Impact Assessment

It is anticipated that the decommissioning and rehabilitation phase will have initial negative impacts as any movement or disturbance to the environment will result in increased sedimentation and potential erosion especially as the activities to be undertaken occur with a watercourse. However, in the long term once the area has been rehabilitated, vehicles removed from site and the vegetation has been re-established all the potential impacts will stop.

Decommissioning Phase

Impacts associated with the decommissioning phase include compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation. This will have an impact on soils, watercourses, wetlands and the aquatic environment in the decommissioned areas and resulting in impacts further downstream.

Any temporary storage or dumping of decommissioned infrastructure within wetland, aquatic environments or watercourses, has the potential to result in loss of stream connectivity, loss of refuge areas, alterations to the terrain profiles of the area and the creation of preferential flow paths. The removal of vegetation and disturbance of soil while the infrastructure is being decommissioned may result in sedimentation, alterations to the vegetation structure of the area, encourage alien vegetation encroachment and result in increased erosion and sedimentation potential.

Additionally, there are also minor potential impacts to soil and water quality because of the ingress of hydrocarbons and mechanical spills associated with moving machinery required for the decommissioning activities.

Mitigation measures provided are predicted to limit the associated impacts from a minor concern to a negligible concern, especially as most of the watercourses crossing points are already impacted from a morphological perspective.

Rehabilitation Phase

Impacts associated with the rehabilitation phase include potential loss of natural vegetation and the increased potential for erosion and sedimentation of the rehabilitated areas. This can result in impacts to water users further downstream.

Removal of vegetation and disturbance of soils during shaping and ripping is likely to give rise to an increased potential for erosion and sedimentation. Encroachment by robust pioneer species and alien invasive species is possible which may further alter the natural vegetation profiles of the wetlands, surface water and aquatic ecology.

However, soil ripping will alleviate compaction in surface soil layers and have little to no effect on deeper soil compaction. Successful re-vegetation of all disturbed areas with indigenous vegetation species can reduce the significance of erosion and compaction to low; therefore, improving the soil status. The focus should be to limit runoff from the ripping and profiling activities which consequently should limit erosion and sedimentation in the associated watercourses.

As this Project is a rehabilitation Project, long term positive impacts are deemed highly likely, should the rehabilitation be done correctly and in adherence to the mitigation measures outlined in this report. Thereby the Project will ultimately improve the wetland, water courses, aquatic environments and soils within the rehabilitated footprint area.

Conclusions and Recommendations

Section 24 of the Constitution stipulates that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected through reasonable legislation and other measures that prevents pollution and ecological degradation.

Sasol Mining are committed to ensuring that correct decommissioning and rehabilitation measures executed at the Twistdraai Colliery are implemented to ensure the environment is preserved for future generations. The Project is a decommissioning and rehabilitation Project with the aim to ensure all mining infrastructure is removed with minimal impact to the surrounding environment and ensure the area is rehabilitated to an acceptable standard in accordance with NEMA, Duty of Care and the Chamber of Mines Guideline. Thereby reducing the impact to the environment caused by previous mining activities. The Project aims to have an overall positive impact on the surrounding environment and people.

The Project is considered to have a positive impact on the livelihoods of the directly and indirectly affected landowners as areas which were previously utilised for mining will now be rehabilitated and changed back to its original or as close as possible to its original land use which in most cases along the conveyor belt will be grazing land.

The following positive impacts are anticipated should the Project be implemented:

- Removal of the culverts will encourage more natural flow of the water courses and reduce erosion leading to improved water quality;
- The conveyor servitude which is currently compacted and un-vegetated will be ripped and vegetated with an indigenous seed mix reducing erosion and encouraging a more natural environment;
- Mining infrastructure which is an eye sore will be removed and improve the aesthetics of the area;
- The sites will be re-profiled to ensure a natural flow and free drainage environment; and
- The quarry will be infilled to ground level and vegetated which in doing so will prevent future impact on the environment through the extension of the pit's footprint which could disturb the surrounding environment further or create a health and safety risk to people and animals in the area.

The Project aims to have an overall positive impact as all mining related infrastructure will be removed and the rehabilitated area will be able to recover thereby improving the aquatic, wetland, soils and surface water environments. Therefore, it is recommended that the Project is approved if the mitigation measures proposed in this report are implemented.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF PLANS

LIST OF ABBREVISATIONS

Acronym	Description
ASPT	Average Score Per Taxon
BA	Basic Assessment
BAR	Basic Assessment Report
BID	Background Information Document
CBAs	Critical Biodiversity Areas
cm	Centimetre
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESAs	Ecological Support Areas
EIS	Ecological Importance and Sensitivity
FRAI	Fish Response Assessment Index
GSDM	Gert Sibande District Municipality
GMLM	Govan Mbeki Local Municipality
IHAS	Invertebrate Habitat Assessment System
I&APs	Interested and Affected Parties
IWUL	Integrated Water Use licence
km^2	Kilometre
LOM	Life of Mine
MAE	mean annual evaporation
MAR	Mean annual runoff
MAP	mean annual precipitation
MIRAI	Macroinvertebrate Response Assessment Index
m	Metres
Mamsl	Metres above mean sea level
mm	Millimetre
MPRDA	Mineral and Petroleum Resources Development (Act 28 of 2002)

Acronym	Description
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act (Act 39 of 2004)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategies
NHRA	National Heritage Resources Act (Act 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act (Act 36 of 1998)
PES	Present Ecological State
PPP	Public Participation Process
PRECIS	Pretoria Computerised Information System
RE	Remaining Extent
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SASS5	South African Scoring System, Version 5
SSC	Species of Conservation Concern
WUL	Water Use Licence
WULA	Water Use Licence Application
WMA	Water Management Area
WML	Waste Management Licence

Part A: Scope of Assessment and Basic Assessment Report

1 Introduction

Sasol Mining (Pty) Ltd (hereinafter Sasol Mining), is the holder of a mining right for coal with Department of Mineral Resources (DMR) reference number MP 30/5/1/2/2/138 MR (known as the Secunda Complex) over various farms and collieries, which include the Twistdraai Colliery where mining activities have ceased and rehabilitation is being attended to

Sasol Mining currently operates six coal mines that supply feedstock (coal) for their Secunda (Sasol Synfuels) and Sasolburg (Sasolburg Operations) complexes in South Africa.

As part of daily management of the different shaft areas, the Secunda Complex has been subdivided, with each of the shaft areas having its own separate Environmental Management Programme (EMPR). The Twistdraai Colliery's EMPR with DMR reference number: MP 30/5/1/2/3/2/1(138) EM was amended and submitted to the DMR in 2010. The DMR approved the EMPR amendment on 29 February 2012.

The Twistdraai Colliery is made up of three separate shafts namely:

- Twistdraai West Shaft;
- Twistdraai East Shaft; and
- Twistdraai Central Shaft.

Of these three shafts two (namely Central and West Shaft) have been decommissioned, partially rehabilitated or renovated for alternative purposes. The Twistdraai East shaft is the last shaft to be decommissioned with most of the infrastructure already being decommissioned. The decommissioning of the infrastructure located at all of these shafts was undertaken in accordance with its approved Amended EMPR, approved in 2012 (Ref No. MP 30/5/1/2/3/2/1(138) EM).

This application relates specifically to the decommissioning activities (access road, conveyor belt servitude and quarry) to be undertaken at Twistdraai East Shaft which triggers listing activities under the Environmental Impact Assessment (EIA) Regulation 2014 (as amended) Government Notice No. R982 of 4 December 2014 as amended by Government Notice No. 326 of 7 April 2017) referred to now as the EIA Regulations, 2014 (as amended) and therefore requires both an Environmental Authorisation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and a General Authorisation in accordance with the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

The Twistdraai East Shaft has been demolished and sealed with most of the ancillary infrastructure removed and areas rehabilitated. However, the remaining infrastructure required Environmental Authorisation before the infrastructure can be decommissioned. The following activities are to be undertaken which may require Environmental Authorisation which will hereafter be referred to as the Project are listed below:

- Decommissioning and rehabilitation of an access road and associated culverts which was constructed between Mynpad Road and the Twistdraai East Shaft which permits access to the Shaft;

- Decommissioning and rehabilitation of the conveyer belt servitude including access road, water supply pipeline[2] and culverts which was previously utilised as supporting secondary infrastructure to convey coal from Twistdraai Colliery to Twistdraai Export Plant; and
- Infilling and rehabilitation of a quarry located near the conveyer belt servitude.

The Project is a decommissioning and rehabilitation Project with the aim to ensure all mining infrastructure is removed with minimal impact to the surrounding environment and ensure the area is rehabilitated. Thereby reducing the impact to the environment caused by previous mining activities. The Project aims to have an overall positive impact on the surrounding environment.

2 Project applicant

Sasol Mining is the proponent in this application. The details of the applicant are presented in Table 2-1.

Table 2-1: Contact details of the Applicant

Name of Applicant:	Sasol Mining (Pty) Ltd		
Registration number (if any):	1950/038590/07		
Contact person:	Jacques du Plessis		
Physical address:	Twistdraai Colliery, Twistdraai, Trichardt		
Postal code:	2300	**Cell:**	Cell phone: +27 79 505 7602
Telephone:	+27 17 614 7063	**Fax:**	-
Email:	jacques.duplessis@sasol.com		

2.1 Details of EAP

Digby Wells Environmental has been appointed by Sasol Mining as the Environmental Assessment Practitioner (EAP) to manage the application processes. The details of the EAP are contained in Table 2-2 and the Curriculum Vitae and EAP qualifications are attached in Appendix A.

[2] It must be noted that the decommissioning of the water supply pipelines will only be decommissioned where it daylights over various tributaries. The remaining pipelines which are located beneath ground level will not be disturbed or removed during the decommissioning process.

Table 2-2: Contact details of the EAP

EAP Company Name:	Digby Wells Environmental
Name of Practitioner:	Claire Wannenburgh
Telephone:	011 789 9495
Fax:	011 069 6801
Email:	Claire.Wannenburgh@digbywells.com
Physical Address:	Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191, South Africa.
Postal Address:	Private Bag X10046, Randburg, 2125

2.2 Expertise of the EAP

This section provides details regarding the EAP's qualifications and experience.

2.2.1 The qualifications of the EAP

Claire Wannenburgh holds the following qualifications:

- BSc Environmental Science – University of Pretoria, 2012; and
- BSc Honours (Environmental Analysis and Management) – University of Pretoria, 2013.

2.2.2 Summary of the EAP's Experience

Claire Wannenburgh is a consultant at Digby Wells within the Compliance Department. She holds a BSc (Hons) in Environmental Analysis and Management from the University of Pretoria where she majored in Environmental Impact Assessment, Auditing and Environmental Law. She has six years work experience specifically in legal compliance and environmental management. Claire has managed various Environmental Audits and Water Use Licence (WUL) Audits and has worked as an Environmental Control Officer. She has also managed high profile Environmental Impact Assessments; Basic Assessments; WUL and Permitting Applications; Environmental Management Programme Amendments; Green Star Environmental Management Programmes and Auditing. Claire is also ISO14001 certified as an internal lead auditor.

3 Location of the overall Activity

Table 3-1 below provides the property details associated with the activities under application.

Table 3-1: Property details

<table>
<tr><td>Farm Name:</td><td>The Project which involves the decommissioning and rehabilitation of the Twistdraai road, Twistdraai conveyer belt servitude and quarry is located on the following properties:
<table>
<tr><th>Farm Name</th><th>Farm Portion</th></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 4 Remaining Extent (RE)</td></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 7 RE</td></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 15 RE</td></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 19</td></tr>
<tr><td>Bosjesspruit 291 IS</td><td>RE</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>Ptn 1 RE</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>Ptn 4</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>Ptn 7 RE</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>Ptn 35</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>Ptn 52</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>Ptn 53</td></tr>
<tr><td>Frischgewaagd 294 IS</td><td>RE</td></tr>
<tr><td>Goedehoop 290 IS</td><td>Ptn 1 RE</td></tr>
<tr><td>Goedehoop 290 IS</td><td>Ptn 5 RE</td></tr>
<tr><td>Goedehoop 290 IS</td><td>Ptn 6 RE</td></tr>
<tr><td>Goedehoop 290 IS</td><td>Ptn 8 RE</td></tr>
<tr><td>Grootvlei 293 IS</td><td>Ptn 13</td></tr>
<tr><td>Grootvlei 293 IS</td><td>Ptn 20 RE</td></tr>
<tr><td>Grootvlei 293 IS</td><td>Ptn 21 RE</td></tr>
<tr><td>Grootvlei 293 IS</td><td>Ptn 29 RE</td></tr>
<tr><td>Grootvlei 293 IS</td><td>Ptn 31</td></tr>
<tr><td>Grootvlei 584 IS</td><td>RE</td></tr>
<tr><td>Poverty Acres 585 IS</td><td>RE</td></tr>
</table></td></tr>
<tr><td>Application Area (Ha):</td><td>The total area which may be impacted by the decommissioning and rehabilitation of the road, conveyer belt servitude and quarry equates to 39.85 ha.</td></tr>
<tr><td>Magisterial District:</td><td>Govan Mbeki Magisterial District.</td></tr>
<tr><td>Distance and direction from nearest town:</td><td>Twistdraai East Shaft is located approximately 15 km South East of the town of Secunda in the Mpumalanga Province.</td></tr>
<tr><td>21-digit Surveyor General Code for each farm portion:</td><td>
<table>
<tr><th>Farm</th><th>Portion</th><th>21 Digit Code</th></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 4 RE</td><td>T0IS00000000029100004</td></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 7 RE</td><td>T0IS00000000029100007</td></tr>
<tr><td>Bosjesspruit 291 IS</td><td>Ptn 15 RE</td><td>T0IS00000000029100015</td></tr>
</table></td></tr>
</table>

	Bosjesspruit 291 IS	Ptn 19	T0IS00000000029100019
	Bosjesspruit 291 IS	RE	T0IS00000000029100000
	Frischgewaagd 294 IS	Ptn 1 RE	T0IS00000000029400001
	Frischgewaagd 294 IS	Ptn 4	T0IS00000000029400004
	Frischgewaagd 294 IS	Ptn 7 RE	T0IS00000000029400007
	Frischgewaagd 294 IS	Ptn 35	T0IS00000000029400035
	Frischgewaagd 294 IS	Ptn 52	T0IS00000000029400052
	Frischgewaagd 294 IS	Ptn 53	T0IS00000000029400053
	Frischgewaagd 294 IS	RE	T0IS00000000029400000
	Goedehoop 290 IS	Ptn 1 RE	T0IS00000000029000001
	Goedehoop 290 IS	Ptn 5 RE	T0IS00000000029000005
	Goedehoop 290 IS	Ptn 6 RE	T0IS00000000029000006
	Goedehoop 290 IS	Ptn 8 RE	T0IS00000000029000008
	Grootvlei 293 IS	Ptn 13	T0IS00000000029300013
	Grootvlei 293 IS	Ptn 20 RE	T0IS00000000029300020
	Grootvlei 293 IS	Ptn 21 RE	T0IS00000000029300021
	Grootvlei 293 IS	Ptn 29 RE	T0IS00000000029300029
	Grootvlei 293 IS	Ptn 31	T0IS00000000029300031
	Grootvlei 584 IS	RE	T0IS00000000058400000
	Poverty Acres 585 IS	RE	T0IS00000000058500000

4 Locality Map

The Project activities subject to this application are being undertaken at the Twistdraai East Shaft which forms part of the greater Twistdraai Colliery. The Project is located approximately 15 km south east of Secunda and 15 km south west of Bethal. The Project is located within the Govan Mbeki Local Municipality (GMLM) in the Gert Sibande District Municipality (GSDM) of the Mpumalanga Province.

The regional and local setting of the Project area is depicted in Plan 1 and Plan 2 respectively; in Appendix B.

4.1 Land Tenure Map

The Land Tenure map for the Twistdraai East Shaft is provided in Figure 4-1 and Plan 3 in Appendix B. Table 4-1 provides a list of all the land owners that are directly affected by the Project.

Table 4-1: Directly affected landowners

Farm	Portion	Landowner Name
Bosjesspruit 291 IS	Ptn 4 RE	Sasol South Africa Pty Ltd
Bosjesspruit 291 IS	Ptn 7 RE	Sasol Mining (Pty) Ltd
Bosjesspruit 291 IS	Ptn 15 RE	Sasol Chemiese Nywerhede Ltd
Bosjesspruit 291 IS	Ptn 19	Republic of South Africa
Bosjesspruit 291 IS	RE	Sasol Mining (Pty) Ltd
Frischgewaagd 294 IS	Ptn 1 RE	Jacobus Nicolaas Boshoff
Frischgewaagd 294 IS	Ptn 4	JNB Familie Trust
Frischgewaagd 294 IS	Ptn 7 RE	Jacobus Nicolaas Boshoff
Frischgewaagd 294 IS	Ptn 35	Jacobus Nicolaas Boshoff
Frischgewaagd 294 IS	Ptn 52	Johannes Corneluis Jacobus Joubert
Frischgewaagd 294 IS	Ptn 53	Jacobus Nicolaas Boshoff
Frischgewaagd 294 IS	Rem	Sasol Mining (Pty) Ltd
Goedehoop 290 IS	Ptn 1 RE	Frederik Johannes Gerhardus Visser
Goedehoop 290 IS	Ptn 5 RE	Sasol South Africa (Pty) Ltd
Goedehoop 290 IS	Ptn 6 RE	Sasol Mining (Pty) Ltd
Goedehoop 290 IS	Ptn 8 RE	Sasol South Africa (Pty) Ltd
Grootvlei 293 IS	Ptn 13	Sasol Mining (Pty) Ltd
Grootvlei 293 IS	Ptn 20 RE	Dewald Te Water
Grootvlei 293 IS	Ptn 21 RE	Willem Frans Te Water
Grootvlei 293 IS	Ptn 29 RE	Sasol Mining (Pty) Ltd
Grootvlei 293 IS	Ptn 31	Vukani Networks CC
Grootvlei 584 IS	RE	WF TE Water Senior Trust
Poverty Acres 585 IS	RE	Louis Hendrik Ludik

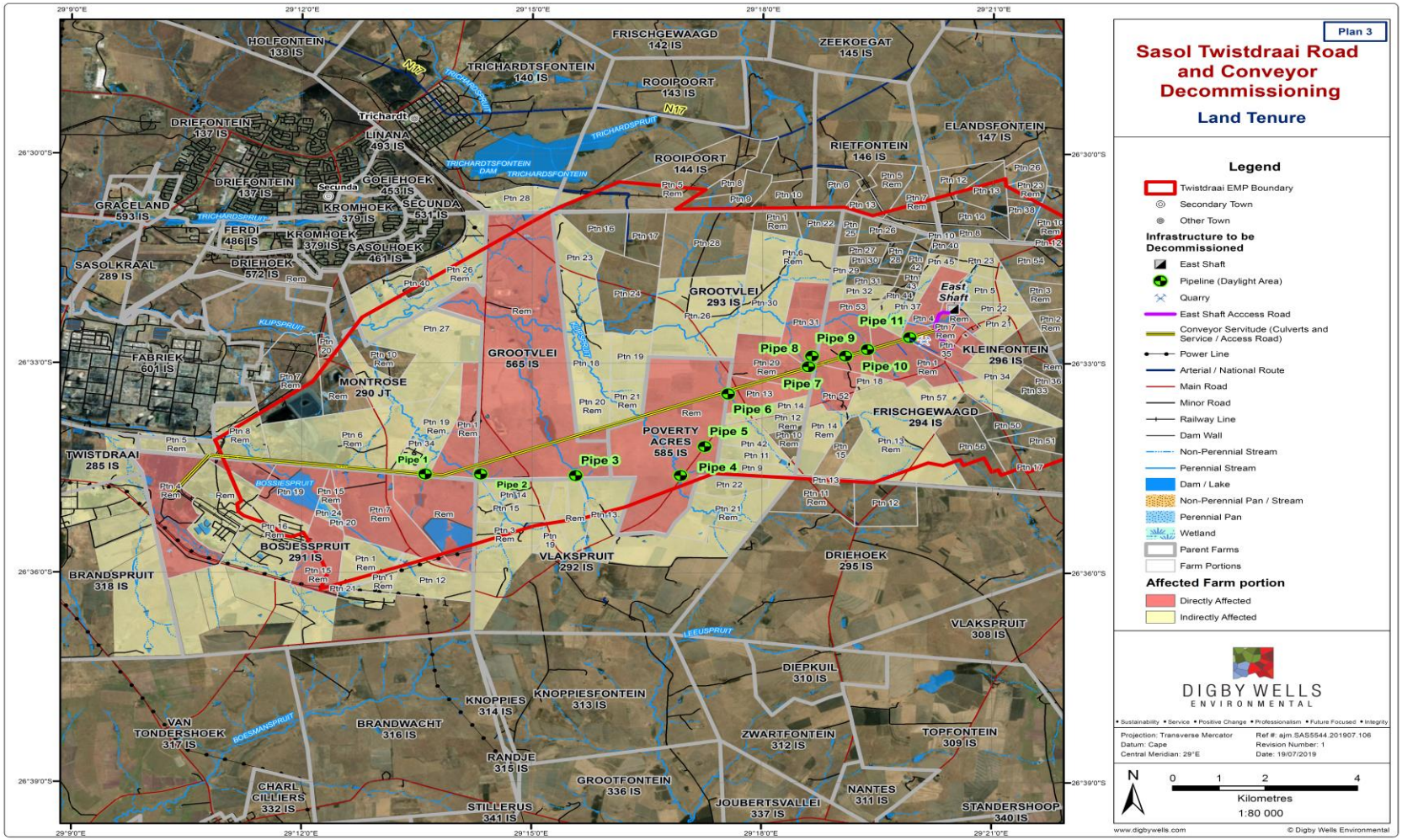


Figure 4-1: Land tenure map

5 Description of the Scope of the proposed Overall Activity

The NEMA provides the environmental legal framework for South Africa. The listed activities that require Environmental Authorisation have been outlined in the EIA Regulations, 2014 (as amended). Together with the EIA Regulations, 2014 (as amended), the Minister published the following Regulations in terms of Sections 24 and 24D of the NEMA:

- Regulation GN R. 327 – Listing Notice 1: This listing notice provides a list of various activities which require Environmental Authorisation and must follow the Basic Assessment (BA) process as described in Regulation 19 and Regulation 20 of the NEMA EIA Regulations;
- Regulation GN R. 325 – Listing Notice 2: This listing notice provides a list of various activities which require Environmental Authorisation and must follow an EIA process as described in Regulation 21 to Regulation 24 of the NEMA EIA Regulations; and
- Regulation GN R. 324 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies. The undertaking of such activities within the stipulated provincial boundaries will require Environmental Authorisation and the BA process as described in Regulation 19 and Regulation 20 of the NEMA EIA Regulations, 2014 (as amended) will need to be followed.

The Project aims to obtain Environmental Authorisation for the decommissioning and rehabilitation of an access road from the main road (Mynpad Road) to the Twistdraai East Shaft, the conveyer belt servitude from Twistdraai East Shaft to Twistdraai Export Plant (TEP), a water pipeline, and a quarry which is within 500 m from a delineated wetland. Table 5-1 provides a list of all the listed activities that may be triggered when undertaking the decommissioning and rehabilitation Project.

5.1 Listed and Specified Activities

Table 5-1 provides the identified Listed Activities as provided by the NEMA EIA Regulations, 2014 (as amended). As indicated in the table below, only Regulation GN R. 327 – Listing Notice 1 activities will be triggered and therefore a BA Process must be undertaken and approval received prior to the activities being commenced with.

Table 5-1: Listed and specified activities

NAME OF ACTIVITY Mining (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads pipelines, power lines, conveyors, etc.)	AERIAL EXTENT OF THE ACTIVITY (Ha or m^2)	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE Listing Notice 1(GN R327/2017); Listing Notice 2 (GN R325/2017) and Listing Notice 3 (GN R324/2017	WASTE MANAGEMENT AUTHORISATION (Indicate whether an authorisation is required in terms of the Waste Management Act). (Mark with an X)
Decommissioning and rehabilitation of an access road which was constructed between Mynpad Road and the Twistdraai East Shaft which permits access to the Shaft. The access road is located over a water course. The removal of the road, culverts and associated rehabilitation may result in the removal of more than $10cm^3$ of soil from the water course	1.26 km – Length 10 m – Width 2.56 Ha - Area	X	Listing Notice 1 (GNR327) Activity 19	**N/A**
Decommissioning and rehabilitation of the conveyer belt servitude including access road, water supply pipeline and culverts which was previously utilised to transport coal from Twistdraai Colliery to Twistdraai Export Plant. The access road is located over a water course. The removal of the road, culverts and associated rehabilitation may result in the removal of more than $10cm^3$ of soil from the water course	17.8 km – Length 10 m – Width 36.21 Ha - Area	X	Listing Notice 1 (GNR327) Activity 19	**N/A**
Infilling and rehabilitation of a quarry located near the conveyer belt. Quarry is located outside of the water course or wetland.	130 m– Length 72 m – Width 0.74 Ha - Area	N/A	N/A	**N/A**

5.2 Description of the Activities to be undertaken

5.2.1 Twistdraai Colliery

The Twistdraai Colliery has been in operation since the late 1980's. Since 1995 the Twistdraai Colliery has been a three-shaft complex producing low-ash steam coal for the export market which is processed at the TEP as well as a middling's product (intermediate quality not suitable for export) sent to Sasol Coal Supply (SCS) for blending prior to sending it to the Synfuels Plant.

The TEP is a coal beneficiation plant that previously received coal mined from the Twistdraai Colliery but is now receiving coal from the Twistdraai Colliery: Thubelisha Shaft. The beneficiated coal is transported to Richards Bay via railway from where it is exported. The TEP is located approximately 6 kilometres south of Secunda.

The Twistdraai Colliery is made up of three separate shafts namely:

- Twistdraai West Shaft;
- Twistdraai East Shaft; and
- Twistdraai Central Shaft.

The Twistdraai Central Shaft, also referred to as Main Shaft, is located approximately 5 km south of Secunda in the Mpumalanga Province. Twistdraai East Shaft and West Shaft are located approximately 7 km and 12 km east of the Central shaft respectively. The North-West Ventilation Shaft is located approximately 3 km north-west of West Shaft and the Frischgewaagd Ventilation Shaft is located approximately 3 km south of Twistdraai East Shaft. The status and co-ordinates of the shafts are provided in Table 5-2 and Figure 5-1 show the location of the Twistdraai Colliery shafts.

These shafts are managed and operated under the approved EMPR with reference number MP 30/5/1/2/3/2/1(138) EM.

Table 5-2: Shaft status and co-ordinates

Shaft	Status	Co-ordinates
Twistdraai Central/Main Shaft	Decommissioned mining infrastructure and converted remaining buildings into training centre and accommodation in 2015	26º34'17.63" S 29º13'22.72" E
Twistdraai West Shaft	Decommissioned shaft and associated mining infrastructure in 2015. Remaining infrastructure handed over to Third Party in 2016	26º33'12.76" S 29º17'30.88" E
North West Ventilation Shaft	Decommissioned and rehabilitated	26º31'56.82" S 29º16'16.93" E

Shaft	Status	Co-ordinates
Twistdraai East Shaft	Decommissioned in December 2018 however road, conveyor belt servitude and quarry have not been decommissioned	26º32’14.27” S 29º20’28.02” E
Frischgewaagd Ventilation Shaft	Decommissioned	26º33’50.86” S 29º20’32.98” E

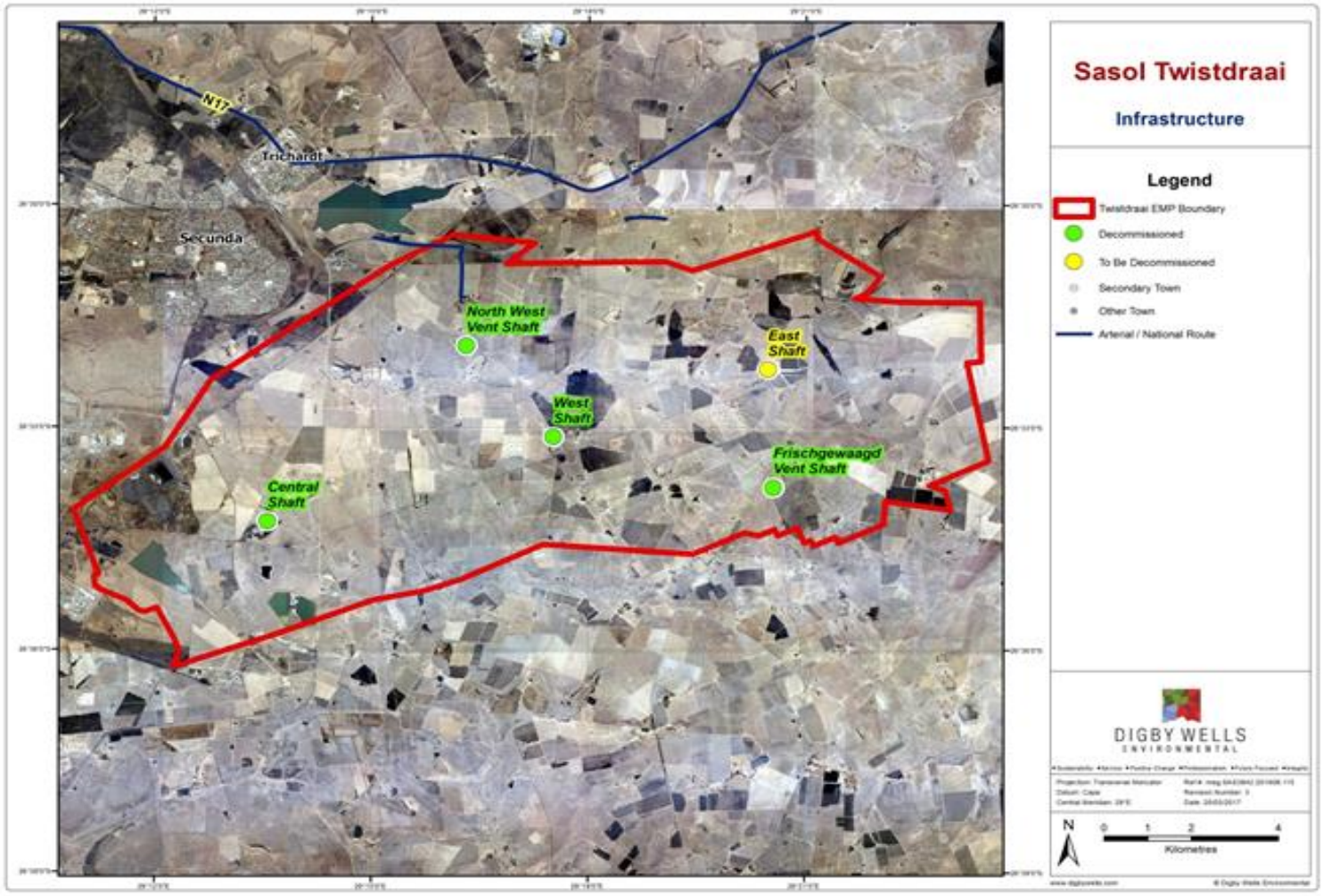


Figure 5-1: Twistdraai colliery shaft locations

5.2.2 Twistdraai East Shaft

The Twistdraai East Shaft began operation in 1997 as an underground coal mine which supplied coal to TEP until December 2017. The mine is now being decommissioned where infrastructure is currently being demolished and salvaged and the land remediated. The decommissioning of the infrastructure was undertaken in accordance with its approved Amended EMPr (2012) (Ref No. MP 30/5/1/2/3/2/1(138) EM).

The infrastructure that has been decommissioned at Twistdraai East Shaft includes the following:

- Vertical and incline shafts;
- Workshops;
- Pollution Control Dams (PCDs);
- Sewage Treatment Plant (STP);
- Waste storage areas;
- Scrap yards;
- Sumps for oil separation;
- Emergency stockpile area;
- Office blocks, parking area, change houses;
- Ventilation shafts; and
- Bulk storage area.

A demolition and rehabilitation contractor was subcontracted to decommission all infrastructure located at the Twistdraai East Shaft and rehabilitate the area to as close as possible to the pre-mining state. As part of the decommissioning process all mining related infrastructure was removed, the soil was ripped and the area revegetated. Erosion berms were constructed to ensure vegetation establishment and to reduce high velocity water flow during rainfall events which in turn encourages water infiltration to promote vegetation regrowth.

Figure 5-2 to Figure 5-16 indicates the infrastructure at Twistdraai East Shaft which has been decommissioned.

Figure 5-2: Twistdraai East Main Shaft prior to decommissioning

Figure 5-3: Twistdraai East Ventilation Shaft prior to decommissioning

Figure 5-4: Rehabilitation of the Twistdraai East Main / Ventilation Shaft

Figure 5-5: Incline Shaft prior to decommissioning

Figure 5-6: Rehabilitation of the Twistdraai Incline 1 and 2 Shaft

Figure 5-7: PCD A prior to decommissioning

Figure 5-8: PCD B prior to decommissioning

Figure 5-9: Rehabilitation of the two PCDs

Figure 5-10: Sewage Treatment Plant prior to decommissioning

Figure 5-11: Rehabilitation of the STP

Figure 5-12: Waste Storage Area prior to decommissioning

Figure 5-13: Rehabilitated Waste Storage Area

Figure 5-14: Emergency Coal Stockpile Area prior to decommissioning

Figure 5-15: Rehabilitation of the Emergency Stockpile Area

Figure 5-16: Rehabilitation of the remaining mining area

5.2.3 Proposed Project

The conveyor belt between Twistdraai East, Central and West to TEP has been decommissioned and rehabilitation has been implemented. However, infrastructure in certain areas along the conveyor belt servitude specifically in wetland areas and along rivers and tributaries have not yet been decommissioned as these activities trigger listed activities in accordance with the EIA Regulations, 2014 (as amended) which this application aims to authorise.

The decommissioning and rehabilitation activities to be undertaken include the following:

- Decommissioning and rehabilitation of an access road and associated culverts which was constructed between Mynpad Road and the Twistdraai East Shaft which permits access to the Shaft. The access road is located over a water course. The removal of the road, culverts and associated rehabilitation may have an impact on the watercourse.
- Decommissioning and rehabilitation of the conveyer belt servitude including access road, water supply pipeline[3] and culverts which was previously utilised as supporting secondary infrastructure to convey coal from Twistdraai Colliery to TEP; and

[3] It must be noted that the decommissioning of the water supply pipelines will only be decommissioned where it daylights over various tributaries. The remaining pipelines which are located beneath ground level will not be disturbed or removed during the decommissioning process.

- Infilling and rehabilitation of a quarry located near the conveyer belt servitude. Although it is located outside of the water course or wetland it is within the 500m delineated buffer of the wetlands.

The conveyor belt and the road crosses several watercourses as illustrated in Figure 5-17 and Plan 4 in Appendix B. Each of these crossings contains a box culvert that must be removed. Figure 5-18 to Figure 5-23 shows some of the culverts located within the

- River that needs to be removed;
- The road at several sections that will be rehabilitated;
- The pipelines that will be removed; and
- The quarry to be rehabilitated.

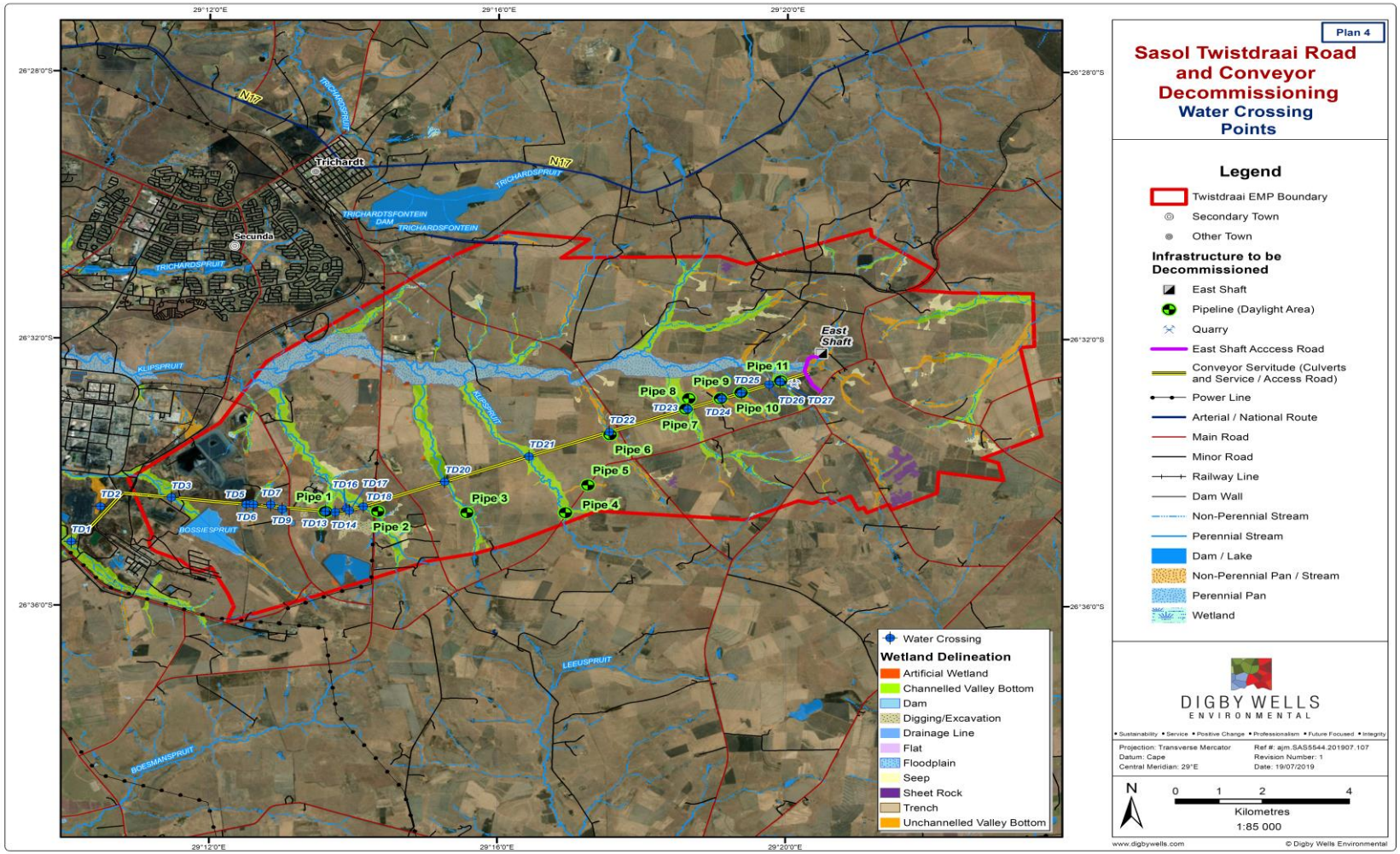


Figure 5-17: Water crossings between Twistdraai East Shaft and TEP that requires rehabilitation

Figure 5-18: Access road to Twistdraai East Shaft (Between Mynpad Road and the Twistdraai East Shaft) before tar removal

Figure 5-19: Access road to Twistdraai East Shaft (Between Mynpad Road and the Twistdraai East Shaft) after tar removal

Figure 5-20: Culverts to be removed

Figure 5-21: Road to be rehabilitated

Figure 5-22: Pipelines to be removed and rehabilitated

Figure 5-23: Quarry to be decommissioned and rehabilitated

5.2.3.1 Removal of culverts

The following actions will be implemented to remove the culverts from the watercourse where the roads (access road to the Twistdraai East Shaft and conveyor belt access road) cross the watercourses:

- All equipment will be inspected by an engineer prior to moving onto the property as a precautionary approach to prevent hydrocarbon spillages;
- The existing road (shown in Figure 5-17) shall be used to access the culvert the furthest from the Twistdraai East Shaft. The work shall commence from this culvert in the

direction of the Twistdraai East Shaft. Once a culvert is removed and the area rehabilitated no large equipment/vehicles will be allowed to enter the area;

- Activities shall start upstream and proceed in a downstream direction to ensure that the recovery process can start immediately without any further disturbance from upstream works;
- Only the existing road will be used to gain access to the culverts, no additional areas shall be used or disturbed adjacent to the road;
- An excavator will utilise the existing access road to gain entree to the identified culvert that will be removed and rehabilitated. The excavator will be located on the banks of the watercourse and will not be allowed in the river bed. The excavator will remove the culvert from the watercourse by picking it up a moving it away. The wing walls and concrete foundation once taken away from the watercourse will be removed by breaking the concrete structures into pieces. The excavator will then be used to remove the rubble from the watercourse;
- All concrete and rubble will be removed from the watercourse and loaded onto a truck for removal. No material shall be stockpiled adjacent to the working areas;
- Once the excavator has removed all construction rubble the area will be shaped to reflect the topography of the area, the compacted soil will be scarified, ripped and hydroseeded with indigenous grass found in the area to promote the revegetation of the river banks; and
- The area where the culvert was placed and the surrounding area will be made free draining and the flow will resume its natural pattern with no ponding taking place.

5.2.3.2 Removal of the Road

The road is to be removed between the culverts as and when the culvert rehabilitation is completed. The following activities will be undertaken to decommission the conveyor belt access road and road utilised to access the Twistdraai East Shaft:

- The road is currently a dirt road and will be ripped to a depth of 150 mm and scarified to promote the growth of vegetation;
- Where necessary the road will be shaped to ensure that it follows the natural topography and it is free draining to prevent erosion; and
- Once the road is sloped it will be top soiled where necessary and hydroseeded to prevent erosion. Where practicably possible all work should be undertaken during the dry season and the hydro seeding done just before the onset of the spring/summer rains.

5.2.3.3 Removal of the Pipelines

Two water pipelines ran along the length of the conveyor in the conveyor belt servitude. The one pipeline currently supplies clean water to a farmer. The clean water is provided by Sasol

because of the farmer's water being impacted by the mining process previously undertaken at the Twistdraai Colliery. An alternative supply is being investigated by Sasol to transfer the farmer from Sasol supplied water to a suitable alternative water source. Only once an alternative sustainable water source has been identified will the pipeline be decommissioned. The second pipeline to be decommissioned was previously utilised to pump dirty water from the underground workings at Twistdraai East Shaft to Synfuels. This pipeline is no longer in operation as the mining activities at Twistdraai East Shaft have ceased.

It must be noted that only areas where the pipeline daylights will be removed, the areas where the pipeline remains underground will not be removed to avoid unnecessary disturbance to the environment. The following activities will be undertaken to decommission the pipeline:

- The pipelines must be drained of any water prior to the pipelines being removed;
- The sections where the pipelines cross the watercourse will be dug out to approximately 300 mm below the soil surface on each side of the watercourse and cut off. The total length of the pipeline will not be removed but rather only the sections where the pipeline crosses the river;
- It must be determined whether the pipeline must be blanked off on either side of the watercourse;
- Once the sections of the pipeline are removed it will be disposed of; and
- The area will be shaped to reflect the topography and all compacted soils will be ripped up to 150 mm to promote the revegetation of the disturbed area.

5.2.3.4 Rehabilitation of the Quarry

The quarry is located near the conveyer belt servitude. Although it is located outside of the water course or wetland it is within the 500m buffer of the wetlands. The following actions will be taken:

- The concrete rubble from the culverts will be crushed and disposed of to the quarry to infill it;
- The remaining material if found to be not enough to infill the quarry, alternative material will be trucked in from an alternative offsite source or if found to be too much the remaining rubble will be disposed of at a registered landfill site; and
- Once the quarry is infilled it will be shaped to be made free draining, the compacted areas shall be ripped, covered with at least 150 mm of topsoil and revegetated.

5.2.3.5 Waste Management

All waste will be handled in accordance with the general and hazardous waste provisions of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA).

Several waste streams can potentially be generated during the decommissioning and rehabilitation process for this Project and these must be managed to ensure that no secondary pollution originate from the site. Therefore, the following measures will be implemented:

- No waste shall be stockpiled within the riparian habitat or within 100 m from the watercourse;
- The rubble generated during the decommissioning process that is not hazardous will be loaded onto trucks and removed immediately to an appropriate landfill site or the quarry to be rehabilitated. This will prevent the re-handling of the material and prevent contamination of other surfaces; and
- Any hazardous waste generated during the decommissioning Project will be removed to an appropriately licences waste facility.

6 Policy and Legislative Context

This section provides a description of the policy and legislative context within which the Project is being proposed. This section has been divided into national, provincial and policies, plans, guidelines and development planning frameworks and tools. Table 6-1 indicates what legislation is applicable to the Project and how it has been complied with.

Table 6-1: Policy and legislative context

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	Twistdraai East Shaft is undertaking a BA process to determine and identify the impacts associated with the decommissioning and rehabilitation of the access roads, water supply pipeline, culverts and quarry. As part of the BA process, mitigation measures and monitoring plans have been recommended to ensure that any potential impacts are managed to an acceptable level to support the rights as enshrined in the Constitution.	A BA application to undertake the Project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 3 June 2019 detailing the activities being undertaken as part of the Project. A BA Process has been undertaken which includes the compilation of a Basic Assessment Report (BAR) where the impacts associated with the activities being undertaken have been determined (Part A: Section 12). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process (Part B: Section 5 and 6). A monitoring programme has also been compiled to ensure the Project does not result in significant environmental damage during the decommissioning and rehabilitation phase (Part B: Section 8).
National Environmental Management Act, 1998 (Act No 107 of 1998) and EIA Regulations (December 2014) NEMA, as amended, was set in place in accordance with Section 24 of the Constitution. Certain environmental principles under NEMA must be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The EIA Regulations, Government Notice (GN) Regulation (R) 982 were published on 04 December 2014 and promulgated on 08 December 2014 together with the amended Listing Notices: GN R326, (EIA Regulations) GN R 327 (Listing Notice 1); GN R325 (Listing Notice 2) and GN R324 (Listing Notice 3) on 7 April 2017.	The Twistdraai Colliery's EMPr with DMR reference number: MP 30/5/1/2/3/2/1(138) EM was amended and submitted to the DMR in 2010. The DMR approved the EMPr amendment on 29 February 2012. The decommissioning of the infrastructure located at the Twistdraai Colliery was undertaken in accordance with its approved Amended EMPr, approved in 2012 (Ref No. MP 30/5/1/2/3/2/1(138)EM). Table 5-1 provides the identified Listed Activities as provided by the NEMA EIA Regulations, 2014 (as amended). As indicated in the table below, only Regulation GN R. 327 – Listing Notice 1 activities will be triggered and therefore a BA Process must be undertaken and approved prior to the activities being commenced with.	This BAR has been compiled in accordance with the requirements of the NEMA EIA Regulations, 2014 (as amended).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Water Act, 1998 (Act No. 36 of 1998) (NWA) The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.	The Twistdraai Colliery operated under a consolidated WUL known as the Block 3 WUL which is applicable to all Sasol Secunda Mines that fall under Block 3. The Water Use Licence was issued by the Department of Water and Sanitation (DWS) on the 21 February 2012, Licence No. 08/C12D/ACEFGIJ/1274. The decommissioning and rehabilitation of the access road, conveyor belt servitude and quarry will be taking place within the watercourse and within 500 m of the delineated wetlands and therefore triggers a water use in terms of Section 21 (c) and (i) of the NWA. This constitutes a water use authorisation. A WUL application is being applied for to obtain the require water authorisation before the activities are commenced with.	A General Authorisation will be applied for, in support of the decommissioning and rehabilitation Project. The application will be submitted to the DWS for the triggered water uses under Section 21 c and i of the NWA. The WUL will be undertaken concurrently with this BA processes.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources be managed and conserved by a Resource Authority, either nationally, by the South African Heritage Resources Agency (SAHRA) or by the relevant provincial Agency. In this case, the Provincial Heritage Resources Authority Mpumalanga (PHRA-M) is responsible for the identification, conservation and management of heritage resources throughout the province.	A Heritage Resource Management (HRM) process has been initiated with the SAHRA in accordance with Section 38 of NHRA. However, given that the new activities are proposed over disturbed footprints and the extent of previous assessments undertaken, this therefore negates the need for a Heritage Impact Assessment (HIA).	No heritage/archaeological resources associated with the Project site have been identified within the footprint of the access road, conveyor belt servitude or quarry. However, the conservation of heritage resources has been considered as part of this Project. A Heritage Notification of Intention to Develop (NID) has been compiled and has been submitted to SAHRA. The report has been attached as Appendix H.
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities. In accordance with the 2014 EIA regulations (as amended) and one environmental management system, all environmental authorisations and EMPs that relate to any mining activity must be submitted to the DMR for consideration and authorisation.	Sasol mining has an approved consolidated mining right (Ref No. MP 30/5/1/2/3/2/1/138 MR). for the Sasol Secunda Mines which was authorised by DMR. The Twistdraai Colliery falls within this mining right. The decommissioning and rehabilitation of the access road, conveyor belt servitude and quarry at Twistdraai East Shaft falls within this mining right boundary. The proposed activities subject to this application are associated with mining-related activities at Twistdraai East Shaft and therefore, the provisions set under the MPRDA will be noted. It should be noted that no closure application and supporting closure plan has been submitted to the DMR for consideration for the Twistdraai Colliery even though it is the intention of the approved Twistdraai EMPr and this Environmental Application process to decommissioning and rehabilitate the Twistdraai Colliery. As the Twistdraai Colliery falls within the greater Secunda Mining Right Complex which is still an active mining right, a closure application cannot be applied for. Additionally, although a partial closure process was investigated by Sasol Mining, this has yet to be supported by the DMR. Therefore, the Twistdraai Colliery will remain until a closure application process has been submitted for the entire Secunda Mining Right Complex estimated to be undertaken in 2050.	A BA application to undertake the Project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 3 June 2019 detailing the activities being undertaken as part of the Project. A BA Process has been undertaken which includes the compilation of a BAR where the impacts associated with the activities being undertaken have been determined (Part A: Section 12). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process (Part B: Section 5 and 6). A monitoring programme has also been compiled to ensure the Project does not result in significant environmental damage during the decommissioning and rehabilitation phase (Part B: Section 8).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates to the protection of species and ecosystems that require national protection and considers the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: ▪ Alien and Invasive Species Lists, 2014 published (GN R.599 in GG 37886 of 1 August 2014); ▪ National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations (GN R.152 in GG 29657 of 23 February 2007) and ▪ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).	As part of this Project, wetlands and aquatics have been investigated to determine the status of the environment and to determine any potential ecological sensitivity to be avoided and/or mitigated. The study focused specifically on where the decommissioning and rehabilitation activities are going to be undertaken. No applications have been submitted in terms of NEM:BA for the Project as no protected species were identified along the existing road and conveyor belt route and therefore permits are not required to remove them.	The wetlands and aquatics assessment details the ecological sensitivities around the area where the access roads, conveyor belt servitude and quarry will be decommissioned and rehabilitated. The findings of the wetlands and aquatic assessments, in the form of the impacts and the proposed mitigation measures for the Project are detailed in Part A: Section 12 and Part B: Section 5 and 6 of this report. The Project is not anticipated to impact on any protected species. The wetland and aquatic assessments have been attached in Appendix D and Appendix E respectively.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) On 29 November 2013, the list of waste management activities published under GN R718 of 3 July 2009 (GN R718) was repealed and replaced with a new list of waste management activities under GN R921 of 29 November 2013. Included in the new list are activities listed under Category A, B and C. These activities include inter alia the following: ▪ Category A describes waste management activities requiring a BA process to be carried out in accordance with the EIA Regulations supporting an application for a waste management licence; ▪ Category B describes waste management activities requiring an EIA process to be conducted in accordance with the EIA Regulations supporting a waste management licence application; and ▪ Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store more than 100 m^3 and storage of hazardous waste more than 80 m^3. The Waste Classification and Management Regulations published under GN R 634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification. The National Norms and Standards for the Assessment of Waste for Landfill Disposal were published under GN R635 on 23 August 2013 and prescribe the requirements for the assessment of waste prior to disposal to landfill in terms of Regulation 8(1)(a) of the Waste Classification and Management Regulations. The National Norms and Standards for the Disposal of Waste to Landfill were published under GN R 636 of 23 August 2013 and determine the requirements for the disposal of waste to landfill as contemplated in Regulation 8(1)(b) and (c) of the Waste Classification and Management Regulations.	The decommissioning and rehabilitation of the access road, conveyor belt servitude and quarry does not trigger any waste related activities therefore no waste management licence is required. Decommissioning waste that will be generated is expected to be limited and will be disposed of into the quarry for rehabilitation if the waste is non-hazardous. All hazardous waste will be disposed of at a licensed waste facility.	Waste management mitigation measures have been identified and will be implemented to ensure no impact to the environment occurs. All waste, both general and hazardous, will be managed in accordance with the NEM:WA and relevant waste regulations. Sasol Mining Twistdraai Colliery internal waste management procedure will also be applicable to all waste generated from the Project.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) CARA aims to provide for the conservation of the natural agricultural resources of the country through the maintenance of the production potential of land, by combatting and preventing erosion and the weakening of water sources. In addition, this Act aims to protect vegetation, while combatting weeds and invader plants	Mitigation measures have been included for the potential impacts on soils and land capability. The mitigation measures complies to the CARA.	Section 12 of the CARA details the maintenance of soil conservation in which every land user will be responsible for the maintenance and conservation of soil. The mitigation measures recommended as part of this BAR aim to prevent the compaction, erosion and degradation of the soil resources. Sasol Mining will be responsible for the removal of any alien invasive species that become established during the decommissioning phase of the culverts and the roads. Once the rehabilitation is completed, including the shaping, replacement of the topsoil and vegetation with an indigenous species seed mix, an alien invasive species monitoring plan will be implemented. The Project aims to transfer land that was previously utilised from mining back to grazing land.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) According to the NEM:AQA the Department of Environmental Affairs (DEA), the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM:AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM:AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GN R 1210 of 2009). These standards provide the goals for air quality management plans and provide the benchmark by which the effectiveness of these management plans is measured.	Air Quality has been considered for the Project. The activities proposed to take place do not trigger any air quality activities and therefore no Air Emissions License will be applied for.	The mitigation and management measures to be implemented as part of the Project aim to manage and prevent potential impacts to air quality. Dust suppression will be implemented during the decommissioning and rehabilitation phase as necessary.

7 Need and Desirability of the Proposed Activities

Section 24 of the Constitution stipulates that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected through reasonable legislation and other measures that prevents pollution and ecological degradation.

Sasol Mining are committed to ensuring that correct decommissioning and rehabilitation measures executed at the Twistdraai Colliery are implemented to ensure the environment is preserved for future generations. The Project is a decommissioning and rehabilitation Project with the aim to ensure all mining infrastructure is removed with minimal impact to the surrounding environment and ensure the area is rehabilitated to an acceptable standard in accordance with NEMA, Duty of Care and the Chamber of Mines Guideline. Thereby reducing the impact to the environment caused by previous mining activities. The Project aims to have an overall positive impact on the surrounding environment and people.

The Project is considered to have a positive impact on the livelihoods of the directly and indirectly affected landowners as areas which were previously utilised for mining will now be rehabilitated and changed back to its original or as close as possible to its original land use which in most cases along the conveyor belt will be grazing land.

The following positive impacts are anticipated should the Project be implemented:

- Removal of the culverts will encourage more natural flow of the water courses and reduce erosion leading to improved water quality;
- The conveyor servitude which is currently compacted and un-vegetated will be ripped and vegetated with an indigenous seed mix reducing erosion and encouraging a more natural environment;
- Mining infrastructure which is an eye sore will be removed and improve the aesthetics of the area;
- The sites will be re-profiled to ensure a natural flow and free drainage environment; and
- The quarry will be infilled to ground level and vegetated which in doing so will prevent future impact on the environment through the extension of the pit's footprint which could disturb the surrounding environment further or create a health and safety risk to people and animals in the area.

The Project aims to have an overall positive impact as all mining related infrastructure will be removed and the rehabilitated area will be able to recover thereby improving the aquatic, wetland, soils and surface water environments.

8 Motivation for the overall preferred site, activities and technology alternative

The Project is a decommissioning and rehabilitation Project and therefore limited alternatives exist as no alternative location, technology or activities can be considered. The only alternative which has been considered in the no-go alternative which has been discussed in Section 9.

9 Full description of the process followed to reach the proposed preferred alternatives within the site

9.1 Details of the development footprint alternatives considered

The consideration of alternatives aims to identify different means of undertaking an activity to ensure that the preferred alternative which is selected is the activity that will result in the least impact to the environment. Alternatives aid in identifying the most appropriate method of developing the Project, considering location or site alternatives, rehabilitation alternatives, as well as the no -go Project alternative.

9.1.1 Alternatives

A location alternative for this Project cannot be considered as the Project will only decommission and rehabilitate the environment in which mining disturbance has occurred which this application relates to. Additionally, no rehabilitation/technology alternatives can be considered as rehabilitation will be undertaken in accordance with relevant legislation such as NEMA, MPRDA and the Chamber of Mines Guidelines with the aim of removing the mining infrastructure, reducing the mining impact which previously occurred at the site and improving the overall environment by rehabilitating the land.

9.1.2 No-Go Alternative

A no-go alternative was however considered which investigates the impact that would occur if the Project was not authorised and therefore the culverts, roads, pipelines and quarry will remain. A no-go alternative has been considered for each activity:

- Should the *access road* to the shaft as well as the access road to the conveyor belt not be decommissioned this road will remain including the culverts. Sasol will therefore remain responsible in maintaining these roads and the land use will remain mining. The roads will not be rehabilitated resulting in increased risk of erosion and sedimentation of the watercourses. Although there is a possibility that the roads could be given to the land owners this is not considered to be a favourable alternative because the maintenance of the culverts and roads will become the responsibility of the land owner. The land owners would need to ensure no erosion occurs along the roads and the culverts are kept clean to prevent blockages and thereby ensure the flow of the watercourses is not restricted. The area will also remain impacted from the

mining infrastructure and the environment will not be rehabilitated as far as what is practically possible back to its pre-mining land use status.

- Should the *pipeline* within the conveyor belt not be removed where the pipeline daylights over the watercourses this will remain an eye sore to the surrounding land users. The pipeline will not be able to be utilised for any alternative purpose as the pipelines are old and will continue to degrade. Additionally, if infrastructure is left exposed theft is likely to occur which can result in increased environmental damage as the illegal removal of the pipeline will not be done in accordance with best practise standards.
- Should the *quarry* not be rehabilitated there is an increased likelihood that the quarry will be utilised for alternative purposes which may result in increased impact to the environment as the quarry will be expanded to access the material such as sand and rock. The quarry is also located within 500 meters of a wetland and therefore any further expansion of this facility could cause further impact to the wetlands in the area. Additionally, there is also an increased risk of erosion and sedimentation of the watercourses.

In general, as all the mining infrastructure is near the water courses an impact to the environment will continue to occur until these structures are removed. It can therefore be concluded that the preferred alternative would be to undertake the Project if the mitigation measures presented in Part A Section 12 and Part B Section 5 and 6 are adhered to.

10 Details of the public participation process followed

A Public Participation Process (PPP) is a legislative requirement in terms of Chapter 6 of the EIA regulations (As amended) in accordance with the NEMA. The main objective of PPP is to provide a platform for the applicant, Interested and affected Parties (I&APs) and relevant organs of state to work together to enable the relevant authorities to make an informed decision on the Project. Through the PPP, I&APs can contribute local knowledge and raise comments applicable to the Project planning and design.

The PPP consists of three phases, namely:

- Announcement Phase;
- BA Phase; and
- Decision Making Phase.

The activities undertaken during each phase are described below. This is the Draft BAR and no comments have been received from I&APs yet. All comments received from I&APs will be recorded in the Comment and Response Report (CRR). In addition, copies of the Background Information Document (BID) with Registration and Comment Form, sites notice, and newspaper advertisements are included in Appendix C.

10.1 Formal Project Announcement

As part of the announcement phase, details of the Project together with availability of the Draft BAR were provided to stakeholders. Below are the key activities undertaken for the PPP Announcement Phase.

10.1.1 Identification of Stakeholders

Stakeholders interested in or affected by the Project were identified by means of the methods indicated below:

- Conducting Windeed and related desktop searches in and around the Project area to verify land ownership and occupancy and obtain landowner contact details;
- Use of Twistdraai Colliery's existing stakeholder databases;
- Responses on the distribution of the BIL, site notices or newspaper advertisement placed; and
- Telephonic consultations with landowners to identify additional I&APs.

Stakeholders for the Project were grouped into the following categories:

- **Government:** National, Provincial, District and Local authorities;
- **Landowners and occupants:** Directly affected, adjacent or indirectly affected landowners and occupants;
- **Parastatals:** Such as Transnet and SANRAL;
- **Non-Governmental Organisations (NGOs):** Environmental and social organisations; and
- **Business:** Small and medium enterprises, mining and industrial companies.

A stakeholder database was compiled and has been updated throughout the environmental regulatory process (see Appendix C).

10.1.2 Public Participation Media

Considering the legislative requirements and good practice the following methods have been implemented to make Project information available to stakeholders:

- **Background Information Document:** BIDs were emailed and distributed around the Project area. The BID included a Project description, information about the required legislation, the competent authorities and details of the appointed EAP. The BID was also accompanied by a registration and comment form for stakeholders to register as I&APs or to submit comments. Information regarding the availability of the Draft BAR was also provided;
- **Newspaper advertisement:** A newspaper advertisement was placed in the **Ridge Times** on **24 July 2019** which distributes so Secunda and surrounding areas including

areas around the Twistdraai East Shaft. The advertisement included a brief Project description, information about the required legislation, the competent authorities, details of the appointed EAP, registration process for I&APs, and information regarding the availability of the Draft BAR for public comment;

- **Site notices:** Site notices were put up at various places around the Project area as well as at local libraries which contained a brief Project description, information about the required legislation, the competent authorities and details of the EAP, registration process for I&APs and information regarding the availability of the Draft BAR for public comment; and
- **SMS:** An SMS was sent to registered I&APs in support of the announcement of availability of the Draft BAR for public comment.

10.2 Basic Assessment Phase

The Draft BAR has been made available for a public comment period of 30 days from **24 July 2019** to **23 August 2019** at publicly accessible places including the Trichardt Public Library, Secunda Public Library and on the Digby Wells website www.digbywells.com (under Public Documents).

Once the commenting period is reached the comments, issues of concern and suggestions received from stakeholders during this public comment period will be captured in the CRR which will be included into the Final BAR. Final BAR will be submitted to the DMR for consideration. Simultaneously, the updated BAR will be made available to I&APs on the Digby Wells website and I&APs will be informed of such by means of a letter (email and SMS). This enables I&APs to verify that their comments have been captured and responded to.

10.3 Decision Making Phase

The Final BAR (including the CRR) will then be submitted to the DMR for consideration. The DMR, as the competent authority, has 107 days to issue a decision on the Environmental Authorisation for the Project. This decision will be communicated to stakeholders as prescribed under the NEMA legislation. As such, notification to stakeholders will be done by means of a letter sent via email and SMS.

10.4 Summary of issues raised by I&APs

No comments have been received to date for the Project. Once comments are received this will be included in the BAR and within in Appendix C under the comment and response report.

10.4.1 Public Participation Activities undertaken

Table 10-1 below provides a summary of the PPP activities undertaken thus far, together with referencing materials included as annexures in Appendix C

Table 10-1: Public participation activities

Activity	Details	Reference in Report
Identification of stakeholders	Stakeholder database was developed which represents various sectors of society, including directly affected and adjacent landowners, in and around the proposed Project area.	Appendix C1: Stakeholder Database
Distribution of BID	A BID with registration and comment form was emailed to stakeholders on 24 July 2019. An SMS was also sent to stakeholders on 24 July 2019 announcing the availability of the Draft BAR.	Appendix C2: BID, letter with registration and comment sheet
Placing of newspaper advertisement	A newspaper advertisement was placed in the Ridge Times on 24 July 2019.	Appendix C3: Advertisement
Putting up of site notices	Site notices were put up at the proposed Project site and around the Project area on 23 July 2019.	Appendix C4: Site Notice
Announcement of the Draft BAR availability	Announcement of availability of the Draft BAR was emailed to stakeholders together with the formal Project announcement on 24 July 2019. Copies of the Draft BAR were available to stakeholders at Trichardt Public Library, Secunda Public Library and on the Digby Wells website www.digbywells.com (under Public Documents). *(The comment period for the Draft BAR is from 24 July 2019 to 23 August 2019)*	Appendix C2: BID Appendix C3: Advert Appendix C4: Site Notice
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders will be captured in the CRR once received.	To be included in the Final BAR

11 The environmental attributes associated with the project

A summary of the baseline environment for the Project area is provided in the sections below. The flowing specialist studies have been undertaken for the Project:

- Wetlands Specialist Study (Appendix **H:**)
- Aquatic Specialist Study (Appendix E**)**;
- Soils, Land Use and Land Capability Specialist Study (Appendix F)
- Surface Water Specialist Study (Appendix G); and
- Heritage Specialist Study (Appendix H).

11.1 Climate and Rainfall

The region is characterised by warm to hot summers and cool to cold winters. Showers and thunderstorms occur during the summer months (September – April) and the winter months are normally arid and cold (June – August). The maximum temperatures range from 30°C in summer to 17.1°C in winter. The minimum temperatures range from 25.8°C in summer to just below 5°C in winter.

Rainfall in the region occurs mainly during the summer months and the average Mean Annual Precipitation (MAP) is 667 mm per annum with a peak in January. The potential Mean Annual Evaporation (MAE) for the region is in the order of 1 580 mm which is more than twice as much as the MAP for the area.

11.2 Topography

The Mpumalanga Province is 1 262 meters above mean sea level (mamsl). Twistdraai Colliery lies in a typical Highveld area and drains to the south towards the Vaal River System. The area characterised by undulating topography of grassland and cultivated fields with surface elevations ranging from 1 590 up to 1660 mamsl.

11.3 Wetlands

Wetland Consulting Services (WCS) completed a wetland delineation for the Project area in 2018 as a separate project to this assessment. WCS as part of the 2018 study completed a Present Ecological State (PES) (WET-Health; Macfarlane *et al*., 2007) and Ecological Importance and Sensitivity (EIS) assessment (Rountree *et al*., 2012) for the Twistdraai Colliery including the Twistdraai East Shaft and conveyor belt servitude. Digby Wells completed an updated assessment in 2019 based on the information provided by the WCS study.

11.3.1 Legislative Wetland Environment

The National Freshwater Ecosystem Priority Areas (NFEPA) Project provides information on wetland and river ecosystems for integrating into freshwater ecosystem, biodiversity planning and decision-making processes. Plan 5 in Appendix B demonstrates the distribution of NFEPA

wetlands within the Project area. The wetland types that dominate the landscape around the conveyor servitude and road are artificial flats. The NFEPA wetlands have been ranked in terms of importance in the conservation of biodiversity. The Project wetlands consist of Rank 6 wetlands.

The Mpumalanga Biodiversity Sector Plan (MBSP) (2014) is a spatial tool that forms part of the national biodiversity planning. The terrestrial MBSP has delineated a considerable area surrounding the pipeline, conveyor and road as 'CBA Irreplaceable' (shown as red) (Plan 6 in Appendix B). 'CBA Optimal' areas are also found within the Project area (yellow), with pockets of 'Heavily Modified' (dark green) and 'Moderately' Modified (cream) areas. According to the guidelines from the MSBP, CBAs must be kept in a natural state with no further loss of habitat; where only low-impact, biodiversity-sensitive land-uses are appropriate.

11.3.2 Wetland Delineation and Classification

WCS (2018) delineated a total of 2199 ha of wetlands within the Project area. The information contained in the below sections are from the WCS report (2018).

11.3.2.1 Present Ecological State

Table 11-1 indicates the PES scores for the various HGM Units observed as completed by WCS (2018).

The wetlands near the Project area exhibit a variety of PES values, ranging from *Largely Natural* (Category B) to *Critically Modified* (Category F), refer to Plan 7 in Appendix B. Most wetlands are characterised as *Moderately Modified (*Category C), followed by *Largely Modified* (Category D). Along the conveyor servitude, most wetlands are *Largely Modified* (Category D), followed by *Moderately Modified (*Category C) with one wetland being classified as *Critically Modified* (Category F).

Impacts to these systems that affected their scores were channel incision, head cut erosion, the impounding nature of roads and dams and upstream pollution.

Table 11-1: Present Ecological Health Score (WCS, 2018)

Wetland Type	PES B	PES C	PES D	PES E	PES F	Total (ha)
Channelled Valley Bottom	0.00%	6.49%	31.51%	0.22%	2.15%	851.38
Drainage Line	0.03%	1.06%	0.23%	0.41%	0.00%	36.32
Flat	0.04%	0.00%	0.00%	0.00%	0.00%	0.78
Floodplain	0.00%	27.22%	0.00%	0.00%	0.00%	574.00
Seep	0.74%	4.40%	2.32%	0.46%	0.00%	166.97
Sheet Rock	0.35%	2.96%	0.00%	0.00%	0.00%	69.67
Unchanneled Valley Bottom	0.06%	8.37%	11.00%	0.00%	0.00%	409.62

Wetland Type	PES B	PES C	PES D	PES E	PES F	Total (ha)
Total (ha)	25.45	1064.64	950.26	23.10	45.30	2108.75
% per PES category	**1.21%**	**50.49%**	**45.06%**	**1.10%**	**2.15%**	**100.00%**

11.3.2.2 Ecological Importance and Sensitivity

Table 11-2 indicates the EIS scores for the various HGM Units with the final EIS scores ranging from *Low/Marginal* to *High*. Along the conveyor servitude, most wetlands are characterised as *Moderate*, followed by *Low/Marginal.*

Most of the *High* scoring wetlands were floodplains. The floodplains received this rating due to the threatened status of the vegetation type, the diversity of habitats supported by these floodplain wetlands as well as the large size of these wetlands (WCS, 2018).

The majority of the *Moderate* EIS scores were the valley bottom wetlands. These are important at a landscape scale and sensitive to changes in flow (WCS, 2018). It is predominantly these wetlands that transect the conveyor servitude.

Most of the *Low/Marginal* importance and sensitivity scores were assigned to the drainage lines, the sheetrock wetlands and the smaller seeps. The EIS (WCS, 2018) is appended as Plan 8 in Appendix B.

Table 11-2: EIS Scores (WCS, 2018)

Wetland Type	High	Moderate	Low/Marginal	Total (ha)
Artificial Depression	0.06%	0.17%	0.55%	16.63
Channelled Valley Bottom	5.26%	33.96%	0.83%	851.38
Drainage Line	0.00%	0.32%	1.39%	36.32
Flat	0.00%	0.04%	0.00%	0.78
Floodplain	27.01%	0.00%	0.00%	574.00
Seep	0.00%	4.16%	3.70%	166.97
Sheet Rock	0.00%	0.00%	3.28%	69.67
Unchanneled Valley Bottom	0.00%	19.14%	0.13%	409.62
Total (ha)	**687.16**	**1228.13**	**210.09**	**2125.38**

11.3.3 Wetland Crossing Assessments

Figure 11-1 demonstrates the wetland crossing points and infrastructure to be decommissioned. Table 11-3 summarises the existing wetland environment in relation to the conveyor servitude and road.

Table 11-3: Wetland crossing Assessment

Crossing	Photo	Current state
TD27		PES C EIS Moderate Dominant Species *Bromus catharticus, Setaria sphacelata, Typha capensis, Helichrysum sp., Paspalum dilatatum, Andropogon appendiculatus.* Invasive species*: Cirsium vulgare*
TD26		PES D EIS Low Dominant Species *Bromus catharticus, Setaria sphacelata, Typha capensis, Helichrysum sp., Paspalum dilatatum, Eragrostis chloromelas.* Invasive species: *Cirsium vulgare, Cosmos bipinnatus.*
TD25		PES: D EIS Moderate Dominant Species *Bromus catharticus, Cynodon dactylon, Themeda triandra, Paspalum dilatatum.* Invasive species: *Cosmos bipinnatus.*

Crossing	Photo	Current state
TD24		PES D EIS Moderate Dominant Species *Bromus catharticus, Setaria sphacelata, Agrostis lacnantha, Helichrysum sp., Paspalum dilatatum, Eragrostis chloromelas, Eleocharis sp., Persicaria sp., Oenothera rosea, Hypoxis sp., Cyperus sp., Schoenoplectus sp.* Invasive species: *Cirsium vulgare, Cosmos bipinnatus, Argemone ochroleuca.*
TD23		PES D EIS Moderate Species *Bromus catharticus, Typha capensis, Setaria sphacelata, Agrostis lacnantha, Oenothera rosea, Crinum bulbispermum.* Invasive species: *Cirsium vulgare, Cosmos bipinnatus.*
TD22		PES C EIS Moderate Dominant Species

Crossing	Photo	Current state
		*Bromus catharticus, Paspalum dilatatum, Typha capensis, Oenothera rosea, Agrostis lacnantha.* Invasive species: *Cosmos bipinnatus, Verbena bonariensis, Argemone ochroleuca*
TD21		PES D EIS High Dominant Species *Bromus catharticus, Phragmites mauritianus, Typha capensis, Setaria sphacelata, Helichrysum sp., Paspalum dilatatum, Eleocharis sp., Persicaria sp., Erythrina zeyheri.* Invasive species: *Cosmos bipinnatus, Argemone ochroleuca*
TD20		PES D EIS Moderate Dominant Species *Helichrysum sp., Persicaria sp., Cyperus sp., Schoenoplectus sp.* Invasive species: *Cosmos bipinnatus.*

Crossing	Photo	Current state
TD18		PES D EIS Moderate Dominant Species *Bromus catharticus, Juncus effusus, Typha capensis, Eragrostis chloromelas, Andropogon appendiculatus.* Invasive species: *Cirsium vulgare.*
TD 16 17		PES Artificial EIS Low/Marginal Dominant Species *Typha capensis, Setaria sphacelata, Helichrysum sp., Paspalum dilatatum, Eragrostis chloromelas, Andropogon appendiculatus. Alloteropsis semialata, Berkheya rigida.* Invasive species: *Cosmos bipinnatus*
TD14		PES Artificial EIS Low/Marginal Dominant Species

Crossing	Photo	Current state
		*Bromus catharticus, Helichrysum sp., Paspalum dilatatum, Eragrostis chloromelas, Oenothera rosea, Cyperus sp.*, *Schoenoplectus.* Invasive species: *Cosmos bipinnatus*
TD13		PES D EIS Moderate Dominant Species *Bromus catharticus, Phragmites mauritianus Juncus dregeana, Typha capensis, Paspalum dilatatum, Eragrostis chloromelas, Oenothera rosea.* Invasive species: *Cirsium vulgare, Argemone ochroleuca*
TD9		PES C EIS Low/Marginal Dominant Species *Typha capensis, Imperata cylindrica, Agrostis lacnantha.*

Crossing	Photo	Current state
TD7		PES C EIS Low/Marginal Dominant Species *Bromus catharticus, Agrostis lacnantha, Eragrostis chloromelas, Helichrysum sp., Paspalum dilatatum, Oenothera rosea, Schoenoplectus sp.* Invasive species: *Cosmos bipinnatus, Pennisetum clandestinum*
TD6		PES D EIS Moderate Dominant Species *Bromus catharticus, Cyperus sp., Helichrysum sp., Paspalum dilatatum.* Invasive species: *Cosmos bipinnatus, Pennisetum clandestinum.*
TD5		PES C EIS Marginal Dominant Species *Bromus catharticus, Paspalum dilatatum.*

Crossing	Photo	Current state
TD3		PES F EIS Moderate Dominant Species *Bromus catharticus, Phragmites mauritianus, Juncus effusus, Typha capensis, Lemna minor.* Invasive species: *Cosmos bipinnatus, Datura stramonium.*
TD2		PES D EIS Moderate Dominant Species *Phragmites mauritianus.* Invasive species: *Cosmos bipinnatus.*
TD1 (Road)		PES D/C EIS Moderate/High Dominant Species *Setaria sphacelata, Phragmites mauritianus, Paspalum dilatatum, Cynodon dactylon,* Invasive species: *Cirsium vulgare, Datura stramonium*

Crossing	Photo	Current state
		Dominant Species
Quarry		*Hyparrhenia tamba, Hyparrhenia hirta, Cynodon dactylon.*

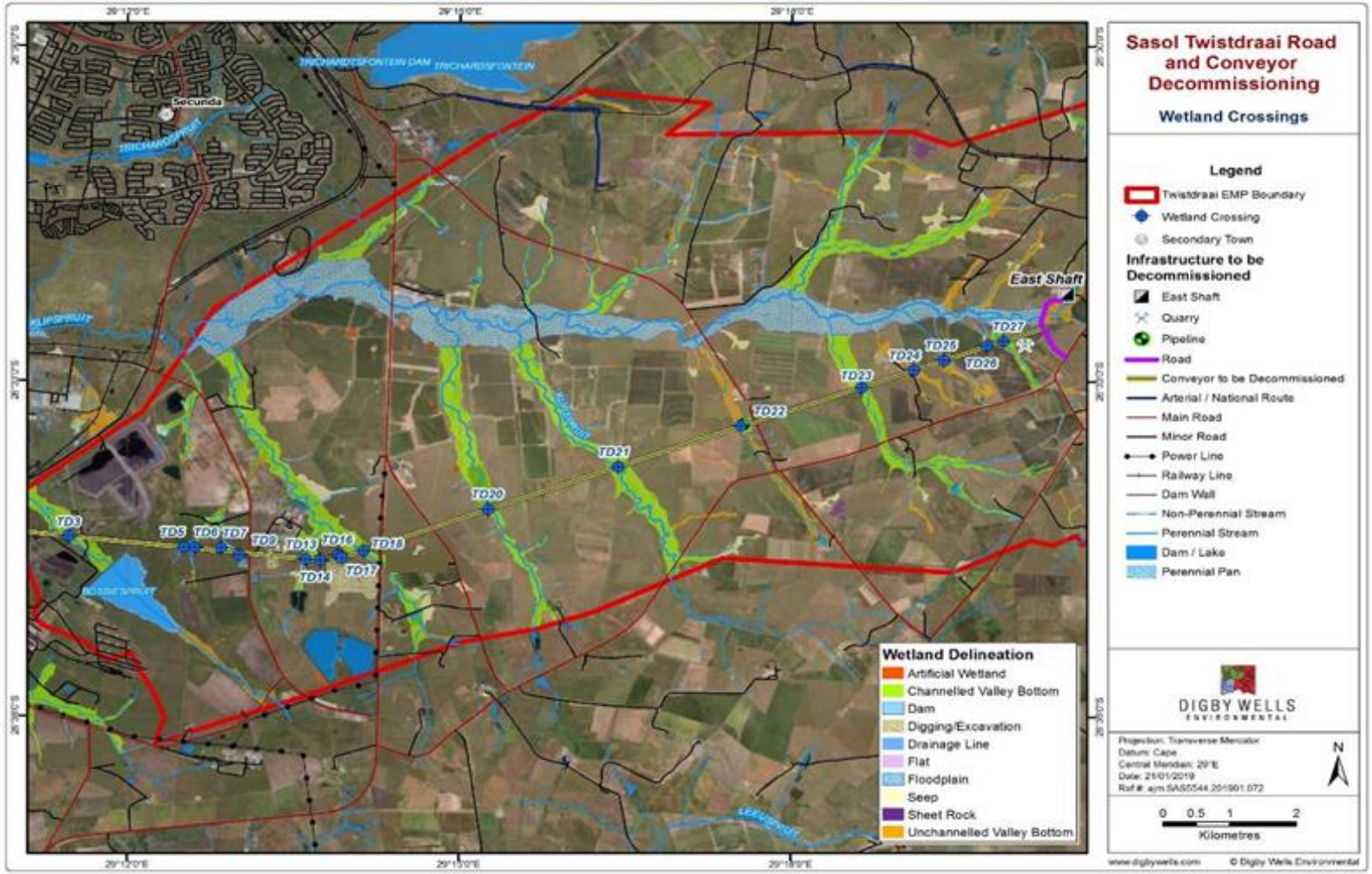


Figure 11-1: Wetland crossing points

11.4 Aquatic Ecology

The Project area is located within the Vaal Water Management Area 5 (WMA 5), in the C12D quaternary catchment. This place the watercourses considered for assessment within the Highveld freshwater ecoregion. Six tributaries and two unclassified drainage lines intersecting the servitude and conveyor of concern are of focus for the assessment. These watercourses drain into the Klipspruit, which ultimately joins with the Waterval River (also referred to as Sub-Quaternary Reach (SQR) C12D-01685) approximately 17.76 km from the most downstream tributary under assessment (DWS, 2018). The watercourses associated with the Project area has been included in Plan 10 in Appendix B . The Project area consists predominantly of typical Highveld grasslands with watercourses comprising mainly of wetland systems, lacking defined riparian zones (Figure 11-2).

These watercourses are further characterised by incised channels with grassy edges and muddy substrate. The systems are also ephemeral and may have seasonal flow.

The aquatic systems have however been impacted by the following manmade aspects:

- Road and conveyor crossings resulting in lack of flows;
- Agriculture; and
- Instream dams (DWS, 2018).

These impacts have the potential to increase sediment content in associated aquatic systems and, in cases of instream dams, result in severe hydrological and morphological changes. Additionally, agricultural practices have the potential to increase nutrient content into associated aquatic systems which in turn, has the potential to alter the water chemistry and quality.

Figure 11-2: Sampling site downstream from the road and conveyor of concern

The localities and descriptions of the sampling sites selected along the aforementioned watercourses have been outlined in Table 11-4 and are displayed in relation to the road and conveyor infrastructure, refer to Plan 11 in Appendix B.

Table 11-4: Coordinates and descriptions of the selected aquatic ecology monitoring sites

Site Name	Coordinates	Description
Major Tributaries		
Site 9	26°34'24.51"S 29°11'25.00"E	Site located along the Bossjesspruit downstream from a large dam. As a result, a large quantity of water was entering from the dam into the site at the time of the survey. The site was split by a road crossing, where the upstream section was comprised of a deep pool which resulted in churning water downstream unsafe for sampling.
Site 1	26°34'32.89"S 29°14'07.02"E	Site impounded, forming a small pool after the servitude of concern. Road crossing is heavily eroded with large amounts of litter in the form of copper cables hidden under the crossing point in the flow pathway of the watercourse. A rubber conveyor belt was also observed to be lying across and in the channel.

Site Name	Coordinates	Description
Site 3	26°34'11.04"S 29°15'13.44"E	A large farm dam was developed just below the monitoring point which has resulted in the attenuation of flow at the site. Furthermore, silt and sediment have smothered the site as a result, creating a mud like substrate allowing no marginal vegetation growth.
Site 4	26°33'47.85"S 29°16'24.56"E	The site was observed as dry at the time of the survey, consisting of an incised channel with grassy edges below a road crossing. Rubble from the crossing was also observed within the pathway of the channel.
Site 0	26°33'25.39"S 29°17'32.68"E	The site was observed as dry at the time of the survey. It is situated after a road crossing, between a fenced off farmland. The substrate of the site consists of compacted sand and gravel and is surrounded by dense wetland vegetation.
Site 11A	26°33'04.96"S 29°18'35.19"E	These sites are both situated along an unnamed tributary flowing under a road and conveyor crossing point. The tributary splits just before the conveyor crossing point and merges again approximately 100 m afterwards. Site 11A is made up of a small trickle of water insufficient for macroinvertebrate sampling. However, Site 11B was receiving a large amount of water from a burst dam wall situated upstream from the site.
Site 11B	26°33'04.29"S 29°18'37.87"E	
Unclassified Drainage Lines		
Site 8	26°34'31.14"S 29°12'35.16"E	The site was observed as dry at the time of the survey. It barely forms a channel after the road crossing but, becomes incised further downstream running along a fenced off area adjacent to the Twistdraai Export Plant.
Site 2	26°34'37.68"S 29°13'35.62"E	This site is situated below a road crossing in an incised channel. There was sufficient water at the site at the time of the survey to form a pool which contained sections of gravel and large cobbles.
Site 7	26°34'33.59"S 29°12'59.05"E	This site is situated between the drainage lines. No channel was observed however, the site had sufficient water and vegetation for diatom sampling (see wetlands report for more information).

11.4.1 Ecological Importance and Sensitivity

Table 11-5 presents the desktop information obtained for the six classified SQR's considered in the assessment (DWS, 2018).

Table 11-5: Desktop information for the Central and Eastern tributaries

Tributary / Site	Stream Order	Stream Length (km)	Present Ecological Status	Ecological Importance	Ecological Sensitivity
Groot-Bossjesspruit (SQR C12D-01657) Site 9	1	14.04	E (Seriously modified)	Low	Moderate
Unnamed (SQR C12D-01662) Site 1	1	8.37	C (Moderately modified)	Moderate	Moderate
Unnamed (SQR C12D-01660) Site 3	1	8.45	C (Moderately modified)	Moderate	Moderate
Klipspruit (SQR C12D-01664) Site 4	1	12.94	C (Moderately modified)	Moderate	Moderate
Unnamed (SQR C12D-01668) Site 0	1	4.68	C (Moderately modified)	Moderate	Moderate
Unnamed (SQR C12D-01663) Site 11A and 11B	2	3.80	C (Moderately modified)	Moderate	Moderate

According to the gathered information most of the tributaries flowing under the road and conveyor belt crossing points are first order streams which have been moderately modified from natural conditions (Ecological Category C). Major changes to these systems have resulted from impacts such as mining, road crossing and instream dam construction (DWS, 2018). Furthermore, Ecological Importance and Sensitivity of all systems has been classified as moderate.

11.4.2 Water Quality

The in-situ water quality is very significant in measuring the water quality variables at selected sampling points which had sufficient water levels. The results of the *in-situ* water quality assessment is provided in Table 11-6.

Table 11-6: Water Quality results recorded during the assessment

Site	Site 0	Site 1	Site 2	Site 3	Site 4	Site 7	Site 8	Site 9	Site 11A	Site 11B	Guideline Values
Temperature (˚C)	DRY	20.4	21.5	20.3	DRY	16.5	DRY	20.8	20.2	18.5	-
pH		**8.39**	**8.58**	**8.63**		**8.01**		7.96	7.78	**8.14**	6-8*
Conductivity (µS/cm)		10050	1116	9730		10610		1153	1317	10050	-
Dissolved Oxygen (mg/l)		8.50	8.51	9.24		8.21		9.21	7.42	9.42	5*
Saturation Percentage (%)		100.5	99.2	103.5		80.7		99.6	81.2	99.5	80-120*

*Red values indicate constituents exceeding guideline values (DWAF, 1996; Nebeker *et. al.*, 1996)

In situ water quality results could not be obtained for Site 8, Site 4 and Site 0 due to the dry conditions observed during the survey.

Temperature readings at all the monitoring sites showed no signs of concern, ranging from a low of 16.5 ˚C at Site 7 to a high of 21.5 ˚C at Site 2. Furthermore, the recorded oxygen constituents (i.e. dissolved oxygen and saturation percentage) were within acceptable ranges, unexpectedly meeting the respective guideline values at all the assessed monitoring sites. Usually, typical wetland systems tend to exhibit low oxygen values based on the lentic nature of said systems. Thus, it is suspected that an additional contributor to the good oxygen levels could be present (e.g. algal growth).

On the other hand, pH recordings at most of the monitoring sites exceeded the recommended guideline value of 8 (DWAF, 1996). Although only exceeding the guideline by a decimal value, the pH values at the sites of concern are expected to present some form of additional stresses on aquatic biota. Limited knowledge is available on the effects of elevated pH on aquatic biota. However, pH values of greater than 8 are known to alter certain compounds from a non-toxic form to a highly toxic form, such as the conversion of ammonium to the highly toxic un-ionized ammonia (DWAF, 1996).

Conductivity values were also recorded to be very high at all the monitoring sites (i.e. > 1000 µS/cm) where values higher than 500 µS/cm are known to adversely affect aquatic life (U.S. EPA, 2010).

11.4.3 Macroinvertebrate Assessment

The subsections below summarise the findings of various macroinvertebrates assessments.

11.4.3.1 Integrated Habitat Assessment System

The results of the Integrated Habitat Assessment System (IHAS) are presented in the Table 11-7. The investigation utilised for the assessment of macroinvertebrate assemblages are not applicable in lentic-wetland ecosystems (i.e. lack of flow). Therefore, limited macroinvertebrate data was obtained for this study.

Table 11-7: IHAS results recorded for the study

Sampling Site	IHAS Score (%)	Interpretation
Site 9	Not assessed due to safety constraints	
Site 8	DRY	
Site 7	N/A	
Site 2	N/A	
Site 1	N/A	
Site 3	N/A	
Site 4	DRY	
Site 0	DRY	
Site 11A	Insufficient water for sampling	
Site 11B	43.64	Poor
Impounded sites not applicable for the assessment indicated by symbol N/A		

The only available IHAS score was obtained from Site 11B which scored 43.64 % indicate that the availability of macroinvertebrate habitat at the time of the survey was poor. This is expected to negatively influence the macroinvertebrate diversity recorded at the site, especially in relation to a typical riverine system. However, this classification can be considered as natural due to the typical wetland nature of the sampling site, lacking a variety of sampling biotopes such as cobbles.

11.4.3.2 South African Scoring System

Table 11-8 outlines the results from the South African Scoring System (SASS5) assessment conducted during the November 2018 survey. It is important to note that only Site 11B was assessed due to the same reasoning indicated above.

Table 11-8: SASS5 result recorded during the study

Taxon	Abundance	Sensitivity Score
Baetidae 1species	A	4
Caenidae	A	6
Coenagrionidae	A	4

Taxon	Abundance	Sensitivity Score
Aeshnidae	1	8
Belostomatidae*	A	3
Corixidae*	B	3
Gerridae*	A	5
Notonectidae*	A	3
Veliidae*	A	5
Dytiscidae*	A	5
Gyrinidae*	A	5
Hydrophilidae*	A	5
Ceratopogonidae	A	5
Chironomidae	A	2
Number of taxa	**14**	
SASS5 Score	**63**	
ASPT Score	**4.5**	
* = air breathing taxa. **Abundance**: A = 2-10; B = 10-100;		

A total of 14 different taxa were sampled at Site 11B, comprising of mainly air breathing, tolerant families (i.e. sensitive score < 8). However, a single individual Aeshnid was sampled at the site (Figure 11-3). These invertebrates belong to the Odonata order and have a moderate requirement for unmodified physiochemical conditions, providing an indication of fair water quality at the site.

Figure 11-3: Aeshnidae nymph samples at Site 11B

11.4.4 Macroinvertebrate Response Assessment Index

The Macroinvertebrate Response Assessment Index (MIRAI) was conducted utilising the SASS5 data obtained from Site 11B. The findings obtained during the assessment are tabulated in Table 11-9.

Table 11-9: MIRAI scores determined for Site 11B

Invertebrate Metric Group	Score Calculated
Flow modification	43.2
Habitat	30.5
Water Quality	27.3
Ecological Score	**33.94**
Invertebrate Ecological Category	**E**

The MIRAI results indicate that the macroinvertebrate assemblage for the assessed site is seriously modified (Ecological Category E). It appears that poor water quality, most likely the high conductivity recorded, is a major driver behind this categorisation compounded by habitat modification.

It is further suspected that the wetland nature of the monitoring site might be influencing this determined category as the monitoring of macroinvertebrate (i.e. SASS5) is not truly applicable in wetland systems. Therefore, the wetland nature may be resulting in the high score pertaining to habitat modification which may be misleading the overall ecological categorisation for the site. It is recommended that the diatom assessment receives more attention when perceiving an Ecological Category for the site.

11.4.5 Diatomic Assessment

Diatom sampling took place at sites that had sufficient substrate (i.e. vegetation) for sampling and that had sufficient water levels suspected to sustain diverse diatom life. Thus, a total of five sites were sampled for diatoms as outlined in Table 11-10.

Table 11-10: Diatomic findings from applicable sampling sites

Sites	%PTV	SPI	Ecological Category	Water Quality Class
Site 9	15.3	9.6	D	Poor
Site 8	DRY			
Site 7	0	10.9	C/D	Moderate
Site 2	Insufficient habitat for sampling			
Site 1	1.3	15.2	B	Good
Site 3	Insufficient habitat for sampling			

Sites	%PTV	SPI	Ecological Category	Water Quality Class
Site 4	DRY			
Site 0	DRY			
Site 11A	Insufficient cell count			
Site 11B	0	12.5	C	Moderate

An insufficient cell count was obtained for the diatom samples at Site 11A. As previously stated, this site was comprised of a tiny tickle of water over limited aquatic vegetation. Therefore, it is suspected that diatoms did not have sufficient time to colonise the site, resulting in a lack of specimens in the sample. The data gathered from the adjacent Site 11B could potentially be inferred for that of Site 11A, as both sites receive water from the same upstream source. This should however be carefully interpreted as the sites do not comprise of the same habitat, which might influence the similarity of the diatom assemblages if they contained the same water level. Furthermore, as this index is better suited for wetland systems, it should be noted that the site is in fact not seriously modified as indicated by the Ecological Category determined from the MIRAI (Table 11-9).

All determined Percentage Pollution Tolerant Valves (%PTV) scores indicated that none of the sites expressed significant amounts of organic pollution (%PTV < 20%; Kelly & Whitton, 1995). The Ecological Categories for the diatoms ranged from Ecological Category D at Site 9 to Ecological Category B at Site 1 with water quality classes ranging from Poor to Good respectively. Site 9 was found to have the lowest scores out of the monitoring sites due to its proximity to the Twistdraai Export Plant activities. These activities, compounded by agricultural activities upstream from the monitoring site, appear to be contributing to the determined Poor Water Quality Class and Ecological Category D.

11.5 Fauna

The Project area falls within the Grassland Biome (Mucina and Rutherford, 2006), one of the nine South African plant Biomes and the second most bio-diverse biome in South Africa. The Grassland Biome is situated primarily on the central plateau of South Africa, and the inland areas of Kwa-Zulu-Natal and the Eastern Cape provinces. This biome is rich in flora and fauna diversity but is under threat due to rapid urbanisation and expansion of mining and industrial activities.

The Project area occurs in the Soweto Highveld Grassland regional vegetation type (Mucina and Rutherford, 2006). It is an endangered vegetation type with a conservation target of 24%. Table 11-11 list the species characteristic of the Soweto Highveld Grassland.

Table 11-11: Plant species characteristic of the Soweto Highveld Grassland

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

11.6 Soils, Land Use and Land Capability

Information related to the soils associated with the Project area is discussed in this section. The land type data gathered suggested that the dominant land type on site were Ea17 and Ea20 characterised by vertic, melanic and red structured diagnostic horizons.

11.6.1 Land Type and Soil Forms

Table 11-12 shows dominant land types and soil forms found along the road, conveyor belt, pipeline and quarry with visual representation depicted in Figure 11-4 and Figure 11-5. Soils found within the Project area include swelling structured black and apedal soils. Soils are generally deeper in the valleys and wetland crossings.

Table 11-12: Dominant land type and soils

Land Type	Soil Forms	Geology	Characteristics
Ea17 & Ea20	Arcadia and Rensburg forms	Alluvium, dolerite, sandstone and shale of the Ecca Group	Consists of soil with significant accumulation of smectitic (swelling) clay (vertic horizon).

Figure 11-4: Examples of swelling structured black soils

Figure 11-5: Examples of apedal soils

11.6.2 Soil Chemical and Physical Properties

A total of 10 soil samples were analysed for the chemical and physical properties as shown in Figure 11-6. The objective is to characterise the soil's physico-chemical properties. The results of soil analysis are presented in Table 11-13 and as a basis for interpreting these results, some local fertility guidelines are presented in Table 11-15.

11.6.2.1 Soil pH

Soil pH influences plant growth in the following ways:

- Through the direct effect of the hydrogen ion concentration on nutrient uptake;
- The mobilisation of toxic ions such as aluminium which restrict plant growth; and

- Indirect impacts that include the effect on trace nutrient availability.

The soil pH ranged from 5.5 to 7.5, these soils are acidic to neutral according to the soil fertility guidelines indicated in Table 11-15.

The soil pH below 7 may be due to the acidic nature of the parent material from which the soils were derived and leaching of nutrients from parent material. Lime is required to counteract acidity and to increase plant growth performance, should agricultural activities take place.

11.6.2.2 Soil Organic Carbon

Soil organic carbon provides an indication of organic matter content in soil. Concentrations above 2% to 3% organic carbon are considered moderate to high according to Du Preez *et al*. (2010). The organic carbon content of the soils at the soil sampling locations ranged from 1% to 7% and concentrations below 2% would have required an external nutrient input source, should the soils have been used for agricultural purposes.

11.6.2.3 Phosphorus

The Bray 1 extraction and analysis procedure for Phosphorus is preferred for soils with pH concentrations below 7. The Phosphorus concentrations encountered in the samples from the site were all very low according to the guidelines in Table 11-15, with most values being > 1 mg/kg and the maximum 5 mg/kg. Phosphorus will be a limiting factor in terms ecosystem function if the soil was going to be used for agricultural purposes and concentrations of at least 15 mg/kg would be required. Phosphorus fertilisation would be required to establish good crop stand and growth, should agricultural activities take place. The low available P concentrations of the clayey soils reflect a probable history of no cropping taking place over a period.

11.6.2.4 Exchangeable Cations

The concentrations of the basic cations Ca, Mg, K and Na are determined in soil samples for agronomic purposes through extraction with an ammonium acetate solution. For most soils, cations follow the typical trend Ca>Mg>K>Na.

Ca, K and Mg concentrations in the soil were generally high as shown in Table 11-13 when compared to the soil fertility guidelines in Table 11-15. These concentrations are adequate for crop production and these nutrients are not limiting any production on the site or considered to be toxic. Thus, there is no need to add calcium, potassium and magnesium in a fertiliser form as they might suppress concentrations of potassium during nutrient uptake by plants, should agricultural activities take place.

The sodium concentrations ranged from 70 to 800 mg/kg and soils with sodium concentrations below 200 mg/kg are considered not to be sodic.

Samples S2, S3, S7 and S10 had sodium concentrations exceeding 200 mg/kg. When compared to the guidelines in Table 11-15 it is sodic due to high sodium concentrations. Soil dispersion is likely to occur and cause dense structure and drainage problems (De Villiers *et al*., 2003).

The clayey (black) soils are considerably better endowed with base cations, organic carbon, clay, and cation exchange capacity. The low available Phosphorus concentrations of the clayey soils reflect a probable history of no cropping. Because of the high nutrient status and well buffered pH, soils with a vertic horizon are potentially very suitable for rehabilitation work.

Although the black clay is potentially difficult to work with because of unfavourable consistence, it has the advantage of a self-mulching habit meaning that clods will weather to a fine crumb structure due to shrinking and swelling with changes in water content. Also, the shrink-swell behaviour could potentially have a favourable effect in counteracting mechanical compaction caused by heavy machinery employed for rehabilitation. Vertic soils can be used successfully for crop and pasture production if managed judiciously (Fey *et al*, 2010).

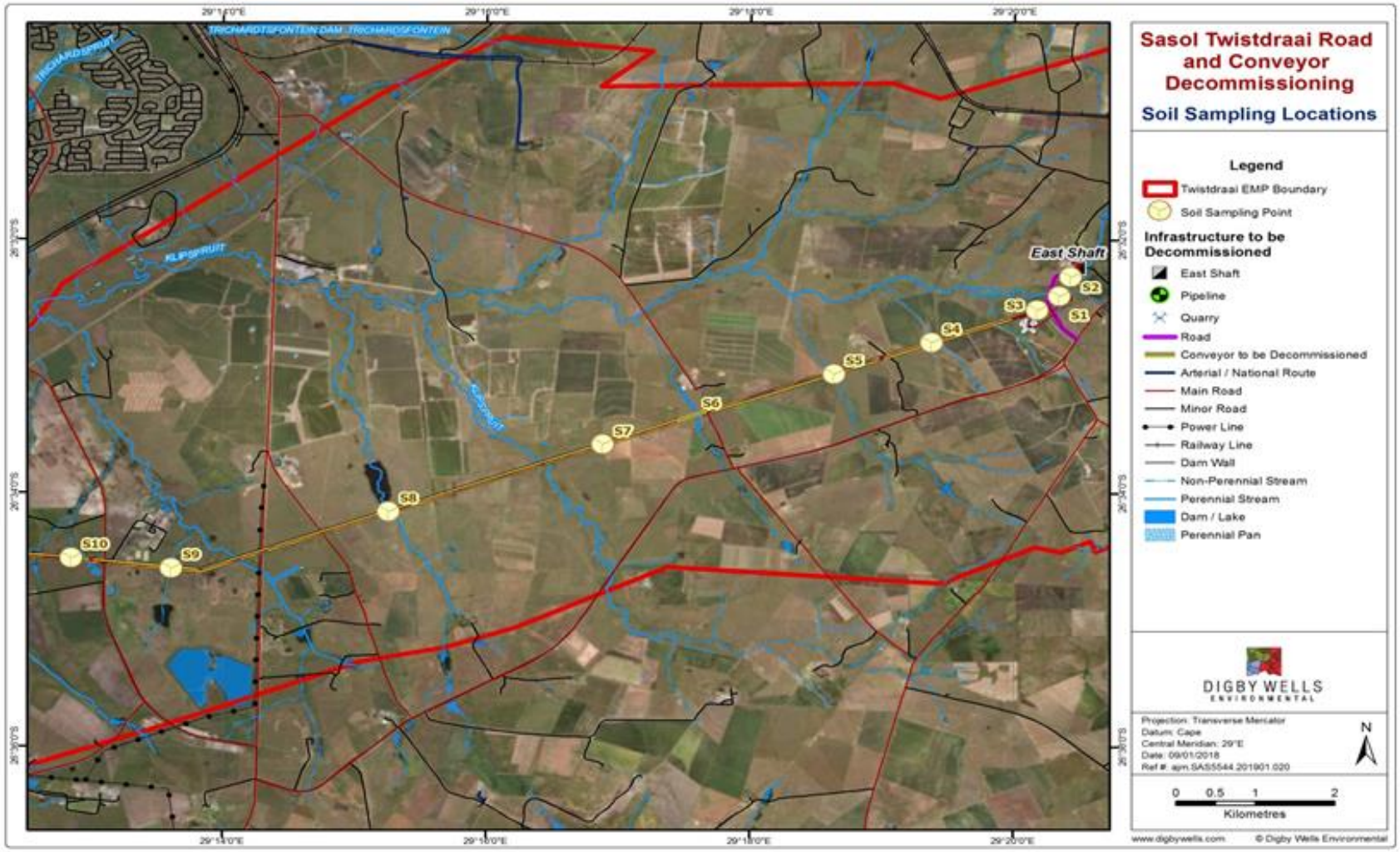


Figure 11-6: Soil sampling locations at Twistdraai Colliery

Table 11-13: Soil chemical and physical properties

Sample ID	pH	P	Na	K	Ca	Mg	OC	Clay	Sand	Silt	Texture
		Concentrations (mg/kg)					Consistency (%)				
S1	6.3	1	123	164	3 912	2 609	1.4	42	38	20	Clay
S2	6.9	5	471	263	5 165	3 029	1.1	26	50	24	Sandy clay loam
S3	5.7	1	265	84	4 880	3 816	1.6	42	32	26	Clay
S4	5.7	1	115	178	4 158	4 074	1.3	42	35	23	Clay
S5	6.4	3	72	171	3 163	1 237	7.4	18	63	19	Sandy loam
S6	5.8	3	101	265	4 165	2 007	1.9	34	35	31	Clay loam
S7	6.7	2	815	151	3 741	2 525	1.3	34	34	32	Clay loam
S8	7.1	2	161	107	5 657	1 709	1.4	18	68	14	Sandy loam
S9	7.2	3	101	173	7 012	2 832	4.2	26	24	50	Silt loam
S10	6.0	2	350	115	4 243	1 568	3.5	30	43	27	Clay loam

Table 11-14: Metals

Parameter	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	SSV1	SSV2
Concentrations (mg/kg)												
Aluminium	19912	20407	18255	18938	11218	13495	14041	13022	9393	13271	NA	NA
Copper	4.6	5.3	5.9	7.4	2.0	6.0	7.7	3.2	9.1	6.7	16	19 000
Iron	50.2	70.2	64.7	61.2	23.3	62.5	81.0	33.1	87.4	88.4	NA	NA
Manganese	13.7	14.2	31.5	36.7	15.2	12.8	14.1	5.9	11.1	15.6	740	12 000
Zinc	0.5	0.9	1.1	0.0	43.0	5.3	10.1	4.4	250.4	195.4	240	150 000

Table 11-15: Soil Fertility Guidelines (Fertiliser Association of South Africa, 2003)

Guideline concentrations (mg/kg)					
Macro Nutrient			**Low**	**High**	
Phosphorus (P)			<5	>35	
Potassium (K)			<40	>250	
Sodium (Na)			<50	>200	
Calcium (Ca)			<200	>3000	
Magnesium (Mg)			<50	>300	
pH (KCl)					
Very Acid	**Acid**	**Slightly Acid**	**Neutral**	**Slightly Alkaline**	**Alkaline**
<4	4.1-5.9	6-6.7	6.8-7.2	7.3-8	>8

11.6.2.5 Heavy Metals

Metals and their compounds present in the soil fractions vary in their degree of mobility. The bioavailability of metals is controlled by biological, chemical and physical processes and their interactions. The bioavailability depends on several soil properties which include:

- Soil pH;
- Organic matter content;
- Form and occurrence of cations;
- Adsorption capacity; and
- Oxidation-reduction potential.

Table 11-14 summarises the concentrations of heavy metals in each sampling point. These concentrations were screened against the soil screening values (SSV1 and SSV2) of the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality, (GN R 37603, May 2014). Soil screening values are used to assess whether constituents present in the soils are at concentrations high enough to pose a potential risk to the receiving environment and require more detailed risk assessment and investigation regarding the source of the contamination.

Concentrations of parameters in soils below threshold of SSVs would suggest that it is unlikely that the significant contamination has occurred, whereas, concentrations above the threshold of SSVs are considered to indicate the possibility of a significant degree of contamination. These values provide a good reference against which to compare the present concentrations of parameters in soils.

The SSV1 (all land-uses protective of the water resource) values are appropriate to assess potential soil contamination when there is potential risk to the groundwater resource. There are groundwater users with 1 km of the site and there are surface watercourses that could be impacted by off-site migration of contaminants (GN R 37603, May 2014). If there is no risk to the to the water resources that can be identified at the site then soil results are compared to SSV2 values which has three sub-categories (i.e. informal residential, standard residential and commercial/industrial), based on the risk to receptors defined by activity and exposure related to land use.

The analytical data in Table 11-14 shows that Copper, Manganese and Zinc concentrations did not exceed the SSV1 and SSV2. However, at the sampling location S9 it exceeded SSV1.

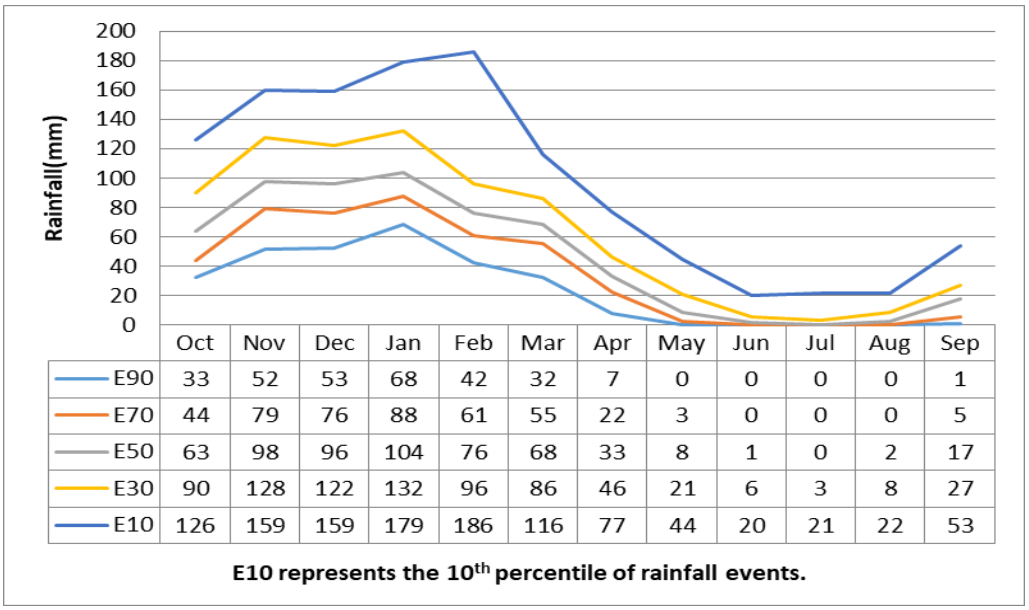
11.6.2.6 Soil Texture

The particle size distribution of the soil sampled in the area was classed into the percentages of sand, silt and clay present. The soils can be described as clay, sandy clay loam, sandy loam, silt loam and clay loam. Clayey soils have a slow infiltration rate, but a good water retention capacity and these soils are more fertile than sandy soils due to high plant nutrient retention. Soils with high clay content have a low to marginal agricultural potential.

11.7 Surface Water

11.7.1 Hydrometeorology

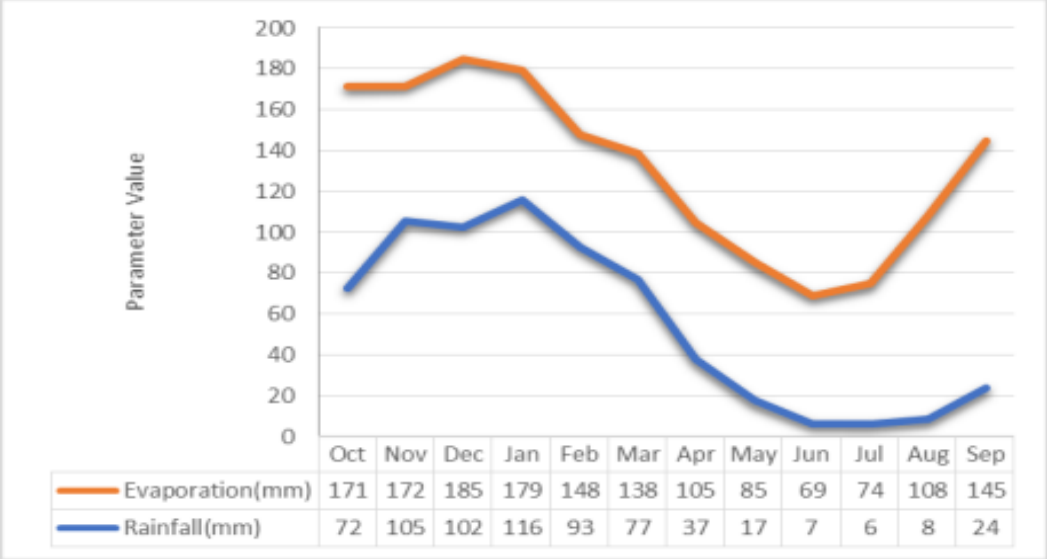
The Mean Annual Precipitation (MAP) for quaternary catchment C12D in which the Twistdraai East Shaft conveyor belt servitude, quarry and road are located is 667 mm. This MAP is likely to be distributed as indicated in Figure 11-7. 90% of the most frequent rainfall events in the wettest month of January did not exceed 68 mm, while 10% of the extreme rainfall events will likely be below 179 mm. The potential Mean Annual Evaporation (MAE) for the region is in the order of 1 580 mm which is more than twice as much as the MAP for the area (Figure 11-8). This indicates the existence of seasonal rainfall in this quaternary catchment with more rainfall being received from October to March and less rainfall from April to September.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
E90	33	52	53	68	42	32	7	0	0	0	0	1
E70	44	79	76	88	61	55	22	3	0	0	0	5
E50	63	98	96	104	76	68	33	8	1	0	2	17
E30	90	128	122	132	96	86	46	21	6	3	8	27
E10	126	159	159	179	186	116	77	44	20	21	22	53

E10 represents the 10th percentile of rainfall events.

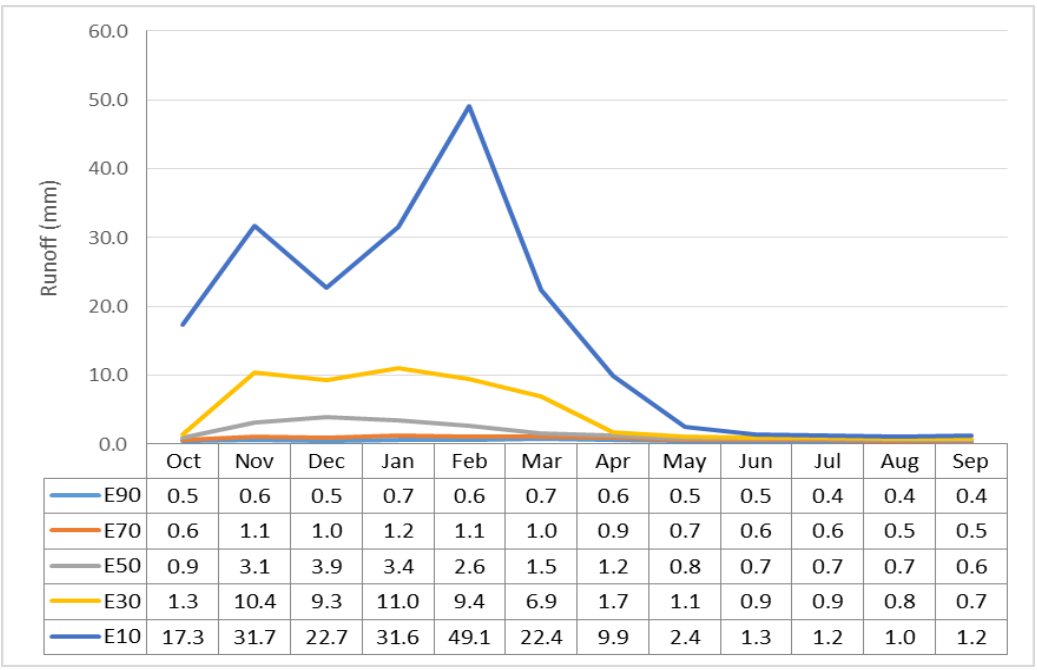
Figure 11-7: Rainfall distribution for quaternary catchment C12D



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation(mm)	171	172	185	179	148	138	105	85	69	74	108	145
Rainfall(mm)	72	105	102	116	93	77	37	17	7	6	8	24

Figure 11-8: Rainfall and evaporation trends for quaternary catchment C12D

Naturalised Mean Annual Runoff (MAR) depth for the Twistdraai East Shaft area was calculated to be 70.57 mm. This runoff depth is approximately 11% of the MAP and is likely to be distributed as indicated in Figure 11-9.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
E90	0.5	0.6	0.5	0.7	0.6	0.7	0.6	0.5	0.5	0.4	0.4	0.4
E70	0.6	1.1	1.0	1.2	1.1	1.0	0.9	0.7	0.6	0.6	0.5	0.5
E50	0.9	3.1	3.9	3.4	2.6	1.5	1.2	0.8	0.7	0.7	0.7	0.6
E30	1.3	10.4	9.3	11.0	9.4	6.9	1.7	1.1	0.9	0.9	0.8	0.7
E10	17.3	31.7	22.7	31.6	49.1	22.4	9.9	2.4	1.3	1.2	1.0	1.2

Figure 11-9: Runoff distribution for quaternary catchment C12D

11.7.2 Surface Water Quality

The water quality information was obtained from a previous monitoring report for the Twistdraai East Shaft (Wet-Earth, 2017). Samples were collected from points on the Klipspruit, upstream and downstream of the conveyor belt as well as at river crossings along the conveyor belt servitude. The conveyor belt servitude crossed tributaries of the Klipspruit and a tributary of the Groot-Bossjesspruit. Monitoring points TD1, TD2 are located at the headwaters of the Klipspruit, TD4 and TD6 on a tributary of the Klipspruit, while BL12 and BL13 are located on a tributary of the Groot-Bossjesspruit. Locations of monitoring points are indicated in Figure 11-10.

Water quality was benchmarked against the South African Water Quality guidelines or target values (SWQTV) (DWA, 1996), S SANS 241-1: 2015 drinking water standards (DWA, 1996), S and the Surface Water Quality Reserve for the Waterval River that is included in the Block 3 Water Use Licence (WUL) (No. 08/C12D/ACEFGIJ/1274) that was issued to Sasol Mining (Pty) Ltd.

A summary of the surface water quality results obtained from the Wet-East report is provided in the appended Surface Water report (Appendix G).

- **Sites TD1:** Surface water quality at the TD1 monitoring site for all assessed parameters, falls within the SWQTV for livestock watering and the SANS 241-1:2015 drinking water standards (Wet-Earth, 2017).
- **Sites TD2 and TD4:** EC, SO_4, Mg and E. Coli levels exceed the WUL limits at both monitoring sites. Nitrate and ammonia TD4 are higher than the WUL limit, while monitoring point TD2 indicates a higher Ortho-Phosphate level than the WUL limit. All other assessed parameters fall below the WUL limits, SWQTV for livestock watering and the SANS 241-1: 2015 drinking water guidelines. E. Coli levels exceed WUL limits and SANS 241-1: 2015 drinking water standards, while Faecal coliform is within the WUL limit but exceeds SANS drinking water standards at TD2 and TD4 monitoring points.
- **Sites TD6:** Surface water quality at the TD6 site for all assessed parameters, falls within the SWQTV for livestock watering and the SANS 241-1:2015 drinking water standards (Wet-Earth, 2017).
- **Site BL12 and BL13:** EC, SO_4, Mg and Na levels (569 mS/m, 2277 mg/L, 145 mg/L and 815 mg/L, respectively) exceed WUL limits at monitoring point BL12. Similarly, 690 mS/m (EC), 2555 mg/L (SO_4), 217 mg/L (Mg) and 764 mg/L (Na), exceed the SANS 241-1: 2015 drinking water standards but are within acceptable levels of the SWQTV for livestock watering at point BL13. The high SO_4 and EC levels might be due to contamination from various sources including the operations at the Sasol Coal Supply and the adjacent Fine Ash and Course Dumps in the area. TDS (2840 mg/L, 3720 mg/L) is also high at BL12 and BL13 exceeding the SWQTV for livestock watering (<1000 mg/L) and the SANS drinking water standard (<1200 mg/L). There is, however, no WUL limit to benchmark TDS against. Cl and Ca are within the WUL limits

and SWQTV for livestock watering but exceed the SANS241-1: 2015 drinking water standards, especially at point BL13. E. Coli exceeds WUL limit (0 CFU/100ml) and SANS drinking water standard at point BL12, while faecal coliform is within the WUL limit (126 CFU/100ml) but exceeds SANS drinking water standard. (See Table 11-16).

Table 11-16: Water quality summary benchmarked to WUL limits, DWS and SANS guidelines

Parameter (Units, mg/L, unless specified)	SANS 241-1: 2015	SWQTV (DWAF, 1996) Livestock Watering	WUL (No: 08/C12D/ACEFGIJ/1274)	TD2	TD4	BL12	BL13
pH	5 - 9.7	NS	5.8 - 9.0	8.2	7.7	7.9	7.73
EC (mS/m)	<170	NS	100	122	103	569	690
TDS	<1200	<1000	NS	647	-	2840	3720
Total Alkalinity, $CaCO_3$	NS	NS	NS	444	424	240	-
Chloride, Cl	<300	<1500	1000	71	17	351	633
Sulphate, SO4	<500	<1000	100	188	133	2277	2555
Calcium, Ca	300	<1000	700	69	58	261	388
Magnesium, Mg	<100	<500	50	99	75	145	217
Sodium, Na	<200	<2000	60	52	58	815	764
Fluoride, F	<1.5	<2	NS	0.2	0.4	1.5	-
Nitrate, NO3	11	<100	1.5	1.1	2	0.2	-
Nitrite, NO2	0.9	NS	NS	<0.05	0.2	<0.05	-
Ortho-Phosphate, P	NS	NS	0.065	0.3	<0.1	<0.1	-
Faecal Coliform	0	NS	126	3	8	7	-
E. Coli	0	NS	0	2	7	2	-
Ammonia, N	<1.5	NS	0.054	<0.1	0.6	0.2	-

Key:	
Red	Exceeds WUL Limit (No. 08/C12D/ACEFGIJ/1274)
Green	Exceeds SANS Drinking water standard
NS	No Standard

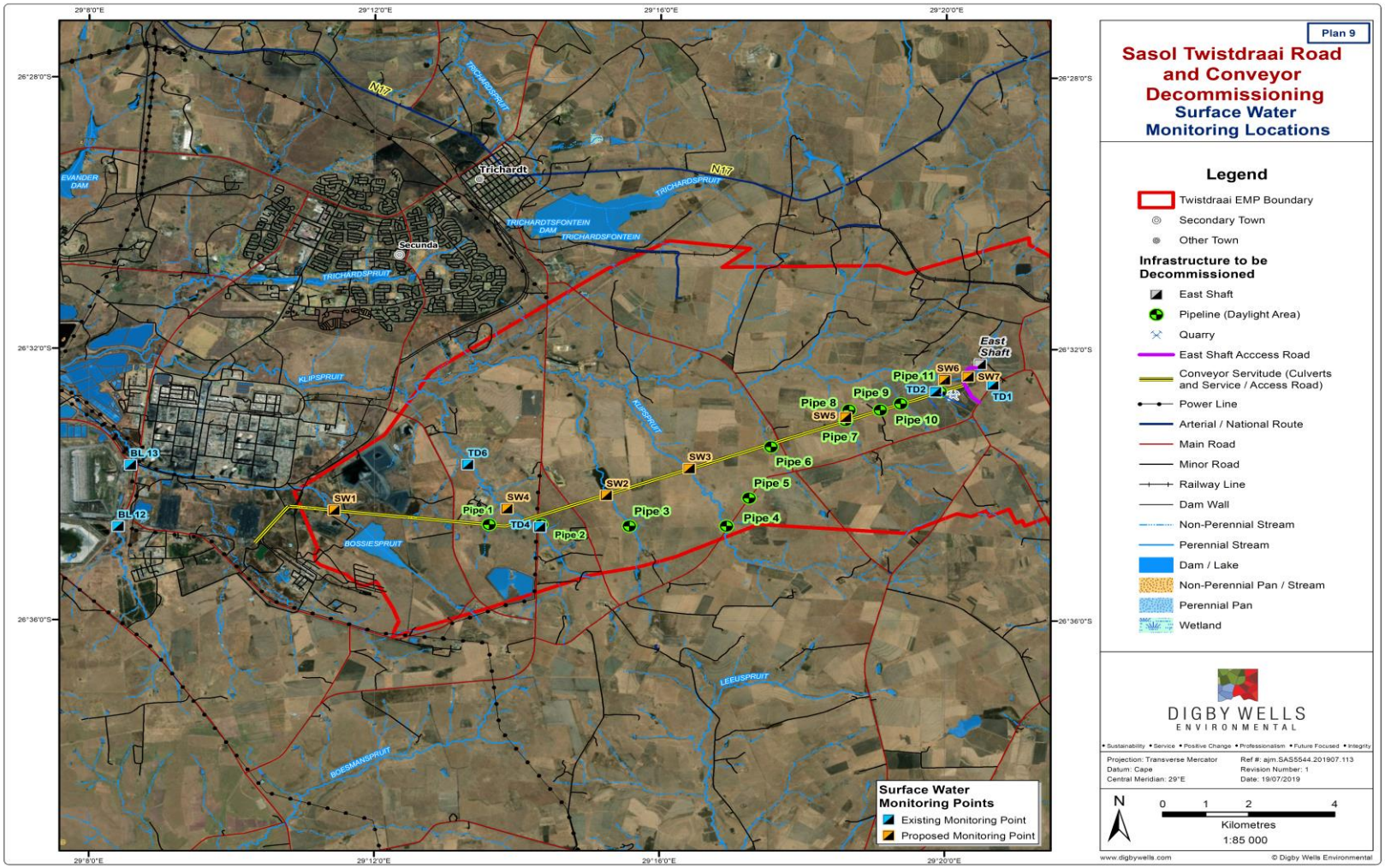


Figure 11-10: Twistdraai East surface water quality monitoring points

11.8 Heritage

The local and regional Project area offers a backdrop to the cultural-historical and socio-economic conditions and planning context within which the Project is situated.

Anthropogenic activities have largely disturbed the Project area and immediate surroundings over time. These activities include the development of historical farmsteads, the establishment and growth of the town of Secunda and the operation of Twistdraai East Shaft, including the development and operation of the conveyor belt servitude, pipeline, quarry and roads to be decommissioned.

11.8.1 Palaeontology

Mpumalanga's geological history takes place over 3 600 million years (Johnson, Anhauesser, & Thomas, 2006; Groenewald & Groenewald, 2014). The province is underlain by valuable geological formations, both in terms of mineral and fossil wealth. Briefly, these comprise:

- The Karoo Supergroup;
- The Bushveld Complex; and
- Transvaal Supergroup.

The regional and local Project areas comprise a part of the Highveld Coalfield, which extends across approximately 7 000 km^2. The Main Karoo Basin is the predominant geological feature to underlie this area. The Main Karoo Basin comprises the lithostratigraphic units associated with the Karoo Supergroup, which dates to the Late Carboniferous to Middle Jurassic periods (between ~320 and 145 million years ago [mya]).

Within the Karoo Supergroup, the sediments of the Ecca Group are the most paleontologically sensitive of the geological layers. The Ecca Group dates to the Permian Period and overlies the *Dwyka Formation*. The Ecca Group dates to the Permian Period and overlies the *Dwyka Formation*. The Ecca Group sediments are well-known for the wealth of plant fossils, characterised by assemblage of the *Glossopteris* flora (plant species which occur together and are typified by the dominant fossil leaves that belong to the glossopterid group). These layers also contain significant coal reserves (Groenewald & Groenewald, 2014).

The Project area is situated with Karoo dolerites and the *Vryheid Formation* (Rubidge, 2008; Rubidge, 2013a; Rubidge, 2013b). The *Vryheid Formation* has a very-high palaeo-sensitivity (SAHRA 2013) and is the primary potential fossil-bearing layer underlying the site-specific study area. The formation corresponds to the basal unit of the Ecca Group, which was deposited roughly 280 mya in a deltaic environment. Shales, sandstones, mudstones and coal feature all form part of this formation (Bamford, 2016).

Coal is formed through compression and heat alteration of plant matter. During the formation of coal, alteration happens to such an extent that potential plant fossil remains are no longer recognisable. The shales between the coal horizons, however, have the potential to preserve very good examples of plant fossils (Bamford, Best Practice for Palaeontological Chance Finds: Proposed extension into adjacent Block 4 reserve of Syferfontein Mine (Sasol), Mpumalanga, 2014; Environmental Authorisation for the Proposed Imvula Mine: Palaeontological Impact Assessment addendum to the Heritage Impact Assessment, 2016). To a lesser extent, the sandstone surface outcrops may also preserve fossil plants. Common fossil plants that could be expected within the *Vryheid Formation* include *Glossopteris* leaves, roots and inflorescences; and *Calamites* stems. Coal deposits can potentially also include fossils of mammal-like reptiles and amphibians. These are however, rarely, if ever, preserved with plant fossils (Bamford, Palaeontological Impact Assessment for Majuba Underground Coal Gasification Project, Mpumalanga, 2012; Environmental Authorisation for the Proposed Imvula Mine: Palaeontological Impact Assessment addendum to the Heritage Impact Assessment, 2016). A detailed Heritage Report is appended in Appendix E: of this document.

11.8.2 Site Specific Heritage Resources

The tracks of the pre-disturbance survey are provided in Plan 12 in Appendix B. Table 11-17 provides descriptions of the heritage resources identified during the pre-disturbance survey.

Table 11-17: Heritage Resources identified through the pre-disturbance survey[4]

Site Name	Description
BGG-001	A small graveyard demarcated with a fence. The graveyard includes two graves, both of which are double graves. The first double-grave belongs to the Snyman family and dates to 1924 and 1938. This grave includes a granite headstone with cement fittings. The other includes members of the Snyman and Kruger families and dates to 1894 and 1930. This grave has a marble headstone with cement and iron fittings.
BGG-002	Burial ground including approximately 15 visible graves, most of which are marked by soil, brick and stone heaps. Two of the graves are marked with brick fittings and a cement headstone and one other grave was marked with a cement headstone and fittings. One grave was partially legible and belonged to the Nkosi family. The headstone dated to either 1955 or 1965. Demarcated by servitude fence.
BGG-003	Burial ground of approximately 10 graves, of which two have headstones. Both these graves have cement headstones and one of these graves had cement fittings as well. The other graves are marked by stone and soil heaps. No headstones were legible. Demarcated by servitude fence.

[4] In accordance with new SAHRA procedures, the GPS co-ordinates of these heritage resources have not been included in documents available to the public.

BGG-001 is located near the sealed Twistdraai East ventilation shaft. Sasol Mining has proactively demarcated the graveyard to prevent risk of direct negative damage to the graves during the operation of the colliery. To date, there is no evidence suggesting that the graves have been damaged by the mining activities. The fence will remain around the graves while the mine is decommissioned and until the final land use is achieved. Sasol Mining have communicated that visitors will be allowed access to the graveyard should this be required.

BGG-002 and BGG-003 occur in areas that should be considered part of the conveyor belt servitude. The boundary fence between the conveyor servitude and the neighbouring farms has been redirected to encompass the burial grounds and separate them from any Project-related activities. The burial grounds are located on the farm side of the boundary fence in both instances. Sasol Mining excluded the burial grounds from the servitude area for ease of access should any Next of Kin (NoK) wish to visit either graveyard and to minimise or avoid the risk of negative impact to the graves during the operational and decommissioning phases.

11.8.3 Results of historical layering

The historical imagery shows similar land use as seen in the present environment. The landscape is predominantly agricultural with several fields and roads within the present-day Project area. The historical landscape includes several small watercourses, many of which appear to be present in the current landscape.

One potential historical structure was identified through the historical imagery. However, this was not ground-truthed by heritage specialist, as it falls outside the Project area (i.e. it is more than 200 m from the conveyor servitude). The Project presents no risk or direct negative impact to this potential heritage resource. No potential historical structures were identified within the Project area.

11.9 Description of the Current Land Uses

The present land use was identified using satellite images and visual observations. The main land uses in the area are cultivated land and veld for grazing, as illustrated in Figure 11-11 and in Plan 13 in Appendix B. A large amount of agricultural activities is taking place within the Project area and surroundings. The area is underlain by underground mining.

Figure 11-11: Land Use at Twistdraai Colliery and surrounding

11.10 Description of Specific Environmental Features and Infrastructure on the Site

11.10.1 Water Resources

The Project is in the Vaal Major Water Management Area 5 (WMA 5), within quaternary catchment C12D. The Klipspruit is a perennial tributary of the Waterval River which traverses the Twistdraai East Shaft mining right boundary.

11.10.2 Wetlands

WCS (2018) delineated a total of 2199 ha of wetland within the Project area. The breakdown of the wetland types per area is detailed in Table 11-18 and illustrated in Plan 14 in Appendix B. Most wetlands that transect the conveyor servitude are Channelled Valley Bottom Wetlands, followed by Unchanneled Valley Bottom Wetlands.

Table 11-18: Wetland Hydro-Geomorphic Units (HGM Units) (WCS, 2018)

Wetland Type	Area (ha)	% of wetland area	% of study area
Artificial Depression	16.63	0.76%	0.12%
Artificial Wetland	3.43	0.16%	0.02%
Channelled Valley Bottom	851.38	38.72%	6.19%
Digging/Excavation	53.04	2.41%	0.39%
Drainage Line	36.32	1.65%	0.26%

Wetland Type	Area (ha)	% of wetland area	% of study area
Flat	0.78	0.04%	0.01%
Floodplain	574.00	26.10%	4.17%
PCD Dam	17.08	0.78%	0.12%
Seep	166.97	7.59%	1.21%
Sheet Rock	69.67	3.17%	0.51%
Trench	0.09	0.00%	0.00%
Unchanneled Valley Bottom	409.62	18.63%	2.98%
Grand Total	**2199.03**	**100.00%**	**15.98%**

11.10.3 Cultural Heritage

A survey was undertaken to identify any tangible heritage resources that could potentially be impacted by the decommissioning of the pipeline, road and conveyor belt servitude and the rehabilitation of the quarry.

Figure 11-12 includes photographs of some of these heritage resources. No heritage resources were identified near the quarry or at any of the water crossing points.

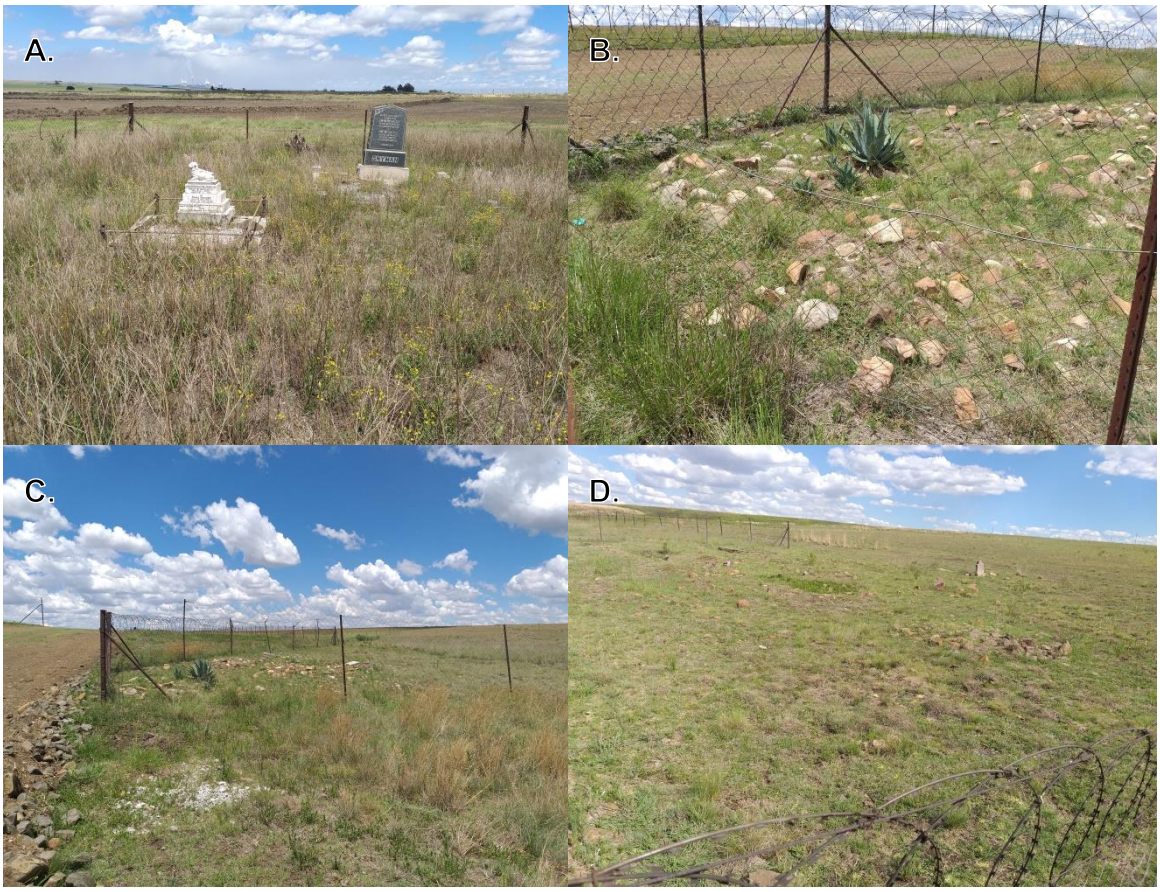


Figure 11-12: Heritage resources identified during the pre-disturbance survey

A.) BGG-001; B.) BGG-002 (photograph taken through the servitude fence); C.) BGG-002 (demarcated by the servitude fence); and D.)

11.10.4 Infrastructure and Facilities

The following infrastructure located within the Project area includes:

- Gravel access road to the conveyor belt;
- Gravel access road from Mynpad Road to the Twistdraai East Shaft;
- Culverts along the conveyor belt servitude;
- Pipelines;
- Dams;
- Agricultural; and
- Fencing along the conveyor belt servitude.

11.10.5 Environmental and Current Land Use Map

Refer to the environmental and current land use map Plan 13 in Appendix B. Current land use is described in Section 11.9.

12 Impacts and risks identified including the Nature, Significance, Consequence, Extent, Duration and Probability of the Impacts, Including the Degree to which these Impacts

This section aims to rate the significance of the identified potential impacts and risks pre-mitigation and post-mitigation. It should be noted that an impact arises from a planned event while a risk arises from an unplanned event. Therefore, both risks and impacts have been assessed below to ensure sound environmental management practices.

The potential impacts and risks identified in this section are a result of both the environment in which the Project activities take place, as well as the actual activities. The potential impacts/ risks are discussed per each aspect per each phase. The Project will however not have a construction or operational phase as the Project is specifically a decommissioning Project. Therefore, only decommissioning and rehabilitation phases have been considered.

The Project will mainly focus on the physical removal of infrastructure associated with the conveyor, its servitude (access road and pipeline), access road and the infilling of the quarry. Additional infrastructure associated with the conveyor crossing points will also be removed include the following:

- All concrete structures, slabs and any concrete remains;
- Culverts;
- Fence lines within the pathway of crossing points; and
- Any final waste material after decommissioning such as eroded rubble and plastic safety barriers.

Once the decommissioning phase has been completed, rehabilitation activities will be undertaken. It should be noted that decommissioning and rehabilitation will be undertaken concurrently to avoid impact to the environment by leaving surfaces bare and exposing it to the elements. The following activities will be undertaken as indicated in Table 12-1.

Table 12-1: Decommissioning and Rehabilitation measures

Crossing	Suggested Rehabilitation measures
Culvert Crossings and access/service road	▪ Remove culvert; ▪ Remove the concrete slabs; ▪ Remove all rubble from site; ▪ Remove fence; ▪ Remove coal contamination and dispose of at an appropriate waste facility; ▪ Due to the steepness of the slopes in some areas, hessian should be used to cover the slopes during the revegetation process to reduce erosion;

Crossing	Suggested Rehabilitation measures
	▪ Reprofile the site to be free draining and to emulate the surrounding environment which will aim to ensure that water is not impeded, and the flow resumes a natural pattern; ▪ Remove Alien Invasive Plan species (AIPs), with a focus on *Cirsium vulgare, Cosmos bipinnatus and Typha capensis*; and ▪ Rip road crossing to a maximum of 150 mm and reseed with species in the plant species plan.
Pipeline	▪ Remove the water extraction pipe from within the channel; ▪ Remove all rubble and materials from site; ▪ Reprofile the site to be free draining and to emulate the surrounding wetland area which will aim to ensure that water is not impeded, and the flow resumes a natural pattern; ▪ Rip the road, as well as any other area that has been compacted, to a maximum of 150 mm and reseed with species listed in the plant species plan; and ▪ Remove all AIPs.
Road (Access road to Twistdraai East Shaft)	▪ Remove all rock and other debris related to the road crossing; ▪ Reprofile the affected road area to emulate the surrounding wetland area, to ensure that water is not impeded, and the flow resumes a natural pattern (restrict activities to the affected road area and ensure no additional disturbance to the original and surrounding wetland surface or substrate); ▪ Rip the road crossing, as well as any other area that has been compacted, to a maximum of 150 mm and reseed with species listed in the plant species plan; and ▪ Remove all AIPs.
Quarry	▪ Infill quarry ▪ Shape and profile the site to be free draining ▪ Rip 150 mm and reseed with species listed in the plant species plan.

12.1 Decommissioning and Rehabilitation Phase

The impacts associated with the decommissioning and rehabilitation phase of the Project has been discussed in Table 12-2.

Table 12-2: Impact Assessment Associated with the Decommissioning and Rehabilitation Phase

Phase	Activity	Aspect	Impacts	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Pre-Mitigation)	Mitigation Measures	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Post Mitigation)
Decommissioning	Decommissioning of all infrastructure, including the road, conveyor and pipeline	Wetlands	Compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas resulting in impacts further downstream. Encroachment by robust pioneer species and alien invasive species	3	3	3	5	45	Minor (negative)	▪ Limit the footprint area of the decommissioning activities to what is essential to minimise impacts because of vegetation clearing and compaction of soils (all areas but critically so in wetland areas); ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; ▪ Ensure that rock is removed carefully, and that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed decommissioning footprint; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ The use of machinery should be minimised to reduce compaction of the wetland soils; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; ▪ All waste generated must be removed to an appropriate waste facility; ▪ Any coal contamination should be removed and discarded at the correct facility; ▪ Rehabilitation measures should take place as soon as possible after decommissioning; and ▪ Monitoring should be carried out as specified in the monitoring programme.	3	2	2	3	21	Negligible (negative)
Decommissioning	Removal of infrastructure	Aquatic Ecology	Direct habitat disturbance (i.e.	3	2	2	6	42	Minor (negative)	▪ Limit machinery access / activities to only the infrastructure footprint area;	1	1	2	5	20	Negligible (negative)

[5] Duration
[6] Spatial Scale
[7] Severity
[8] Probability
[9] Significance

Phase	Activity	Aspect	Impacts	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Pre-Mitigation)	Mitigation Measures	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Post Mitigation)
	utilising heavy machinery in direct contact with aquatic / wetland habitat		instream morphological change) and destruction during decommissioning							▪ Areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix); ▪ High rainfall periods (usually December to March) should be avoided during the operation of machinery; and ▪ Make use of environmentally friendly barrier systems, such as silt nets, to trap potential runoff of unearthed sediment which has the potential to directly impact aquatic habitat.						
Decommissioning	Physical removal of infrastructure unearthing sediment and compaction of surfaces using heavy machinery at watercourse crossing points	Aquatic Ecology	Increase in sediment and potentially contaminants entering the watercourses at infrastructure crossing points	3	3	3	5	45	Minor (negative)	▪ High rainfall periods should be avoided during the Project; ▪ Bare surfaces in proximity to watercourses or areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix) to limit erosion; ▪ Environmentally friendly barrier systems, such as silt nets or in severe cases the use of trenches, can be used downstream from decommissioning sites to limit erosion and possibly trap contaminated runoff from the Project; ▪ Areas observed to be concentrating water flow need to be dispersed in such a manner to limit erosion and flow through the physical working area (i.e. use of baffles at the end of canals or trenches diverting major flow from decommissioning sites if applicable or needed); ▪ Any water used at decommissioning sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses which, depending on its quality and quantity, could alter the natural conditions of the receiving environment; and ▪ Ensure the correct storage of any chemicals needed near watercourse crossing points (e.g. machinery oils or hydrocarbons).	3	1	2	3	18	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Soil, land use and land capability	The movement of heavy machinery on the soil surface causes compaction which reduces the vegetation's ability to grow and as a result erosion could occur.	4	2	4	6	60	Minor (negative)	▪ Runoff must be controlled and managed by use of proper storm water management measures; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events; ▪ Restriction of vehicle movement over sensitive areas to reduce compaction; ▪ Minimise unnecessary removal of the natural vegetation cover; ▪ All vehicles must be regularly inspected for potential hydrocarbon leaks; ▪ No re-fuelling is allowed on site; ▪ Fuel and oils spills should be remediated using commercially available emergency clean up kits.	3	2	3	4	32	Negligible (negative)

Phase	Activity	Aspect	Impacts	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Pre-Mitigation)	Mitigation Measures	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Post Mitigation)
										For major spills, if soils are contaminated they must be stripped and disposed of at a licensed waste disposal site; and ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.						
Decommissioning	Decommissioning of the infrastructure	Surface Water	Sedimentation and siltation of nearby watercourses leading to deteriorated water quality	6	4	3	4	52	Minor (negative)	▪ Accredited contractors should be utilised for demolition and removal of infrastructure to reduce the risk of waste generation and accidental spillages; ▪ Removal of infrastructure should be conducted during the dry season to reduce chances of soil erosion and sedimentation; ▪ Vehicle movement through watercourses at river crossings should be limited to minimise damage to channel geometry. ▪ Where infrastructure is removed at river crossings, the disturbed channel geometry should be profiled to allow free drainage. Silt fences should be installed at profiled and re-vegetated river crossings to prevent entrance of sediment into the stream prior to vegetation establishment. ▪ The decommissioned quarry should be infilled, top-soiled and re-vegetated to reduce chances of soil erosion, sedimentation and siltation of nearby watercourses; and ▪ Re-profiling of the infilled quarry and road surfaces prior to revegetation must be undertaken to ensure surface profiles that allow free drainage. This will ensure improvement of catchment yield to pre-mining conditions in the surrounding watercourses.	2	2	2	2	12	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Alteration of stream channel geometry at conveyor belt and road river crossings	6	4	3	4	52	Minor (negative)		2	2	2	2	12	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Contamination of surface water resources leading to deteriorated water quality	5	4	3	4	48	Minor (negative)		2	1	1	2	8	Negligible (negative)
Rehabilitation	Implementing rehabilitation measures such as shaping, ripping and reseeding and site access	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	3	3	4	5	50	Minor (negative)		3	2	2	3	21	Negligible (negative)
Rehabilitation	Infilling and rehabilitation of a quarry located near the conveyer belt which is within 500m of surrounding wetlands	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream.	3	3	2	5	40	Negligible (negative)		3	3	1	3	21	Negligible (negative)

Phase	Activity	Aspect	Impacts	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Pre-Mitigation)	Mitigation Measures	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Post Mitigation)
			Encroachment of alien invasive species							area, it is important to seed the area to promote stabilisation and reduce the possibility of weed infestation, erosion and/or associated sedimentation of the wetland system both in the immediate surrounds or further downstream; ▪ Ripping should take place to a maximum depth of 150mm; ▪ Seeding should take place immediately after ripping to ensure the best chance of survival and should be done by hand to avoid compaction of the soils; ▪ After ripping and seeding has taken place, the area should be avoided and not driven over; ▪ As much vegetation growth as possible should be promoted within the proposed development area during all phases. To protect soils, vegetation clearance should be kept to a minimum; ▪ Cattle movement should be restricted from the areas that have been repaired until those areas have been reasonably rehabilitated; ▪ An AIP management plan to be implemented and managed for the life of the proposed decommissioning, rehabilitation, closure and post-closure phases; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; and ▪ Monitoring should be carried out as specified in the monitoring programme.						
Rehabilitation	Physical ripping operations and seeding activities near watercourses	Aquatic Ecology	Potential for the compaction of land and increased surface runoff/erosion into associated watercourses during the planned rehabilitation	3	2	2	4	28	Negligible (negative)	▪ High rainfall periods should be avoided during ripping activities; ▪ Operators of machinery (i.e. tractors) should ensure that their own tracks have been ripped especially near watercourses and crossing points; ▪ Seeding near watercourses and especially at crossing points should take place by hand; and ▪ Use correct species for seeding as per the recommendations in wetland report (Digby Wells, 2019a).	7	3	3	5	65	Minor (positive)

Phase	Activity	Aspect	Impacts	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Pre-Mitigation)	Mitigation Measures	D[5]	SS[6]	S[7]	P[8]	S[9]	Rating (Post Mitigation)
Rehabilitation	Rehabilitation of the disturbed areas	Soil, land use and land capability	After decommissioning, there will be less movement of heavy machinery on the soil surface leading to less soil compaction and vegetation's ability to regrow and as a result erosion will be minimised. Other excavations will be re-filled. This will eventually lead to improved soil status	4	2	3	5	45	Minor (positive)	▪ Effective soil cover and adequate protection from wind and water; ▪ Soil chemical and physical amelioration to enhance the growth capability of the soils; ▪ If erosion has occurred, usable soil should be sourced and replaced and shaped to reduce the recurrence of erosion; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; ▪ Return the land conditions capable of supporting prior land use or uses equal or better than prior land use to the extent feasible or practical; and ▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated.	6	2	4	6	72	Minor (positive)
Rehabilitation	Reshaping or profiling at river crossings with the conveyor belt servitude, access road and water pipeline. Infilling and reshaping of the quarry area 200 m from a watercourse.	Surface Water	Sedimentation and siltation of nearby watercourses	2	3	3	4	32	Negligible (negative)	▪ River geometry at affected crossings should be profiled, decommissioned quarry should be infilled and reshaped. Reseeding of exposed rehabilitated surfaces should be undertaken to reduce soil erosion and sedimentation in nearby watercourses; and ▪ Prior to vegetation establishment, seeded areas should have temporary silt fences installed to keep soils from being washed into nearby watercourses.	2	2	2	2	12	Negligible (negative)
Post-closure	Removal of cattle from site, ongoing vegetation growth.	Wetlands	Ensure vegetation establishment, prevent erosion and ensure successful rehabilitation	4	3	2	4	36	Minor (positive)	▪ Monitoring should be carried out as specified in the monitoring programme to ensure that rehabilitation is taking place; ▪ Any required maintenance works should be done by hand to reduce disturbance within the wetland; ▪ Cattle movement must be restricted until rehabilitation has taken place; and ▪ Restrict movement of personnel in the wetland areas.	6	3	2	6	66	Minor (positive)
Post-closure	Water quality monitoring downgradient of river crossings; Erosion monitoring at rehabilitated, profiled and re-vegetated surfaces.	Surface Water	Restoration of good drainage and runoff regime close to pre-development conditions	5	4	3	7	84	Minor (positive)	▪ Implement erosion and surface water monitoring	7	6	3	7	112	Major (positive)

13 Methodology used in Determining and Ranking the Nature, Significance, Consequence, Extent, Duration and Probability of Potential Environmental Impacts and Risks

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 13-3. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 13-2, which is extracted from Table 13-1. The description of the significance ratings is discussed in Table 13-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 13-1: Impact assessment parameter ratings

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly sensitive** cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the Project.	Definite: There are sound scientific reasons to expect that the impact will occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to cultural/social resources of **moderate to highly** sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond Project life: The impact will remain for some time after the life of the Project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the Project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of **low to moderately** sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur. <25% probability.
2	**Minor loss and/or effects** to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low because of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	**Minimal to no loss** and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 13-2: Probability/ Consequence Matrix

Probability \ Consequence	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Significance																																							
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Table 13-3: Significance rating description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the Project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

13.1 The Positive and Negative Impacts that the Proposed Activity (In terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be affected

It is anticipated that the decommissioning and rehabilitation phase will have initial negative impacts as any movement or disturbance to the environment will result in increased sedimentation and potential erosion especially as the activities to be undertaken occur with a watercourse. However, in the long term once the area has been rehabilitated, vehicles removed from site and the vegetation has been re-established all the potential impacts will stop.

13.1.1 Decommissioning Phase

Impacts associated with the decommissioning phase include compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation. This will have an impact on soils, watercourses, wetlands and the aquatic environment in the decommissioned areas and resulting in impacts further downstream.

Any temporary storage or dumping of decommissioned infrastructure within wetland, aquatic environments or watercourses, has the potential to result in loss of stream connectivity, loss of refuge areas, alterations to the terrain profiles of the area and the creation of preferential flow paths. The removal of vegetation and disturbance of soil while the infrastructure is being decommissioned may result in sedimentation, alterations to the vegetation structure of the area, encourage alien vegetation encroachment and result in increased erosion and sedimentation potential.

Additionally, there are also minor potential impacts to soil and water quality because of the ingress of hydrocarbons and mechanical spills associated with moving machinery required for the decommissioning activities.

Mitigation measures provided are predicted to limit the associated impacts from a minor concern to a negligible concern, especially as most of the watercourses crossing points are already impacted from a morphological perspective.

13.1.2 Rehabilitation Phase

Impacts associated with the rehabilitation phase include potential loss of natural vegetation and the increased potential for erosion and sedimentation of the rehabilitated areas. This can result in impacts to water users further downstream.

Removal of vegetation and disturbance of soils during shaping and ripping is likely to give rise to an increased potential for erosion and sedimentation. Encroachment by robust pioneer species and alien invasive species is possible which may further alter the natural vegetation profiles of the wetlands, surface water and aquatic ecology.

However, soil ripping will alleviate compaction in surface soil layers and have little to no effect on deeper soil compaction. Successful re-vegetation of all disturbed areas with indigenous

vegetation species can reduce the significance of erosion and compaction to low; therefore, improving the soil status. The focus should be to limit runoff from the ripping and profiling activities which consequently should limit erosion and sedimentation in the associated watercourses.

As this Project is a rehabilitation Project, long term positive impacts are deemed highly likely, should the rehabilitation be done correctly and in adherence to the mitigation measures outlined in this report. Thereby the Project will ultimately improve the wetland, water courses, aquatic environments and soils within the rehabilitated footprint area.

13.2 The Possible Mitigation Measures that could be applied and the Level of Risk

Mitigation measures for each identified impact have been proposed and are presented in Part A Section 15.

13.3 Motivation where no alternatives sites were considered

A location alternative for this Project cannot be considered as the Project will only decommission and rehabilitate the environment to which mining disturbance has occurred which this application relates to. Additionally, no rehabilitation/technology alternatives can be considered as rehabilitation will be undertaken in accordance with relevant legislation such as NEMA, MPRDA and the Chamber of Mines Guidelines with the aim of removing the mining infrastructure, reducing the mining impact which previously occurred at the site and improving the overall environment by rehabilitating the land.

13.4 Statement motivating the alternative development location within the overall site

No alternative development location alternative can be considered for this Project. Refer to Part A Section 9.

14 Full description of the Process undertaken to Identify, Assess and Rank the Impacts and Risks the Activity will impose on the Preferred Site (In respect of the Final Site Layout Plan) through the Life of the Activity

The identification, assessment and ranking of potential new impacts associated with the Project were informed by the environmental and technical specialist investigations undertaken. The impacts associated with the decommissioning and rehabilitation Project are presented in Table 15-1.

15 Assessment of each identified potentially significant impact and risk

Table 15-1 provides all identified impacts associated with the decommissioning, rehabilitation and post closure phase aspects.

Table 15-1: Assessment of each identified potentially significant impact

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Mitigation Measures	Rating (Post Mitigation)
Decommissioning	Decommissioning of all infrastructure, including the road, conveyor and pipeline	Wetlands	Compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas resulting in impacts further downstream. Encroachment by robust pioneer species and alien invasive species	Minor (negative)	▪ Limit the footprint area of the decommissioning activities to what is essential to minimise impacts because of vegetation clearing and compaction of soils (all areas but critically so in wetland areas); ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; ▪ Ensure that rock is removed carefully, and that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed decommissioning footprint; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ The use of machinery should be minimised to reduce compaction of the wetland soils; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; ▪ All waste generated must be removed to an appropriate waste facility; ▪ Any coal contamination should be removed and discarded at the correct facility; ▪ Rehabilitation measures should take place as soon as possible after decommissioning; and ▪ Monitoring should be carried out as specified in the monitoring programme.	Negligible (negative)
Decommissioning	Removal of infrastructure utilising heavy machinery in direct contact with aquatic / wetland habitat	Aquatic Ecology	Direct habitat disturbance (i.e. instream morphological change) and destruction during decommissioning	Minor (negative)	▪ Limit machinery access / activities to only the infrastructure footprint area; ▪ Areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix); ▪ High rainfall periods (usually December to March) should be avoided during the operation of machinery; and ▪ Make use of environmentally friendly barrier systems, such as silt nets, to trap potential runoff of unearthed sediment which has the potential to directly impact aquatic habitat.	Negligible (negative)

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Mitigation Measures	Rating (Post Mitigation)
Decommissioning	Physical removal of infrastructure unearthing sediment and compaction of surfaces using heavy machinery at watercourse crossing points	Aquatic Ecology	Increase in sediment and potentially contaminants entering the watercourses at infrastructure crossing points	Minor (negative)	▪ High rainfall periods should be avoided during the Project; ▪ Bare surfaces in proximity to watercourses or areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix) to limit erosion; ▪ Environmentally friendly barrier systems, such as silt nets or in severe cases the use of trenches, can be used downstream from decommissioning sites to limit erosion and possibly trap contaminated runoff from the Project; ▪ Areas observed to be concentrating water flow need to be dispersed in such a manner to limit erosion and flow through the physical working area (i.e. use of baffles at the end of canals or trenches diverting major flow from decommissioning sites if applicable or needed); ▪ Any water used at decommissioning sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses which, depending on its quality and quantity, could alter the natural conditions of the receiving environment; and ▪ Ensure the correct storage of any chemicals needed near watercourse crossing points (e.g. machinery oils or hydrocarbons).	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Soil, land use and land capability	The movement of heavy machinery on the soil surface causes compaction which reduces the vegetation's ability to grow and as a result erosion could occur.	Minor (negative)	▪ Runoff must be controlled and managed by use of proper storm water management measures; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events; ▪ Restriction of vehicle movement over sensitive areas to reduce compaction; ▪ Minimise unnecessary removal of the natural vegetation cover; ▪ All vehicles must be regularly inspected for potential hydrocarbon leaks; ▪ No re-fuelling is allowed on site; ▪ Fuel and oils spills should be remediated using commercially available emergency clean up kits. For major spills, if soils are contaminated they must be stripped and disposed of at a licensed waste disposal site; and ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.	
Decommissioning	Decommissioning of the infrastructure	Surface Water	Sedimentation and siltation of nearby watercourses leading to deteriorated water quality	Minor (negative)	▪ Accredited contractors should be utilised for demolition and removal of infrastructure to reduce the risk of waste generation and accidental spillages; ▪ Removal of infrastructure should be conducted during the dry season to reduce chances of soil erosion and sedimentation; ▪ Vehicle movement through watercourses at river crossings should be limited to minimise damage to channel geometry. ▪ Where infrastructure is removed at river crossings, the disturbed channel geometry should be profiled to allow free drainage. Silt fences should be installed at profiled and re-vegetated river	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Alteration of stream channel geometry at conveyor belt and road river crossings	Minor (negative)		Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Contamination of surface water resources leading to deteriorated water quality	Minor (negative)		Negligible (negative)

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Mitigation Measures	Rating (Post Mitigation)
					crossings to prevent entrance of sediment into the stream prior to vegetation establishment. ▪ The decommissioned quarry should be infilled, top-soiled and re-vegetated to reduce chances of soil erosion, sedimentation and siltation of nearby watercourses; and ▪ Re-profiling of the infilled quarry and road surfaces prior to revegetation must be undertaken to ensure surface profiles that allow free drainage. This will ensure improvement of catchment yield to pre-mining conditions in the surrounding watercourses.	
Rehabilitation	Implementing rehabilitation measures such as shaping, ripping and reseeding and site access	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	Minor (negative)	▪ Limit the footprint area of the rehabilitation activities to what is essential to minimise impacts because of compaction of soils (all areas but critically so in wetland areas); ▪ Ensure that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed rehabilitation footprint; ▪ When reprofiling, ensure that machinery does not disturb additional wetland; ▪ All erosion noted within the rehabilitation footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ The use of machinery should be minimised to reduce compaction of the wetland soils; ▪ Although it is expected that the existing Phragmites, Typha and other wetland species will spread and colonise the newly rehabilitated area, it is important to seed the area to promote stabilisation and reduce the possibility of weed infestation, erosion and/or associated sedimentation of the wetland system both in the immediate surrounds or further downstream; ▪ Ripping should take place to a maximum depth of 150mm; ▪ Seeding should take place immediately after ripping to ensure the best chance of survival and should be done by hand to avoid compaction of the soils; ▪ After ripping and seeding has taken place, the area should be avoided and not driven over; ▪ As much vegetation growth as possible should be promoted within the proposed development area during all phases. To protect soils, vegetation clearance should be kept to a minimum; ▪ Cattle movement should be restricted from the areas that have been repaired until those areas have been reasonably rehabilitated; ▪ An AIP management plan to be implemented and managed for the life of the proposed decommissioning, rehabilitation, closure and post-closure phases; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; and	Negligible (negative)
Rehabilitation	Infilling and rehabilitation of a quarry located near the conveyer belt which is within 500m of surrounding wetlands	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	Negligible (negative)		Negligible (negative)

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Mitigation Measures	Rating (Post Mitigation)
					▪ Monitoring should be carried out as specified in the monitoring programme.	
Rehabilitation	Physical ripping operations and seeding activities near watercourses	Aquatic Ecology	Potential for the compaction of land and increased surface runoff/erosion into associated watercourses during the planned rehabilitation	Negligible (negative)	▪ High rainfall periods should be avoided during ripping activities; ▪ Operators of machinery (i.e. tractors) should ensure that their own tracks have been ripped especially near watercourses and crossing points; ▪ Seeding near watercourses and especially at crossing points should take place by hand; and ▪ Use correct species for seeding as per the recommendations in wetland report (Digby Wells, 2019a).	Minor (positive)
Rehabilitation	Rehabilitation of the disturbed areas	Soil, land use and land capability	After decommissioning, there will be less movement of heavy machinery on the soil surface leading to less soil compaction and vegetation's ability to regrow and as a result erosion will be minimised. Other excavations will be re-filled. This will eventually lead to improved soil status	Minor (positive)	▪ Effective soil cover and adequate protection from wind and water; ▪ Soil chemical and physical amelioration to enhance the growth capability of the soils; ▪ If erosion has occurred, usable soil should be sourced and replaced and shaped to reduce the recurrence of erosion; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; ▪ Return the land conditions capable of supporting prior land use or uses equal or better than prior land use to the extent feasible or practical; and ▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated.	Minor (positive)
Rehabilitation	Reshaping or profiling at river crossings with the conveyor belt servitude, access road and water pipeline. Infilling and reshaping of the quarry area 200 m from a watercourse.	Surface Water	Sedimentation and siltation of nearby watercourses	Negligible (negative)	▪ River geometry at affected crossings should be profiled, decommissioned quarry should be infilled and reshaped. Reseeding of exposed rehabilitated surfaces should be undertaken to reduce soil erosion and sedimentation in nearby watercourses; and ▪ Prior to vegetation establishment, seeded areas should have temporary silt fences installed to keep soils from being washed into nearby watercourses.	Negligible (negative)
Post-closure	Removal of cattle from site, ongoing vegetation growth.	Wetlands	Ensure vegetation establishment, prevent erosion and ensure successful rehabilitation	Minor (positive)	▪ Monitoring should be carried out as specified in the monitoring programme to ensure that rehabilitation is taking place; ▪ Any required maintenance works should be done by hand to reduce disturbance within the wetland; ▪ Cattle movement must be restricted until rehabilitation has taken place; and ▪ Restrict movement of personnel in the wetland areas.	Minor (positive)
Post-closure	Water quality monitoring downgradient of river crossings; Erosion monitoring at rehabilitated, profiled and re-vegetated surfaces.	Surface Water	Restoration of good drainage and runoff regime close to pre-development conditions	Minor (positive)	▪ Implement erosion and surface water monitoring	Major (positive)

16 Summary of Specialist Reports

Table 16-1 provides a summary of the specialist studies that have were undertaken for the proposed decommissioning and rehabilitation of an access road, conveyor belt servitude and quarry infilling Project.

Table 16-1: Specialist studies that have been undertaken for the Project

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Aquatic Ecology Assessment	The objective during decommissioning activities is to preserve the Ecological Categories determined for the various watercourses associated with the Project and prevent further degradation of local aquatic environments. However, the post rehabilitation of the affected areas is expected to hopefully improve the Ecological Categories determined for the various watercourses. The following recommendations are made: ▪ Limit machinery access/activities to only the infrastructure footprint area where applicable (i.e. remain on the servitude proposed for decommissioning during the Project); ▪ High rainfall periods (usually December to March) should be avoided during the Project to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and / or dissolved solids) into associated watercourses; ▪ Environmentally friendly barrier systems, such as silt nets or in severe cases the use of trenches, can be used downstream from decommissioning sites to limit erosion and possibly trap contaminated runoff from the Project. Trapped silt or soil during decommissioning activities could potentially be used during rehabilitation (i.e. re-profiling of the area); ▪ Areas observed to be concentrating water flow need to be dispersed in such a manner to limit erosion and flow through the physical working area; and ▪ Any water used at decommissioning sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses; and ▪ An aquatic biomonitoring programme has been developed in this document and should be implemented for the entirety of the decommissioning Project.	X - All recommendations have been considered and included in this report.	Mitigation and management measures included in this report were recommended by the Aquatic Specialist. This includes the impact assessment and mitigation measures discussed in Section 15 Part A, as well as recommendations provided in Part B, Sections 5 and 6 the monitoring provided in Section 8.
Surface water Assessment	Accredited contractors should be utilised for demolition and removal of infrastructure to reduce the risk of waste generation and accidental spillages. Removal of infrastructure at river crossings should be conducted during the dry season when water levels and erosion rates are low. Where infrastructure is removed at river crossings, the disturbed channel geometry should be reshaped or profiled to allow for free drainage. Temporary silt fences should be installed at the profiled and re-vegetated river crossings to prevent entrance of sediment into the stream prior to vegetation establishment. Vehicle movement through watercourses at river crossings should be limited to minimise damage to channel geometry. The decommissioned quarry should be infilled, top-soiled and re-vegetated to reduce chances of soil erosion, sedimentation, siltation of nearby watercourses. Re-profiling of the infilled quarry and road surfaces prior to re-vegetation must be undertaken to ensure surface profiles that allow freely draining runoff mimicking pre-mining conditions as much as practically possible. This will ensure improvement of catchment runoff yield benefitting aquatic ecosystems and downstream water users.	X - All recommendations have been considered and included in this report.	Mitigation and management measures included in this report were recommended by the Hydrologist. This includes the impact assessment and mitigation measures discussed in Section 15, as well as recommendations provided in Part B, Sections 5 and 6 and the monitoring provided in Section 8

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Soils, Land Use and Land Capability Assessment	The following actions are recommended to minimise adverse effects of the proposed activities on soils: ▪ Runoff must be controlled and managed by use of proper storm water management measures; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place. Soil erosion might pose a problem once vegetation cover is removed; thus, erosion monitoring should take place at regular intervals and after high rainfall events; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ Soil chemical amelioration to enhance the growth capability of the soils; ▪ Return the land conditions capable of supporting prior land use or uses equal or better than prior land use to the extent feasible or practical; ▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; ▪ Minimise unnecessary removal of the natural vegetation cover; ▪ All vehicles must be regularly inspected for potential hydrocarbon leaks; ▪ No re-fuelling is allowing on site; and ▪ Fuel and oils spills should be remediated using commercially available emergency clean up kits. For major spills, if soils are contaminated they must be stripped and disposed of at a licensed waste disposal site.	X - All recommendations have been considered and included in this report.	Mitigation and management measures included in this report were recommended by the Soil Specialist. This includes the impact assessment and mitigation measures discussed in Section 15, as well as recommendations provided in Part B, Sections 5 and 6 and the monitoring provided in Section 8
Heritage Assessment	No impact to heritage resources have been anticipated because of the proposed decommissioning and rehabilitation Project. However, the following has been recommended: ▪ Sasol Mining develops a Project-specific Chance Find Protocol (CFP) and Fossil Finds Procedure (FFP) for implementation during decommissioning activities; and ▪ Sasol Mining immediately informs SAHRA of any chance finds identified and enlists the services of a qualified and accredited archaeologist and/or palaeontologist to assess and recommend appropriate mitigation measures as required.	X - All recommendations have been considered and included in this report.	Mitigation and management measures included in this report were recommended by the Heritage Specialist. This includes the impact assessment and mitigation measures discussed in Section 15, as well as recommendations provided in Part B, Sections 5 and 6 and the monitoring provided in Section 8.

Note: Attach copies of specialist reports as appendices to this report

17 Environmental Impact Statement

17.1 Summary of the Key Findings of the Environmental Impact Assessment

The findings of the impact assessment perceive that the major concern associated with the Project is the potential to erode and increase sediment load into the watercourses associated with the quarry, access road crossing points, including the exposed pipeline sections. In addition, habitat destruction and deterioration has also been highlighted as a potential cause for concern. It is predicted that the operation of heavy machinery during decommissioning will result in the compaction of surfaces, potentially increasing runoff, causing minor erosion and sedimentation of the downstream aquatic ecosystems. Physical machinery contact within the instream pathway of the watercourse crossing points (e.g. during the removal of structures such as culverts) as well as the proximity of operations to vegetation associated with the watercourses are predicted to result in the most significant impacts through the potential of hydrocarbon spillages.

Mitigation measures provided are predicted to limit the associated impacts from a minor concern to a negligible concern, especially as most of the watercourses crossing points are already impacted from a morphological perspective. However, the proposed rehabilitation activities are envisaged to greatly improve the habitat and water quality conditions.

17.2 Final Site Map

The aim of the Project is to decommission the access roads, infrastructure within the servitude and to fil the quarry. Therefore, should the Project be implemented all mining related infrastructure will be removed. Plan 15 in Appendix B provides the location of the infrastructure to be decommissioned.

17.3 Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

A summary of negative impacts associated with the Project during the decommissioning and rehabilitation phase are depicted in Table 17-1 while the positive impacts associated with the Project during the decommissioning and rehabilitation phase are described in Table 17-2.

Table 17-1: Summary of all negative impacts for the Project

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Rating (Post Mitigation)
Decommissioning	Decommissioning of all infrastructure, including the road, conveyor and pipeline	Wetlands	Compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas resulting in impacts further downstream. Encroachment by robust pioneer species and alien invasive species	Minor (negative)	Negligible (negative)
Decommissioning	Removal of infrastructure utilising heavy machinery in direct contact with aquatic / wetland habitat	Aquatic Ecology	Direct habitat disturbance (i.e. instream morphological change) and destruction during decommissioning	Minor (negative)	Negligible (negative)
Decommissioning	Physical removal of infrastructure unearthing sediment and compaction of surfaces using heavy machinery at watercourse crossing points	Aquatic Ecology	Increase in sediment and potentially contaminants entering the watercourses at infrastructure crossing points	Minor (negative)	Negligible (negative)

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Rating (Post Mitigation)
Decommissioning	Decommissioning of the infrastructure	Soil, land use and land capability	The movement of heavy machinery on the soil surface causes compaction which reduces the vegetation's ability to grow and as a result erosion could occur.	Minor (negative)	
Decommissioning	Decommissioning of the infrastructure	Surface Water	Sedimentation and siltation of nearby watercourses leading to deteriorated water quality	Minor (negative)	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Alteration of stream channel geometry at conveyor belt and road river crossings	Minor (negative)	Negligible (negative)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Contamination of surface water resources leading to deteriorated water quality	Minor (negative)	Negligible (negative)

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Rating (Post Mitigation)
Rehabilitation	Implementing rehabilitation measures such as shaping, ripping and reseeding and site access	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	Minor (negative)	Negligible (negative)
Rehabilitation	Infilling and rehabilitation of a quarry located near the conveyer belt which is within 500m of surrounding wetlands	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	Negligible (negative)	Negligible (negative)
Rehabilitation	Reshaping or profiling at river crossings with the conveyor belt servitude, access road and water pipeline. Infilling and reshaping of the quarry area 200 m from a watercourse.	Surface Water	Sedimentation and siltation of nearby watercourses	Negligible (negative)	Negligible (negative)

Table 17-2: Summary of all positive impact for the Project

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Rating (Post Mitigation)
Rehabilitation	Physical ripping operations and seeding activities near watercourses	Aquatic Ecology	Potential for the compaction of land and increased surface runoff/erosion into associated watercourses during the planned rehabilitation	Negligible (negative)	Minor (positive)
Rehabilitation	Rehabilitation of the disturbed areas	Soil, land use and land capability	After decommissioning, there will be less movement of heavy machinery on the soil surface leading to less soil compaction and vegetation's ability to regrow and as a result erosion will be minimised. Other excavations will be re-filled. This will eventually lead to improved soil status	Minor (positive)	Minor (positive)
Post-closure	Removal of cattle from site, ongoing vegetation growth.	Wetlands	Ensure vegetation establishment, prevent erosion and ensure successful rehabilitation	Minor (positive)	Minor (positive)

Phase	Activity	Aspect	Impact	Rating (Pre-Mitigation)	Rating (Post Mitigation)
Post-closure	Water quality monitoring downgradient of river crossings; Erosion monitoring at rehabilitated, profiled and re-vegetated surfaces.	Surface Water	Restoration of good drainage and runoff regime close to pre-development conditions	Minor (positive)	Major (positive)

18 Proposed Impact Management Objectives and the Impact Management Outcomes for Inclusion in the EMPR

The EMPR seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment will be mitigated, controlled and monitored.

The EMPR will address the environmental impacts during the decommissioning and rehabilitation phases of the Project. Due regard must be given to environmental protection during the entire Project; many environmental recommendations are made to achieve environmental protection. These recommendations are aimed at ensuring that the contractor maintains adequate control over the Project to:

- To minimise the extent of an impact during the life of the Project;
- To ensure appropriate restoration of areas affected by the Project; and
- To prevent long term environmental degradation.

19 Aspects for inclusion as conditions of authorisation

It is not foreseen that any additional aspects other that what has been included and discussed in this document, are required.

20 Description of any Assumptions, Uncertainties and Gaps in Knowledge

This section highlights the assumptions, uncertainties, limitations and knowledge gaps relevant to the various specialist studies undertaken.

Table 20-1: Specialist studies assumptions, uncertainties and gaps

Specialist Study	Assumptions, Uncertainties and Gaps
Soils, Land Use and Land Capability Assessment	The information provided in this report is based on information gathered from the site visit undertaken on 03 December 2018 by a qualified soil specialist and information reviewed from previous studies: ▪ A total of 10 soil samples were collected at the crossings and infrastructure and analysed at an accredited Intertek Laboratory; and ▪ The area surveyed is based on the layout presented by Sasol Mining.
Surface Water Assessment	▪ No water quality sampling was undertaken in this study. Only a descriptive summary of findings from a previous report is provided (Wet-Earth, 2017). ▪ It was assumed that the water quality write-up in the Wet-Earth (2017) report was accurate and representative of the site conditions.

Specialist Study	Assumptions, Uncertainties and Gaps
Wetlands Assessment	▪ The wetland impact assessment is based on a baseline wetland assessment completed by WCS in 2018 therefore a repeat of this work was not deemed necessary; ▪ It is assumed that the work carried out by WCS is accurate and complete; ▪ With ecology being dynamic and complex, certain aspects, some of which may be important, may have been overlooked. It is, however, expected that the Project area has been accurately assessed and considered, based on the field observations undertaken and the consideration of existing studies and monitoring data in terms of freshwater ecology.
Aquatic Ecology Assessment	The aquatic indices utilised in the study, such as SASS5 and IHAS, were developed for lothic watercourses of typical riverine nature. Additionally, as described in Dickens and Graham (2002), the SASS5 assessment is not suitable for non-perennial systems (i.e. having seasonal flow). As a result, these indices were limited to the application at only a single site. Therefore, more attention should be paid to the ecological categories determined through the diatom assessments, where successful.

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

21.1 Reasons why the activity should be authorised or not

Twistdraai East Shaft is in the decommissioning phase with most of the mining infrastructure at the Shaft already decommissioned, however, for the remaining infrastructure which is located within or near watercourses to be decommissioned an Environmental Authorisation is required as the Project triggers listed activities of the EIA Regulation 2014, (as amended). Specialist studies have been undertaken with the objective of identifying and assessing the anticipated impacts and risks associated with the decommissioning and rehabilitation activities.

The findings of the impact assessment have shown that the Project will not have significant impacts on the receiving environment. The impacts that are anticipated will have a minor impact on the environment because of the potential removal of vegetation and increased activities within the watercourses. These activities can result in increased erosion and sedimentation of the watercourses and have an impact on wetland and aquatic ecology. Additionally, the increased vehicle movement could lead to increased compaction and the potential for hydrocarbon spillages. However, with the implementation of the mitigation measures these impacts are taken from a minor impact to a negligible impact with only one minor impact.

It should also be noted that the Project is a decommissioning and rehabilitation Project. The Project therefore aims to have an overall positive impact as all mining related infrastructure

will be removed and the rehabilitated area will be able to recover thereby improving the aquatic, wetland, soils and surface water environments. Therefore, it is recommended that the Project is approved if the mitigation measures proposed in this report are implemented.

21.2 Conditions that must be included in the authorisation

21.2.1 Specific conditions to be included into the compilation and approval of EMPR

The following specific conditions are proposed:

- Limit the footprint area of the decommissioning activities to what is essential to minimise impacts because of vegetation clearing and compaction of soils (all areas but critically so in wetland areas);
- Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream;
- Ensure that rock is removed carefully, and that no additional areas are disturbed in the rehabilitation process;
- No material may be dumped or stockpiled within any water course areas (or the buffers) near the proposed decommissioning footprint;
- All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan;
- All vehicles must be regularly inspected for hydrocarbon leaks;
- Areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix);
- Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from water courses to prevent ingress of hydrocarbons into topsoil;
- All spills from machinery should be immediately cleaned up and treated accordingly;
- All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis;
- Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities;
- All waste generated must be removed to an appropriate waste facility;
- Any coal contamination should be removed and discarded at the correct facility;
- Rehabilitation measures should take place as soon as possible after decommissioning;
- Make use of environmentally friendly barrier systems, such as silt nets, to trap potential runoff of unearthed sediment which has the potential to directly impact aquatic habitat;

- Areas observed to be concentrating water flow need to be dispersed in such a manner to limit erosion and flow through the physical working area (i.e. use of baffles at the end of canals or trenches diverting major flow from decommissioning sites if applicable or needed);
- Any water used at decommissioning sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses which, depending on its quality and quantity, could alter the natural conditions of the receiving environment;
- Ensure the correct storage of any chemicals needed near watercourse crossing points (e.g. machinery oils or hydrocarbons);
- Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams;
- Accredited contractors should be utilised for demolition and removal of infrastructure to reduce the risk of waste generation and accidental spillages;
- Vehicle movement through watercourses at river crossings should be limited to minimise damage to channel geometry;
- Where infrastructure is removed at river crossings, the disturbed channel geometry should be profiled to allow free drainage. Silt fences should be installed at profiled and re-vegetated river crossings to prevent entrance of sediment into the stream prior to vegetation establishment;
- The decommissioned quarry should be infilled, top-soiled and re-vegetated to reduce chances of soil erosion, sedimentation and siltation of nearby watercourses;
- Re-profiling of the infilled quarry and road surfaces prior to revegetation must be undertaken to ensure surface profiles that allow free drainage. This will ensure improvement of catchment yield to pre-mining conditions in the surrounding watercourses.
- Although it is expected that the existing Phragmites, Typha and other wetland species will spread and colonise the newly rehabilitated area, it is important to seed the area to promote stabilisation and reduce the possibility of weed infestation, erosion and/or associated sedimentation of the wetland system both in the immediate surrounds or further downstream;
- Ripping should take place to a maximum depth of 150mm;
- Seeding should take place immediately after ripping to ensure the best chance of survival and should be done by hand to avoid compaction of the soils;
- After ripping and seeding has taken place, the area should be avoided and not driven over;

- As much vegetation growth as possible should be promoted within the proposed development area during all phases. To protect soils, vegetation clearance should be kept to a minimum;
- Cattle movement should be restricted from the areas that have been repaired until those areas have been reasonably rehabilitated;
- An AIP management plan to be implemented and managed for the life of the proposed decommissioning, rehabilitation, closure and post-closure phases;
- Operators of machinery (i.e. tractors) should ensure that their own tracks have been ripped especially near watercourses and crossing points;
- Seeding near watercourses and especially at crossing points should take place by hand;
- Soil chemical and physical amelioration to enhance the growth capability of the soils;
- If erosion has occurred, usable soil should be sourced and replaced and shaped to reduce the recurrence of erosion;
- Only the designated access routes are to be used to reduce any unnecessary compaction;
- Return the land conditions capable of supporting prior land use or uses equal or better than prior land use to the extent feasible or practical;
- Any required maintenance works should be done by hand to reduce disturbance within the wetland; and
- Monitoring should be carried out as specified in the monitoring programme (Refer to Part B Section 8).

22 Period for which the Environmental Authorisation is required

The Project is anticipated to be undertaken within 12 months should the Environmental Authorisation be approved. However, it is required that monitoring is undertaken for a period of three years after the completion of the rehabilitation phase. Therefore, it is recommended that the authorisation is valid for a period of four years.

23 Undertaking

Please refer to Part B, Section 11 for the complete undertaking applicable to both the BAR and EMP sections of this report.

24 Financial Provision

The Financial Provisioning Assessment for the Twistdraai East Shaft is updated annually and submitted to DMR, the last update was conducted by Jones and Wagner in March 2018.

The estimated closure cost required for the rehabilitation and closure of the Twistdraai Colliery is **R 14,021,604.00 (incl. VAT)**. The decommissioning of the access road, conveyor belt servitude (access road, culverts and pipeline) and quarry have already been included into the Twistdraai Colliery financial provision.

24.1 Explain how the aforesaid amount was derived

The financial liability cost update was calculated in alignment with Financial Provisioning Regulations, 2015 (GN R 1147).

24.2 Confirm that this amount can be provided for from operating expenditure

This section is not applicable.

25 Specific Information required by the competent Authority

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the: -

25.1 Impact on the socio-economic conditions of any directly affected person

The Twistdraai East Shaft stopped mining in December 2017, with the closure of the shaft all work opportunities were transferred from this operation to the Twistdraai Colliery: Thubelisha Shaft. Therefore, no significant impact to people's livelihoods occurred because of the closure of the mine as is usually excepted when mines are decommissioned.

The Project is a decommissioning and rehabilitation Project therefore only a few jobs will be created. Additionally, the Project is anticipated to be completed within 12 months. However, as a rehabilitation Project it is expected to have a positive impact on the livelihoods of the directly and indirectly affected landowners. The areas which were previously utilised for mining will now be rehabilitated and changed back to its original or as close as possible to its original land use which in most cases along the conveyor belt will be grazing land.

It is anticipated that with the removal of the culverts, the watercourses are anticipated to flow more freely reducing erosion and in so doing improving the water quality of the water courses which people rely on for their survival.

25.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

A Heritage NID was compiled and submitted to the SAHRA. Three burial grounds and graves were identified in proximity to Project activities. No impact to these heritage resources by Project-related activities is envisaged as they have all been demarcated and fenced off from Project activities. No other heritage resources were recorded within the Project area. This is most likely due to the highly-disturbed nature of the Project area, which has a history of mining, agriculture and associated activities. As no impact to heritage resources is envisaged, no impact assessment has been undertaken. However, mitigation measures are proposed which include the compilation of A Chance Finds procedure for heritage and fossil resources. The procedure must be implemented during the decommissioning phase to ensure the national estate is not impacted, if unknown heritage resources are uncovered during decommissioning.

26 Other matters required in terms of sections 24(4)(a) and (b) of the Act

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts. The outcome of the investigation has been provided in Section 7 to Section 13 Part A of this BAR.

Part B: Environmental Management Programme Report

1 Details of the EAP

Digby Wells Environmental has been appointed by Sasol Mining as the Environmental Assessment Practitioner (EAP) to manage the application processes. The details of the EAP are contained in Table 2-2 and the Curriculum Vitae and EAP qualifications are attached in Appendix A.

Table 1-1: Contact details of the EAP

Name of Practitioner:	Claire Wannenburgh
Telephone:	011 789 9495
Fax:	011 069 6801
Postal Address	Private Bag X10046, Randburg, 2125, South Africa
Email:	Claire.Wannenburgh@digbywells.com

2 Description of the aspects of the activity

A summary of the baseline environment within the Project footprint area is provided in Part A: Section 11.

The flowing specialist studies have been undertaken for the Project:

- Wetlands Specialist Study Appendix D)
- Aquatic Specialist Study (Appendix E);
- Soils, Land Use and Land Capability Specialist Study (Appendix F)
- Surface water Specialist Study (Appendix G); and
- Heritage Specialist Study (Appendix H).

3 Composite Map

The composite plan for the Project area, indicating sensitive areas, heritage resources watercourse buffers, is included as Plan 16 in Appendix B.

4 Description of Impact Management Objectives including Management Statements

4.1 Determination of Closure Objectives

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the Project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental outcome, but it will also reduce the

financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure which will be implemented in for this Project:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Utilise approved sites for the safe disposal of all waste either onsite or off site;
- Rehabilitation should strive to rehabilitate the soil and land capability to emulate pre-disturbance land capability;
- Minimise negative impacts and maximise positive benefits on the local community;
- Maintain and monitor all rehabilitated areas following re-vegetation and, if this monitoring shows that the objectives have been met, make an application for closure;
- Prevent soil and surface/groundwater contamination by managing all water on site to acceptable and agreed standards;
- Comply with local, district and national regulatory requirements;
- Promote active partnerships with local communities, where possible;
- Monitoring of key environmental variables (i.e. soils, erosion, vegetation, groundwater, surface water and air quality) to demonstrate stability of rehabilitated areas, this will be done for three years after the completion of the Project;
- Maintain or restore biodiversity at levels that are sustainable in the long term; and
- Follow a comprehensive consultation and communication process with all stakeholders.

4.2 Volumes and rate of water use required for the operation

It is not anticipated that a significant amount of water will be utilised for the Project as the Project is a decommissioning Project. Clean water will be brought in for personnel usage and hydration purposes during the decommissioning phase. During the rehabilitation phase to encourage vegetation establishment once seeding has taken place the area may need to be irrigated for a short period of time until a more natural rainfall event occurs as seeding may need to occur just before the rainy season is anticipated to start. The water will be sourced from the municipality or from other Sasol Mining operations located within the area.

4.3 Has a water use licence has been applied for

Twistdraai East Shaft is in possession of a Water Use Licence (08/C12D/ACEFGIJ/1274) which was authorised by the Department of Water and Sanitation on 21 February 2012. This WUL is applicable to the entire Block 3 area and not only the Twistdraai operation.

A General Authorisation will be applied for, in support of the decommissioning and rehabilitation Project.

5 Impacts to be mitigated in their respective phases

Table 5-1 explains the measures to rehabilitate the environment affected by the undertaking of any listed activity.

Table 5-1: Impacts to be mitigated in their respective phases.

Phase	Activity	Aspect	Impact	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Decommissioning	Decommissioning of all infrastructure, including the road, conveyor and pipeline	Wetlands	Compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas resulting in impacts further downstream. Encroachment by robust pioneer species and alien invasive species	39.51 Ha	▪ Limit the footprint area of the decommissioning activities to what is essential to minimise impacts because of vegetation clearing and compaction of soils (all areas but critically so in wetland areas); ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; ▪ Ensure that rock is removed carefully, and that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed decommissioning footprint; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ The use of machinery should be minimised to reduce compaction of the wetland soils; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; ▪ All waste generated must be removed to an appropriate waste facility; ▪ Any coal contamination should be removed and discarded at the correct facility; ▪ Rehabilitation measures should take place as soon as possible after decommissioning; and ▪ Monitoring should be carried out as specified in the monitoring programme.	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014	Decommissioning Phase
Decommissioning	Removal of infrastructure utilising heavy machinery in direct contact with aquatic / wetland habitat	Aquatic Ecology	Direct habitat disturbance (i.e. instream morphological change) and destruction during decommissioning	39.51 Ha	▪ Limit machinery access / activities to only the infrastructure footprint area; ▪ Areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix); ▪ High rainfall periods (usually December to March) should be avoided during the operation of machinery; and ▪ Make use of environmentally friendly barrier systems, such as silt nets, to trap potential runoff of unearthed sediment which has the potential to directly impact aquatic habitat.	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014	Decommissioning Phase

Phase	Activity	Aspect	Impact	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Decommissioning	Physical removal of infrastructure unearthing sediment and compaction of surfaces using heavy machinery at watercourse crossing points	Aquatic Ecology	Increase in sediment and potentially contaminants entering the watercourses at infrastructure crossing points	39.51 Ha	▪ High rainfall periods should be avoided during the Project; ▪ Bare surfaces in proximity to watercourses or areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix) to limit erosion; ▪ Environmentally friendly barrier systems, such as silt nets or in severe cases the use of trenches, can be used downstream from decommissioning sites to limit erosion and possibly trap contaminated runoff from the Project; ▪ Areas observed to be concentrating water flow need to be dispersed in such a manner to limit erosion and flow through the physical working area (i.e. use of baffles at the end of canals or trenches diverting major flow from decommissioning sites if applicable or needed); ▪ Any water used at decommissioning sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses which, depending on its quality and quantity, could alter the natural conditions of the receiving environment; and ▪ Ensure the correct storage of any chemicals needed near watercourse crossing points (e.g. machinery oils or hydrocarbons).	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014	Decommissioning Phase
Decommissioning	Decommissioning of the infrastructure	Soil, land use and land capability	The movement of heavy machinery on the soil surface causes compaction which reduces the vegetation's ability to grow and as a result erosion could occur.	39.51 Ha	▪ Runoff must be controlled and managed by use of proper storm water management measures; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events; ▪ Restriction of vehicle movement over sensitive areas to reduce compaction; ▪ Minimise unnecessary removal of the natural vegetation cover; ▪ All vehicles must be regularly inspected for potential hydrocarbon leaks; ▪ No re-fuelling is allowed on site; ▪ Fuel and oils spills should be remediated using commercially available emergency clean up kits. For major spills, if soils are contaminated they must be stripped and disposed of at a licensed waste disposal site; and ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.	▪ Chamber of Mines Guidelines ▪ CARA	Decommissioning Phase
Decommissioning	Decommissioning of the infrastructure	Surface Water	Sedimentation and siltation of nearby watercourses leading to deteriorated water quality	39.51 Ha	▪ Accredited contractors should be utilised for demolition and removal of infrastructure to reduce the risk of waste generation and accidental spillages; ▪ Removal of infrastructure should be conducted during the dry season to reduce chances of soil erosion and sedimentation; ▪ Vehicle movement through watercourses at river crossings should be limited to minimise damage to channel geometry. ▪ Where infrastructure is removed at river crossings, the disturbed channel geometry should be profiled to allow free drainage. Silt fences should be installed at profiled and re-vegetated river crossings to prevent entrance of sediment into the stream prior to vegetation establishment. ▪ The decommissioned quarry should be infilled, top-soiled and re-vegetated to reduce chances of soil erosion, sedimentation and siltation of nearby watercourses; and ▪ Re-profiling of the infilled quarry and road surfaces prior to revegetation must be undertaken to ensure surface profiles that allow free drainage. This will ensure improvement of catchment yield to pre-mining conditions in the surrounding watercourses.	▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)	Decommissioning Phase
Decommissioning	Decommissioning of the infrastructure	Surface Water	Alteration of stream channel geometry at conveyor belt and road river crossings	39.51 Ha		▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)	Decommissioning Phase

Phase	Activity	Aspect	Impact	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Decommissioning	Decommissioning of the infrastructure	Surface Water	Contamination of surface water resources leading to deteriorated water quality	39.51 Ha		▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)	Decommissioning Phase
Decommissioning	Decommissioning of the infrastructure	Heritage	Impact to heritage resources that may be found during the decommissioning phase	39.51 Ha	▪ Sasol Mining develops a Project-specific Chance Find Protocol (CFP) and Fossil Finds Procedure (FFP) for implementation during decommissioning activities; and ▪ Sasol Mining immediately informs SAHRA of any chance finds identified and enlists the services of a qualified and accredited archaeologist and/or palaeontologist to assess and recommend appropriate mitigation measures as required.	▪ The National Heritage Resources Act, 1999 (Act No. 25 of 1999) ▪ Regulations to the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (GN R 548) (SAHRA Regulations)' ▪ SAHRA Minimum Standards: Archaeological and Paleontological Components of Impact Assessment Reports	Decommissioning Phase
Rehabilitation	Implementing rehabilitation measures such as shaping, ripping and reseeding and site access	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	39.51 Ha	▪ Limit the footprint area of the rehabilitation activities to what is essential to minimise impacts because of compaction of soils (all areas but critically so in wetland areas); ▪ Ensure that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed rehabilitation footprint; ▪ When reprofiling, ensure that machinery does not disturb additional wetland; ▪ All erosion noted within the rehabilitation footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ The use of machinery should be minimised to reduce compaction of the wetland soils;	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005);	Rehabilitation Phase

Phase	Activity	Aspect	Impact	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Rehabilitation	Infilling and rehabilitation of a quarry located near the conveyer belt which is within 500m of surrounding wetlands	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	39.51 Ha	▪ Although it is expected that the existing Phragmites, Typha and other wetland species will spread and colonise the newly rehabilitated area, it is important to seed the area to promote stabilisation and reduce the possibility of weed infestation, erosion and/or associated sedimentation of the wetland system both in the immediate surrounds or further downstream; ▪ Ripping should take place to a maximum depth of 150mm; ▪ Seeding should take place immediately after ripping to ensure the best chance of survival and should be done by hand to avoid compaction of the soils; ▪ After ripping and seeding has taken place, the area should be avoided and not driven over; ▪ As much vegetation growth as possible should be promoted within the proposed development area during all phases. To protect soils, vegetation clearance should be kept to a minimum; ▪ Cattle movement should be restricted from the areas that have been repaired until those areas have been reasonably rehabilitated; ▪ An AIP management plan to be implemented and managed for the life of the proposed decommissioning, rehabilitation, closure and post-closure phases; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; and ▪ Monitoring should be carried out as specified in the monitoring programme.	▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014	
Rehabilitation	Physical ripping operations and seeding activities near watercourses	Aquatic Ecology	Potential for the compaction of land and increased surface runoff/erosion into associated watercourses during the planned rehabilitation	39.51 Ha	▪ High rainfall periods should be avoided during ripping activities; ▪ Operators of machinery (i.e. tractors) should ensure that their own tracks have been ripped especially near watercourses and crossing points; ▪ Seeding near watercourses and especially at crossing points should take place by hand; and ▪ Use correct species for seeding as per the recommendations in wetland report (Digby Wells, 2019a).	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014	Rehabilitation Phase
Rehabilitation	Rehabilitation of the disturbed areas	Soil, land use and land capability	After decommissioning, there will be less movement of heavy machinery on the soil surface leading to less soil compaction and vegetation's ability to regrow and as a result erosion will be minimised. Other excavations will be re-filled. This will eventually lead to improved soil status	39.51 Ha	▪ Effective soil cover and adequate protection from wind and water; ▪ Soil chemical and physical amelioration to enhance the growth capability of the soils; ▪ If erosion has occurred, usable soil should be sourced and replaced and shaped to reduce the recurrence of erosion; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; ▪ Return the land conditions capable of supporting prior land use or uses equal or better than prior land use to the extent feasible or practical; and ▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated.	▪ Chamber of Mines Guidelines ▪ CARA	Rehabilitation Phase

Phase	Activity	Aspect	Impact	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Rehabilitation	Reshaping or profiling at river crossings with the conveyor belt servitude, access road and water pipeline. Infilling and reshaping of the quarry area 200 m from a watercourse.	Surface Water	Sedimentation and siltation of nearby watercourses	39.51 Ha	▪ River geometry at affected crossings should be profiled, decommissioned quarry should be infilled and reshaped. Reseeding of exposed rehabilitated surfaces should be undertaken to reduce soil erosion and sedimentation in nearby watercourses; and ▪ Prior to vegetation establishment, seeded areas should have temporary silt fences installed to keep soils from being washed into nearby watercourses.	▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)	Rehabilitation Phase
Post-closure	Removal of cattle from site, ongoing vegetation growth.	Wetlands	Ensure vegetation establishment, prevent erosion and ensure successful rehabilitation	39.51 Ha	▪ Monitoring should be carried out as specified in the monitoring programme to ensure that rehabilitation is taking place; ▪ Any required maintenance works should be done by hand to reduce disturbance within the wetland; ▪ Cattle movement must be restricted until rehabilitation has taken place; and ▪ Restrict movement of personnel in the wetland areas.	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); MTPB, 2014	Post Closure Phase
Post-closure	Water quality monitoring downgradient of river crossings; Erosion monitoring at rehabilitated, profiled and re-vegetated surfaces.	Surface Water	Restoration of good drainage and runoff regime close to pre-development conditions	39.51 Ha	▪ Implement erosion and surface water monitoring	▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)	Post Closure Phase

6 Impact Management Outcomes

A description of impact management outcomes of the EMP is outlined in Table 6-1.

Table 6-1: Objectives and outcomes of the EMP

Phase	Activity	Aspect	Impact	Mitigation Measures	Compliance with standards
Decommissioning	Decommissioning of all infrastructure, including the road, conveyor and pipeline	Wetlands	Compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas resulting in impacts further downstream. Encroachment by robust pioneer species and alien invasive species	▪ Limit the footprint area of the decommissioning activities to what is essential to minimise impacts because of vegetation clearing and compaction of soils (all areas but critically so in wetland areas); ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; ▪ Ensure that rock is removed carefully, and that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed decommissioning footprint; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ The use of machinery should be minimised to reduce compaction of the wetland soils; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; ▪ All waste generated must be removed to an appropriate waste facility; ▪ Any coal contamination should be removed and discarded at the correct facility; ▪ Rehabilitation measures should take place as soon as possible after decommissioning; and ▪ Monitoring should be carried out as specified in the monitoring programme.	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014
Decommissioning	Removal of infrastructure utilising heavy machinery in direct contact with aquatic / wetland habitat	Aquatic Ecology	Direct habitat disturbance (i.e. instream morphological change) and destruction during decommissioning	▪ Limit machinery access / activities to only the infrastructure footprint area; ▪ Areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix); ▪ High rainfall periods (usually December to March) should be avoided during the operation of machinery; and ▪ Make use of environmentally friendly barrier systems, such as silt nets, to trap potential runoff of unearthed sediment which has the potential to directly impact aquatic habitat.	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014
Decommissioning	Physical removal of infrastructure unearthing sediment and compaction of surfaces using heavy machinery at watercourse crossing points	Aquatic Ecology	Increase in sediment and potentially contaminants entering the watercourses at infrastructure crossing points	▪ High rainfall periods should be avoided during the Project; ▪ Bare surfaces in proximity to watercourses or areas damaged by the operation of machinery should be vegetated as soon as possible (see wetlands report for species / seed mix) to limit erosion; ▪ Environmentally friendly barrier systems, such as silt nets or in severe cases the use of trenches, can be used downstream from decommissioning sites to limit erosion and possibly trap contaminated runoff from the Project; ▪ Areas observed to be concentrating water flow need to be dispersed in such a manner to limit erosion and flow through the physical working area (i.e. use of baffles at the end of canals or trenches diverting major flow from decommissioning sites if applicable or needed); ▪ Any water used at decommissioning sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses which, depending on its quality and quantity, could alter the natural conditions of the receiving environment; and ▪ Ensure the correct storage of any chemicals needed near watercourse crossing points (e.g. machinery oils or hydrocarbons).	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014

Phase	Activity	Aspect	Impact	Mitigation Measures	Compliance with standards
Decommissioning	Decommissioning of the infrastructure	Soil, land use and land capability	The movement of heavy machinery on the soil surface causes compaction which reduces the vegetation's ability to grow and as a result erosion could occur.	▪ Runoff must be controlled and managed by use of proper storm water management measures; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events; ▪ Restriction of vehicle movement over sensitive areas to reduce compaction; ▪ Minimise unnecessary removal of the natural vegetation cover; ▪ All vehicles must be regularly inspected for potential hydrocarbon leaks; ▪ No re-fuelling is allowed on site; ▪ Fuel and oils spills should be remediated using commercially available emergency clean up kits. For major spills, if soils are contaminated they must be stripped and disposed of at a licensed waste disposal site; and ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.	▪ Chamber of Mines Guidelines ▪ CARA
Decommissioning	Decommissioning of the infrastructure	Surface Water	Sedimentation and siltation of nearby watercourses leading to deteriorated water quality	▪ Accredited contractors should be utilised for demolition and removal of infrastructure to reduce the risk of waste generation and accidental spillages; ▪ Removal of infrastructure should be conducted during the dry season to reduce chances of soil erosion and sedimentation; ▪ Vehicle movement through watercourses at river crossings should be limited to minimise damage to channel geometry. ▪ Where infrastructure is removed at river crossings, the disturbed channel geometry should be profiled to allow free drainage. Silt fences should be installed at profiled and re-vegetated river crossings to prevent entrance of sediment into the stream prior to vegetation establishment. ▪ The decommissioned quarry should be infilled, top-soiled and re-vegetated to reduce chances of soil erosion, sedimentation and siltation of nearby watercourses; and ▪ Re-profiling of the infilled quarry and road surfaces prior to revegetation must be undertaken to ensure surface profiles that allow free drainage. This will ensure improvement of catchment yield to pre-mining conditions in the surrounding watercourses.	▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Alteration of stream channel geometry at conveyor belt and road river crossings		▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)
Decommissioning	Decommissioning of the infrastructure	Surface Water	Contamination of surface water resources leading to deteriorated water quality		▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)
Decommissioning	Decommissioning of the infrastructure	Heritage	Impact to heritage resources that may be found during the decommissioning phase	▪ Sasol Mining develops a Project-specific CFP and FFP for implementation during decommissioning activities; and ▪ Sasol Mining immediately informs SAHRA of any chance finds identified and enlists the services of a qualified and accredited archaeologist and/or palaeontologist to assess and recommend appropriate mitigation measures as required.	▪ The National Heritage Resources Act, 1999 (Act No. 25 of 1999) ▪ Regulations to the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (GN R 548) (SAHRA Regulations)' ▪ SAHRA Minimum Standards: Archaeological and Paleontological Components of Impact Assessment Reports
Rehabilitation	Implementing rehabilitation measures such as shaping, ripping and reseeding and site access	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	▪ Limit the footprint area of the rehabilitation activities to what is essential to minimise impacts because of compaction of soils (all areas but critically so in wetland areas); ▪ Ensure that no additional wetland area is disturbed in the rehabilitation process; ▪ No material may be dumped or stockpiled within any wetland areas (or the buffers) near the proposed rehabilitation footprint; ▪ When reprofiling, ensure that machinery does not disturb additional wetland; ▪ All erosion noted within the rehabilitation footprint should be remedied immediately and included as part of the ongoing rehabilitation plan;	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005);

Phase	Activity	Aspect	Impact	Mitigation Measures	Compliance with standards
Rehabilitation	Infilling and rehabilitation of a quarry located near the conveyer belt which is within 500m of surrounding wetlands	Wetlands	Potential loss of natural vegetation and the increased potential for erosion and sedimentation in the rehabilitated areas resulting in impacts further downstream. Encroachment of alien invasive species	▪ The use of machinery should be minimised to reduce compaction of the wetland soils; ▪ Although it is expected that the existing Phragmites, Typha and other wetland species will spread and colonise the newly rehabilitated area, it is important to seed the area to promote stabilisation and reduce the possibility of weed infestation, erosion and/or associated sedimentation of the wetland system both in the immediate surrounds or further downstream; ▪ Ripping should take place to a maximum depth of 150mm; ▪ Seeding should take place immediately after ripping to ensure the best chance of survival and should be done by hand to avoid compaction of the soils; ▪ After ripping and seeding has taken place, the area should be avoided and not driven over; ▪ As much vegetation growth as possible should be promoted within the proposed development area during all phases. To protect soils, vegetation clearance should be kept to a minimum; ▪ Cattle movement should be restricted from the areas that have been repaired until those areas have been reasonably rehabilitated; ▪ An AIP management plan to be implemented and managed for the life of the proposed decommissioning, rehabilitation, closure and post-closure phases; ▪ All vehicles must be regularly inspected for hydrocarbon leaks; ▪ Re-fuelling must take place at a diesel facility on a sealed and bunded surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills from machinery should be immediately cleaned up and treated accordingly; ▪ All existing litter and debris should be removed from the freshwater systems and littering should be prohibited on an ongoing basis; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities; and ▪ Monitoring should be carried out as specified in the monitoring programme.	▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014
Rehabilitation	Physical ripping operations and seeding activities near watercourses	Aquatic Ecology	Potential for the compaction of land and increased surface runoff/erosion into associated watercourses during the planned rehabilitation	▪ High rainfall periods should be avoided during ripping activities; ▪ Operators of machinery (i.e. tractors) should ensure that their own tracks have been ripped especially near watercourses and crossing points; ▪ Seeding near watercourses and especially at crossing points should take place by hand; and ▪ Use correct species for seeding as per the recommendations in wetland report (Digby Wells, 2019a).	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); ▪ MTPB, 2014
Rehabilitation	Rehabilitation of the disturbed areas	Soil, land use and land capability	After decommissioning, there will be less movement of heavy machinery on the soil surface leading to less soil compaction and vegetation's ability to regrow and as a result erosion will be minimised. Other excavations will be re-filled. This will eventually lead to improved soil status	▪ Effective soil cover and adequate protection from wind and water; ▪ Soil chemical and physical amelioration to enhance the growth capability of the soils; ▪ If erosion has occurred, usable soil should be sourced and replaced and shaped to reduce the recurrence of erosion; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; ▪ Return the land conditions capable of supporting prior land use or uses equal or better than prior land use to the extent feasible or practical; and ▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated.	▪ Chamber of Mines Guidelines ▪ CARA
Rehabilitation	Reshaping or profiling at river crossings with the conveyor belt servitude, access road and water pipeline. Infilling and reshaping of the quarry area 200 m from a watercourse.	Surface Water	Sedimentation and siltation of nearby watercourses	▪ River geometry at affected crossings should be profiled, decommissioned quarry should be infilled and reshaped. Reseeding of exposed rehabilitated surfaces should be undertaken to reduce soil erosion and sedimentation in nearby watercourses; and ▪ Prior to vegetation establishment, seeded areas should have temporary silt fences installed to keep soils from being washed into nearby watercourses.	▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)

Phase	Activity	Aspect	Impact	Mitigation Measures	Compliance with standards
Post-closure	Removal of cattle from site, ongoing vegetation growth.	Wetlands	Ensure vegetation establishment, prevent erosion and ensure successful rehabilitation	▪ Monitoring should be carried out as specified in the monitoring programme to ensure that rehabilitation is taking place; ▪ Any required maintenance works should be done by hand to reduce disturbance within the wetland; ▪ Cattle movement must be restricted until rehabilitation has taken place; and ▪ Restrict movement of personnel in the wetland areas.	▪ The NWA Section 21 (c), (g) and (i) of the NWA ▪ Section 24 of the Constitution ▪ NEM:BA ▪ NEMA ▪ Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); ▪ Mining and Biodiversity Guideline (DEA et al., 2013); MTPB, 2014
Post-closure	Water quality monitoring downgradient of river crossings; Erosion monitoring at rehabilitated, profiled and re-vegetated surfaces.	Surface Water	Restoration of good drainage and runoff regime close to pre-development conditions	▪ Implement erosion and surface water monitoring	▪ Based on the GN 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. ▪ The National Water Act (NWA), 1998 (Act No. 36 of 1998)

7 Financial Provision

7.1 Determination of the amount of Financial Provision

7.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation

The rehabilitation and closure objectives have been set out in Section 4.1 Part B above which this Project aims to achieve as it is a decommissioning and rehabilitation Project. The overarching objective for closure is to ensure that impacted land is rehabilitated in a manner that allows it to be ceded for other sustainable land uses.

7.1.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

A separate closure plan does not form part of this BAR process. The activities relevant to the decommissioning and rehabilitation Project will be included into the Twistdraai closure plan.

It should be noted that no closure application and supporting closure plan has been submitted to the DMR for consideration for the Twistdraai Colliery even though it is the intention of the approved Twistdraai EMPr and this Environmental Application process to decommissioning and rehabilitate the Twistdraai Colliery.

As the Twistdraai Colliery falls within the greater Secunda Mining Right Complex which is still an active mining right, a closure application cannot be applied for. Additionally, although a partial closure process was investigated by Sasol Mining, this has yet to be supported by the DMR. Therefore, the Twistdraai Colliery will remain until a closure application process has been submitted for the entire Secunda Mining Right Complex estimated to be undertaken in 2050.

However, this BAR relates to the decommissioning and rehabilitation of the access road, conveyor belt and quarry will be made available for public review for a period of 30 days.

7.1.3 Provide a Rehabilitation Plan that describes and shows the scale and aerial extent of the Main Mining Activities, including the Anticipated Mining Area at the time of Closure

The Project is a decommissioning and rehabilitation Project and therefore this report is a rehabilitation plan aimed at removing mining infrastructure and rehabilitating the impacted footprint.

7.1.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The closure objectives which this project aims to meet were categorised into various aspects, which relate to

- Protection of the environment;
- Not affecting existing infrastructure and property; and
- Ensuring the health and safety of the community and public is protected.

The following aspects were identified, and the specific objective(s) related to each were determined based on this specific project:

- Land use, soils, fauna and flora;
- Surface water quality;
- Surface water quantity;
- Surface infrastructure; and
- Health and safety.

The closure objectives are summarised in Table 7-1 below.

Table 7-1: Twistdraai closure objectives

Aspect	Closure Objective(s)
Land Use, soils, fauna and flora	1. To restore mining areas to the pre-mining or agreed/ authorised land capability/ land use/ vegetation type (4% basal cover). 2. Not to impact on the pre-subsided land capability/ land use/ vegetation type.
Surface water quality	3. To have no impact on surface water quality based on upstream and downstream monitoring.
Surface water quantity	4. To maintain the pre-determined catchment yield.
Surface Infrastructure	5. Mining infrastructure: Demolish infrastructure unless agreed otherwise. 6. Externally owned infrastructure: To limit impact on infrastructure to the level agreed with owners.
Health and Safety	7. To leave a safe and healthy environment for people and animals.

7.1.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The Financial Provisioning Assessment for the Twistdraai East Shaft is updated annually and submitted to DMR, the last update was conducted by Jones and Wagner in March 2018.

The estimated closure cost required for the rehabilitation and closure of the Twistdraai Colliery is **R 14,021,604.00 (incl. VAT)**. The decommissioning of the access road, conveyor belt servitude (access road, culverts and pipeline) and quarry have already been included into the Twistdraai Colliery financial provision.

7.1.6 Confirm that the financial provision will be provided as determined

Refer to Section 7.1.5 above.

8 Monitoring compliance with and performance assessment

8.1 Monitoring of impact management actions

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented. The monitoring programmes have been discussed below.

8.1.1 Wetland Monitoring Programme

The rehabilitated areas should be monitored by a qualified wetland specialist

- Monthly during the decommissioning and rehabilitation phases;
- Quarterly for a minimum of three years thereafter to ensure that vegetation is establishing.

Should vegetation not establish, the area may need to be ripped/spiked (to a depth no deeper than 150 mm) and reseeded. Monitoring will then need to continue until vegetation has established.

PES and EIS will only need to be assessed annually. The remainder of the assessments should be monitoring the rehabilitation to remedy any issues that may arise.

8.1.1.1 Plant Species Plan

Due to the nature of wetland areas, wetland species will naturally colonise the area. The focus of revegetation now is to create a cover to stabilise the area, prevent erosion, reduce the probability of alien species colonising the area and to create a favourable habitat for wetland species to proliferate. Therefore, it is ideal to seed with species that are quick-growing and are stoloniferous.

Table 8-1: Plant species plan

Species	Common name	Seeding rate
Cynodon dactylon	Couch Grass	20kg/ha
Digitaria eriantha	Smutsvinger	5kg/ha
Chloris gayana	Rhodes Grass	5kg/ha

8.1.2 Aquatic Biomonitoring

An aquatic biomonitoring programme has been developed for the monitoring and preservation of the assessed aquatic systems. It is recommended that this programme is to be conducted for the entirety of the decommissioning phase and until rehabilitation has been proved successful by a SASS5 DWS-accredited practitioner. It is further recommended that monitoring takes place biannually for a minimum period of three years until the rehabilitation measures have been deemed successful. A single survey should be conducted during the wet season associated with the Project area (i.e. within the months of November-January) and a single survey during the dry season (i.e. within the months of May-August) to understand the seasonal variations within the aquatic ecosystems.

Table 8-2 outlines the methodology/indices needed to be undertaken downstream from the decommissioning and rehabilitation activities at the monitoring points indicated in Table 11-4 and Plan 11 in Appendix B in order to determine the PES of the assessed watercourses in this study and to monitor for potential impacts the Project may pose on the aforementioned aquatic ecosystems.

Table 8-2: Biannual aquatic biomonitoring programme

Method / focus	Details
Water Quality	*In situ* water quality parameters as per this study
Habitat Quality	IHAS where applicable (wetland assessments will be more suited for habitat monitoring)
Macroinvertebrate Assemblages	SASS5 and MIRAI at sites where and if applicable. (wetland assessments will be more suited for habitat monitoring)
Diatom Assemblages	Biannual diatom sampling at all watercourse crossing points
Yellow shading indicates non-essential indices for monitoring which should be applied if deemed necessary by the approved SASS5 practitioner; Green shading indicates indices that must be implemented	

8.1.3 Soils, Land Use and Land Capability

The following items for soil, land use and land capability should be monitored quarterly for the first year and bi-annually for the second year to final closure:

- Soils:
  - Erosion status;
  - Compaction;
  - Runoff; and
  - Contamination.
- Vegetation:
  - Vegetation cover; and
  - Species diversity.

8.1.4 Surface Water Monitoring Plan

Monitoring is currently being conducted by Institute of Groundwater Studies (IGS) and Wet-Earth at the Twistdraai East Shaft and along servitudes that are being decommissioned. The current monitoring plan provides a programme to detect any surface water impacts likely to occur during the decommissioning of the conveyor belt servitude, access road, quarry and pipeline, and subsequent rehabilitation of all associated sites within the Twistdraai mining right area. Post closure monitoring must be undertaken for at least three years after the Project has ceased, or until rehabilitation has reached a sustainable state with no further changes to the environment, as recommended by the Department of Water and Sanitation (DWS). Monitoring frequencies are described in this monitoring plan. All water quality results should be benchmarked to the WUL standards and the South African Water Quality guidelines: (Livestock watering, Aquatic Ecosystems, Irrigation and Drinking water) to determine the impact of the proposed Twistdraai East decommissioning activities on the quality of water (positive/negative).

The surface water monitoring plan is summarised in Table 8-5.

8.1.4.1 Proposed Surface Water Monitoring Points

Surface water quality monitoring should be conducted at Twistdraai East Colliery at river crossings along the conveyor route. Coordinates of the surface water monitoring points are presented in Table 8-3.

Table 8-3: Twistdraai East surface water monitoring points

Monitoring Point	Description	Coordinates	
		Latitude	Longitude
TD1	Upstream of conveyor belt starting point on an unnamed Klipspruit tributary	-26.5425556	29.344056
TD2	500 m from start of conveyor belt on the same unnamed Klipspruit tributary	-26.544266	29.330721
TD4	6 km from end of conveyor belt at a crossing with Klipspruit tributary	-26.577662	29.23834
TD6	Downstream of river crossing, 1 km from Sasol Mining Conveyor Belt Training Area	-26.5623611	29.22150
BL 12	Downgradient of conveyor belt on tributary of Bossjesspruit.	-26.5775556	29.139833
BL 13	Point on the Brandspruit (Tributary of Groot-Bossjesspruit) downgradient of the conveyor belt	-26.562508	29.142686
SW1	Conveyor-river crossing 845 m from Bossjesspruit Dam	-26.573554	29.190318
SW2	At Farm Dam on Klipspruit tributary	-26.569822	29.253891
SW3	Point on Klipspruit 2 km before Farm Dam	-26.563227	29.273145
SW4	Klipspruit Tributary downstream of conveyor/river crossing closer to decommissioned Twistdraai Central Shaft	-26.573155	29.230692
SW5	Klipspruit tributary downstream of conveyor/river crossing	-26.550523	29.309701
SW6	Klipspruit close to quarry on Klipspruit	-26.541309	29.332801
SW7	Klipspruit close to decommissioned access road	-26.540558	29.338276

Collected surface water samples should be analysed for the following Table 8-4 chemical parameter.

Table 8-4: Chemical parameter analysis suite

Parameter	Unit
pH	pH unit
Electrical conductivity (EC)	mS/m
Sulphate (SO_4)	mg/l

Parameter	Unit
Chloride (Cl)	mg/l
Sodium (Na)	mg/l
Magnesium (Mg)	mg/l
Calcium (Ca)	mg/l
Total Suspended Solids (TSS)	mg/l
Aluminium (Al)	mg/l
Ammonium (NH_4+)	mg/l
Nitrate (NO_3)	mg/l

8.2 Monitoring and Reporting Frequency

Table 8-5 discusses the monitoring and reporting frequency.

8.3 Responsible persons

The roles and responsibilities associated with the monitoring programme are set out in Table 8-5.

8.4 Time period for implementing impact management actions

Time for implementing impact management actions is captured in Table 8-5.

8.5 Mechanism for monitoring compliance

Table 8-5 sets out the method of monitoring, the implementation of the impact management actions, the frequency of monitoring the implementation of the impact management actions, an indication of the persons who will be responsible for the implementation of the impact management actions, the time periods within which the impact management actions must be implemented and the mechanism for monitoring compliance with the identified impact management actions.

Table 8-5: Monitoring and management of environmental impacts

Source Activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities	Monitoring of Aquatic Ecology	An aquatic biomonitoring programme has been developed for the monitoring and preservation of the assessed aquatic systems. It is recommended that this programme is to be conducted for the entirety of the decommissioning phase and until rehabilitation has been proved successful by a SASS5 DWS-accredited practitioner.	Biomonitoring should be conducted by Aquatic Ecologist.	A single survey should be conducted during the wet season associated with the Project area (i.e. within the months of November-January) and a single survey during the dry season (i.e. within the months of May-August) in attempt to understand the seasonal variations within the aquatic ecosystems. It is further recommended that monitoring takes place biannually for a minimum period of three years until the rehabilitation measures have been deemed successful.
All activities	Monitoring of Soils	The rehabilitated area must be assessed for compaction, fertility, and erosion and must meet the Chamber of Mines Guidelines.	Soil Monitoring should be conducted Soils Specialist.	The rehabilitated area must be assessed once a year for compaction, fertility, and erosion during the dry season so that recommendations can be implemented before the start of the wet season to correct any nutrient deficiencies.
All activities	Monitoring Surface Water (water quality)	Surface Water quality monitoring must be undertaken as per proposed monitoring programme. Parameters to be assessed include but not limited to; pH, Electrical Conductivity, Sulphate, Calcium, Magnesium, Sodium, Nitrate, Ammonia, Chloride, Aluminium and Total Suspended Solids.	Monitoring should be undertaken by a qualified Surface Water Specialist.	Monthly monitoring for at least three (3) years after the Project has ceased, or until rehabilitation has reached a sustainable state with no further changes to the environment, as is standard practice to detect residual impacts.
All activities	Monitoring Surface Water (sedimentation)	Inspect conveyor belt/road/pipeline river crossings and rehabilitated quarry to ensure no entrance of sediment into the watercourse, especially after rain events. Temporary silt fences should be installed and maintained until vegetation establishment	Monitoring should be conducted by an Environmental Practitioner	Fortnightly, until the establishment of vegetation on the river banks at all river crossings.
All activities	Monitoring Wetlands	Monitoring is required to ensure that vegetation is establishing. Should vegetation not establish, the area may need to be ripped /spiked (to depth no deeper than 150 mm) and reseeded.	Should be monitored by a qualified Wetland Specialist	Monthly during the decommissioning and quarterly for a minimum of three years during rehabilitation. PES and EIS will only need to be assessed annually.
Audit Reports	Internal Environmental Audit	Auditing against the decommissioning and rehabilitation conditions outlined within the approved EMP and Environmental Authorisation	Internal Environmental Officer	Weekly monitoring by ECO during decommissioning and rehabilitation phase
Audit Reports	Internal Environmental Audit	Auditing against the decommissioning and rehabilitation conditions outlined within the approved EMP and Environmental Authorisation	Environmental Officer/Independent Third Party	Monthly by an external independent ECO until the completion of the decommissioning and rehabilitation phase Annual Performance Assessment (for a period of three years thereafter)

9 Indicate the frequency of the submission of the performance assessment/ environmental audit report

Monitoring to be undertaken during the decommissioning and rehabilitation phase of the Project must be completed weekly by an internal ECO and monthly by an external independent ECO. The reports must be submitted to the DMR monthly. On completion of the decommissioning and rehabilitation phase an external independent Environmental Audit will be undertaken on an annual basis thereafter for a period of three years until the closure objectives are met. The Environmental Audit Report will be submitted to the DMR and other relevant authorities where required.

10 Environmental Awareness Plan

10.1 Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

Sasol Mining has developed internal Environmental, Health and Safety Policies. The Environmental Policy will be communicated to all personnel, whether they are contractors or permanent staff.

Employees will receive general environmental awareness training on specific items contained in this EMP, as well as on Best Possible Environmental Practices (BPEP).

10.1.1 Specific Environmental Training

Environmental Awareness Training will be undertaken to make employees and contractors aware of the following:

- The importance of conforming with the environmental policy and procedures and with the requirements of the EMP;
- The significant social and environmental impacts of their work activities and the environmental benefits of improved personal performance;
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirements of the environmental management system;
- The potential consequences of departure from specified operating procedures; and
- Possible archaeological finds action steps for mitigation measures, surface collections, excavations and communication routes to follow in the case of a discovery.

The guidelines for training are summarised below, which are in line with the ISO 14001:2004 guidelines with regards to training and awareness creation.

Table 10-1: Training guidelines

Types of Training	Audience	Purpose
Raising awareness of the strategic importance of environmental management	Senior management	To gain commitment and alignment to the organisation's environmental policy.
Raising general environmental awareness	All employees	To gain commitment to the environmental policy and objectives and to instil a sense of individual responsibility.
Skill enhancement	Employees with environmental responsibilities	To improve performance in specific tasks.
Compliance	Employees whose actions can affect compliance	To ensure that regulatory and internal requirements for training are met.

The training programme will consist of the following elements:

- Identification of employee training needs;
- Development of a training plan to address defined needs;
- Verification of conformance of the training programme to regulatory or organisation requirements and standards;
- Training of target employee groups;
- Documentation of training received; and
- Evaluation of training received.

This training is undertaken on an annual basis for all personnel, together with the annual required induction programmes. The training material provided will be subject to annual review, based on issues such as incidents, accidents, new legislative requirements, modified processes and environmental and social aspects identified from time to time. This training is to be carried out and coordinated internally by Sasol Mining.

Sasol Mining will, therefore, develop the capabilities and support mechanisms necessary to achieve its environmental policy, objectives and targets.

In addition, the Twistdraai Colliery Emergency Preparedness and Response Plan will be updated to include measures relevant to the surface mitigation measure Project and communicated and trained to all site personnel during the induction process

10.2 Manner in which risks will be dealt with to avoid pollution or the degradation of the environment

Unplanned events may occur during the Project that may have potential impacts which will need mitigation and management measures implemented. The key risks associated with the Twistdraai East Shaft is that watercourses associated with the infrastructure crossing points could be affected by the entry of hazardous substance, such as hydrocarbons, in the event of a spillage or unseen seepage from storage facilities.

An Emergency Response Plan has been developed for the Twistdraai Colliery and will be updated and implemented for the Project. The approach used by Twistdraai Colliery to respond to risks that may pollute or degrade the environment during the decommissioning phase are detailed in this internal procedure.

The unplanned events that may happen at the Project site and the proposed mitigation plan are listed in Table 10-2.

Hydrocarbon spills or leaks can occur; therefore, emergency procedures need to be put in place for remediation. These procedures can include the following:

- Contractors must ensure that all employees are aware of the procedure for dealing with spills and leaks and properly trained to deal with such incidents;
- Ensure that emergency spill equipment is available to site personnel;
- No re-fuelling is allowed on site; and
- Fuel and oil spills should be remediated using commercially available emergency clean up kits. For major spills, if soils are contaminated they must be stripped and disposed of at a licensed waste disposal site.

Table 10-2: Unplanned events, risks and their management measures

Unplanned event	Potential impact	Mitigation/Management/Monitoring
Hydrocarbon leaks from vehicles and machinery or hazardous materials	Soil Contamination	▪ Place drip trays where the leak is occurring if vehicles are leaking; ▪ All vehicles should be serviced at the workshop location specifically designed for servicing of machinery; ▪ Machinery must be parked within hard park areas and the machinery must be inspected daily for fluid leaks; ▪ If a spill occurs it should be cleaned up (Drizit spill kit/ Enertech type spill kit, Oil or Chemical spill kit) immediately and if applicable reported to the appropriate authorities; and ▪ Emergency response plans should be in place.

Unplanned event	Potential impact	Mitigation/Management/Monitoring
Hazardous substance spillage from waste storage	Soil Contamination	▪ Prevent any spills from occurring; ▪ If a spill occurs it should be cleaned up (Drizit spill kit/ Enertech type spill kit, Oil or Chemical spill kit) immediately and if applicable reported to the appropriate authorities; and ▪ Emergency response plans should be in place.

11 Specific information required by the Competent Authority

No request for specific information has been requested for this Project by the DMR to date.

12 Undertaking

The EAP herewith confirms: -

- the correctness of the information provided in the reports
- the inclusion of comments and inputs from stakeholders and I&APs;
- the inclusion of inputs and recommendations from the specialist reports where relevant; and
- the acceptability of the Project in relation to the finding of the assessment and level of mitigation proposed.

Signature of the Environmental Assessment Practitioner:	
Name of Company:	Digby Wells Environmental
Date:	July 2019

Appendix A: EAP CV

Appendix B: Plans

Plan 1: Regional Setting

Plan 2: Local Setting

Plan 3: Land Tenure Map

Plan 4: Water crossings between East Shaft and TEP

Plan 5: NFEPA Wetlands

Plan 6: Mpumalanga Biodiversity Sector Plan (MBSP)

Plan 7: Present Ecological State (WCS, 2018)

Plan 8: Ecological Importance and Sensitivity (WCS, 2018)

Plan 9: Wetland Crossing Points

Plan 10: Watercourses associated with the Project area

Plan 11: Aquatic Ecology Sampling site localities in relation to the infrastructure proposed for decommissioning

Plan 12: Heritage Survey Tracklog and Identified Heritage Resources

Plan 13: Land Use at Twistdraai Colliery and Surrounding

Plan 14: Wetland Delineation

Plan 15: Infrastructure to be decommissioned

Plan 16: Composite Map

Appendix C: PP Documents

Appendix D: Wetlands Specialist Study

Appendix E: Aquatic Ecology Specialist Study

DIGBY WELLS ENVIRONMENTAL

Appendix F: Soils, Land Use and Land Capability Specialist Study

DIGBY WELLS ENVIRONMENTAL

Appendix G: Surface Water Specialist Study

Appendix H: Heritage Specialist Study