mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT BASIC ASSESSMENT REPORT

VELE COLLIERY RIVER DIVERSION PROJECT

FOR LISTED ACTIVITIES ASSOCIATED WITH MINING RIGHT AND/OR BULK SAMPLING ACTIVITIES INCLUDING TRENCHING IN CASES OF ALLUVIAL DIAMOND PROSPECTING

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

NAME OF APPLICANT: Limpopo Coal Company (Pty) Limited

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FILE REFERENCE NUMBER SAMRAD:

IMPORTANT NOTICE

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

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

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

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or 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 (EAP) 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–

(a) 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;

(b) identify the alternatives considered, including the activity, location, and technology alternatives;

(c) describe the need and desirability of the proposed alternatives,

(d) 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 the these aspects to determine:

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

  (ii) the degree to which these impacts—

    (aa) can be reversed;

    (bb) may cause irreplaceable loss of resources; and

    (cc) can be managed, avoided or mitigated;

(e) 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—

  (i) identify and motivate a preferred site, activity and technology alternative;

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

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

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

TERM / ABBREVIATION	MEANING
AQA	National Environmental Management: Air Quality Act 39 of 2004
CARA	Conservation of Agricultural Resources Act 43 of 1983
CRR	Comment and Response Report
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEMC	Desired Ecological Management Class
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
Ecological integrity	Overall functioning of the ecological system as a whole
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity Classification
EMC	Ecological Management Class
EMPr	Environmental Management Programme
ESA	Earlier Stone Age
ESP	Exchangeable sodium percentage
FAII	Fish Assemblage Integrity Index
GDP	Gross Domestic Product
GPS	Global Positioning system
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Parties
IDPs	Integrated Development Plans
IHAS	Invertebrate Habitat Assessment System
IHIA	Intermediate Habitat Integrity Assessment
ISP	Internal Strategic Perspective
IUCN	International Union for Conservation of Nature and Natural Resources
IWUL	Integrated Water Use Licence
IWWMP	Integrated Water and Waste Management Plan
LCC	Land Claims Commissioner
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LIHRA	Limpopo Heritage Resources Agency
LM	Local Municipality

TERM / ABBREVIATION	MEANING
LOM	Life of Mine
LSA	Late Stone Age
Mamsl	Meters above mean sea level
MPRDA	Mineral and Petroleum Resources Development Act 28 of 2002
MRA	Mining Right Application
MSA	Middle Stone Age
NEMA	National Environmental Management Act 107 of 1998
NEMBA	National Environmental Management: Biodiversity Act 10 of 2004
NEMWA	National Environmental Management: Waste Act 59 of 2008
NFA	National Forest Act 84 of 1998
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act 25 of 1999
NWA	National Water Act 36 of 2008
NWCS	National Wetland Classification System
PEMC	Present Ecological Management Class
PES	Present Ecological State
PRECIS	Pretoria Computer Information Systems
QDS	Quarter Degree Square
RDL	Red Data List
RDM	Resource Directed Measures
RE	Risk estimation
REC	Recommended Ecological Category
RHP	River Health Programme
ROM	Run of Mine
SANBI	South African National Biodiversity Institute
SASS5	South African Scoring System version 5
SDF	Spatial Development Framework
SEIA	Socio-Economic Impact Assessment
SIA	Social Impact Assessment
SSC	Species of Special Concern
TOPS	Threatened or Protected Species
UNESCO	United Nations Education, Science and Cultural Organizations
WHS	World Heritage Site
WMA	Water Management Area

1. INTRODUCTION

Vele Colliery owned by Limpopo Coal Company (Pty) Ltd (LCC), a wholly owned subsidiary of Coal of Africa Limited (CoAL). CoAL is an emerging developer of high-quality thermal and coking coal, with its assets located primarily in the Limpopo Province of South Africa. The company is listed on the Johannesburg Stock Exchange (JSE) in South Africa, Alternative Investment Market (AIM) in the United Kingdom and the Australian Stock Exchange (ASX).

LCC operates under an existing mining licence (LP 30/5/1/2/2/103 MR) approved on 19 March 2010 and an approved Environmental Management Programme (EMP) approved and issued on 19 March 2010 in terms of Section 39 of the Mineral and Petroleum Resources Development Act (MPRDA), 2002 (Act 28 of 2002). The Integrated Water Use License (IWUL) was issued to the company on 29 March 2011 and amended in August 2011.

LCC applied for rectification in terms of Section 24G of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) for activities that commenced without environmental authorisation on Portions 3, 4 and 5 of the farm Overvlakte 125 MS, Bergen Op Zoom 124 MS and Erfrust 123 MS. LCC was granted the Environmental Authorisation in terms of Section 24G of NEMA in July and October 2011. Both an EIR submitted in 2011 and an Environmental Management Plan (EMP) submitted in March 2012, in terms of NEMA was approved by the Department of Environmental Affairs (DEA).

Vele Colliery started production of thermal coal in January 2012, producing 697 953 tonnes of Run-of-Mine (ROM) coal, yielding 195 756 tonnes of export quality coal up to June 2013. Further extensive product quality testing of the coking coal commenced in August 2013, after the approval of the Plant Modification Project (PMP) concept by the CoAL board. In October 2013, the Colliery was placed under care and maintenance in preparation for the implementation of the PMP. Vele Colliery applied for an Amendment to its Environmental Authorisation and Integrated Water Use Licence Application to align its authorisations to the proposed PMP. These authorisations were approved on 16 January 2015 and 18 December 2015 respectively.

As part of the continuous development of the Vele Colliery, additional activities have been identified that require Environmental Authorisation and a Water Use License.

This document serves the purpose of the Environmental Impact Assessment (EIA) for the additional activities, as required in terms of NEMA (as amended), and is termed the **Vele River Diversion Project**. Please note that the framework of this report is in accordance with the guidelines published by the Department of Minerals Resources (DMR) in terms of the recently published 2014 Environmental Impact Assessment (EIA) Regulations.

2. ENVIRONMENTAL ASSESSMENT PRACTITIONER

Independent EAP	Jacana Environmentals cc
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Curriculum Vitae	Refer to Appendix 2

Marietjie Eksteen is the Managing Director of the consulting firm Jacana Environmentals cc, an environmental consulting firm based in Polokwane. She is an environmental scientist with 24 years' experience, her main fields of expertise being water quality management, mine water management, environmental legal compliance and project management. Ms Eksteen is a registered Professional Environmental Scientist (Pr.Sci.Nat.) at the South African Council for Natural Scientific Professions – Registration No. 400090/02.

Since establishing Jacana Environmentals in 2006, she has been involved in a variety of mine-related environmental projects serving clients such as Coal of Africa Limited, BHP Billiton Energy Coal SA, Xstrata Coal SA and Optimum Coal. Prior to 2006 she was employed by Pulles Howard & De Lange Inc as an environmental consultant for 2 years. Before consulting, Ms Eksteen was employed by BHP Billiton as a mine environmental manager at their operations in Mpumalanga, as well as the Department of Water Affairs where she was appointed as a water quality specialist for the mining industry. Her career started off as a geophysicist at Genmin in 1990. Ms Eksteen obtained a Master degree in Exploration Geophysics (MSc) from the University of Pretoria in 1993. Her Curriculum Vitae is attached as Appendix 2.

3. LOCATION OF THE OVERALL ACTIVITY

The Vele Colliery is situated in the magisterial district of Musina in the Limpopo Province of South Africa. The project area is bounded in the north by the Limpopo River, which defines the international border with Zimbabwe. The Mapungubwe World Heritage Site (Mapungubwe Hill) is situated approximately 20 km to the west of the westernmost boundary of the Vele Colliery. The nearest town is Musina, situated approximately 40 km to the southeast of the Vele Colliery.

Farm name(s)	Refer to Table 1
Application area (ha)	8 663
Magisterial District	Musina Local Municipality Vhembe District
Distance and direction from nearest town	Musina, 40 km southeast
21 digit SG Code	Refer to Table 1

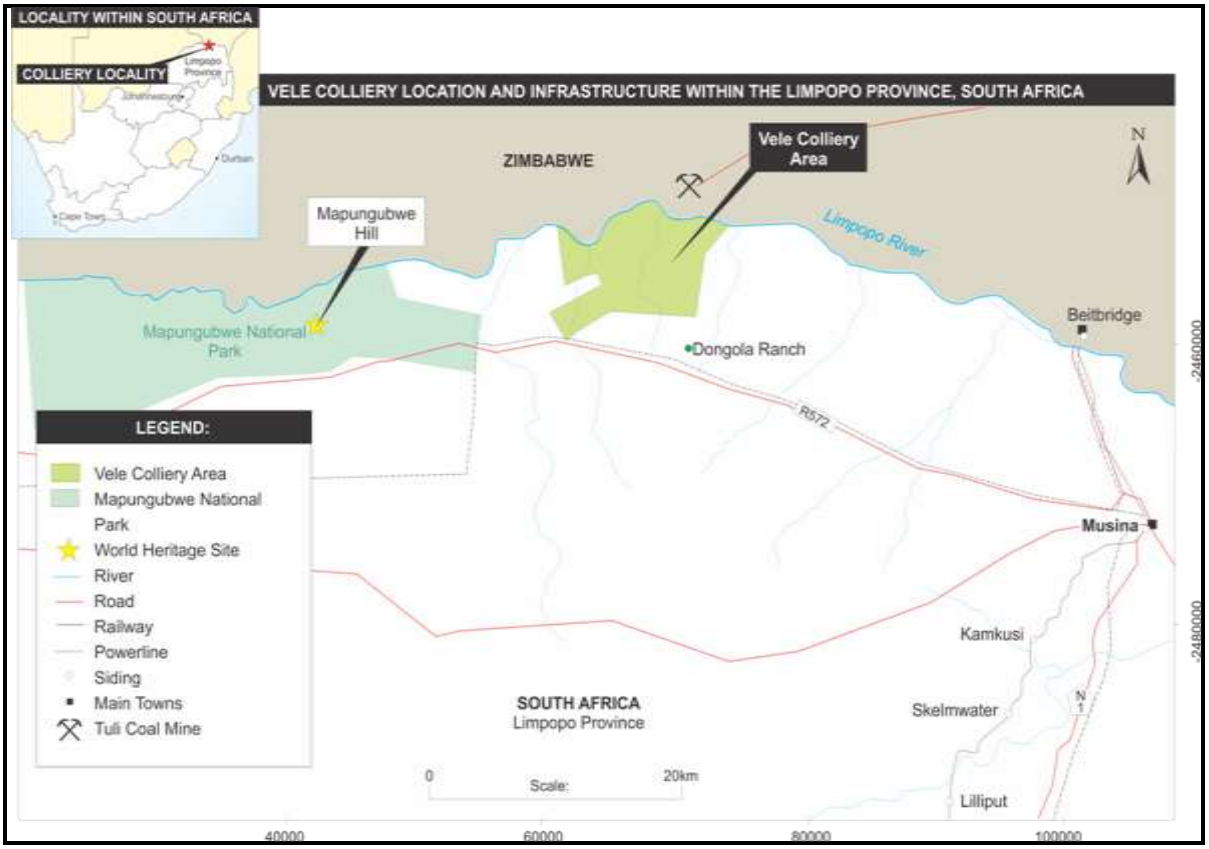

Figure 1: Locality Map

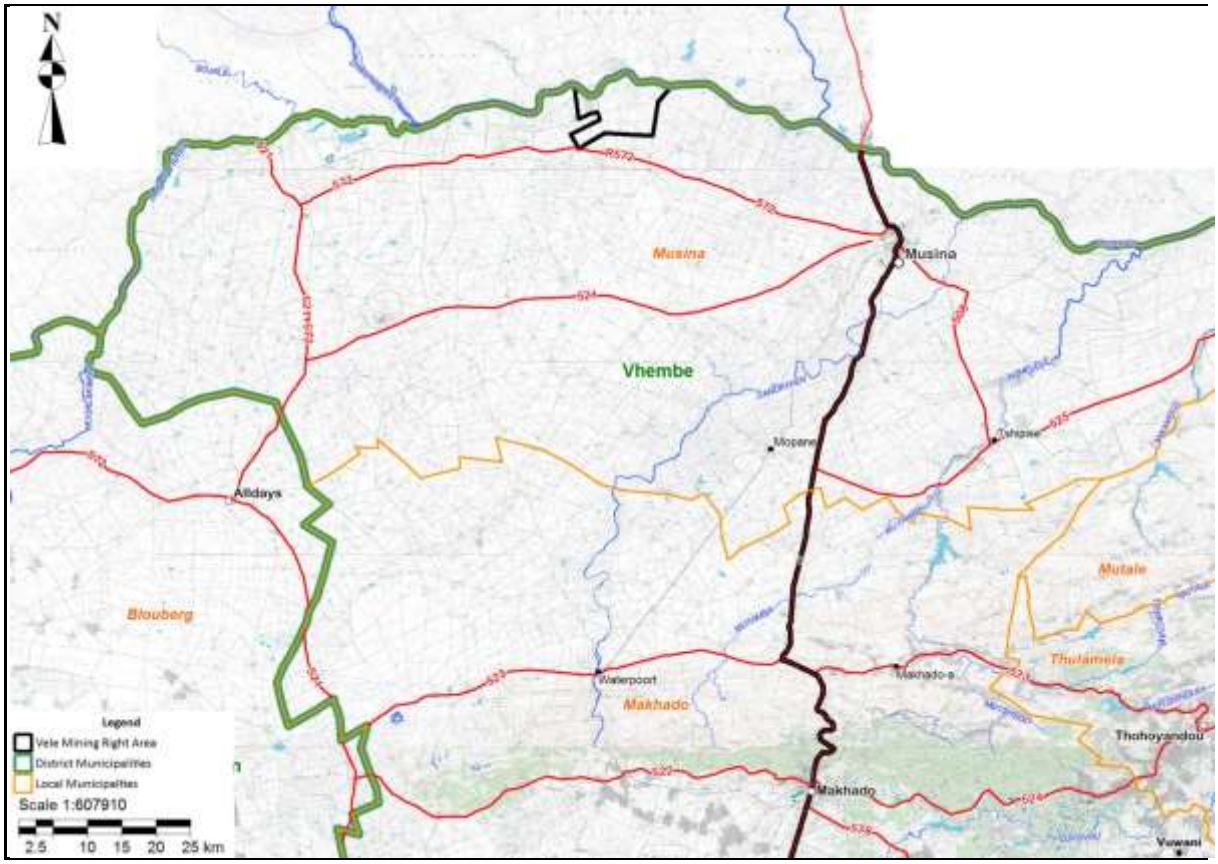

Figure 2: Institutional Map

Table 1: Properties associated with Vele Colliery mining right

Property (Farm)	Ownership	Size (ha)	Title deed	SG Key
Overvlakte 125 MS Ptn 3&4	Harrisia Investment Holdings (Pty) Ltd	1184.823	T44946/2009	TOMS00000000001250003 TOMS00000000001250004
Overvlakte 125 MS Ptn 5	Harrisia Investment Holdings (Pty) Ltd	842.2117	T22619/2009	TOMS00000000001250005
Overvlakte 125 MS Ptn 6	Overvlakte No 6 (Pty) Ltd	219.0000	T74891/1990	TOMS00000000001250006
Overvlakte 125 MS Ptn 13	Swempie Beleggings (Pty) Ltd	268.8496	T16039/2012	TOMS00000000001250013
Overvlakte 125 MS Ptn 14	Limpopo Trust	416.3760	T42510/1994	TOMS00000000001250014
Overvlakte 125 MS RE	Overvlakte Eiendom (Pty) Ltd	623.2108	T78260/1989	TOMS00000000001250000
Semple 155 MS	Semple Eiendom (Pty) Ltd	942.9147	T89069/1996	TOMS00000000001550000
Bergen op Zoom 124 MS (RE)	Harrisia Investment Holdings (Pty) Ltd	2078.133	T12375/2009	TOMS00000000001240000
Voorspoed 836 MS	Factaprops128 (Pty) Ltd	2087.2216	T97196/1997	TOMS00000000008360000
TOTAL		**8662.7396**		

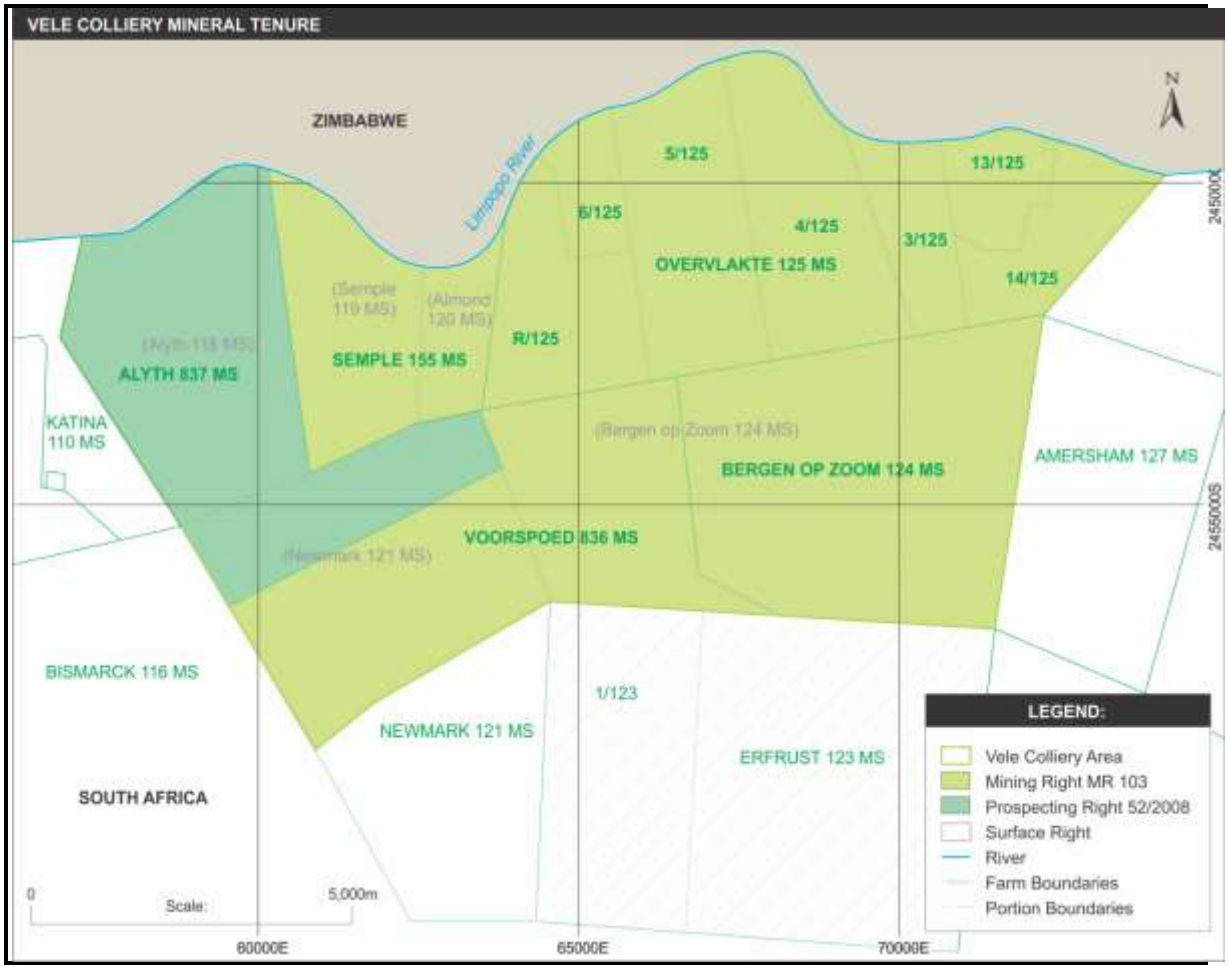

Figure 3: Vele Colliery Mining Right Area

4. LOCALITY MAP

A Locality Map (Master Plan) is attached in Appendix 1.

5. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

Vele Colliery is currently mining its East Pit. The mine planning over the next sixteen years is shown in Figure 4. Mining operations over the next 16 years will be centred on the East Pit as approved in the Environmental Management Programme (EMPr), Environmental Authorisation and Water Use Licence. No underground mining is planned during this period.

The Vele Colliery currently consists of opencast mining operations, associated workshops and stores and a coal beneficiation plant. Other facilities at the mine include the following:

- Topsoil and overburden stockpiles
- ROM coal storage areas
- ROM coal crushing plant (primary, secondary and tertiary crusher)
- Associated conveyors from the crusher to storage stockpiles and from the washing plant to the product storage stockpiles
- Product stockpile areas
- Haul roads and service roads
- Change-houses and offices
- Clean water management infrastructure, including:
    - Storm water canals
    - Flood protection berms
    - Surface water dams
    - Abstraction boreholes and reticulation system, including clean water storage dam
- Dirty water management infrastructure, including:
    - Dirty water dams
    - Sewage treatment facility
    - Temporary slimes dams
- Discard stockpiles
- Access road from the R572 Pondrift-Musina road

The infrastructure layout plan for Vele Colliery is shown in Figure 5.

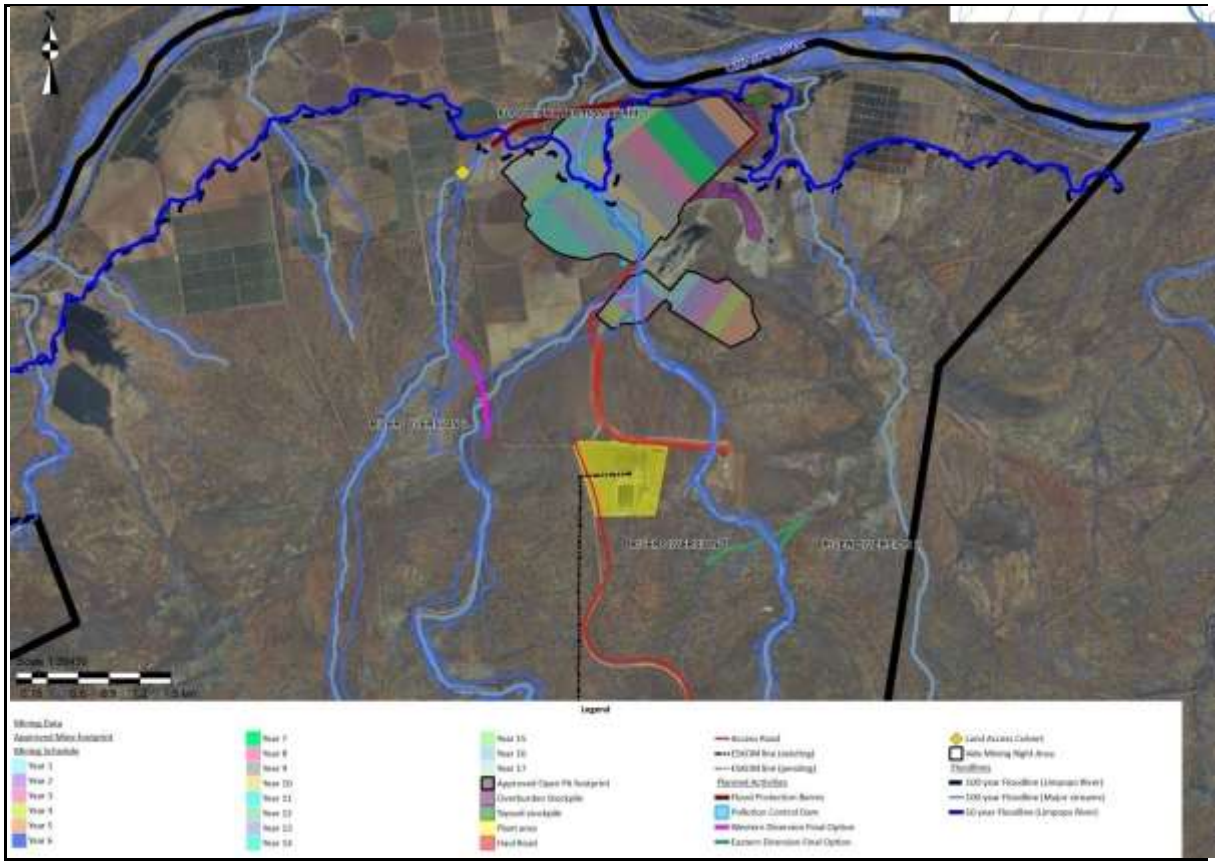

Figure 4: Vele Colliery mining schedule over next 16 years

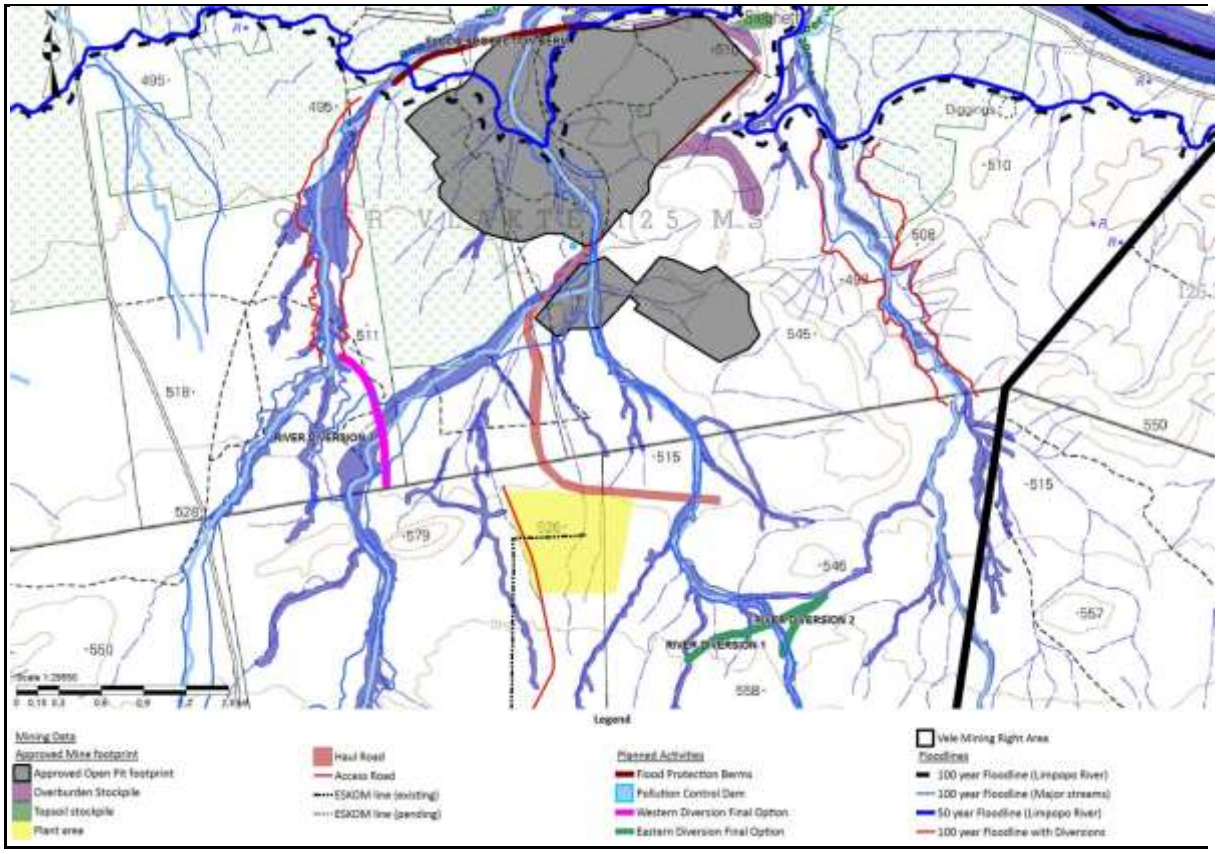

Figure 5: Vele Colliery infrastructure layout plan

5.1 Listed and Specified Activities

Table 2 lists the Listed Activities applicable to the Vele Colliery River Diversion Project, for which additional Environmental Authorisation is seeked.

The additional activities are located on Bergen op Zoom 124 MS and Overvlakte 125 MS Ptn 3 & 4. Refer to Section 5.2 below for a detail description of the activities.

Table 2: Listed Activities associated with the Vele Colliery River Diversion Project, 2014 EIA Regulations

Name of Activity	Aerial Extent of Activity	Listed Activity	Applicable Listing Notice
Eastern Diversion Works	3.7 ha	Development of canals, channels or bridges exceeding 100 square meters within a watercourse	GNR 983, Activity 12
Western Diversion Works	2.2 ha	Development of canals, channels or bridges exceeding 100 square meters within a watercourse	GNR 983, Activity 12
Pollution Control Dam		Not applicable	-
Flood Protection Berm	3.3 ha	The infilling, depositing or excavation of material of more than 5 cubic meters from a watercourse	GNR 983, Activity 19
Land Access Culvert	32m length, 8m width	Development of canals, channels or bridges exceeding 100 square meters within a watercourse	GNR 983, Activity 12
Temporary construction roads	Approx 5 ha	The development of a road wider than 8 meters (no reserve)	GNR 983, Activity 24
Vegetation clearance	Approximately 10 hectares, pending final designs	Clearance of vegetation of 1 hectare or more, but less than 20 hectares	GNR 983, Activity 27

5.2 Description of the Activities to be Undertaken

The additional activities are described below and illustrated in Figure 5.

- There are two (2) non-perennial streams which confluence into one that carries clean surface run-off through the mining activities area, as approved. In order to comply with legislation, this run-off needs to be diverted around the "dirty water" area of the mine. The clean run-off will be diverted into a tributary just to the east that passes the mining activities on the eastern side. This is termed the **Eastern Diversion Works (River Diversions 1&2)**.

- Similarly, there is a well-defined tributary flowing through the future mining area to the west (footprint as approved in the 2010 EMP for Vele Colliery). The clean run-off water from this tributary will be diverted into a neighbouring tributary located to the west of the mining activities, by means of constructing a diversion berm to take the water around the "dirty water" area. This is termed the **Western Diversion Works (River Diversion 3)**.

- A third **Pollution Control Dam** (PCD) with a 10 000m³ capacity and not exceeding the 5m wall height will be constructed within the mining area. The combined quantity of the current two PCDs plus the additional PCD will be 48 750m^3, which will fall below the limit that triggers a new listed activity. The life of mine operations indicates that a third PCD will ensure best practice with sound environment practice in terms of dirty water management and pollution prevention. This dam is practically a surge dam that will be used to temporarily store the dewatering from the opencast areas, after which the water will be pumped to the processing plant for reuse.

- In addition to the above, the 1:100 year flood-line shows that the north-western corner of the future mining area is below the 1:100 year flood level of the well-defined tributary associated with the Western Diversion Works. A flood protection structure is required to protect this portion of the pit. This is termed the **Flood Protection Berm**.

- The potential flooding of an existing access road, providing access to the pivot irrigation areas to the west of the pit, was identified as an impact. A new culvert system will be put in place to prevent flooding, thereby ensuring safe access to the irrigation fields. This is termed the **Land Access Culvert**.

The designs of the proposed activities (final preferred option) are attached as:

- Appendix 4a: Element Consulting Engineers, May 2015: Final alignment and design of the Eastern Diversion Works and Flood Protection Berm

- Appendix 4b: Element Consulting Engineers, January 2016: Final (revised) alignment and design of the Western Diversion Works

- Appendix 4c: PG Consulting: PCD design criteria

6. POLICY AND LEGISLATIVE CONTEXT

6.1 Applicable Legislation

The legal frameworks within which the mining development and associated infrastructure aspects operate is complex and include many acts, associated regulations, standards, principle, guidelines, conventions and treaties on an international, national, provincial and local level. The main legal frameworks that require compliance in terms of Environmental and Water Use Authorisation are:

- Act No. 28 of 2002: Mineral and Petroleum Resources Development Act (MPRDA), as amended
- Act No. 107 of 1998: National Environmental Management Act (NEMA), as amended
- Act No. 36 of 1998: National Water Act (NWA), as amended
- Act No. 59 of 2008: National Environmental Management: Waste Act (NEMWA), as amended
- Act 25 of 2014: National Environmental Management Laws Amendment Act (NEMLAA)

Other legislative frameworks applicable to the Vele Colliery River Diversion Project include:

- Act No. 108 of 1996: The Constitution of South Africa
- Act No. 25 of 1999: National Heritage Resources Act (NHRA)
- Act No. 10 of 2004: NEMA: Biodiversity Act (NEMBA)
- Act No. 43 of 1983: Conservation of Agricultural Resources Act (CARA)
- Act No. 84 of 1998: National Forests Act (NFA)
- Act No. 39 of 2004: National Environmental Management: Air Quality Act (AQA)
- Act No. 57 of 2003: National Environmental Management: Protected Areas Act
- Act No. 26 of 2014: National Environmental Management Act: Waste Amendment Act
- Act No. 101 of 1998: National Veld and Forest Fire Act
- Act No. 15 of 1973: Hazardous Substances Act
- GN No. 704 of 4 June 1999: Regulation on use of water for mining and related activities aimed at the protection of water resources
- GN No. R. 982-986 of 4 December 2014: NEMA: EIA Regulations
- GN No. 718 of 3 July 2009 and R. 921 of 2013: NEMWA: Waste Management Activities
- GN No. 634 of 23 August 2013: NEMWA: Waste Classification and Management Regulations

- GN No. 248 of 31 March 2010: AQA: Atmospheric Emissions Activities
- GN No. R.152 of 2007: NEMBA: Threatened or Protected Species (TOPS) Regulations
- Act No. 2 of 2000: Promotion of Access to Information Act
- Act No. 3 of 2000: Promotion of Administrative Justice
- Act No. 85 of 1993: Occupational Health and Safety Act

Strategies, guidelines and other documents of importance to this project (list not exhaustive) are:

- National Protected Areas Expansion Strategy, 2010 (NPAES)
- National List of Threatened Terrestrial Ecosystems for South Africa, 2011
- National Biodiversity Assessment, 2011 (NBA)
- The Mining and Biodiversity Guideline: Mainstreaming Biodiversity into the Mining Sector, 2013
- Implementation Manual for Freshwater Ecosystem Priority Areas, 2011
- Good Practice Guidance for Mining and Biodiversity: International Council on Mining and Metals
- Convention on Biological Diversity (1995)
- World Summit for Sustainable Development (2002)
- Important Bird Areas, BirdLife South Africa

6.2 Licensing Requirements

The enactment of the NEMLAA introduced the One Environmental System (OES) on 8 December 2014. In terms of the OES, every applicant who applies for a mining right in terms of Section 22 of the MPRDA must conduct an Environmental Impact Assessment (EIA) and submit an Environmental Impact Report (EIR) and Management Programme Report (EMPr) in terms of the NEMA (amendments) and its EIA regulations (2014).

Under the OES, these reports are submitted to the Department of Mineral Resources (DMR) who is the lead authority for any mining and related activities. The system requires all permitting applications to be conducted in parallel to facilitate integrated decision making at Government level and the Environmental Authorisation application should therefore ideally include the requirements of the NEMA, the NEM: Waste Act of 59 of 2008 (NEMWA) and others, as applicable.

A number of listed activities are triggered by the proposed infrastructure developments (Table 2) as described above, requiring an application for Environmental Authorisation in terms of Listing Notice

1 (GN No. R.983) of the 2014 EIA Regulations (GN No. R.982 to 985) promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA) on 4 December 2014.

Listing Notice 1 requires application for Environmental Authorisation following a Basic Assessment procedure as prescribed in regulations 19 and 20 of the EIA Regulations, 2014. No listed activities in terms of Listing Notices 2-4 are triggered by the proposed infrastructure development.

In addition, the proposed infrastructure development trigger water use in terms of Sections 21(c) and (i) for the river diversions, flood protection berm and land access culvert and Section 21(g) for the PCD of the National Water Act 36 of 1998 (NWA). Application will be made to the Department of Water and Sanitation (DWS) for the additional water uses associated with this project.

As part of the Basic Assessment procedure, an EMPr needs to be compiled. For the purpose of this project, this involved the review and integration of all existing (approved) EMPr's for Vele Colliery and development of a consolidated EMPr for the full operation, inclusive of all existing activities and new proposed infrastructure developments.

The following licencing requirements have been identified for the Vele River Diversion Project:

Applicable Legislation	**Applicability and Requirement**	**Compliance**
MPRDA	LCC is in possession of mining right – LP 30/5/1/2/2/103 MR.	None
NEMA EIA Regulations (2014)	A number of listed activities are applicable, triggering the threshold limit for a Basic EIA required in terms of GN984.	EA application submitted to DMR: Limpopo
NWA, S21	Licences will be required for a number of water uses.	IWULA and IWWMP submitted to DWS: Limpopo
NEM:BA, TOPS regulations	Permits required for the destruction and/or relocation of protected species.	Permit application to LEDET prior to construction

7. NEED AND DESIRABILITY OF PROPOSED ACTIVITIES

7.1 Economic Benefits

The activities may be small in number compared to the mining activities making up the Vele Colliery project, but have a significant contribution to make to the total mining component and should not be viewed individually, but in the context of the entire Vele Colliery mining project. Within that context, mining in general has transformed South Africa's economic and social landscapes. Currently, mining contributes an average of 20% to South Africa's Gross Domestic Product (GDP), of which about 50% is contributed directly. Furthermore, mining employs about half a million people and contributes over R330 billion of the country's total annual income. In 2007, the South African Chamber of Mines (SACM) established that nearly 58 000 people were directly employed in coal mining alone (which is 13% of the mining sector's workforce). The SACM estimated that the numbers could be more if those employed in coal-fired electricity generation; liquid fuel production and distribution are included.

Vele Colliery is located in the Limpopo Coalfield that forms part of the greater Tuli Block Coalfield, and is represented in South Africa by very narrow deposit of the Karoo Sequence rocks of the southern bank of the Limpopo River. The mineral resource is estimated to contain 793.95Mt of gross in situ coal resources.

The area Vele Colliery intends to mine has an economically viable coal reserve estimated to be at more than 325 Mt total mineable in situ coal reserve. The mine development process has been extended for a 3-year period with an approximate capital investment of R1.5 billion. At full production, annual costs associated with the mining activities are estimated to be in the order of R900 million of which R315 million is direct labour costs.

Coal is vital for economic development. It is important for electricity generation and a vital input into steel production. Over the past 30 years, coal has been the indispensable driver for economic and social development and around 40% of the world's electricity is produced using coal. Coal will have a major role in meeting the future energy needs and the demand for coal and its vital role in the world's energy system is set to continue, as strong competitive forces continue to drive coal market prices.

The estimated total Gross Domestic Product (GDP) that LCC will contribute during its operational phase of the project is expected to contribute R 7.6 billion per annum to the GDP of the country, and two thirds i.e. R 4.9 billion of the amount will be contributed to the GDP of Limpopo Province.

In addition to the quantifiable economic benefits that will result from this development, there are also a number of benefits that are not measurable in the same way, but that should be considered. These benefits could include:

- ***Technology***: Technology used on the mine will work towards improving knowledge on available technologies and skills in using such technology. This may enable local communities to run their own successful businesses in the future.

- ***Skills development***: Local communities who may not have any marketable skills other than a basic education will be able to acquire skills through employment on the mine. This benefit

will be least for those who work as employees. However, those who work in other roles may take on leadership positions or acquire technical skills in their roles.

- ***Asset base***: The capital expenditure outlaid into the land in the area will result in an asset base upon which future development can occur. In addition to this, the asset base adds value to the municipality itself and provides a starting point for future developments.

- ***Local procurement and SMME opportunities***: Local communities will be provided with opportunities and capacity to participate in contracts that would become available during the construction and operational phases.

- ***Equal employment opportunities*** and training and skills development opportunities associated with the mine will improve.

7.2 Employment

During the construction phase of the Vele River Diversion Project, contractor labour numbers will peak at approximately 150 with a large percentage drawn from the local area. During the operational phase, the project will employ approximately 450 permanent employees with varying skills, thus affecting directly on livelihoods of approximately 810 people. The mine closure operation will provide employment for between 200 and 450 people, declining over the five-year period.

7.3 Social and Labour Plan

7.3.1 Workforce Development

An integrated Human Resource Development (HRD) Programme has been formulated and implemented to maximise the productive potential of people involved with the Vele Colliery through implementation of the following:

- A Skills Development Plan;
- A Career Progression Plan;
- A Mentorship Plan;
- Internship and Bursary Plans; and
- Effective and legally compliant Employment Equity Plan.

The primary objective of human resource development programme is to ensure the availability of mining and production operation specific skills and competencies of the workforce; as well as providing employees with portable skills that the employees can utilise outside the mining industry.

The full potential of the HRD programme can only be comprehensively implemented once the Colliery is in full production.

LCC will extend its current programmes in respect of its five-year plan to address the following:

- Adult Education and Training;
- Core Skills Training;
- Bursaries – to date, 45 students have graduated from the Vele Bursary Fund, with 6 still remaining on the system; and
- Internships.

7.3.2 Community Development (LED projects)

LCC has successfully implemented its first 5-year SLP, and is in now in the process of implementing its 2nd SLP, which will stretch from 2016 – 2020. This SLP focuses on the following projects:

- Infrastructure Development: Vele Colliery is currently paving sidewalks (1.9km) in Nancefield, at a cost of R3.7million, with 60 jobs created. Fifteen people were trained by the School of Paving.
- School Transformation Project: Upgrading of a farm school in close proximity to Vele Colliery at a cost of over R2million. It is expected that 15 jobs will be created.
- Health: A mobile clinic will be donated to the Provincial Department of Health. This will create 3 permament jobs.

7.4 Environmental Policy, Commitment and Resources

LCC has committed to implement feasible biodiversity offsets and rehabilitation programmes at Vele. In addition, the company has committed to appoint permanent environmental personnel on site and other relevant specialists (as required) to oversee the implementation of environmental plans and facilitate compliance with environmental statutes.

The Company has committed to comply with environmental legislation and undertake all future developments in accordance with the prescribed legal framework. The following progress has been made regarding the implementation of the biodiversity offset and rehabilitation programmes by LCC:

- Commenced with the plant moisture stress (PMS) monitoring. The monitoring data is used to detect early changes in the riparian vegetation i.e. *Croton megalabothrys* along the Limpopo River on the farm Overvlakte 125 MS. The PMS continue to be used to detect imbalances in the plant water status to determine the degree of moisture stress under different conditions. The information gathered will be valuable in the long-term rehabilitation of the riverine forest.
- Completed a baseline study for the restoration of the riparian floodplains, as the initial step that forms part of LCC's commitment to rehabilitate the Limpopo riverine forest along Limpopo River on LCC property at the farm Overvlakte 125 MS.

- Biodiversity offset agreement (BoA) – Signed in October 2014, the BoA is being implemented by the Project Steering Committee, comprising of representative from the signatories to the agreement.

It is stated in LCC's management documentation that the Board is committed to administering policies and procedures with openness and integrity, pursuing the true spirit of corporate governance commensurate with the Company's needs. LCC states that one of the categories of risk is the environment and that any risk that could have a material impact on its business is included in its risk profile and this is considered in the Company's Safety, Health and Environmental Policy. The Company and its board have committed to:

- sustainable business models for all stakeholders, including shareholders, employees, communities and the environment;
- compliance with all applicable environmental legislation and environmental best practice;
- adherence to restoration and rehabilitation of affected areas; and
- establishment of appropriate and effective mitigation measures and conducting progressive and innovative programmes to minimize environmental impacts.

The significance of an Environmental Policy is that it sets the stage for all of the other elements of the company's Environmental Management System (EMS). It provides a unifying environmental management vision for the company and establishes goals for environmental performance against which the effectiveness of its management system will be judged.

7.5 No-Go Option

In the event that the proposed activities are not approved, Vele Colliery will not be able to continue their mining operations safely and in compliance with legal requirements. Ultimately this could result in the closure of the mine, and thereby the loss of opportunity to continue to develop a high quality mineral resource which has the potential for huge economic benefits on local, provincial and national level in terms of employment and the contribution to the GDP.

Other socio-economic benefits that will be lost include:

- Skills development opportunities;
- Employment opportunities;
- LED projects (SLP); and
- Local procurement and SMME opportunities.

8. MOTIVATION FOR THE OVERALL PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVE

As indicated earlier in this report, LCC operates under an existing mining licence and approved EMPr. The opencast mining footprint as presented in Figure 4 was approved as part of the EMPr. Similarly, the proposed river diversions and flood protection berm formed part of the proposed mitigation measures in the approved EMPr and was indicated in the mining layout. The proposed activities related to the Vele River Diversion Project are therefore essentially approved as part of the mining licence and EMPr.

Having said this, no Environmental or Water Use Authorisation for these activities is in place yet, due to the phased implementation of the Vele Colliery project and mining schedule. In order to continue mining as per the approved mining schedule, it has now become pertinent to obtain these additional authorisations.

The mining site is dictated by the mining licence, thus no site alternatives are considered feasible. Similarly, the proposed activities are prescribed by LCC's EMPr and therefore no alternatives in respect of the specific mitigation measures (activities / technology) have been considered. In addition, the separation of clean and dirty water is a legislative requirement and a condition of LCC's existing water use licence. LCC therefore need to divert the clean runoff around their mining area in order to ensure legal compliance.

The same applies for the Flood Protection Berm that is required to prevent the potential flooding of the pit from the Limpopo River, which could lead to water quality and flow impacts, as well as the risk of human fatalities.

However, in terms of the alignment and design of these structures, alternative options have been considered. These are presented in detail in the following Section.

9. FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVES WITHIN THE SITE

9.1 Details of Alternatives Considered

9.1.1 Step 1: Preliminary alignment and design

This step entailed the identification of the required river diversions and flood protection berm (Element, 2014), and preliminary alignment and design of these structures. The preliminary alignment and design of the structures were based on the catchment parameters, the expected flood peaks and volumes, as well as the topography of the area.

9.1.2 Step 2: Review of alignment and design

9.1.2.1 Step 2A: Hydrological review

WSM Leshika Consulting (Pty) Ltd reviewed the January 2014 design report and recommended that the vertical alignment of the canals should be adjusted to a flatter slope by incorporating a stepped diversion channel in order to achieve a lower flow velocity, preferably in the order of 1 m/s velocity. They further recommended that the bed of the diversion channel should also be protected except where solid rock outcrops is evident, as identified by a registered engineering geologist.

The design report was subsequently updated in line with the recommendations, as follow (Element, May 2015):

- Berm Protection: Erosion protection (dump rock/riprap) will be placed on both the upstream slope of the berm and toe of the berm to prevent scour. During construction, problem areas will be identified and additional protective measures will be put in place where required. The figure below illustrates the proposed protection to be implemented.

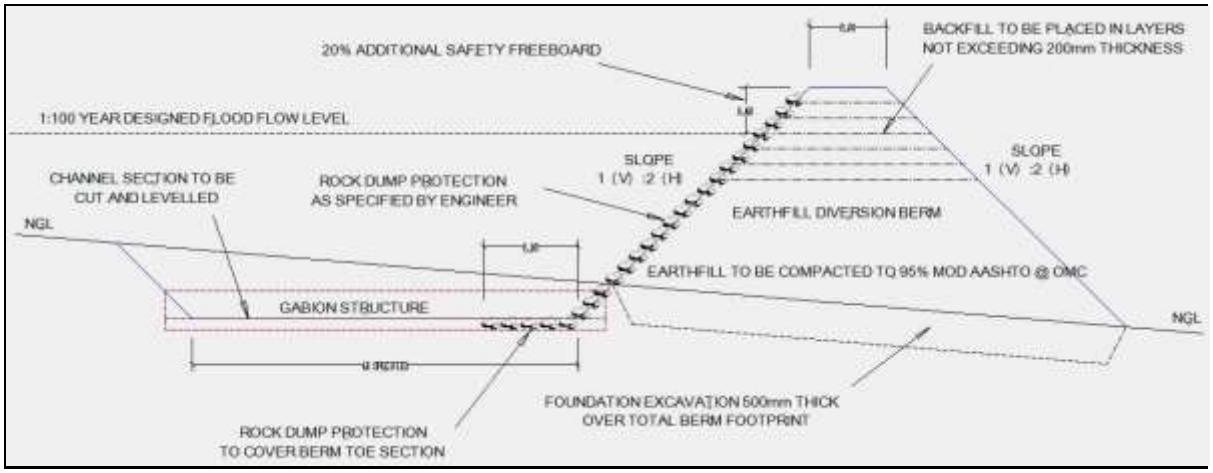

Figure 6: Revised protection measures (Source: ELEMENT Consulting Engineers)

- Proposed structures to reduce flow velocities: Cross-sectional gabions structures will be constructed within the diversion channels on calculated distances to reduce flow velocities, minimize erosion, attenuate flow velocities and act as silt traps. Specified intervals for positioning of erosion gabion structures:
    - Western diversion berm (preferred position) - 62m intervals = 10 structures
    - Eastern diversion berm No. 1 - 50m intervals = 20 structures
    - Eastern diversion berm No. 2 - 25m intervals = 14 structures

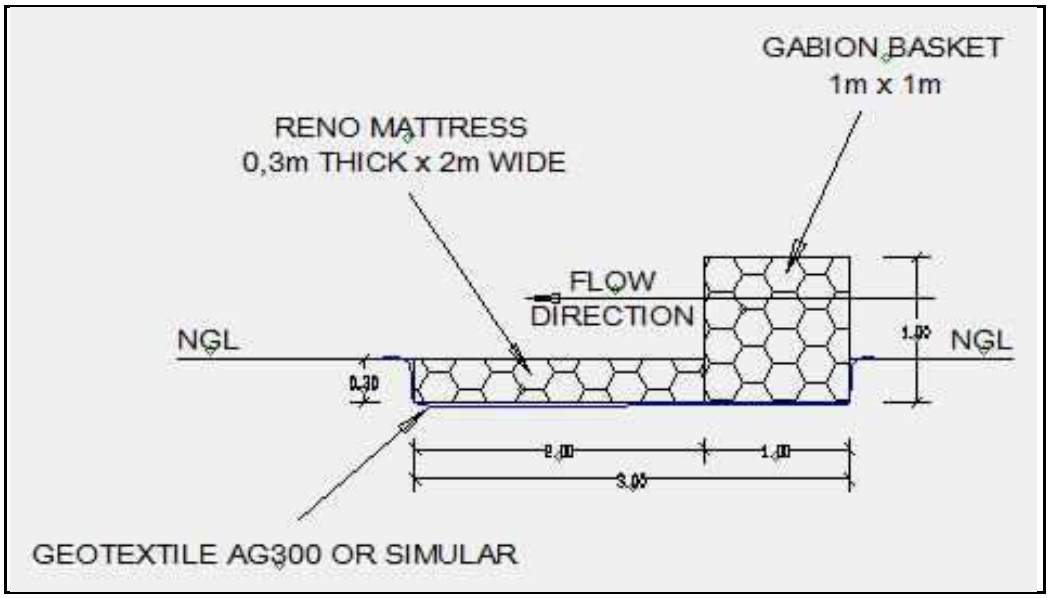

Figure 7: Proposed gabion structures (Source: ELEMENT Consulting Engineers)

The final designs are presented in the May 2015 and February 2016 design reports, attached as Appendix 4. WSM Leshika concluded that addresses all issues raised by WSM, viz. the impact of high flow velocities, the need for adequate scour protection and the erosion potential and sediment loads. The full hydrological review is attached as Appendix 5.

9.1.2.2 Step 2B: Ecological Review

The preliminary alignments of the river diversion systems and flood protection berm were further reviewed by Ysterberg Environmental Services (2014) to identify any species of conservation value and ecological sensitive areas. A number of protected tree species and sensitive areas were identified – refer to Section 9.4.1.2.1 for a detail discussion in this regard. An alternative alignment was then proposed for the Eastern Diversion Works: River Diversion 1, as indicated in Figure 8. No alternative was considered for the Western Diversion Works at this point in time. Refer to Appendix 9 for the ecological reviews.

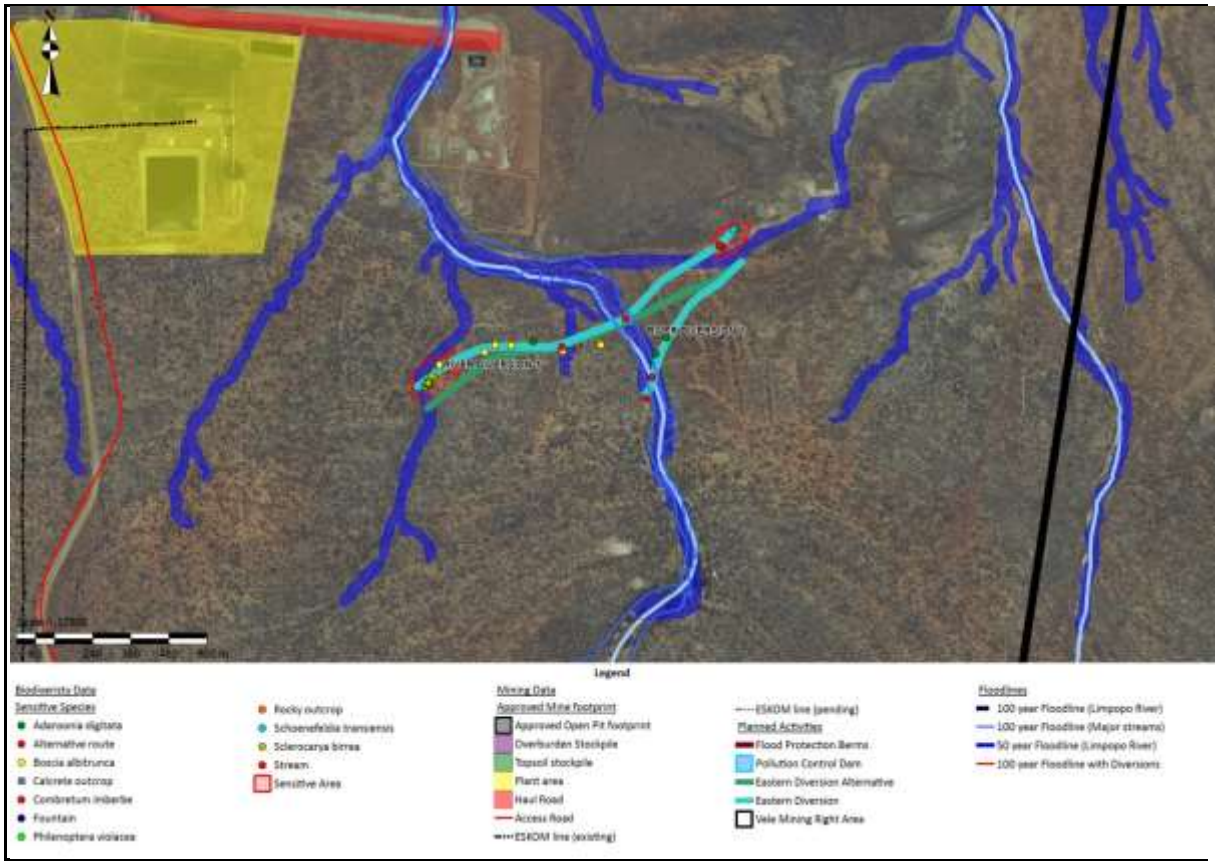

Figure 8: Alternative alignment for the Eastern Diversion Works

9.1.3 Step 3: Aquatic assessment

Following the aquatic assessment conducted by Scientific Aquatic Services (2015), a further micro-ecology sensitive habitat was identified downstream of the Western Diversion Works. This led to the re-alignment of the River Diversion 3 to reduce the impact on the local riparian vegetation of the system to be diverted. The Eastern Diversion Works was relocated to a position further downstream nearer to where agricultural activities occur on the banks of the system as shown in Figure 9. The design report was subsequently revised to allow for this further alternative.

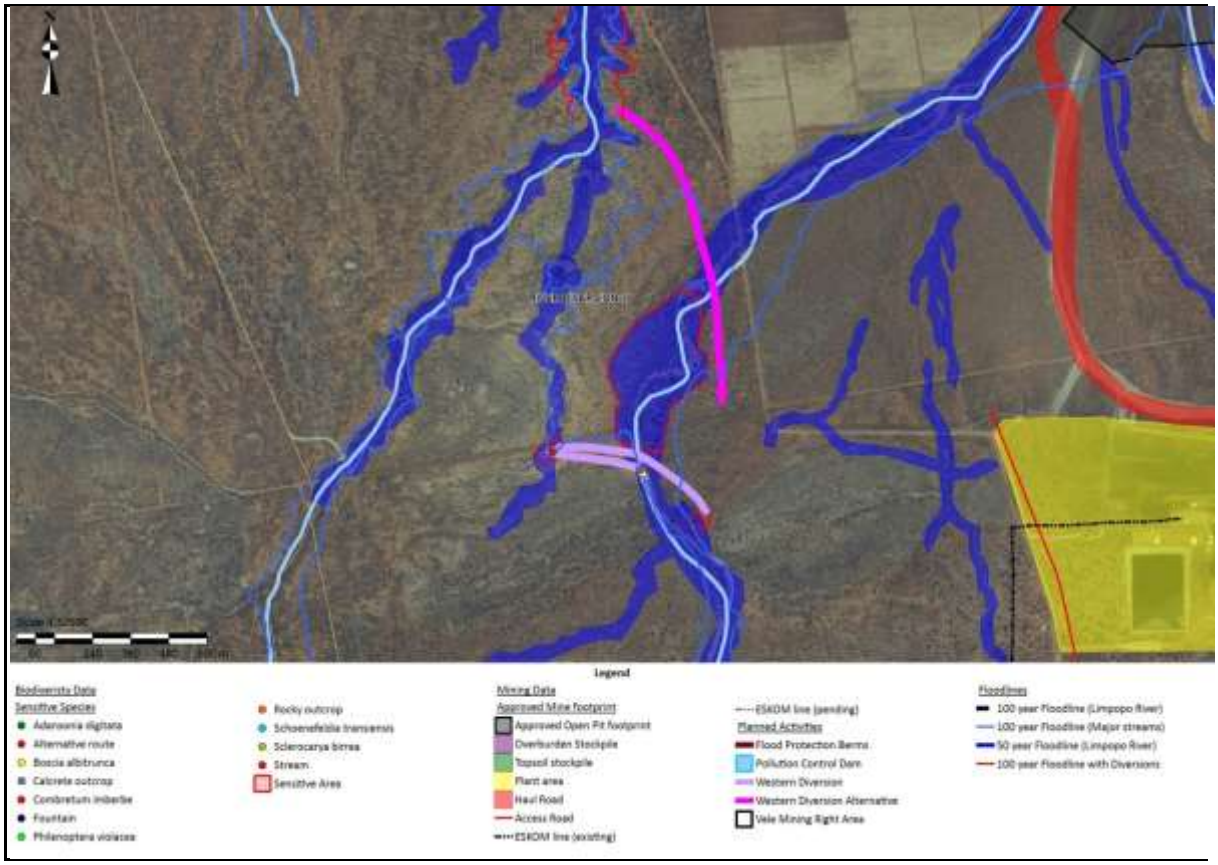

Figure 9: Alternative alignment for the Western Diversion Works

9.2 Details of Public Participation Process Followed

9.2.1 Register of Interested and Affected Parties

The following parties are contained in the current Interested and Affected Party (IAP) Register (Appendix 3-1):

- Relevant National and Provincial Authorities;
- Local Government, Municipalities and Ward Councillors;
- Landowners and neighbours of the Mining Right Area;
- Environmental NGO's Advocacy Groups or Conservation Groups;
- Vhembe Mineral Resources Stakeholder Forum (VMRSF);
- Vele Environmental Monitoring Committee (EMC); and
- Any other party that attended a meeting, submitted comments or requested to be registered.

9.2.2 Written Notice of the Application

The following written notifications (Appendix 3-2) were sent in the announcement of the project and application:

Table 3: IAP Notification Table

Stakeholder Group	IAP	Method of Notification	Date of Notification
Organs of State	All relevant Authorities contained in the Authority Register	Letter / BID emailed Invitations	29 May 2015 24 July 2015
Municipalities	All District and Local Municipalities as contained in the Municipal Register	Letter / BID emailed Invitations	29 May 2015 24 July 2015
Landowner, Lawful Occupier, Community	All landowners identified as contained in the Property Register	Letter/BID emailed, faxed, posted SMS sent Advertisement placed On site notices Invitation to Focus Group	29 May 2015 29 May 2015 29 May 2015 2 June 2015 24 July 2015
	Land Claimants / Communities	Letter/BID emailed, faxed, posted SMS sent Advertisement placed On site notices Invitation to Focus Group	29 May 2015 29 May 2015 29 May 2015 2 June 2015 24 July 2015
Other Interested and Affected Parties	Environmental NGO's / Conservations Clubs	Letter / BID emailed	29 May 2015
	VMRSF	Letter / BID emailed	29 May 2015
	Vele EMC	Letter / BID emailed	29 May 2015
	Other, as registered	Advertisement placed On site notices Letter emailed, faxed, posted SMS sent	29 May 2015 2June 2015 29 May 2015 29 May 2015

The announcement notification was sent with a copy of the Background Information Document (BID) (Appendix 3-3) that contains the following information:

- Details of the application or proposed application that is subjected to public participation;
- Explanation of the proposed project's nature, location and planned activity;
- Stating the required regulated processes in terms of the relevant legislations;
- Stating where further information on the application can be obtained; and
- Stating the manner in which a person can become involved / register as an IAP.

9.2.3 Advertisements and On-site Notifications

The following advertisements (Appendix 3-4) were placed to announce the project and application:

Table 4: Advertisement Table

Type of Media	Name of Media	Distribution	Date of placement
Newspaper	The Zoutpansberger	North of the Soutpansberg	29 May 2015
Newspaper	Limpopo Mirror	Limpopo Province	29 May 2015

The following on-site notices (Appendix 3-5) were placed to announce the project and application:

Table 5: On-Site Notices Table

Location of Notice	Name of Location	Coordinate of Placement	Date of placement
Property Boundary	Vele Colliery Entrance	22.206838° S 29.677009° E	2 June 2015
Municipality	Musina Local Municipality	22.3557545° S 30.0347545° E	2 June 2015
	Blouberg Local Municipality	23.1418232° S 28.9932509° E	2 June 2015
Public Places	Mapungubwe Reception	22.2430679° S 29.3993377° E	2 June 2015

9.2.4 Availability of Project Documentation

The following documents were made available throughout the process:

Table 6: Public Documents Table

Document	Timeframe	Date of availability	Date of comment closure
BID (attached as App 3-3)	Ongoing throughout the process	29 May 2015	Not applicable
Consultation BAR and EMPr (request for comments attached as App 3-2)	30 days	To be determined	To be determined

9.2.5 IAP Engagements and Meetings

The following engagements have been held and records are attached as follows:

- Notification of project and request for comments on documents attached as Appendix 3-2.
- Minutes of the Authority Meetings attached as Appendix 3-6.
- Minutes of the Focus Group meetings attached as Appendix 3-7.
- Minutes of the Vele EMC attached as Appendix 3-10.
- Comments received to date as contained in the Comment and Response Report (CRR) attached as Appendix 3-8.

Table 7: Engagement Session Table

Party	Type of Engagement	Date of Engagement
AFFECTED PARTIES		
Landowners		
Project Landowners	Request for comment letter (App3-2) Landowner site visit Focus Group meeting (App3-7)	29 May 2015 16 July 2015 14 Aug 2015
Lawful occupier/s of the land		
No occupants on property	Not applicable	Not applicable
Land Claimants		
Land Claimants & DRDLR	Request for comment letter (App3-2) Focus Group meeting (App3-7)	29 May 2015 15 Aug 2015
Municipal Councillor		
Ward Councillors	Request for comment letter (App3-2) Authority meeting (App3-6)	29 May 2015 14 Aug 2015
Municipality		
District Municipality	Request for comment letter (App3-2)	29 May 2015
Local Municipality	Request for comment letter (App3-2) Authority meeting (App3-6)	29 May 2015 14 Aug 2015
Traditional Leaders		
Property does not fall under a Traditional Authority	Not applicable	Not applicable
Communities		
No communities residing on the Infrastructure Properties	Not applicable	Not applicable
Organs of State		
Department of Mineral Resources		
Department of Environmental Affairs	Request for comment letter (App3-2) Authority meeting (App3-6)	29 May 2015 13 Aug 2015
Department of Water and Sanitation	Request for comment letter (App3-2) Authority meeting (App3-6)	29 May 2015 13 Aug & 3 Sept 2015
Department of Rural Development and Land Reform	Request for comment letter (App3-2)	29 May 2015
Department of Agriculture	Request for comment letter (App3-2) Authority meeting (App3-6)	29 May 2015 13 Aug 2015
South African Heritage Resource Agency Limpopo Heritage Resource Agency	Request for comment letter (App3-2)	29 May 2015
OTHER AFFECTED PARTIES		
Environmental NGOs & Advocacy Groups		
Birdlife SA	Request for comment letter (App3-2)	29 May 2015
VMRSF	Request for comment letter (App3-2) Focus Group meeting (App3-7) Comments (App3-9)	29 May 2015 14 Aug 2015
All other parties on register	Request for comment letter (App3-2) Comments (App3-9)	29 May 2015
Adjacent landowners		
Landowners adjacent to the project area	Request for comment letter (App3-2) Focus Group meeting (App3-7)	29 May 2015 14 Aug 2015
Adjacent Traditional Leaders		
No adjacent Traditional Authorities	Not applicable	Not applicable
Adjacent communities		
No adjacent communities	Not applicable	Not applicable
Other		
Vele EMC	Meetings (App3-10)	21 Aug 2015
Coalition	Meetings (App3-10)	10 Sept 2015
INTERESTED PARTIES		
Invited to comment on project during Announcement Phase and comment on Consultation BAR & EMPr	Request for comment letter (App3-2)	To be determined

9.3 Summary of Issues raised by IAPs

Table 8: Comment and Response Summary

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by applicant	Consultation Status (consensus, dispute, not finalised)
AFFECTED PARTIES					
Landowners					
Project Landowners	X	14 Aug 2015	Surface & Groundwater Pollution Flooding Increased water volume in the western course could result in the inability to access the lands by farm equipment	Controlled blasting if required Clean and Dirty Water Management Monitoring Channels with berms and gabions will be used to control and delay the flow of the river during rain events Land access culvert included in the design	Consensus Consensus Consensus
Lawful occupier/s of the land					
No occupants on property		Not applicable	Not applicable	Not applicable	Not applicable
Land Claimants					
Land Claimants & DRDLR	X	15 Aug 2015	Benefits to land claimants Information dissemination & regular meetings Grave access	Included in the Social and Labour Plan of the mine Meetings will be scheduled as required CoAL has a Grave visitation policy	Not finalised Consensus Consensus
Municipal Councillor					
Ward Councillor		No comments	No comments	No comments	
Municipality					
District Municipality		No comments	No comments	No comments	
Local Municipality	X	14 Aug 2015	Surface & Groundwater Pollution Continuous engagement	Water balance in deficit, no discharge Clean and Dirty Water Management Monitoring Meetings will be scheduled as required	Consensus Consensus
Traditional Leaders					
Property does not fall under a Traditional Authority		Not applicable	Not applicable	Not applicable	
Communities					
No communities residing on the		Not applicable	Not applicable	Not applicable	

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by applicant	Consultation Status (consensus, dispute, not finalised)
Infrastructure Properties					
Organs of State					
Department of Mineral Resources		No comments	No comments	No comments	
Department of Environmental Affairs	X	13 Aug 2015	Avoidance of sensitive species Share list of alien species with LEDET	Where possible species will be avoided when route is surveyed and pegged out Agreed	Consensus
Department of Water and Sanitation	X	13 Aug 2015 3 Sept 2015	Groundwater Studies Separate application	Specialist opinion does not foresee any changes to original study Due to timing and extent of application cannot be amendment	Consensus
Department of Rural Development and Land Reform		No comments	No comments	No comments	
Department of Agriculture	X	13 Aug 2015	Downstream land and water use activities Flooding	Farm activities supplied from Limpopo River. CoAL landowner with lease back arrangements Channels with berms and gabions will be used to control and delay the flow of the river during rain events	Consensus
SA Heritage Resources Agency Limpopo Heritage Resource Agency		No comments	No comments	No comments	
OTHER AFFECTED PARTIES					
Environmental NGO's					
Birdlife SA & Birding conservation groups		No comments	No comments	No comments	
VMRSF	X	1 July 2015 25 Feb 2016	Registration Provide information Due to interaction on other projects, and legal action – organisation is opposed to all mining activities continuing in the Limpopo Valley without a Strategic Environmental Assessment	Request a meeting to discuss project – meeting refused	Dispute
All other parties on register	X	23 July 2015	Provide more information	BID supplied and meeting arranged	Consensus
Adjacent landowners					
Landowners adjacent to the project area	X	14 Aug 2015	Owner of Ptn 1 Samera MS object against mining due to its proximity to world heritage site (property is located 25km west of activities)	Noted	Not finalised
Adjacent Traditional Leaders					

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by applicant	Consultation Status (consensus, dispute, not finalised)
No adjacent Traditional Authorities		N/A			
Adjacent communities					
No adjacent Communities		N/A			
Other					
Vele EMC	X	21 Aug 2015	Involvement in the process Identification of eco corridors Additional monitoring	Will be taken into consideration and included in the EMP.	Not finalised
Coalition	X	10 Sept 2015	Integrate the river diversion plans with the overall management of clean and dirty water. Involvement of other stakeholders such as landowners and land claimants. Take into consideration the baseline water quality, which is poor, that it is not further deteriorated. How will you be able to improve the status of the streams? Additional monitoring to be incorporated into the current monitoring programme. Identification of eco corridors	An integrated EMP will be compiled for the Vele Colliery. Meetings have been held with land claimants, and will continue. Landowners have been consulted and their concerns were addressed. Monitoring will be done and reported at the EMC. Monitoring and management measures flowing from the monitoring results in partnership with landowners. It will be incorporated. Will be taken into consideration and included in the EMP.	Not finalised
INTERESTED PARTIES					
No other comments received					

A detailed Comment and Response Report (CRR) is attached as Appendix 3-8, and copies of written submissions are included in Appendix 3-9. It should be noted that this CRR is provided with the Consultation BAR and therefore only include initial comments. The final BAR and PP report will include all comments received on this Consultation BAR.

9.4 Environmental Attributes associated with the Alternatives

9.4.1 Baseline Environment

A number of specialist studies have been conducted over the past 10 years at Vele Colliery and formed part of the numerous submissions for environmental authorisation for the site. These are not repeated here and the following section is a summary of the main findings of the specialist work and relevant environmental attributes associated with the proposed activities for the Vele River Diversion Project.

9.4.1.1 Conservation Characteristics of the Vele Colliery Project Area

According to the National Biodiversity Assessment (NBA), 2011, Vele Colliery is not located within a formally or informally protected area. It does however fall within the boundaries of the Vhembe Biosphere Reserve. Protected areas in the vicinity of the site include:

- Mapungubwe National Park and World heritage Site to the west; and
- Musina Nature Reserve to the southeast.

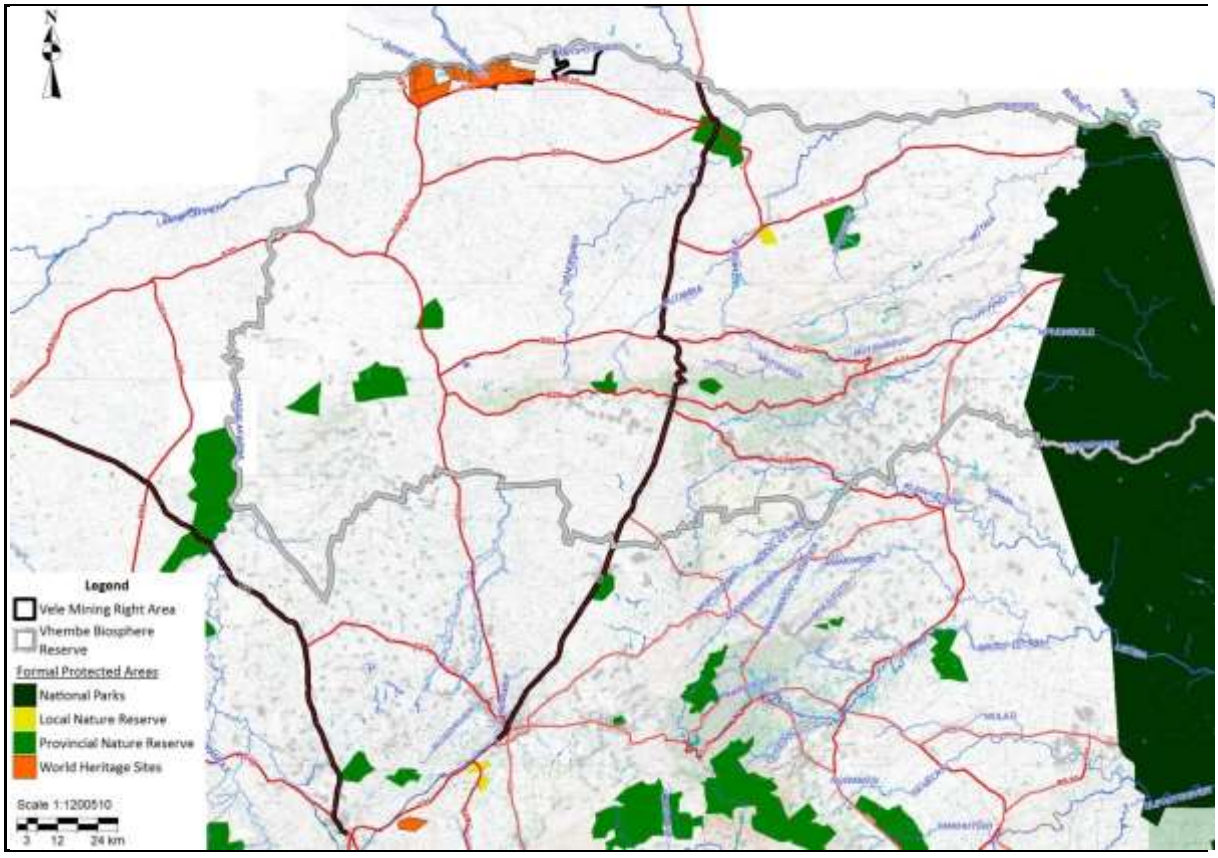

Figure 10: Protected areas

The Limpopo Conservation Plan V2 was consulted in order to determine whether the proposed activities fall within any areas of conservation importance. From Figure 11, it is evident that the flood protection berm falls partly within a Critical Biodiversity Area (CBA) 1, associated with the Limpopo River. The other proposed activities fall within an Ecological Support Area (ESA) 1.

The following land use guidelines and compatible land uses are proposed for CBA 1 and ESA 1 areas:

- CBA 1:
    - Conservation and associated activities;
    - Extensive game farming and eco-tourism operations with strict control on environmental impacts and carrying capacities, where overall there is a net biodiversity gain;
    - Extensive livestock production with strict control on environmental impacts and carrying capacities;
    - Required support infrastructure for the above activities; and
    - Urban Open Space Systems.
- ESA 1:
    - Conservation and associated activities;
    - Extensive game farming and eco-tourism operations;
    - Extensive Livestock Production;
    - Urban Open Space Systems; and
    - Low-density rural residential, smallholdings or resorts where development design and overall development densities allow maintenance of ecological functioning.

It must however be noted that the mining operation and its opencast footprint have been approved previously. The additional activities as proposed in this document will have limited impact compared to the existing land use activities (mining and intensive irrigation).

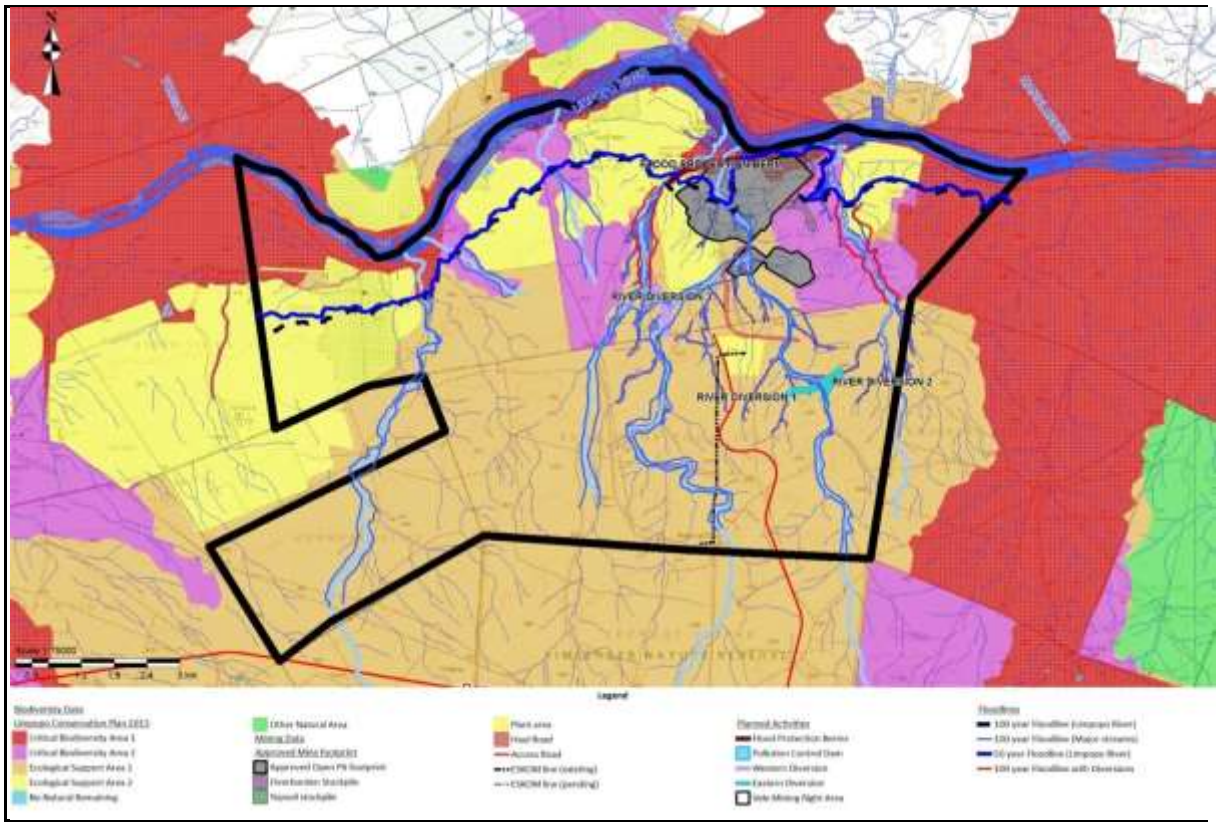

Figure 11: Limpopo Critical Biodiversity areas

The Vele Colliery and proposed activities fall outside of any Important Bird Area (IBA) – refer to Figure 12.

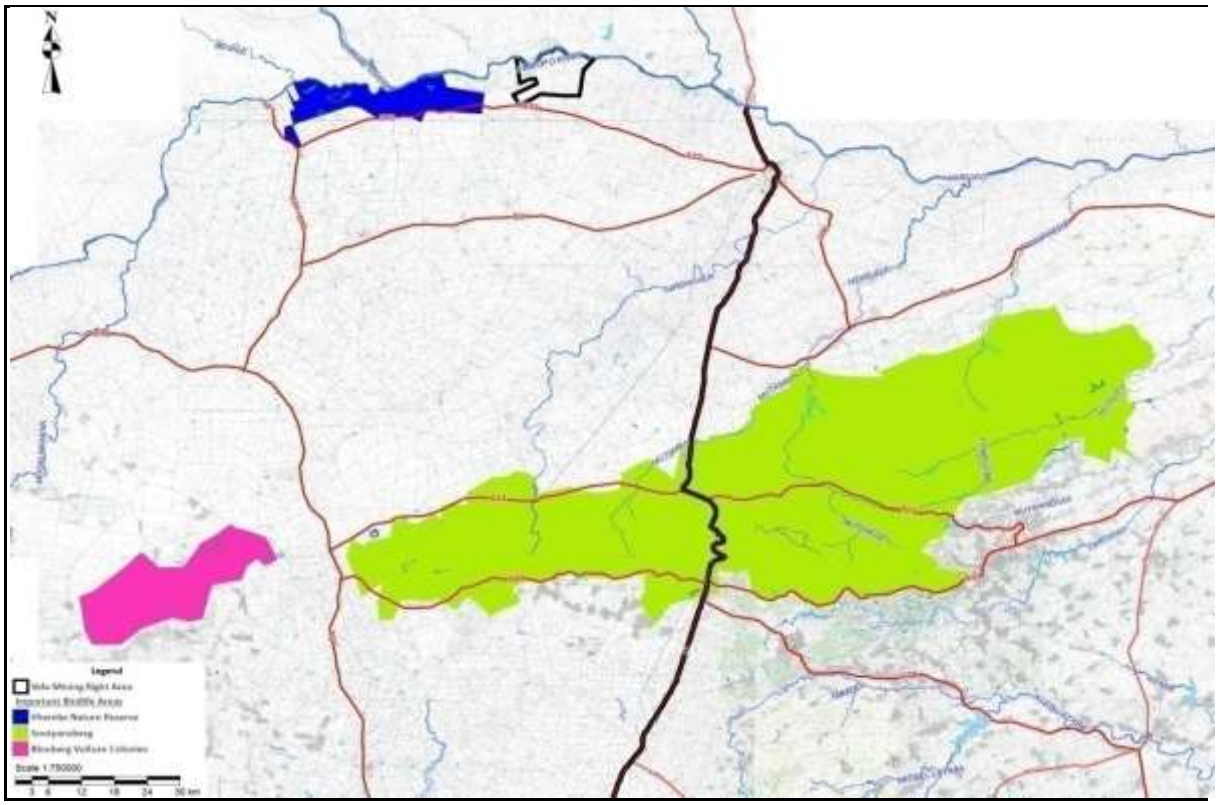

Figure 12: Important Bird Areas

9.4.1.2 Biophysical Environment

9.4.1.2.1 Biodiversity

Environment Research Consulting (ERC) conducted specialist vegetation assessment of the Vele Colliery area with specific reference to Threatened or Protected Species (TOPS) in February 2012 and again over the period 23 – 26 April 2014. Refer to Appendix 7 for the complete report.

The operations at Vele Colliery and the area that it has an impact on, is situated within three vegetation types as described by Mucina & Rutherford (2006). These are the Musina Mopane Bushveld (SVmp 1), the Limpopo Ridge Bushveld (SVmp 2) and Subtropical Alluvial Vegetation (AZa 7). The total of plant species recorded by ERC is 280 from 57 plant families and 179 genera, which indicates moderately high species diversity. The woody layer (trees & shrubs) is represented by 83 species and the herbaceous layer is made up of 44 grass species, 147 herbaceous shrubs, dwarf shrubs, geophytes and other herbs, and 6 sedges. Ninety-three (93) % (259 of 280) of the recorded plant species are indigenous to South Africa. ERC established that at least 95 of the 280 recorded plant species are to some extent used for some or other social activities (medicinal, food/nourishment and/or cultural).

In summary, ERC identified the following floral species of concern:

- No red data plant species as listed by Raimondo *et al* (2009) was recorded in the study area. This does not suggest that no such species occur in the study area, only that such species were not encountered and recorded.

- No species that are listed on the latest TOPS (2013) lists were recorded. This does not suggest that no such species occur in the study area, only that such species were not encountered and recorded.

- Five protected tree species, according to the SA national protected tree list (DWAF, 2007) occur in the study area and six species that are protected by the Limpopo Environmental Management Act (LEMA) of 2003. These species are protected because of them being exploited mainly for firewood, traditional medicine, horticulture, the furniture market and other cultural uses.

Five protected tree species, according to the SA national protected tree list (DWAF, 2007) occur in the study area and six species that are protected by the LEMA of 2003. These species are listed in Table 9.

Table 9: List of protected plant species (ERC, 2014)

Species Name	Common Name	Growth Form	Protected Status
Adansonia digitata	Baobab	Tree	Protected – NFA
Adenium multiflorum	Impala lily	Succulent shrub	Protected – LEMA
Aloe globuligemma	Knoppiesaalwyn	Succulent shrub	Protected – LEMA
Aloe greatheadii var. *davyana*	Greathead's aloe	Succulent herb	Protected – LEMA
Aloe chabaudii var. *chabaudii*	Chabaud's aloe	Succulent shrub	Protected – LEMA
Aloe littoralis		Succulent tree	Protected – LEMA
Boscia albitrunca	Shepherd's tree	Tree	Protected – NFA
Combretum imberbe	Leadwood	Tree	Protected – NFA
Philenoptera violacea	Apple leaf	Tree	Protected – NFA
Sclerocarya birrea subsp. *caffra*	Marula	Tree	Protected – NFA
Stapelia kwebensis		Succulent herb	Protected – LEMA

Two plant species that are not protected, but were found to be locally rare are:

- *Schoenefeldia transiens* – grass species
- *Sesamothamnus lugardii* – Transvaal sesame-bush

Following the above surveys, Ysterberg Environmental Services conducted an assessment along the three linear activities, i.e. the flood protection berm and river diversions, to identify any rare or protected plant species that need to be conserved. The reports are attached as Appendix 9.

Proposed Activity	Species	Number
River Diversion 1 – Eastern Diversion	*Boscia albitrunca* (Shepherds tree)	7
	Sclerocarya birrea (Marula)	10
	Combretum imberbe (Leadwood)	1
	Adansonia digitata (Baobab)	1 (outside)
River Diversion 2 – Eastern Diversion	*Adansonia digitata* (Baobab)	2
River Diversion 3 – Western Diversion	*Boscia albitrunca* (Shepherds tree)	2
Flood Protection Berm	*Boscia albitrunca* (Shepherds tree)	Outside
	Combretum imberbe (Leadwood)	Outside
	Philenoptera violacea (Apple leaf)	12 (seedlings)

The positions of the protected species in relation to the proposed linear activities are shown in Figure 13.

In addition, sensitive habitats were identified along River Diversions 1 and 3 (Ysterberg, 2014):

- There are a concentration of large *Sclerocarya birrea* trees (12) and one *Combretum imberbe* at the start of River Diversion 1.
- The quartzite kopje at the end of River Diversion 1 can be regarded as sensitive as it provides habitat for rare grass species such as *Schoenefeldia transiensis*.
- River Diversion 3 starts at a calcrete outcrop that should be avoided. Similarly, River Diversion 3 ends within highly erodible soils, which should also be avoided.
- All river crossings are regarded as sensitive and care should be taken to minimise the impacts.

The sensitive habitats associated with River Diversions 1 and 3 are shown in Figure 14 and Figure 15 respectively.

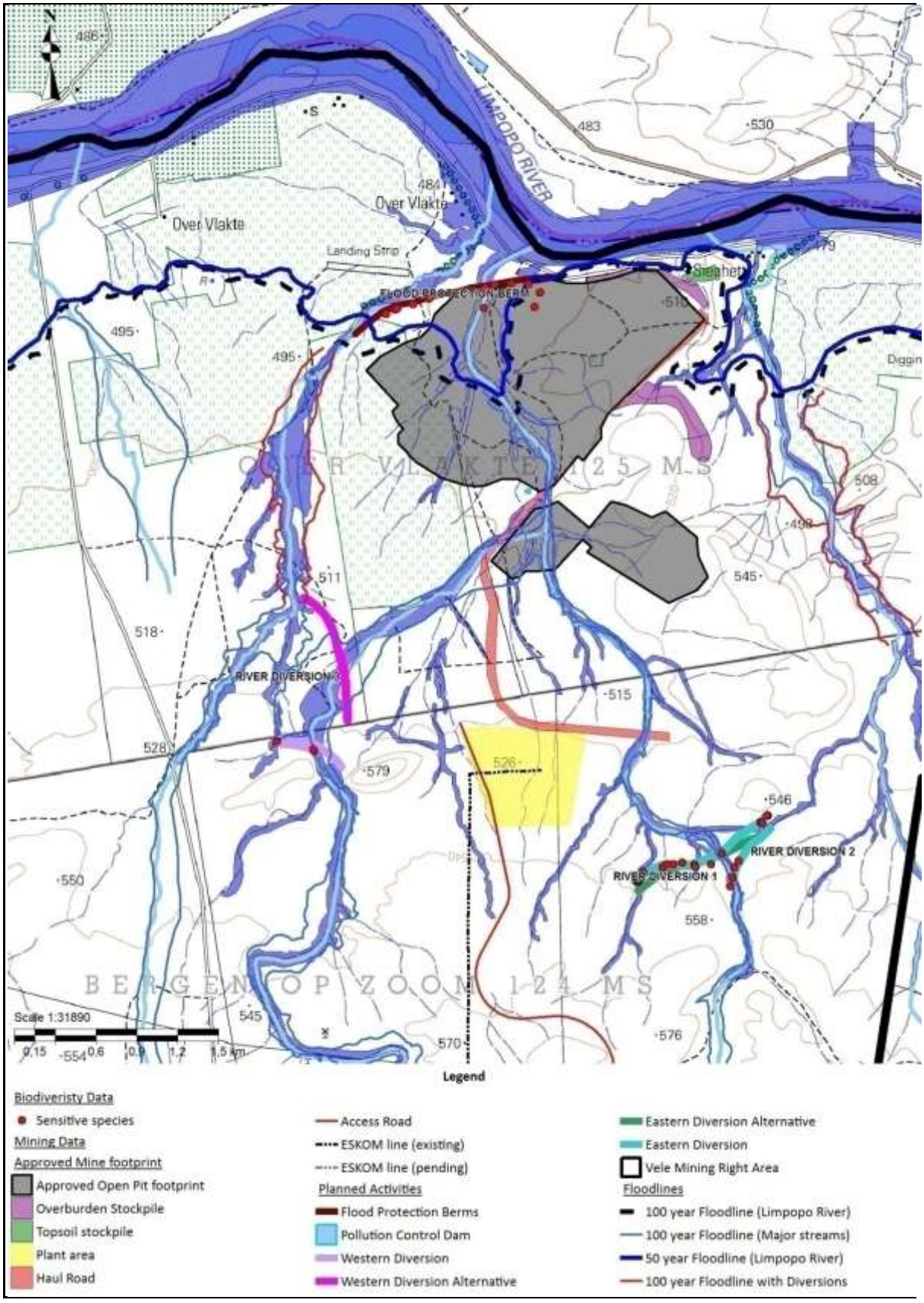

Figure 13: Sensitive species map

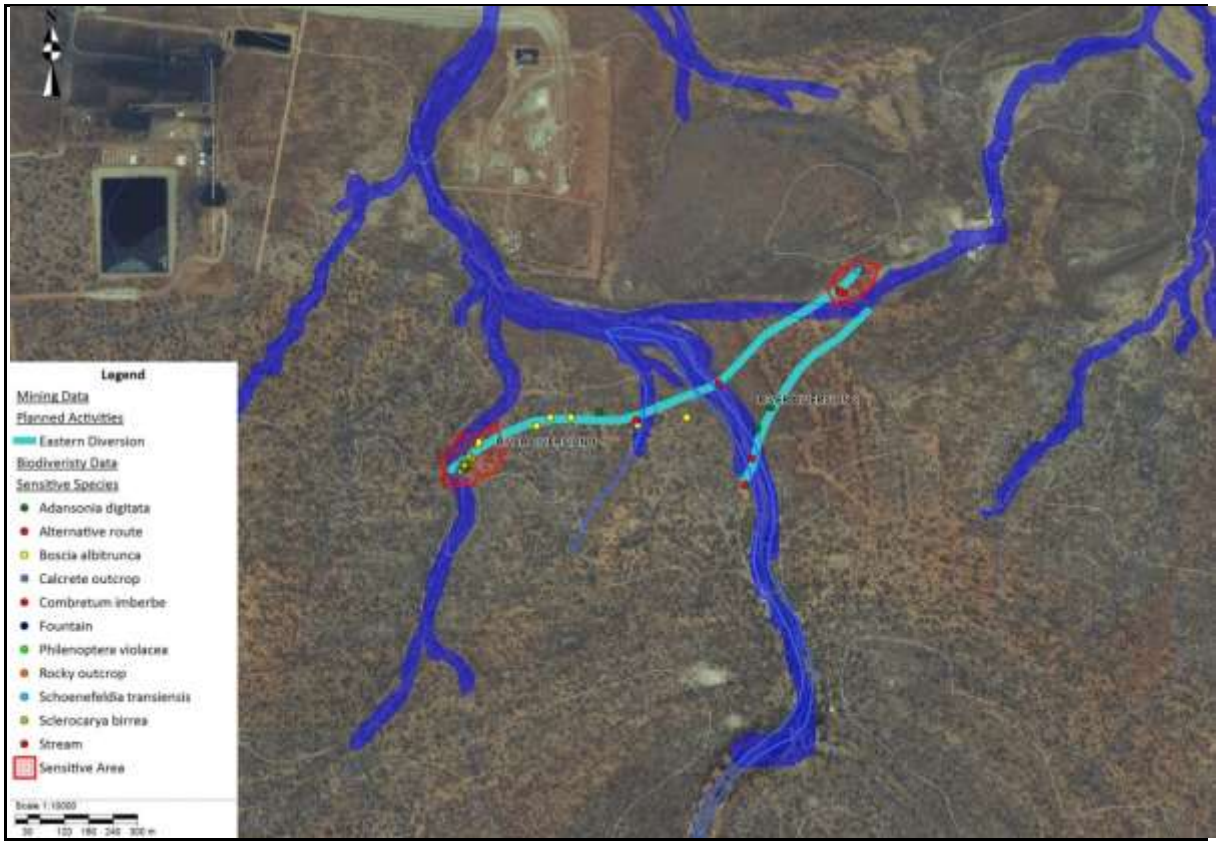

Figure 14: Sensitive habitats along the Eastern Diversion Works

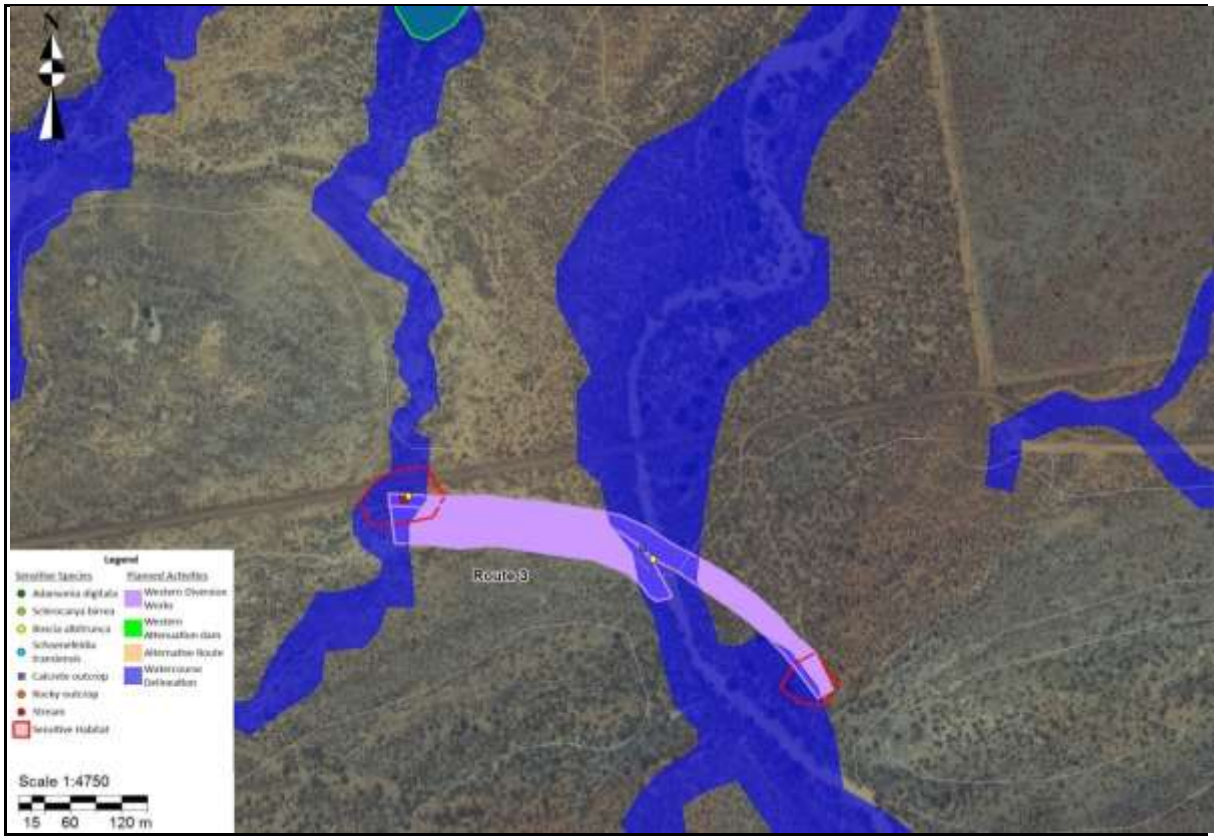

Figure 15: Sensitive habitats along the Western Diversion Works

Similarly, there are sensitive habitats and rare species that occur on the flood protection berm route, including the drainage lines, possible fountains/wetlands and some rocky outcrops that provide habitat for rare grass species such as *Schoenefeldia transiensis*.

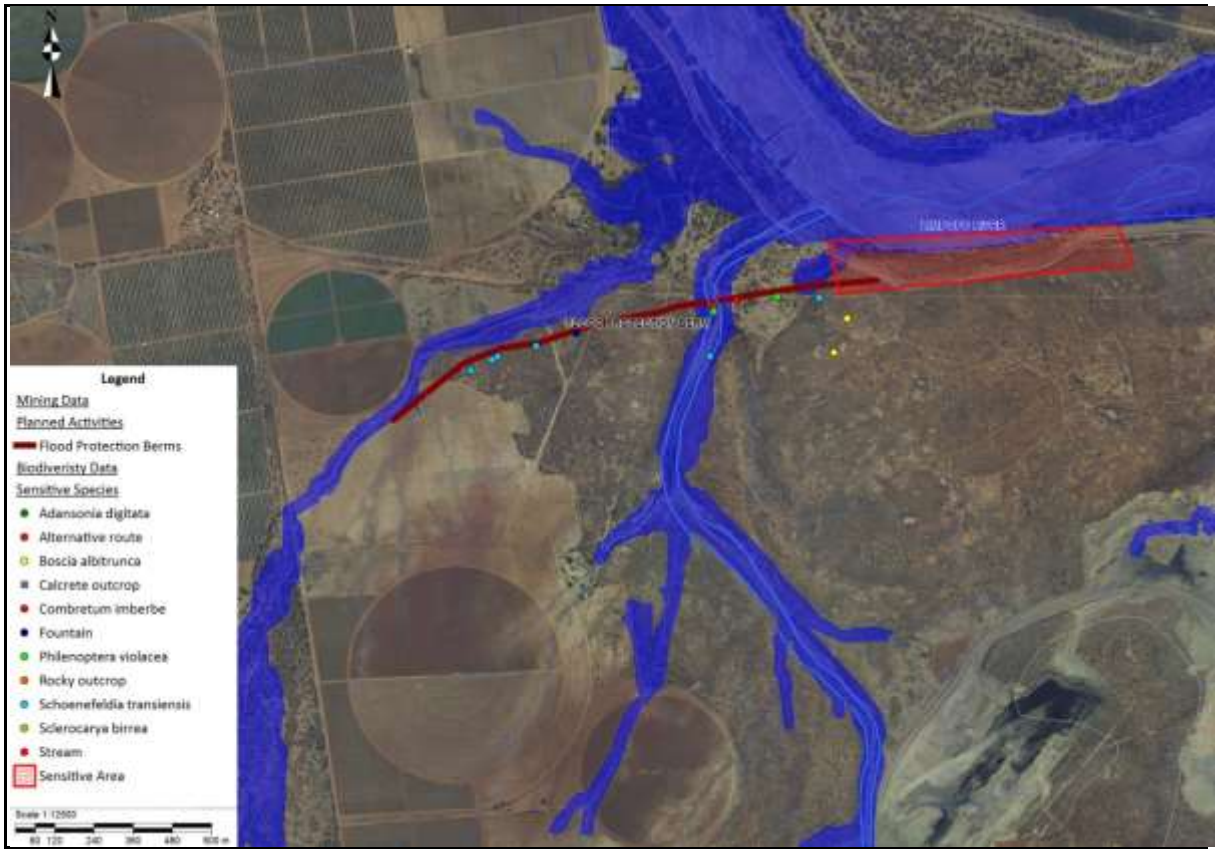

Figure 16: Sensitive habitats along the Flood Protection Berm

9.4.1.2.2 Surface Water

The Vele Colliery Project Area falls within the Limpopo Plain Aquatic Ecoregion and is located within the A71L quaternary catchment. According to the ecological importance classification for the quaternary catchment, the system in the vicinity of Vele Colliery can be classified as a resilient system with low to marginal aquatic ecological importance which, in its present state, can be considered to be a Class A (natural) stream (Class B largely natural based on desktop certainty) (IWQS, 2000).

The most significant riverine resource within the Vele Colliery Project area within the A71L quaternary catchment is the Limpopo River. The RSA Wetland Types (2010) and National Freshwater Ecosystem Priority Areas (NFEPA, 2011) databases were consulted to define the ecology of the wetland or river systems within the Vele Colliery project area that may be of ecological importance.

The Vele Colliery project area falls within the Limpopo Water Management Area (WMA). Each Water Management Area is divided into several sub-Water Management Areas (subWMA), where catchment or watershed is defined as a topographically defined area that is drained by a stream or

river network. The subWMA indicated for the Vele Colliery Project Area is the Lephalala subWMA. Aspects applicable to the Vele Colliery project area and surroundings are discussed below:

- The subWMA is regarded important in terms of fish sanctuaries, rehabilitation or corridors.
- The subWMA is considered important in terms of translocation and relocation zones for fish.
- The subWMA is listed as a fish Freshwater Ecosystem Priority Area (NFEPA rank 3).
- The Limpopo River and some of its tributaries extend through the Vele Colliery Project Area.
- The Limpopo River is a perennial system classified as a Class B (largely natural) river and is not indicated as a free flowing or flagship river. However, the Limpopo River is indicated as a NFEPA River. The wetlands of the Limpopo River are identified as NFEPA rank three wetlands (identified by experts at the regional review workshops as containing wetlands of biodiversity importance, but with no other documented reason).
- The unnamed tributary of the Limpopo River, whose tributaries are proposed to be diverted, is an NFEPA river, which is considered to be in a Class B PES (NFEPA, 2011).
- River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species, and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. Although FEPA status applies to the actual river reach within such a sub-quaternary catchment, the shading of the whole sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach.

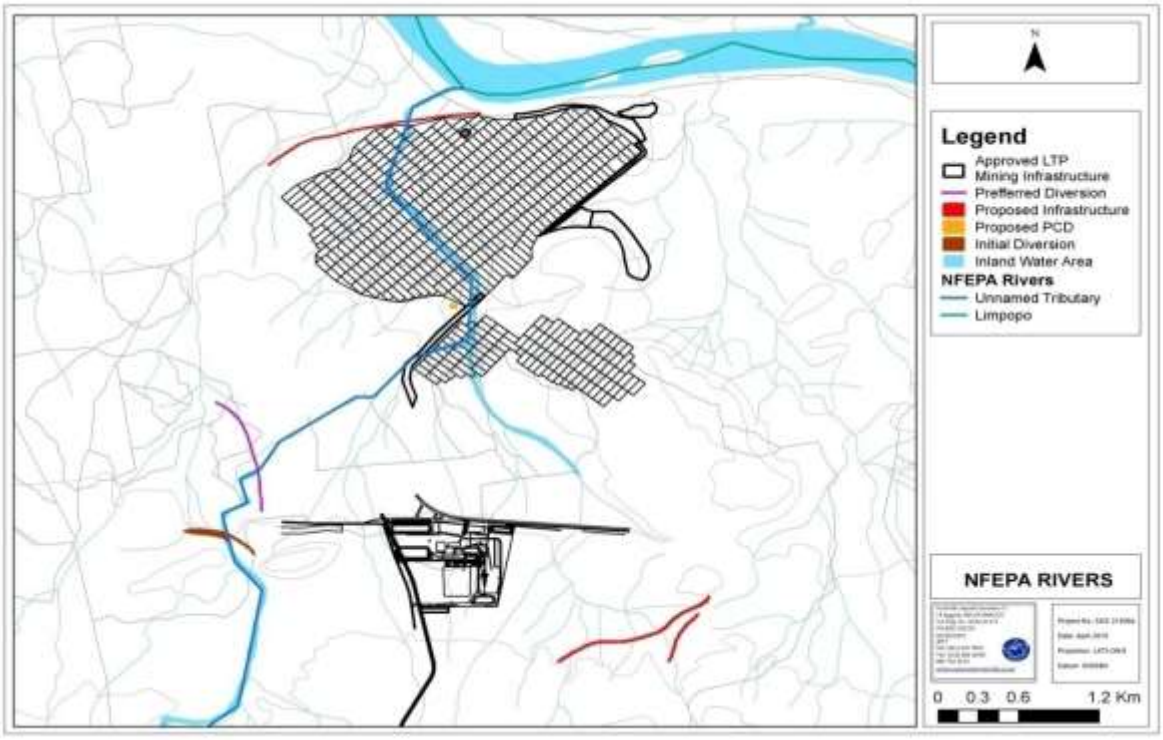

Figure 17: NFEPA rivers in the Vele Colliery project area

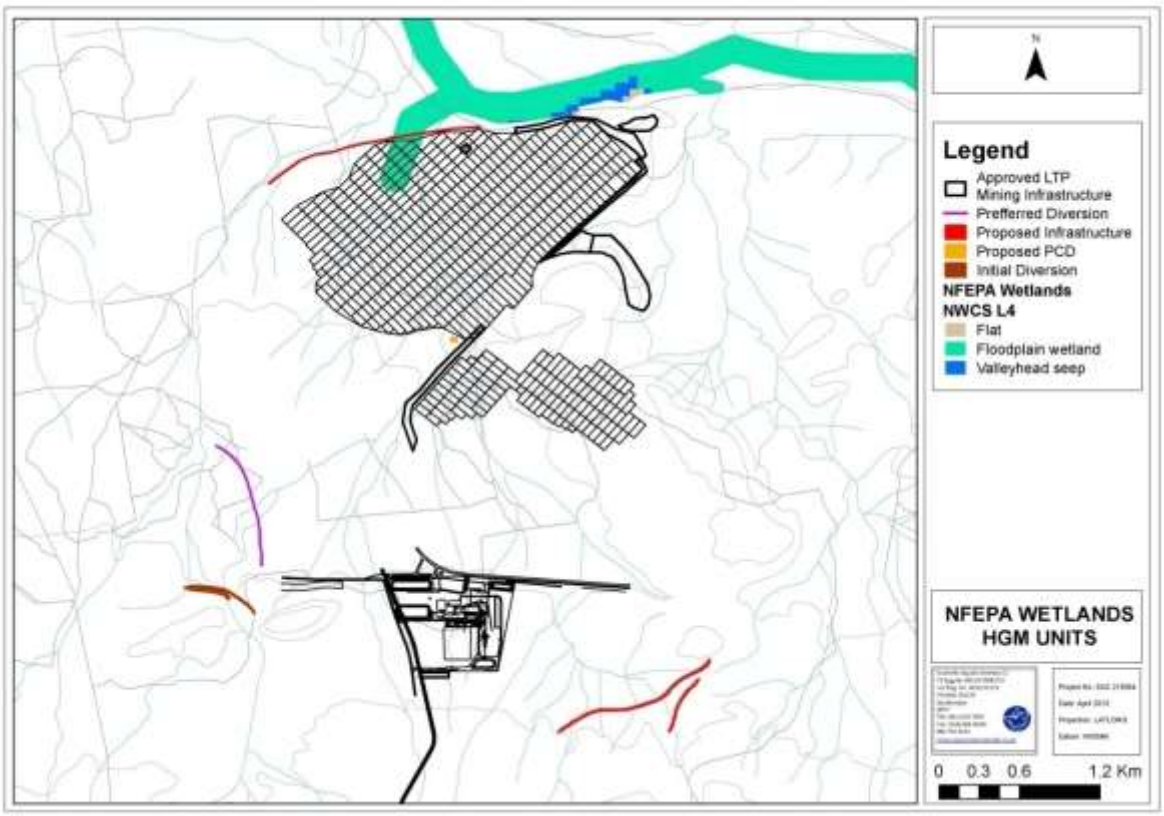

Figure 18: NFEPA wetlands HGM units

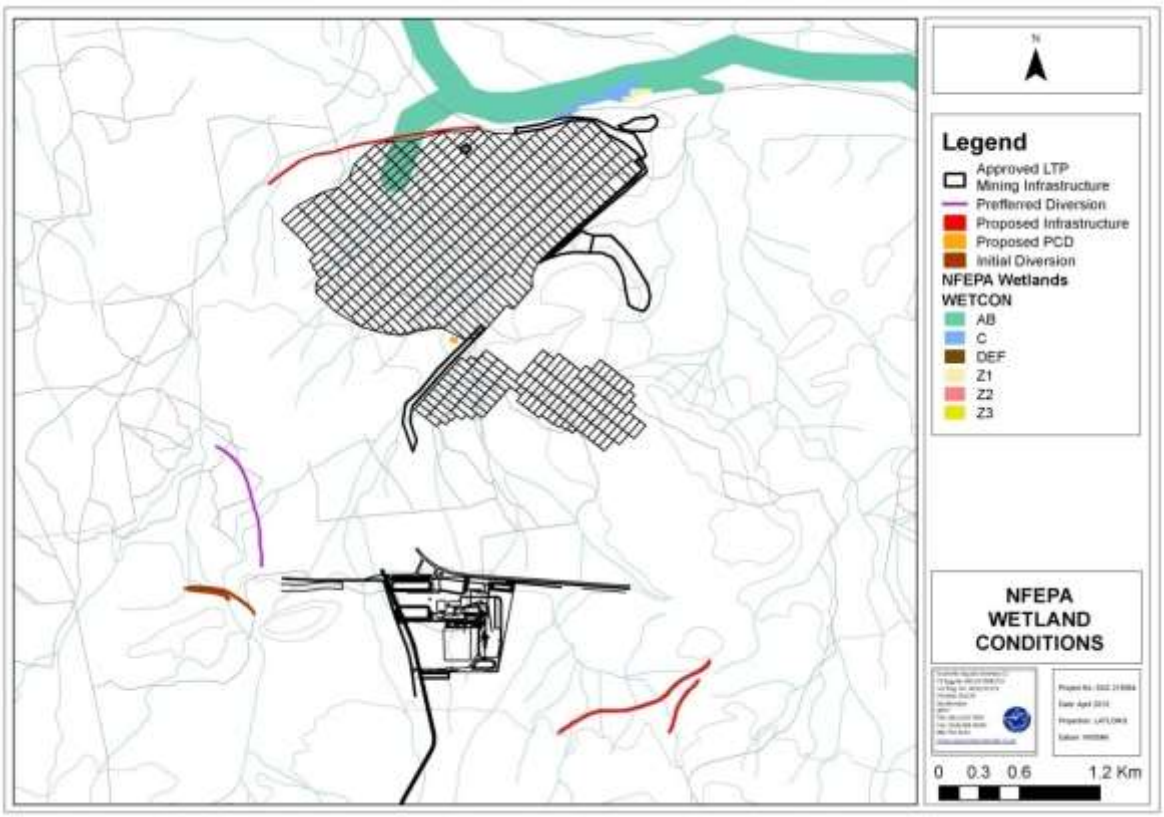

Figure 19: NFEPA (2011) wetland conditions

Scientific Aquatic Services (SAS) was appointed to undertake a Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) analysis and impact assessment of wetland, aquatic and riparian resources as part of the environmental assessment and authorisation process for the proposed Vele River Diversion Project.

Features within the study area were categorised with the use of the *Classification System for Wetlands and other Aquatic Ecosystems in South Africa* (Ollis *et al*, 2013). After the field assessment, it can be concluded that there are two main feature groups present within the study area, namely rivers (the three unnamed tributaries to be diverted) with a flood plain wetland. The flood plain wetland contained two ephemeral drainage lines. These wetland and rivers were then assessed to determine importance in terms of function and service provision (applicable to the wetland only) as well as PES, and EIS of the systems. The bullets below summarise the key findings:

- The diverted and augmented systems were collectively assessed with the IHI, as they were considered identical in condition relative to the reference state. The average score calculated for the unnamed tributaries with the use of the Wetland IHI indicates that the feature can be considered to fall within PES Category A (Unmodified). This is considered representative of a system that has remained largely undisturbed and in which ecosystem function remained largely natural. The geomorphology of the catchment may have been slightly altered due to a small number of dirt roads, and a decrease in vegetation due to mining activities. The average score calculated for the area where the tributaries are proposed to be diverted to, with the use of the Wetland IHI, indicates that the feature can be considered to fall within PES Category A (Unmodified). This is considered representative of a system that has remained largely undisturbed and in which ecosystem function remained largely natural. The geomorphology of the catchment may have been slightly altered due to a small number of dirt roads, and a decrease in vegetation due to mining activities.

- The wetland intersected by the proposed flood protection berm (Structure 3) was also assessed. The average score calculated for the wetland intersected by the proposed berm with the use of the Wetland IHI, indicates that the feature can be considered to fall within PES Category C (moderately modified).

- Because of anthropogenic interference, water within the tributary was channelled and a formal canal was formed. Canalisation upstream of the wetland has likely created permanent seasonally, increased the base flow as well as increased the water retention in the floodplain, thus hydrological impacts were considered most severe as calculated by the IHI. These changes were also evidenced by the high abundance of dead trees visible in the wetland feature. Thus, hydrological impacts were considered most severe as calculated by the IHI. These changes were also evidenced by the high abundance of dead trees visible in the wetland feature that were likely killed by inundation.

- Water quality of the wetland has likely been impaired through increases in salts upstream; this was clearly visible in the non-marginal zone of the wetland and is considered a large modification by the IHI system.

- The results obtained for the function and service provision of the wetland indicated that all of the features directly linked to human ecoservice provision (i.e. cultivated foods) were considered to be of low importance, this was likely primarily due to the isolation necessarily afforded to aquatic resources within an active mine. The importance of the wetland ecosystem functions (i.e. streamflow regulation) were of intermediate to high importance.

As the wetland receives effluent from upstream sources, toxicant removal is of moderately-high to high importance. Due to the dominance of an arid landscape, this permanent wetland is of moderately high importance in terms of biodiversity maintenance.

- VEGRAI was used to assess the response of riparian vegetation to impacts within the streams as well as the wetland. The mean scores calculated for current streams, and the area they are proposed to be diverted into both fall within Class A (unmodified, natural) and mean average scores calculated for the wetland fell within Class D (largely modified). It was evident from the results above that the riparian ecosystems of the unnamed tributaries were unmodified, with negligible change of cover, abundance and species composition when compared to the reference condition in both the marginal as well as non-marginal zones. It is also evident that the vegetation structure of the proposed diversions was natural and unmodified. The vegetation of the wetland has been largely modified due to canalisation increasing discharge and impairment of water quality leading to extensive changes and homogeneity in ecosystem structure and composition.

- The current streams and areas where the streams are proposed to be diverted to, as well as the wetland intersected by the proposed flood protection berm were assessed to determine ecological sensitivity (EIS). It is evident that from a wetland point of view, the EIS of the river systems are largely similar. All systems were determined to have moderate sensitivity and to be of moderate ecological importance (Class C).

- According to the resource directed measures for protection of water resources, a wetland or river may receive the same class for the PES, as the REC, if the habitat is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as to enhance the PES of the feature. The results obtained from the assessments indicate a relatively low level of transformation on all levels of ecology. It is therefore recommended that the three features to be diverted should have an REC of a Class C allocated to them since the downstream area is currently in a Class C state. The features into which the systems will be diverted should retain their Class A status. Should the proposed diversion and mining proceed it may not be possible to retain this REC.

From the results of the aquatic biomonitoring program, it can be concluded that surface water in the drainage features is largely ephemeral under normal circumstances and when flows do occur the water quality is generally impaired with water containing elevated salt concentrations. Due to the lack of flow in the systems, only the most tolerant aquatic macro-invertebrates can sustain populations in the systems and only the fish species *Oreochromis mossambicus,* which can tolerate water with elevated salt content, are likely to occur in areas where surface water persists perennially.

9.4.1.2.3 Wetland Systems

Only one wetland was found and delineated at the proposed development sites for the river diversions and the flood protection berm (SAS, 2016). The flood protection berm intersects this wetland, which is also shown to be a NFEPA wetland feature categorized as of least concern.

The field assessment was undertaken during the early spring; as a result, surface water was present only at the wetland that is fed by a sand channelled tributary of the Limpopo. Water was also present in the Limpopo River and a wetland south of all of the proposed diversions; however, these

features were not in contact with the proposed infrastructure development areas related to the Vele River Diversion Project.

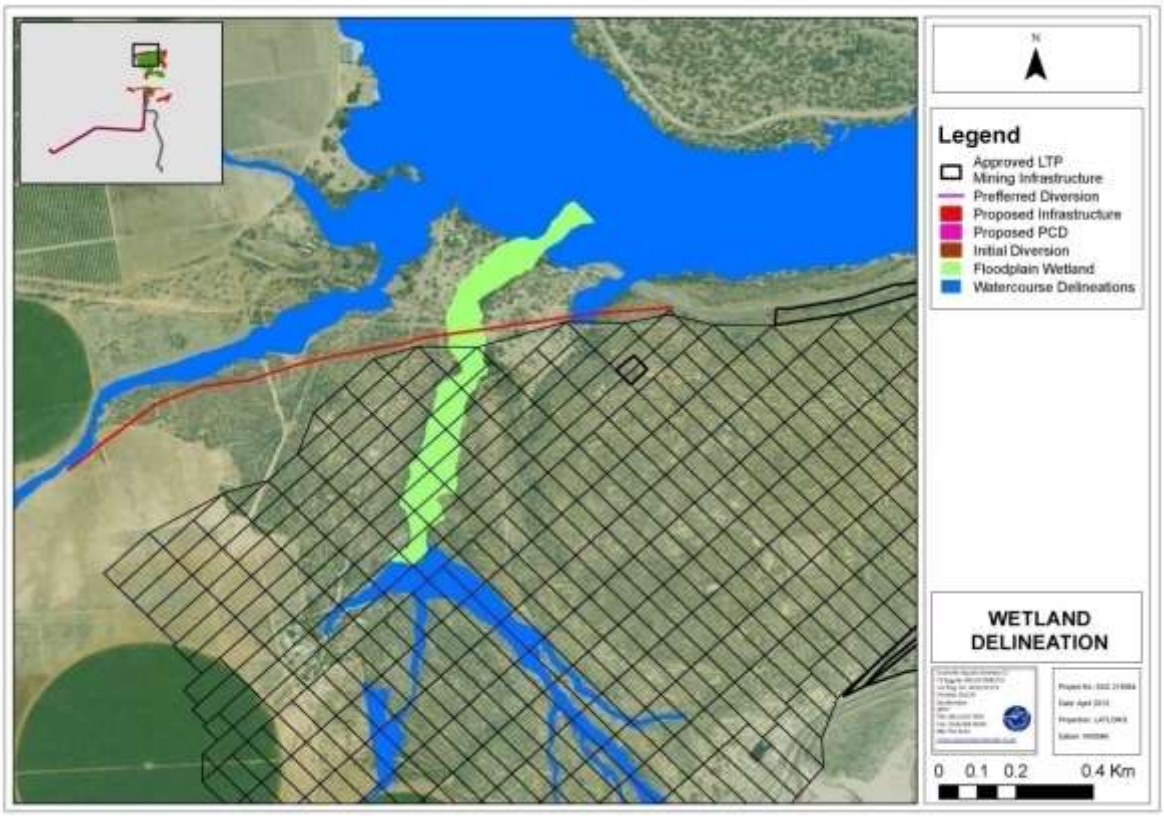

Figure 20: Wetland delineation map

The results obtained from the wetland assessment indicate that the floodplain wetland system is currently in a Class C condition. The diverted and augmented systems are a Class A in its upper reaches, whilst the augmented systems show a Class B in its lower reaches. Refer to Figure 20.

The riparian ecosystems of the diverted systems are unmodified, with negligible change in cover, abundance and species composition when compared to the reference condition in both the marginal as well as non-marginal zones. The vegetation structure of the proposed augmented systems is natural and unmodified.

The vegetation of the floodplain wetland system has however been largely modified, causing extensive changes and homogeneity in ecosystem structure and composition. Previously the wetland was seasonally dependent upon annual flooding of the Limpopo River and discharges from the purportedly highly ephemeral unnamed tributaries. Sand channelling by farmers has created canalisation and modified the wetland to be permanently seasonal, and led to extensive modification of the riparian habitat and increased the extent of the marginal zone. Based on a visual assessment it is also likely that salt loading of the wetland is taking place, altering the water quality.

Based on the above, it is recommended that the wetland and three systems to be diverted should have an REC of a Class C. The features into which the systems will be diverted should retain their Class A status.

Table 10: PES, EIS and REC classes

Structures	VEGRAI Ecostatus	Wetland PES Classes	EIS Class	REC Class
Floodplain wetland	D	C/D	B	C
Diverted systems	A	A	C	C
Augmented systems	A	A	C	A

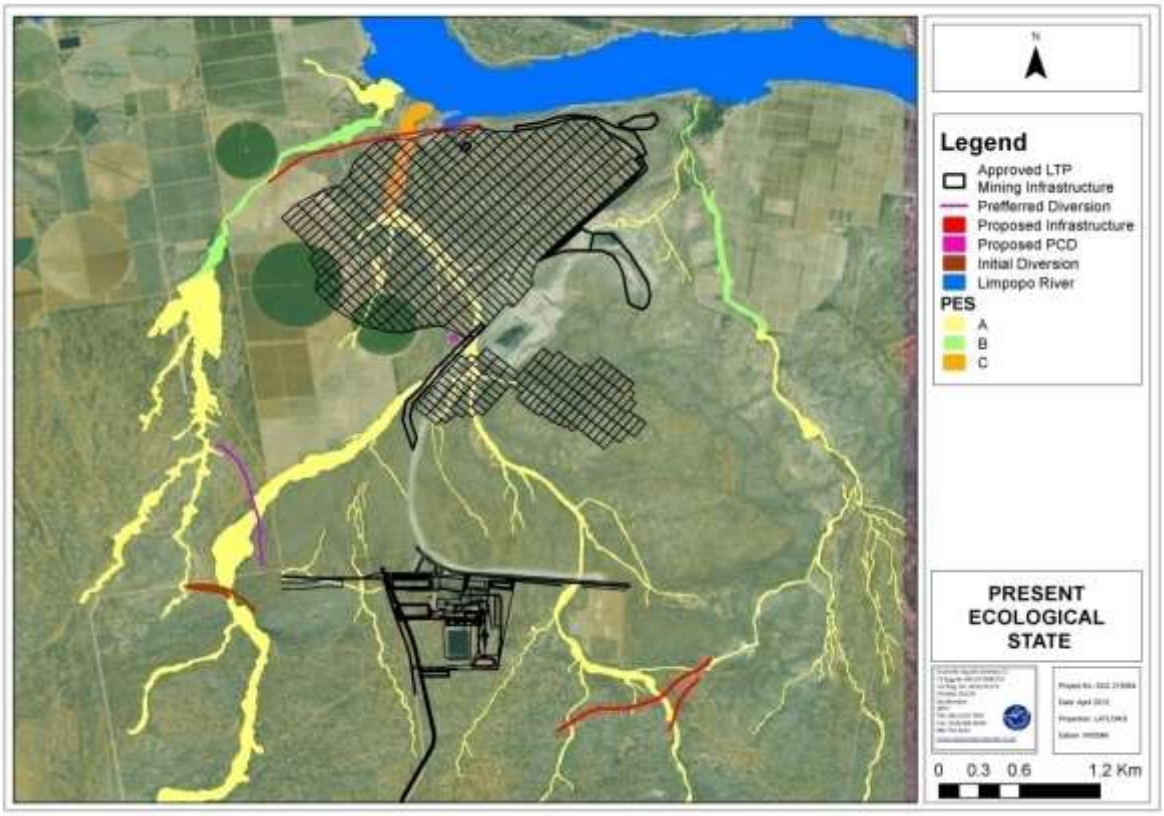

Figure 21: Present Ecological State (PES) of streams and wetlands

After the assessment, it can be concluded that the wetland is important in terms of function and service provision with special mention of biodiversity as well as toxicant removal within a water stressed region. The wetland is an NFEPA wetland and is important in terms of biodiversity and conservation value as it might receive water from the mining area before it discharges into the NFEPA Limpopo River. Furthermore, although the wetland vegetation is considered largely modified, the wetland supports protected species, including a small population of *Combretum imberbe* (Leadwood tree). The proposed activities will have significant impacts upon the wetland. In particular, the wetland will likely become permanently dry. Measures to ensure the ongoing functioning of this wetland in the area is therefore considered of high importance.

From the results of the aquatic biomonitoring program, it can be concluded that surface water in the drainage features is largely ephemeral under normal circumstances and when flows do occur the water quality is generally impaired with water containing elevated salt concentrations. Due to the lack of flow in the systems, only the most tolerant aquatic macro-invertebrates can sustain populations in the systems and only the fish species *Oreochromis mossambicus,* which can tolerate water with elevated salt content, are likely to occur in areas where surface water persists perennially.

9.4.1.2.4 Groundwater

The drainage systems in question are all ephemeral and are not connected to the groundwater. The streams are separated from the shallow aquifer by at least 10 metres of calcrete, fine alluvium and mudstone. In addition, they flow only during large storm events for a short duration.

Consequently, flow in the channels has no or a very insignificant impact on the groundwater.

9.4.1.3 Socio-Economic Baseline Environment

The socio-economic baseline information was updated in light of more recent data, and is attached as Appendix 13.

9.4.1.4 Cultural and Heritage Resources

Since 2008, a number of heritage impact assessments have been performed in the Vele Colliery project area. Table 11 provides a list of the most recent cultural and heritage resources identified in the area (R&R Cultural Resources, 2015); the sites are shown in Figure 22.

Table 11: List of cultural and heritage resources in the Vele Colliery area

No	Latitude	Longitude	Description
1	-22.14322	29.67917	Early Iron Age
2	-22.14661	29.68147	Fountain with cultural significance
3	-22.16092	29.61722	Graves
4	-22.16269	29.62422	Middle Iron Age / K2
5	-22.17656	29.67475	Middle Iron Age / Mapungubwe
6	-22.18739	29.68653	Possible Grave
7	-22.20119	29.67428	Old mine shaft
8	-22.20544	29.66706	Old farmhouse
9	-22.15536	29.59314	Iron Age - pottery scattering on floodplain - obliterated during last flood 2012
10	-22.14986	29.58717	Iron Age / K2
11	-22.14089	29.6485	Iron Age / K2
12	-22.19022	29.64964	Iron Age / K2
13	-22.18611	29.65011	Iron Age / K2
14	-22.17894	29.65511	Iron Age - Probably Khami
15	-22.18139	29.65561	Iron Age - Probably Khami
16	-22.18031	29.66422	Iron Age / K2
17	-22.18108	29.66331	Iron Age / K2
18	-22.17383	29.67206	Delisted as a heritage site
19	-22.17372	29.67461	Iron Age / K2 - overflow of activities from site 5
20	-22.2065	29.58011	Late Stone Age
21	-22.19222	29.60306	Early Stone Age
22	-22.20778	29.5125	Early Stone Age / Iron Age
23	-22.14231	29.68222	Iron Age - Not positively identified
24	-22.151	29.68589	Iron Age / K2
25	-22.14889	29.68733	Iron Age / K2
26	-22.14808	29.65622	Iron Age - Not positively identified

No	Latitude	Longitude	Description
27	-22.191056	29.657694	Iron Age / K2
28	-22.18425	29.649833	Iron Age / Probably Khami
29	-22.183583	29.684056	Iron Age - Ritual site
30	-22.150889	29.674	Gravesite
31	-22.147972	29.669861	Gravesite
32	-22.206056	29.663694	Gravesite
33	-22.140528	29.668111	Gravesite
34	-22.201665	29.652221	Iron Age / possibly Khami
35	-22.146	29.672861	Unidentified - possibly Iron Age, but probably historic farmworkers
36	-22.166944	29.670833	Identified in the Siyathembaba report as Stone Age - could not be located
37	-22.158667	29.673556	Unidentified
38	-22.185417	29.684417	Iron Age / K2
39	-22.186389	29.685	Iron Age / probably K2
40	-22.198639	29.653639	Iron Age / K2
41	-22.201389	29.66075	Iron Age / K2
42	-22.199583	29.653528	Iron Age / K2
43	-22.194861	29.655472	Unidentified - probably historic
44	-22.182881	29.687346	Iron Age / K2

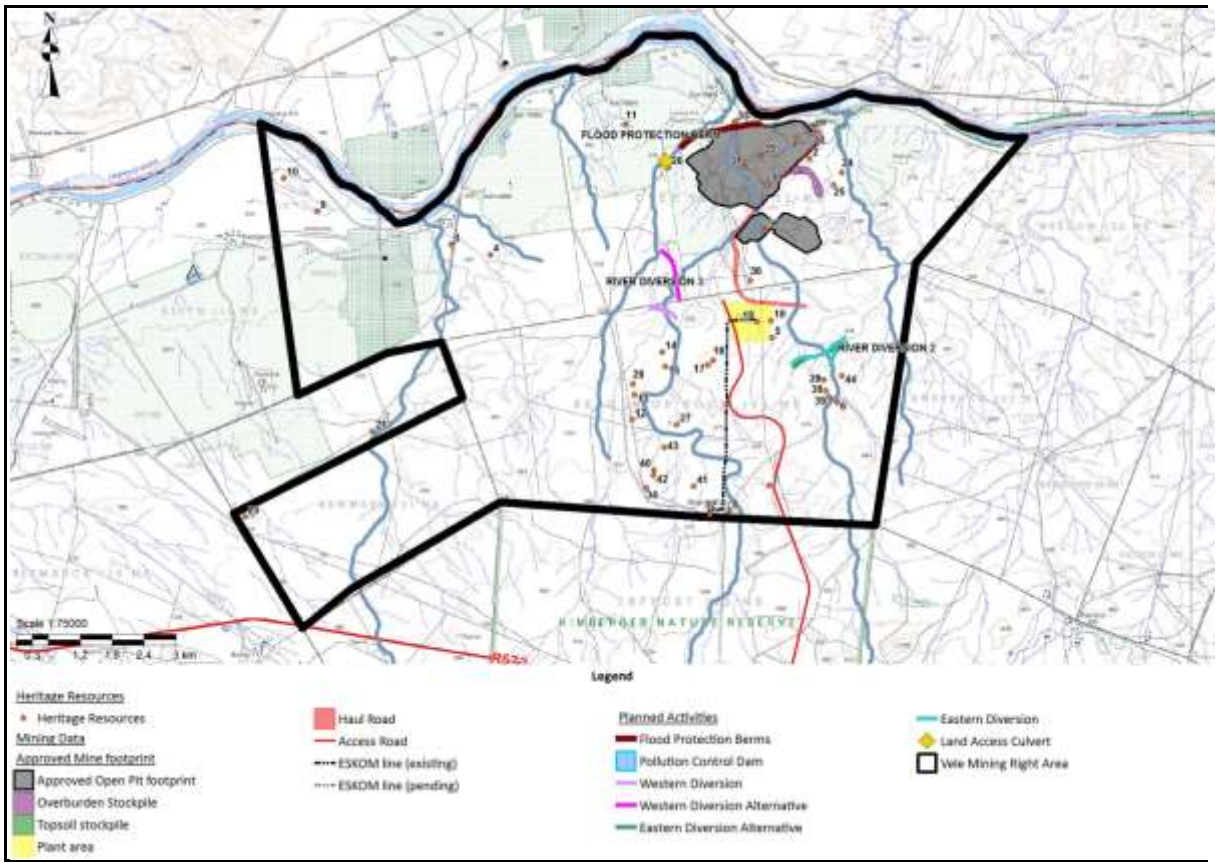

Figure 22: Cultural and heritage resources

9.4.2 Description of Current Land Use

The land coverage at Vele Colliery is primarily natural, with some cultivation. Intensive irrigated agricultural activities are focused along the Limpopo River and intersect with approximately half of the proposed flood protection berm, along the western extent.

The majority of the intensive agricultural area is utilised for predominantly citrus and vegetable production, with fields of tomatoes and red peppers observed on site. The mine owns the majority of the land that the proposed developments encompass. The three stream diversions are not in close proximity (within 5km) to any agricultural activity. River Diversion 2 is located within 2 km of the present mining plant; however, the stream will be diverted further away from the plant if the proposed development occurs. The south-eastern edge of the flood protection berm occurs adjacent to the proposed new mining activity and is designed to protect the environmental integrity of the area and economic assets of the mine from a 1:200 year flood (Element Consulting Engineers, 2014).

The stakeholders raised the potential of downstream flooding as a concern – refer to Section 9.5.1.4.

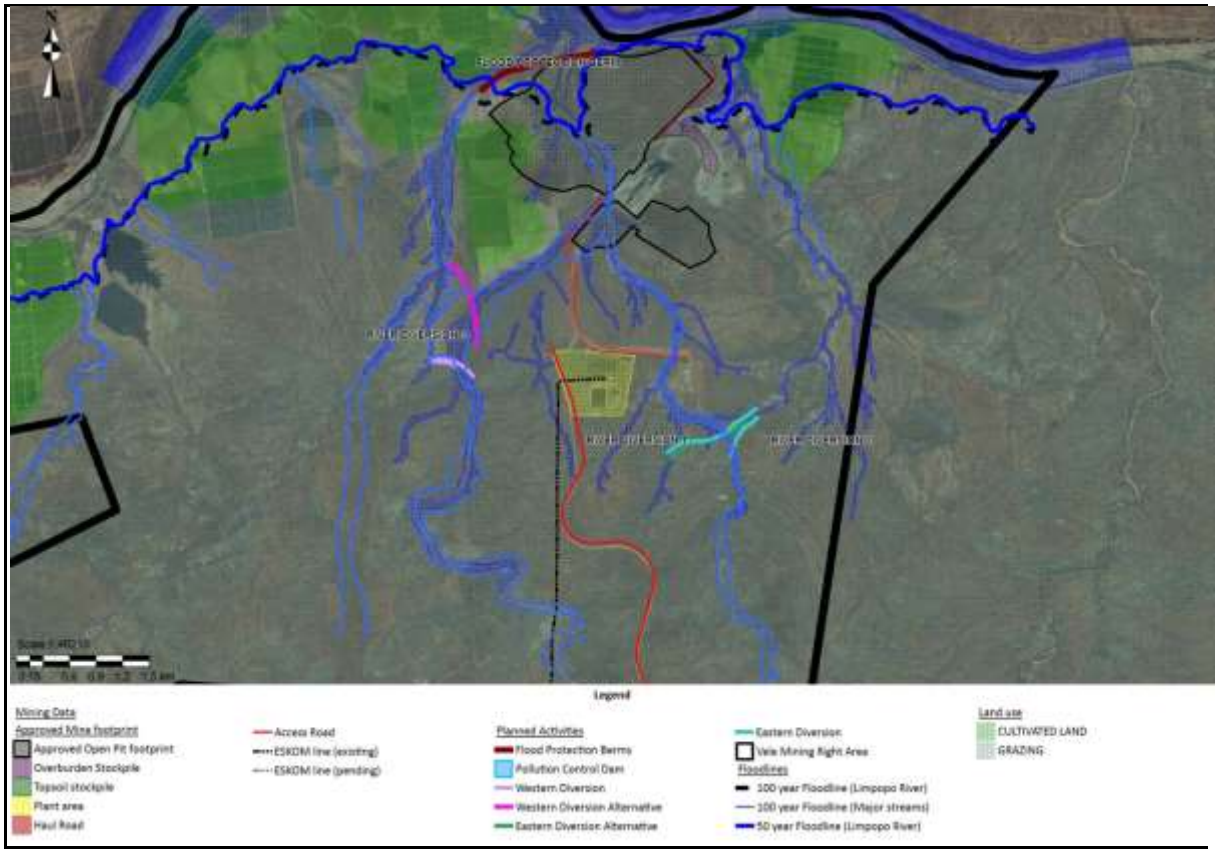

Figure 23: Existing land use

9.4.3 Specific Enviromental Features and Infrastructure

Available information, ortho-photos and satellite imagery was utilised to identify sensitive receptors. The following sensitive receptors have been identified in the Vele Colliery Project area:

- Residential areas (houses, lodges, hunting facilities);
- Agricultural infrastructure;
- Mining Activities: Existing infrastructure;
- Cultural and heritage resources;
- Surface water resources;
- Protected species; and
- Conservation areas.

9.4.4 Environmental and Current Land Use Map

Refer to Figure 24 and Figure 25 for the sensitive receptor and current land use maps, respectively excluding and including cultural and heritage resources. All the relevant alternative options investigated are included on these plans, as well as the pre- and post-diversion 1:100 year flood-lines.

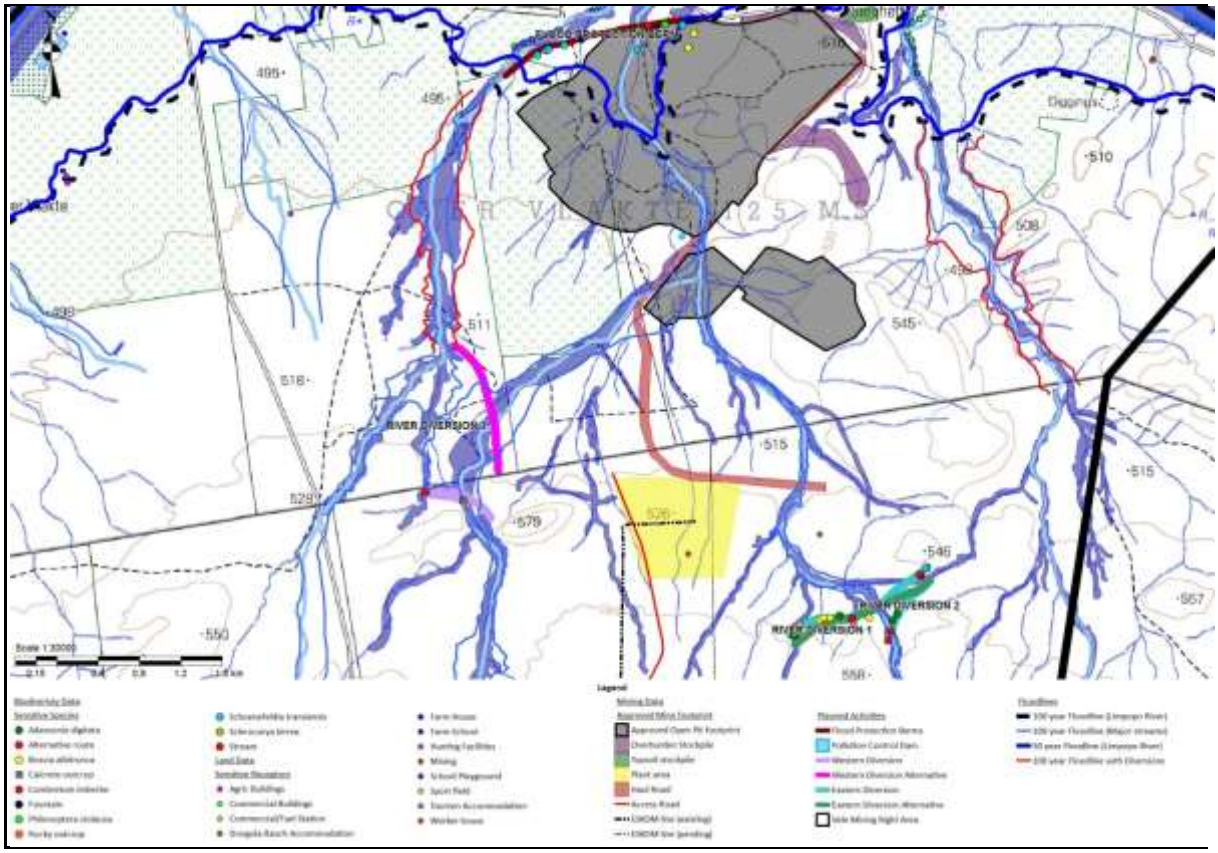

Figure 24: Sensitive receptor and land use map (excluding cultural & heritage resources)

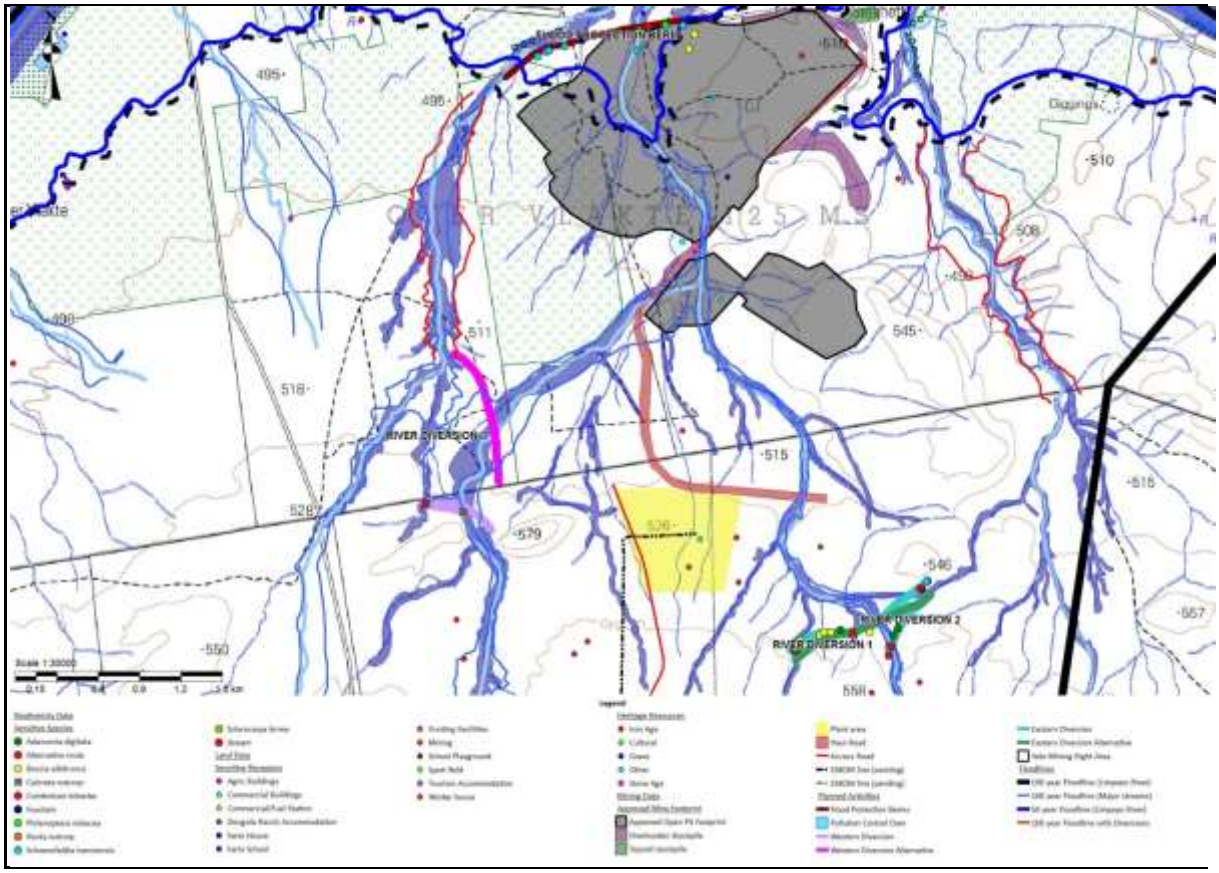

Figure 25: Sensitive receptor and land use map (including cultural & heritage resources)

9.5 Impacts and Risks Identified

9.5.1 Biophysical Environment

9.5.1.1 Soils, Land Use and Land Capability

9.5.1.1.1 Soils

Most of the soils, especially on River Diversion 3 and at the end of River Diversions 1 & 2, are highly erodible. This will need additional measures to mitigate this area concerning erosion.

9.5.1.2 Biodiversity – Flora

The following potential impacts related to the Vele River Diversion Project were identified (ERC, 2014):

- Existing habitats for plant as well as animal life (including red data, TOPS and other protected and rare species) will be destroyed while new transformed habitats with very different characteristics will be create / caused, therefore the biodiversity of the directly affected areas will change dramatically with the potential of changing the natural environment directly adjacent to it.

- Fragmentation, disruption or destruction of natural habitats has taken place and will take place with each new development at the mine. This may negatively affect the flow of ecosystem services (seed dispersal, pollination, exchanging of genes from one area to the next, etc.) in and through these habitats. The disruption of ecosystem services will have a negative effect on the local and possibly regional vegetation and especially on isolated fragments.

- With any new development at the mine or the expansion of an existing development, natural vegetation will probably have to be destroyed or at the very least disturbed. This has the potential of causing the loss of habitat for red data, TOPS or other protected or rare plant species.

- The newly discovered population (at the time of reporting, only the second known location in southern Africa) of the rare grass species *Schoenefeldia transiens* is under serious threat of destruction due to its direct proximity to the end-point of the Eastern River Diversion. Any expansions of the current mining footprint in the direction of this population will be devastating for the local, and possibly also the regional occurrence of this species.

- During the construction phase, natural vegetation may be disturbed, destroyed or polluted by construction teams or other mineworkers (human interference) and/or heavy construction and/or earth moving machinery.

- Poor water runoff control at any type of mining development may cause the siltation of lower lying plant communities as well as the loss of topsoil through erosion.

- Unnecessary or injudicious clearing of natural vegetation will leave large patches of bare soil that will be vulnerable and different forms of erosion (sheet, rill and gully) that will have a negative effect on plant establishment or natural rehabilitation.

- Disturbance of the soil in general will create conditions favourable for the establishment of exotic weeds and invader plant species as well as other common weeds. This will lead to an increased responsibility to the management of the mine to control these species.

- Natural flow of water in dry streambeds may be obstructed because of the river diversions, which may negatively affect the natural integrity of the generally sensitive riparian habitat found in these areas.

- Poor water runoff control may also lead to the pollution and siltation of the streambed downstream, which once again may adversely affect this habitat.

9.5.1.3 Biodiversity – Fauna

Zoological Consulting Services (ZCS) was contracted by Dr Gerhard de Beer of Ysterberg Environmental to conduct a follow up specialist assessment of fauna occurring at and adjacent to current and proposed developments of Vele Colliery with special reference to Threatened or Protected Species (TOPS).

ZCS concluded that the overall construction and operational activities would irreversibly change the habitat structure of the Vele Colliery project site. Even with mitigation measures and rehabilitation, the habitat structure is likely to be different as the areas will be altered to hard surfaces and the fauna assemblages will therefore be changed as the use of the area for fauna species will change.

These changes to the site or surrounding area will likely impact negatively on the fauna of the area due to habitat fragmentation, less space and more people present within the area and other associated aspects. This will lead to a decrease in species number and/or suppression of the faunal species concerned as well as a reduction in migration routes for faunal species.

In general, the rivers form corridors of faunal movement. The reduction of such corridors will be restrictive especially to smaller animals that cannot deal with an increase of distance and/or terrain.

With the preferred alignment of the Western Diversion Works, very little (if any) medium to large faunal species will be affected as the area to the east of the diversion is agricultural lands, and so it's unlikely that there is any historic faunal migration/movement happening between the area to the west of the proposed diversion and the agricultural areas. Small mammals may be affected, but as to the extent, that will be unknown and would require further studies, looking at past faunal presence and movement before and after the diversion takes place.

The diversion however may actually result in an increase in useable faunal habitat, as the floral habitat would increase because of the increased water input into the secondary (augmented) systems. Effectively there may possibly be an initial impact of some faunal species, however the area is probably underutilised as it is due to the proximity to the current farming areas. Further, the main "boundary" effect that will be experienced with the diversion will be that of seasonal water flow. Provided the sides of the diversion are not too high or steep, they should not hinder the movement of faunal species in the dry season to such an extent that the diversion will completely cut off faunal movement (*pers comm*. Chris Hooton, SAS, 2016).

9.5.1.4 Surface Water – Hydrology

WSM Leshika Consulting (Pty) Ltd was appointed to update the 1:100 year flood-lines for pre- and post-diversion scenarios.

The flood-lines of the unnamed tributaries have been re-modelled and updated with the post diversion flood peaks provided by Element Consulting.

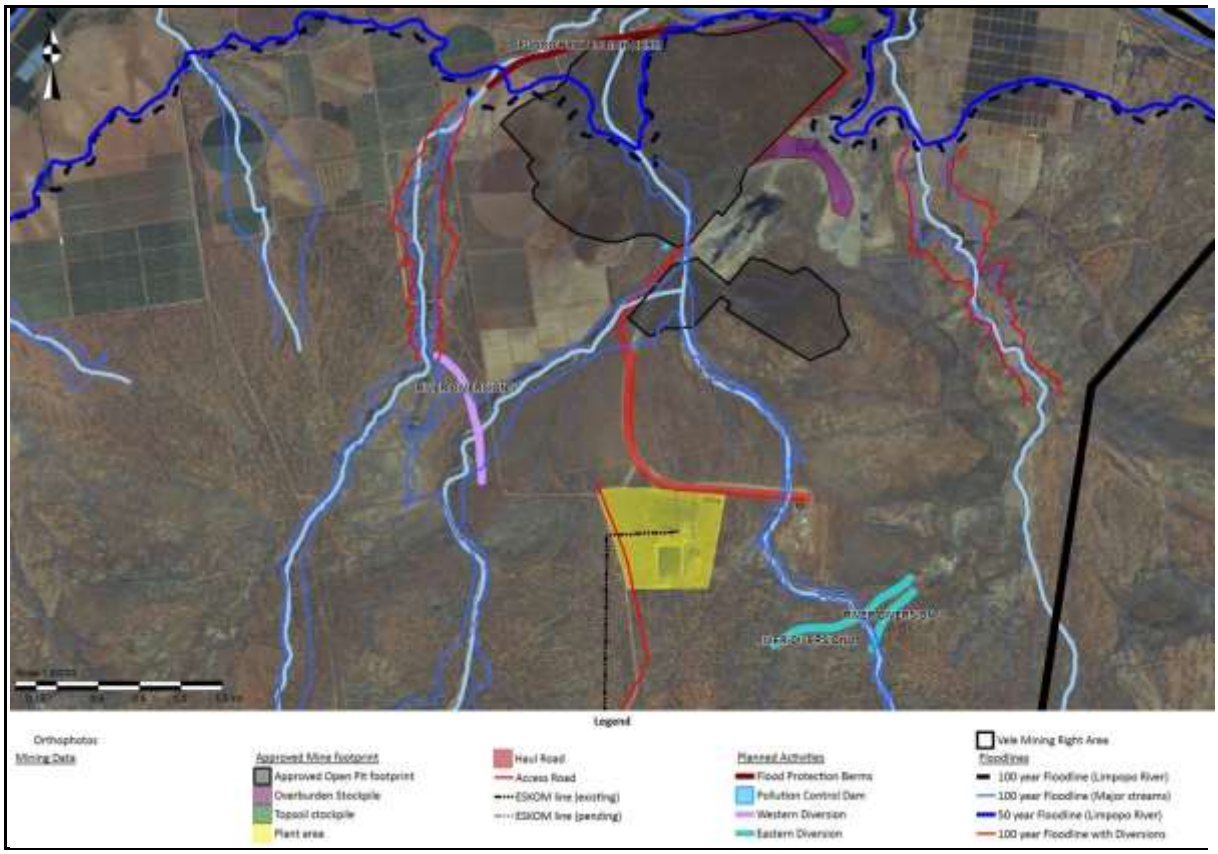

Figure 26: 1:100 year flood-lines pre- and post-construction of the river diversions

There is a distinct possibility of flooding of the downstream irrigation fields, especially because of the Eastern Diversion Works. Further, concern was raised by the farmers to the west of the opencast pit regarding the possible flooding of the access road to their pivots.

This would be monitored once the diversion works are in place, and in the event that flooding do take place the necessary infrastructure will be developed in conjunction with the farmers. Possible mitigation measures include:

- The construction of a Land Access Culvert (included in this application) to prevent flooding of the access road on the west.
- The construction of attenuation dams downstream of the diversion works to prevent downstream flooding of the irrigated fields (not included in this application).

Following the design review, WSM Leshika concluded that although the flood peak run-off has increased, the velocity would be well controlled by the proposed structures and will not necessarily

increase erosion potential downstream. This will need to be monitored and the necessary mitigation measures implemented in the event that increased erosion is detected. WSM Leshika did however recommend that the gabion silt traps be cleaned of silt on a regular basis, especially after the wet season.

9.5.1.5 Surface Water – Aquatic Ecosystems and Wetlands

The aquatic assessment by SAS (20150) details impacts on the physical structure and function of each system, which informed the assessment of the ecological impacts on each system. These include the following:

- Changes to in-stream flow;
- Changes to water quality;
- Changes in sedimentation and erosion;
- The loss of wetland, aquatic and riparian habitat;
- The loss of aquatic biodiversity and sensitive taxa; and
- Changes to wetland ecological and socio-cultural service provision.

As part of the assessment, the key drivers of water in the landscape were assessed including hydrogeological considerations, geohydrological drivers and hydropedological considerations. Specific attention was also given to geomorphological processes of the systems to be affected. In addition, specific attention was paid to habitat for aquatic, riparian and wetland biota and the riparian vegetation and aquatic faunal assemblages with specific mention of aquatic macro-invertebrates and fish.

9.5.1.5.1 Changes to in-stream flow, sedimentation, erosion as well as impacts on wetland and riparian habitat, biodiversity and sensitive taxa

Riverine systems and particularly ephemeral riverine systems or river systems that have very low flows as part of their annual hydrological cycles are particularly susceptible to changes in habitat condition. The proposed stream diversions and flood protection berm have significant potential to lead to aquatic habitat loss and/or alteration of the aquatic and riparian resources on the study area.

The main land use constitutes game farming and to a lesser extent crop cultivation and mining at the current time. As a result, overall landscape and vegetation transformation near watercourses and depressions are considered low. Consequently, all features presently provide niche habitat for wetland and aquatic faunal and floral species within a water stressed region.

Species such as *Combretum imberbe* (Leadwood), *Adansonia digitata* (baobab tree), *Boscia albitrunca* (Sheppard's tree) and *Sclerocarya birrea* (Marula) (protected in accordance to the National Forests Act (Act No 84 of 1998 as amended September 2008) were present in the riparian zone of the current streams and wetland as well as the area the streams will be diverted to. In particular, the population of *Combretum imberbe* (Leadwood) occurred in the southern side of the proposed flood protection berm.

Loss or impact on wetland and riparian habitat would result in loss of niche habitat for various faunal and floral species within a water stressed region. Due to the sandy nature of the soil, it is deemed likely that it would be difficult to rehabilitate wetland and riparian habitat to resemble these unique habitat units presently within the study area.

9.5.1.5.1.1 Impact on diverted systems

- If the current ephemeral streams are diverted then the riverbeds will have reduced recharge from surface runoff and compaction of the interflow zone under the berm may lead to a loss of interflow recharge. With the impact on these hydrological drivers, the systems downstream of the diversion are likely to become moisture stressed. Terrestrial vegetation encroachment and a change in species structure may occur with the loss of some important species such as Co*mbretum imberbe*.

- If terrestrial encroachment occurs less infiltration into the ground will occur (approximately 0-20%), resulting in more surface runoff following storms.

- Due to a lack of flow in the systems, the geomorphological functioning of the system and the sediment balance is likely to change. This could lead to increased sediment deposition in the systems or a lack of sediment removal or the diverted systems and could lead to a loss of sediment input that could then lead to erosion in the system. It is uncertain which of these processes will occur.

- Changes in the sediment balance may affect the geomorphological processes in the system for a long period of time, which in turn could affect the ephemeral riverbeds, and the stability of the banks of the systems.

- The diverted systems downstream of the proposed diversion will potentially have decreased nutrient deposition over time and thus the water quality of any runoff will contain fewer nutrients than previously and the soil is likely to become nutrient poor over time. This decrease in available nutrients will likely lead to a loss of individuals and consequently a decrease in biodiversity of the system.

- The systems to be diverted are highly ephemeral, only purportedly flowing for 2-4 hours for 2-3 days a year (*pers comm*. J. Sparrow, CoAL). However, considering the limited groundwater recharge and potential impacts on interflow, the weakly developed riparian zones of these systems will still likely be affected by a decreasing the water availability for an extended duration (more than 5 years).

- The aquatic habitat of these systems will be permanently lost for the duration of the proposed development. However, the berm will be positioned in such a manner as to reduce the extent of riparian areas, which are in good condition by placing the berm closer to the areas of active cultivation adjacent to the watercourse. Furthermore the loss of tree specimens (with protected species prioritised) in as much as is practically possible. This consideration will reduce the impact the proposed activities pose towards the biodiversity of the ecosystems.

- No discharge or refuge pools for aquatic biota were observed at the time of sampling in any of the streams that will be diverted, only dry sandy alluvial riverbeds with weakly developed riparian zones.

9.5.1.5.1.2 Impact on augmented systems

- The diverted streams will alter the in-stream flow when confluencing with downstream systems, which may lead to some community structure changes, most notably the riparian zone.

- Development of the project area will change the surface coverage of the streams from sandy alluvial soils to vegetated soils. These new surface types will allow considerably less infiltration into the ground (typically 0-20%) as compared to the previous natural surface (typically 60-70%), resulting in more surface runoff following storms and consequently higher peak flow rates.

- The volume of water within the systems receiving the water would increase due to a newly increased catchment area, which would alter flow volumes and flood peaks. This is particularly pertinent since the relatively small systems would now receive greater runoff from the larger area, which in turn will affect the hydrological, geomorphological, and water quality drivers in the system as well as the sediment balance in the system.

- In the natural state of the project site, vegetation cover causes friction to rainfall runoff, that reduces flow velocities and consequently shear forces between the water and the ground surface, resulting in the ground surface remaining intact and not being eroded away. If for any reason flow velocities are increased, there is potential for increased erosion and incision to occur which will affect the bed and banks of the river and affect the geomorphological balance of the system.

- Increased erosion of disturbed surfaces means that the runoff contains a higher silt or sediment load, which is discharged to the surrounding river systems. A component of this sediment load is particles fine enough to remain in suspension, 'clouding' or 'muddying' the water. This is likely to occur in the short term when the augmented system first receives water from the diverted system. However, the impact is likely to be limited in duration, and not unduly affect the system, as the velocity of the water at the current time already exceeded the velocity at which scouring is expected to occur (0.3m/s) (*pers comm*. Rian Coetzee, WSM Leshika), and it was determined that the installation of the berms and diversion of the system would only increase the pre-development velocity of the water 11-13% (*pers comm*. Rian Coetzee, WSM Leshika).

- The proposed diversion berms will alter in-stream flow creating deeper turbulent sections of water where diversion occurs as well as a large backflow and increasing erosion of the area. The diverted streams will alter the in-stream flow when confluencing with downstream systems.

- The aquatic and riparian habitat will increase slightly in the augmented system with an increase in the amount of available water and nutrients for the duration of the project. Thus, the impact is considered positive from a riparian vegetation conservation aspect as the impact will likely lead to a successive small increase in biodiversity and in the abundance of sensitive taxa unless the diverted flow leads to erosion of the banks of the systems, which could damage the riparian zone vegetation structure.

9.5.1.5.1.3 Impact on wetland system

- The wetland system is an unchannelled valley bottom wetland, and receives surface water from the three upstream tributaries whose diversions are proposed as well as the Limpopo

River when it is in flood (the wetland is within the 1:100 year floodplain). Due to artificial canalisation upstream, the wetland appears to be permanent throughout the year. Prior to the upstream canalisation, the wetland was purportedly seasonal with high flows of the Limpopo River creating a backwater effect into the system that recharged this area of the system. The proposed flood protection berm will traverse the northern downstream drainage area of the wetland, which drains towards the Limpopo River and is located within the river's 1:100 year floodplain.

- When installed the proposed flood protection berm would act as an artificial impoundment on the north-western side of the wetland, preventing runoff from entering the Limpopo River, and preventing surface flows from the Limpopo River from entering the wetland.

- The proposed activities will have significant impacts upon the wetland. The diversion of the unnamed tributaries in conjunction with the proposed flood protection berm will likely cause the southern section of the wetland, which is currently permanently wet, to dry out permanently. This state will be augmented by reduced flow into the southern portion of the wetland from high flows in the Limpopo due to the flood protection berm, even when considering seepages into the soil traversing the barrier.

- The loss of discharge in the southern portion of the wetland will result in limited sedimentation and erosion occurring.

- The northern section of the wetland will only receive water when the Limpopo is in flood, however the flood protection berm will potentially lead to increased erosion of the area when flooding occurs.

- Surface water that would provide habitat for aquatic species as well as drinking water for terrestrial wildlife was concentrated at the Limpopo River and the wetland system. The wetland constitutes one of the few current permanent sources of water in the area. The proposed development activities will likely cause the wetland to become permanently dry, causing a significant yet localised decrease in biodiversity and a loss of sensitive species in both the northern and southern portions.

- The wetland is likely to become more homogenous in terms of species richness due to cumulative salt loads eliminating non-tolerant sensitive taxa as well as all species that permanently require water.

- The change in water quality and flows will likely eliminate suitable aquatic refugia for the majority of aquatic species and flow dependent taxa, and severely degrade the currently impaired present ecological state, despite the improvement in seasonality.

9.5.1.5.2 Impacts on Water Quality

The aquatic assessment of the Limpopo River has demonstrated that the current land use activities (agriculture mainly) are likely affecting the river through increased salt loading; this was also visually evident at the wetland system.

9.5.1.5.2.1 Impact on diverted systems

- Due to the diversion of the majority of the discharge upstream, only very limited flow will be present in the system during high rainfall events. The system has demonstrated that downstream, as it approaches the wetland, the water is highly saline. This salinity is likely a

result of natural geological process, as determined in the aquatic assessment, and not pollutants from another source. Thus, there is not likely to be a build-up of pollutants within the system due to a lack of dilution and the quality of water will remain similar to the reference condition.

9.5.1.5.2.2 Impacts on augmented system

- The geology of the proposed augmented system appears very similar to that of the diverted system, thus there is unlikely to be a significant change in water quality of the augmented system over time.

- In the short term, the proposed diversion will potentially marginally increase sediment loads in the water due to erosion of new surfaces on the diversion. This will lead to a small increase in total suspended solid load in the short term.

- In the longer term, impacts on the system due to increased erosion may affect water quality.

- Thus, the impact of the proposed development is considered low. Although a greater mass of nutrients will be available to associated plants.

9.5.1.5.2.3 Impact on wetland system

- The current assessment of the wetland has indicated that salt loading is occurring, likely due to natural processes (as determined in the aquatic assessment). Although the wetland will likely be permanently dry, due to the lack of flow-through, the wetland will exponentially accumulate any salts that are transported during the wet season. This accumulation is likely to be small due to the lack of discharge in the upstream system and the loss of catchment yield due to the mining out of the catchment. These features are likely to only have direct impacts upon the southern portion of the wetland, as the berm will prevent flow to the Limpopo River.

- Additionally with no flushing and outflow from the southern section of the wetland, the water and sediment will accumulate salts washed in by runoff.

- With no upstream source of water, the northern portion of the wetland will become permanently dry except during flooding of the Limpopo. Therefore, impacts upon the water quality of this portion of the wetland cannot be determined, and the water quality when the Limpopo is in flood will be linked to the quality of the water in the Limpopo River system at that time.

9.5.1.5.3 Changes to System Ecological and Socio-cultural Service Provision

Of the watercourses affected by the proposed activities, only the wetland system contained water and could be assessed for ecosystem services. All of the features directly linked to human ecoservice provision (i.e. cultivated foods) were considered to be of low importance, this was primarily due to the isolation necessarily afforded to aquatic resources within an active mine. The importance of the wetland ecosystem functions (i.e. stream flow regulation) were of intermediate to high importance. As the wetland receives effluent from upstream sources, toxicant removal was of moderately-high to high importance. Due to the dominance of an arid landscape, this permanent wetland is of moderately high importance in terms of biodiversity maintenance. Loss or impact on wetland and riparian habitat would reduce a feature's importance in terms of function and service provision.

Although it is deemed possible to reduce impact in terms of changes to ecological and socio-cultural service provision it is doubtful that the level of importance could be reinstated after mine closure, unless all allocated 100m buffer zones are kept strictly off limits to any mining related activity, including general infrastructure and that water abstraction is kept to a minimum and there is no formation of a cone of dewatering which may be created through the opencast mining methods which affects the base flows in the aquifers of the Limpopo River system.

The diversion of the unnamed tributaries in conjunction with the proposed flood protection berm will likely cause the southern section of the wetland to dry out permanently, except for short periods during the peak rainfall season. This will result in the loss of approximately 38% of the floodplain wetland, which has an extent of 7.8 ha, thus resulting in a loss of approximately 3 ha. Concurrently, the wetland section north of the proposed flood protection berm will become permanently dry as well, except during flooding of the Limpopo. Additionally with no flushing and outflow from the southern section of the wetland, the water and sediment will accumulate salts. This change in water quality and flows will likely impede the toxicant assimilation capacity of the wetland as well as other ecosystem functions such as flood attenuation.

9.5.1.5.3.1 Impact Summary

Impacts on water quality are considered low for all the relevant activities.

The overall the impact of the proposed Vele River Diversion Project on the streams to be diverted is of medium-high negative significance without mitigation and medium-low with mitigation measures.

The overall the impact of the proposed Vele River Diversion Project on the streams, which will be augmented by diverted flow, are considered to be of medium negative significance without mitigation measures and medium-low significance with the implementation of mitigatory measures. The most significant impacts will be on riparian vegetation, as well as the hydrological and geomorphological drivers of the system along with the sediment balance of the system.

Due to location of mining activity, even with rehabilitation, it is recommended that the stream diversions be maintained permanently to reduce the risk of water contamination. Additionally, the impact of re-altering the system and removing the berms will likely deteriorate the PES of all systems. Thus it is recommended that the stream diversion be installed permanently and not be decommissioned with the mining activities (all impacts were assessed with an assumed duration of 20 years).

9.5.1.6 Groundwater

No impact is envisaged on the groundwater because of the construction of the proposed linear activities (river diversions and flood protection berm). WSM Leshika confirmed this – refer to Appendix 11.

The impact of the additional activities is therefore limited to potential seepage from the PCD, which could affect the groundwater quality in the area. The PCD will therefore be appropriately lined to prevent any seepage into the groundwater regime.

9.5.1.7 Air Quality

Construction is a source of dust emission that has a temporary impact on the local air quality. Infrastructure and road construction are the two types of construction activity with high emission potentials. The emissions associated during construction can be associated with land clearing, drilling and blasting, ground excavation and depending on the level of activity, the specific operation and the prevailing meteorological conditions. It has been noted that large quantities of the emissions is generated due to the traffic movement of equipment across temporary roads and around the construction site (USEPA, 1996).

The temporary nature of construction activities is what distinguishes it from other fugitive sources present within the locality. Emissions from construction activities are expected to have a definitive start and end period and will vary depending on the various construction phases. In contrast to other fugitive sources, here the emissions occur in a steady state or follow a discernible pattern. The quantity of dust emissions from construction activities is proportional to the area of land under construction (USEPA, 1996).

The impact on air quality and air pollution of fugitive dust is dependent on the quantity and drift potential of the dust particles (USEPA, 1996). Large particles settle out near the source causing a local nuisance problem. Fine particles can be dispersed over much greater distances. Fugitive dust may have significant adverse impacts such as reduced visibility, soiling of buildings and materials, reduced growth and production in vegetation and may affect sensitive areas and aesthetics. Fugitive dust can also adversely affect human health.

The following components of the environment may be affected during the project construction phase:

- The ambient air quality;
- Local residents, farms and neighbouring communities; and
- The surrounding environment and possibly the fauna and flora.

Because of the relatively short-term nature of construction activities, some control measures are more cost effective than others are. Wet suppression and wind speed reduction are two common methods used to control open dust sources at a construction site, as water and material for wind barriers are readily available.

9.5.1.8 Environmental Noise

Potential increase of ambient noise levels generated by construction equipment would affect the surrounding environment. The potential extent depends on a number of factors, including the prevailing ambient sound levels during the instance the maximum noise event occurred, as well as the spectral character of the noise and the ambient soundscape in the surroundings.

Average or equivalent sound levels are another factor that affects the ambient sound levels and is the constant sound level that the receptor can experience.

The level and character of the construction noise will be highly variable as different activities with different equipment take place at different times, for different periods of time (operating cycles), in different combinations/sequences and on different parts of the construction site.

An additional source of noise during the construction phase is additional traffic to and from the site, as well as traffic on the site. This will include heavy and light vehicles transporting equipment, topsoil, overburden, as well as contractors to and from the site.

Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period.

A potential source of noise is blasting associated with construction when hard rock is reached. However, blasting will not be considered further for the following reasons:

- Blasting is highly regulated and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use minimum explosives and will occur in a controlled manner.
- Blasting is a highly specialised field, and various management options are available to the blasting specialist. Options available to minimise the risk to equipment, people and infrastructure includes:
    - The use of different explosives that have a lower detonation speed, which reduces vibration, sound pressure levels as well as air blasts.
    - Blasting techniques such as blast direction and/or blast timings (both blasting intervals and sequence).
    - Reducing the total size of the blast.
    - Damping materials used to cover the explosives.
- People are generally more concerned over ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. This is normally associated with close proximity mining/quarrying, not with construction activities.

9.5.1.9 Visual and Aesthetics

9.5.1.9.1 Visual Exposure and Visibility

Visual exposure refers to the geographic area from which the proposed project will be visible and is defined by the degree of visibility of a proposed project from various receptors sites. Visibility, in turn, is determined by distance between the components of a proposed project and the viewer.

The river diversions will have a limited impact as the structures are on ground level, at low points along the streams. Vegetation screening will further limit any visual intrusion from these structures.

The Flood Protection Berm along the Limpopo River will be highly visible, at a height of 10m (maximum), especially from the Limpopo River side and Zimbabwe. The necessary mitigation

measures such a vegetation screening, grassing, etc. should be implemented to reduce the visual impact.

9.5.1.9.2 Night-Time Lighting

Construction activities at the Vele River Diversion Project will be restricted to daylight hours and no impact is envisaged in respect of nighttime lighting.

9.5.2 Socio- Economic and Cultural Aspects

9.5.2.1 Social Impacts and Benefits

The socio-economic impacts and benefits are listed below:

- Quality of the living environment
- Quality of the physical environment
- Nuisance Impacts
- Employment opportunities
- Replacement cost of environmental functions
- Contribution to the Gross Domestic Product
- Local Procurement Opportunities
- Skills Development of Local people
- Bursary Programme
- Local Economic Development Initiatives
- Economic change

It must be emphasised that Vele Colliery is an existing operation, and the Vele River Diversion Project will have a limited relative contribution to the social impacts and benefits.

9.5.2.2 Cultural and Heritage Resources

The following potential direct impacts on heritage sites have been identified:

- The Eastern Diversion Works may result in the flooding of sites 24 and 25 (Iron Age/K2 sites), leading to the silting-up or severe erosion and destruction of the sites.
- Although not yet positively identified, the Western Diversion Works may result in the flooding of site 26, a potential Iron Age site.
- Accidental damage to sites in close proximity to construction works**.**

The necessary monitoring (of flooding) and demarcation of all existing sites in close proximity (to construction) must be implemented to prevent and, if required, rectify any impacts.

It must further be noted that most archaeological and paleontological remains are subterranean and there is always a chance that archaeological material may be exposed during earthworks. The discovery of undetected heritage remains must be reported to a qualified archaeologist, who will then comply with the necessary legal requirements.

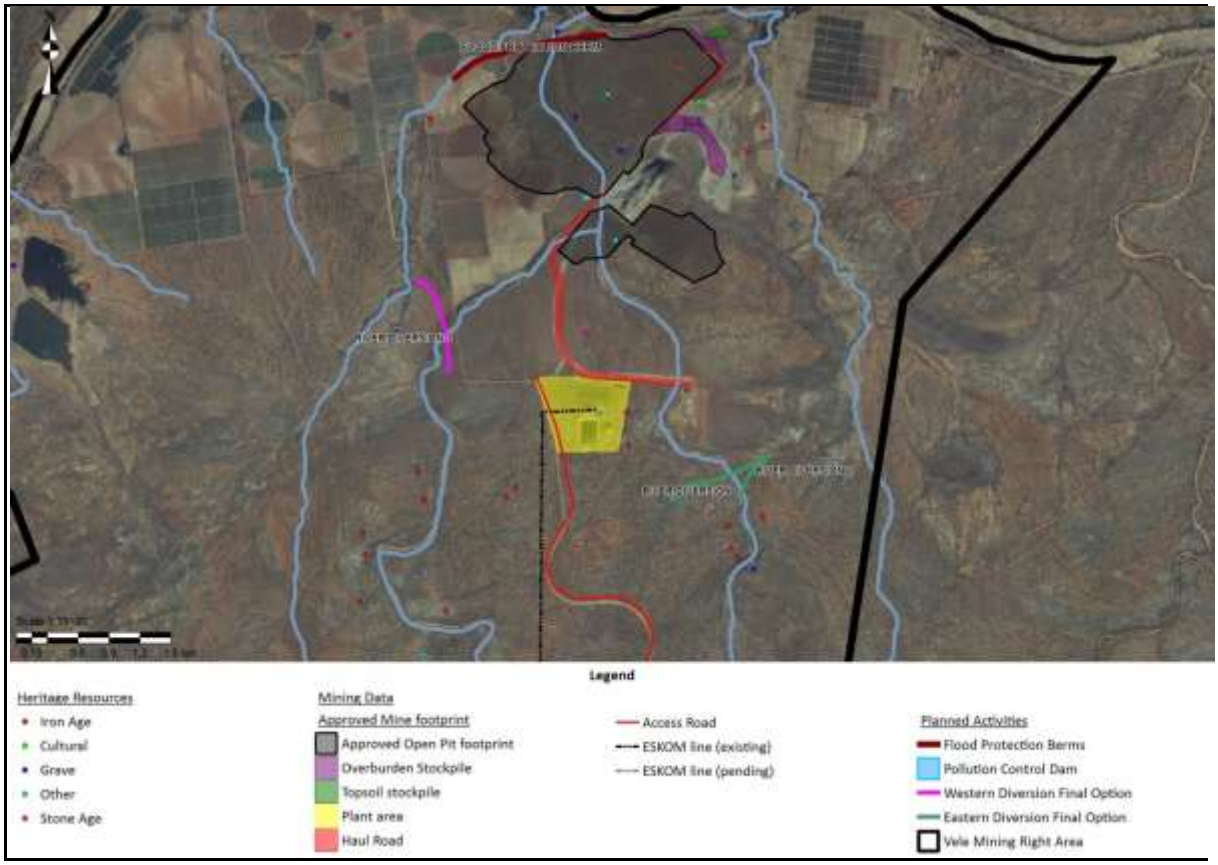

Figure 27: Heritage sites in relation to final infrastructure

9.5.3 Cumulative Impact Assessment

The main cumulative impacts associated with the Vele River Diversion Project are:

- Impact on ecological habitats and protected species as a result of further vegetation clearance (approximately 10 ha); and
- Impact on the aquatic ecosystems and surface water resources.

The Limpopo River is an extremely important system providing potable water as well as large volumes of water for the irrigation of crops downstream and water for the Marelani National Park, and ultimately (~100km) the Kruger National Park. The irrigation of the crops is critical to their success and the crops produced can considered of high significance as the crops are produced in

winter when areas further to the south cannot produce food for the South African consumer. Furthermore, prior to any large scale mining in the area both these systems could already be considered stressed from a water supply point of view. Current major drivers of impact on water quantity in the system include impacts from mining activities such as the Venetia Diamond mine (which most likely abstracts water from the Limpopo River) as well as coal mining operations such as the Vele Colliery and the Thuli Mine (Zimbabwe) impact on the system through water abstraction. Expansion of these mines could lead to further precedent being created for mining and hence further water abstraction. Further drivers of impact include abstraction from the river for irrigation purposes wherever the underlying geology and soil conditions prove viable along the river. The impact from agriculturally related abstraction is currently considered significantly higher than the impact from mining activities in the area (85% vs 2.5%).

The Limpopo River system has been identified as a NFEPA river system and an upstream support area for a fish FEPA and is therefore considered important in fish conservation. For these reasons, extreme caution must be used in decision making in the area concerning any activity that may affect water supply in the Limpopo River and any stream flow reduction or consumptive uses must consider the ecological reserve. The reserve has been set at a Class C. From the data available, the Environmental Flow Requirements for the system will be between 16% and 19% of the Mean Annual Runoff.

Stream flow reductions on the Limpopo River therefore need to be considered with caution as the Limpopo River is defined as a Semi-permanent River with no flow for 23% of the time. However, due to the highly ephemeral nature of the unnamed tributaries whose diversions are proposed, it is highly unlikely that the stream diversions will significantly lower the discharge of the Limpopo River during low flow seasons, when the aquatic ecology is the most sensitive. Although this project is not necessarily a consumptive use, consideration to cumulative impacts must however be given in light of use by other mines (both current and future) in the area as well as the significant use by the local farming community.

Although the proposed flood protection berm will have a high impact on the wetland present, due to its position on the drainage line it will also serve as a robust barrier protecting the Limpopo River in case of emergency discharges or flooding of the current and future mining activities. Thus, the proposed stream diversions will likely enhance the overall protection and ecological integrity of the catchment, despite localized impacts. Further, it is important to note that the impacts of these stream diversions on the wetland will be no longer be applicable if the authorised mining activities take place before the stream diversions are implemented, which will involve the conversion of the wetland into an open cast pit, leading to a total loss of habitat.

In order to ensure an ongoing acceptable level of functioning and biodiversity in the Limpopo River, extreme caution and care should take place throughout the entire life cycle of the current and future mining operations.

- **Pre-construction**: ensure that the design of all infrastructure is optimal to minimise impacts on the aquatic and wetland areas within this already water scarce area and within the water stressed systems of the area.

- **Construction:** ensure that the design of all infrastructure is adhered to and ensure that very good housekeeping takes place to prevent impacts on the receiving aquatic and riparian environments.

- **Operation:** ensure that mine planning and original designs are adhered to and ensure that very good housekeeping takes place to prevent impacts on the receiving aquatic and riparian environments. In addition specific attention must be given to keep all stream flow reduction activities to the absolute minimum.

- **Closure:** ensure that long in advance prior to closure that detailed investigations are undertaken and a detailed closure plan is developed in order to ensure that latent impacts are minimised to ensure that an ongoing acceptable level of functioning and biodiversity occurs in the area. It should also be ensured that a suitably qualified team of ecologists are involved in the project to ensure that closure takes place in such a way as to ensure that post closure sustainability is reached.

9.6 Risk Assessment Methodology

The Risk Assessment Methodology is described in Section 10.1 of this report.

A high-level assessment of the positive and negative impacts of the alternative options is described in the following section. A full risk assessment of the preferred alternative is provided in Section 11.

9.7 Positive and Negative Impacts of Activity Alternatives

A detail description of the alternative options that were evaluated is provided in Section 9.1, together with the steps that were followed to determine the preferred alternative option.

The Eastern Diversion Works consist of two river diversion channels, namely River Diversion 1 and River Diversion 2. From the ecological assessment (Ysterberg, 2014), the following can be concluded:

- River Diversion 1 could potentially affect 18 protected tree species, with the majority situated at the western end of the alignment. A sensitive rocky outcrop area is situated at the eastern end of the alignment.

- River Diversion 2 could potentially affect two protected trees; no sensitive habitats were identified along this alignment.

- Similarly, sensitive habitats have been identified at the start and end of River Diversion 3.

- The Flood Protection Berm could potentially affect a number of small protected tree species.

In addition, a sensitive habitat area have been identified downstream of River Diversion 3 during the Aquatic Assessment (SAS, 2016).

In order to minimise the effect on the protected tree species and sensitive habitats, the following realignments were done:

- River Diversion 1: Re-alignment to avoid the sensitive habitats at the start and end of the river diversion. By doing this, the sensitive habitat areas will be avoided completely, with a limited impact on protected tree species.

- River Diversion 3: Re-alignment downstream to avoid the sensitive habitat area to the north of the original alignment. By doing this, the sensitive area is avoided and a larger portion of the habitat associated with the stream will remain intact.

No re-alignment of River Diversion 2 and the Flood Protection Berm was considered; however, it is recommended that the final alignment in the field be done such as to avoid any large protected tree species that cannot be relocated successfully.

Impacts related to the other environmental and social aspects, e.g. aquatic and wetland systems, cultural and heritage resources and soils are similar for the different alternatives. However, as indicated, the preferred alignment of River Diversion 3 will conserve a larger portion of portion of riparian habitat that is considered positive.

The PCD is situated in the dirty water area, between the northern and southern opencast pits. No alternative positions for the PCD were considered. The main impact associated with the PCD is the potential leaching of dirty water into the groundwater system, which could affect the groundwater quality in the area. However, with appropriate lining this impact could be prevented completely.

Probable latent (residual) impacts on the ecosystem include (SAS, 2016):

- Improvement in water quality and ecological state of the unnamed tributaries and the Limpopo River in terms of salts and toxicants.
- Impaired water quality and ecological integrity of the wetland.
- Altered riparian vegetation structures and increased moisture stress on riparian vegetation communities.
- Loss of some species relying on system recharge and base flow in the diverted systems is probable.
- Loss of some species less tolerant of water quality changes is possible.
- Changes to streambed and banks and geomorphological processes are deemed likely.
- Reduced ability for features to provide ecological and socio-cultural services.

9.8 Possible Measures to Avoid, Reverse, Mitigate or Manage Potential Impacts

Apart from the re-alignment of River Diversions 1 & 3, as indicated in the previous section, a number of mitigation measures are possible to prevent (as far as possible) and/or minimise the impacts to an acceptable level. These are listed below. The full risk assessment associated with the final preferred alternative is presented in Section 11, without and with mitigation measures.

Table 12: Measures to avoid, reverse, mitigate or manage potential impacts

{RD: River Diversion; FPB: Flood Protection Berm; PCD: Pollution Control Dam}

Activity	Potential Impact	Possible Mitigation Measures	Mitigation Efficiency
All RDs FPB	Loss of soil depth (volume), fertility and organic carbon content	• The available topsoil will be stripped prior to construction for final rehabilitation. • Soil analysis will be performed prior to seeding (post rehabilitation) and the soil fertility rectified (if necessary) to facilitate vigorous growth. • Organic fertilisers will be used as far as possible.	Medium to High
All RDs FPB	Impact on species of conservation concern	• The final routes should be verified on ground to minimize the impact on protected and rare plant species. • A protected and RDL floral relocation, monitoring and management plan will be designed and implemented by a suitably qualified specialist and should address all species which can be successfully rescued and relocated. • A flora rescue operation will be undertaken prior to construction during the growing season. • A rescue and relocation programme for fauna species will be developed and implemented with the assistance of specialists in this field. • An environmental awareness campaign will be launched, both internally and externally.	Medium
All RDs FPB	Impact on protected tree species in terms of the NFA and rare tree species	• The final routes should be verified on ground to minimize the impact on protected and rare plant species. • Protected trees such as *Boscia albitrunca* (Shepherds' tree) and *Combretum imberbe (*Leadwood) should be avoided and care should be taken not to damage these trees during construction. • Seedlings of *Philenoptera violacea* (Apple Leaf) should be transplanted where possible, or kept in the nursery. • Obtain necessary permits for destruction and/or relocation where these species cannot be avoided.	Medium
RD 1&3	Impact on sensitive habitats riparian habitats and rocky outcrops	• Re-alignment of RD 1 & 3 as discussed in Section 9.1. • Special care should be taken within the sensitive riverine and riparian habitats associated with the streams, especially on the augmented systems.	Medium to High
RD 1 FPB	Impact on rare grass species, *Sclerocarya birrea*	• The newly discovered population of *Schoenefeldia transiens* needs to be actively conserved and demarcated to ensure no planned or accidental anthropogenic disturbance can take place in its direct vicinity. • A population study of *Schoenefeldia transiens* should be initiated to determine the extent of the impact on this rare species.	Medium
Construction Rehabilitation	Spreading of alien / invasive species	• The ongoing eradication and control of declared weed and invader plant populations in and around the mine area and its associated infrastructure must be common practice as part of the general environmental management of the mine. • Regular, effective biodiversity and veld condition monitoring by professionals of the natural environment surrounding Vele Colliery, including the recording of alien / invasive species.	Medium to High
Construction	Disturbance of natural vegetation	• Avoidance of unnecessary disturbance of natural vegetation during construction. • Transplanting specimens that are likely to survive and are in danger of being destroyed into similar localities in nature. • Transplanting specimens into a nursery until it can be relocated or used in the rehabilitation phase.	Medium to High

Activity	Potential Impact	Possible Mitigation Measures	Mitigation Efficiency
		• Regular, effective biodiversity and veld condition monitoring by professionals of the natural environment surrounding Vele Colliery. • Mineworkers and contractors to the mine should not be allowed to exploit the natural environment surrounding the mine in any way. This includes the removal of plants, collecting of firewood, etc. • Wherever possible, any soil that can serve as a growth medium for plants must be stripped and stockpiled for future rehabilitation purposes and used as soon as possible after "harvesting" to ensure that seed sources does not become worthless due to decomposition of the seed.	
Construction	Disturbance of faunal species	• Construction activities should be restricted to daylight hours to prevent any disturbance such as floodlights. • Fencing should be friendly to faunal species allowing for movement between areas. This can be achieved by applying culverts and an open mesh. • A management plan and awareness training to prevent the employees from harassing or poaching the faunal species should be developed and implemented. The awareness training should include information on fauna assemblages and the correct procedures to follow should fauna be found within the site. • As much of the natural vegetation as possible should be left intact in order to maintain ecological corridors for the movement of faunal species. • The development area should be rehabilitated and re-vegetated as soon as possible using an appropriate rehabilitation plan that incorporates indigenous plant species. • Should the faunal species need to be removed from the study area, a faunal capture and relocation plan should be developed and implemented.	Medium to High
Construction vehicles	Killing of animals and avifauna on the roads, especially nocturnal animals/birds	• Maintaining vehicle low speeds. • Construction limited to daylight hours. • Implementation of an Environmental Awareness Programme for contractors and employees.	Medium
All RDs FPB	Loss of wetland and riparian habitat and ecological and socio-cultural service provision	• No dumping of waste should take place within the riparian zone. If any spills occur, they should be immediately cleaned up. • Implement alien vegetation control program within wetland areas with special mention of water loving tree species. • Ongoing wetland monitoring to determine any deterioration in the Present Ecological State (PES) of the wetland systems. • Biodiversity offset programmes should include wetland offsets where appropriate.	Medium
All RDs	Increased erosion and siltation due to increased flow velocities in receiving streams	• Design and install appropriate outlet structures to retard flow velocity. • Construct energy dissipating structures along steep slopes. • Side slopes of earth berms / canals to be designed to 1:3 and protected & vegetated to prevent erosion. • Erosion protection (dump rock/riprap) to be placed on both the upstream slope of the berm and toe of the berm to prevent scour. • During construction, problem areas must be identified and additional protective measures put in place where required. • Cross-sectional gabions structures to be constructed within the diversion channels on calculated to reduce flow	Medium to High

Activity	Potential Impact	Possible Mitigation Measures	Mitigation Efficiency
		velocities, minimize erosion, attenuate flow velocities and act as silt traps. Specified intervals for positioning of erosion gabion structures: ○ Western diversion berm - 62m intervals = 10 structures ○ Eastern diversion berm No. 1 - 50m intervals = 20 structures ○ Eastern diversion berm No. 2 - 25m intervals = 14 structures • Final topsoiling and re-vegetation according to the rehabilitation plan.	
All RDs FPB	Impact on watercourses and wetland systems due to increase in erosion	• Infrastructure near or over such watercourses should be constructed in such a way that it is ensured that erosion will be kept to a minimum and that the natural flow of water is not restricted. • Ensure that all berms and/or stockpiles are fitted with hessian sheets to prevent excessive erosion and sedimentation. • Watercourses being augmented by the diversions must be monitored for erosion and incision.	Medium to High
All RDs FPB	Reduced recharge resulting in moisture stressed systems, terrestrial vegetation encroachment and a change in species structure	• No use of clean surface water or groundwater, which potentially recharges the watercourses in the area, should take place. • Use of water must be minimised as far as possible in order to minimise the loss of recharge of the Limpopo River. • Monitor all affected riparian systems for moisture stress. • Monitor all potentially affected riparian zones for changes in riparian vegetation structure.	Low to Medium
All RDs	Impact on the REC class of the augmented (receiving) systems	• Infrastructure near to the diversions and flood berm must be kept to an absolute minimum and must be placed as far from these water courses as possible. • Ongoing aquatic ecological monitoring must take place on a 6 monthly basis by an SA RHP Accredited assessor, of the direct diversions and wetland around the berm as well as the Limpopo River before and after the confluences of the tributaries.	Medium to High
Construction	Impact on sensitive wetland systems during construction	• Ensure that as far as possible all construction infrastructure is placed outside of wetland areas and streams. • Limit the footprint area of the construction activity to what is essential in order to minimise the loss of clean water runoff areas and the concomitant recharge of streams in the area and minimise environmental damage. • Permit only essential construction personnel within 32m of all riparian systems. • Keep all demarcated sensitive zones outside of the construction area off limits during the construction phase of the development. • All vehicles should remain on designated roads with no indiscriminate driving through adjacent wetland areas.	Medium to High
Construction PCD All RDs	Impact on water quality	• Very clear and well managed clean and dirty water separation must take place in line with the requirements of GN704. • The PCD must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs. • Dirty water dams (PCDs) to be plastic lined (HDPE) to prevent groundwater contamination. • Ensure that the current and future mine process water system is managed in such a way as to prevent discharge to the receiving environment and to prevent discharge of dirty water. • Regular assessment of erosion and sedimentation must	Medium

Activity	Potential Impact	Possible Mitigation Measures	Mitigation Efficiency
		take place. • Excessive silt deposition downstream of the berms should be removed in the dry season taking care not to remove natural sediments in the system. • The gabion silt traps must be cleaned of silt on a regular basis, after the wet season.	
Construction All RDs FPB	Changes to Wetland Ecological and Socio-cultural Service Provision	• The construction footprint area must be limited to what is essential in order to minimise environmental damage. • The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • Impacts on the affected wetland features should be managed to minimise impacts on wetland areas not directly affected by or falling within the proposed development. • Edge effects of activities including erosion and alien / weed control need to be strictly managed in these areas. • Implement alien vegetation control program within wetland areas with special mention of water loving tree species. • Revegetate all disturbed areas with indigenous tree species and make use of indigenous species with an affinity for riparian zones such as *Combretum imberbe*, *Faedherbia albida* and *Xanthocercis zambesiaca* as well as fig species. • Develop a detailed closure plan in order to ensure that latent impacts are minimised to ensure that an ongoing acceptable level of functioning and biodiversity occurs in the area and in such a way as to ensure that post-closure sustainability is reached.	Medium
All RDs	Potential of flooding of downstream cultivated areas	• Confirmation of design flood peaks to ensure sufficient safety factor – completed. • Construction of Land Access Culvert to ensure safe access to irrigation fields. • In the event that regular flooding is experienced, the necessary attenuation structures must be implemented in consultation with immediate downstream land users.	Medium
Construction hazardous chemicals and waste	Pollution as a result of accidental spillages of chemicals and hazardous material	• Strict control of chemical ablution facilities and/or sewage water treatment during construction must take place. • Develop and implement hydrocarbon management procedure to prevent accidental spillages. • Bulk facilities and chemical stores to be concrete lined and bunded to a capacity of 110%. • Spillages must be cleaned up immediately in line with the Spill Management procedure.	Medium to High
Construction	Increased dust levels as a result of construction	• Set the speed limit for hauling vehicles and vehicles in general to 40 km/h and enforce the speed limits specified. • Include speed bumps to control the speed limits. • Implement a program of wet-suppression of the unpaved roads with major vehicle activity.	Medium
Construction	Potential for noise impact during construction	• Construction to be restricted to daylight hours. • Use of low-noise generation plant and equipment. • All plant, equipment and vehicles are to be kept in good repair. • Maintaining vehicle low speeds.	Medium
FPB	Visual intrusion, impacting on the sense of place	• The development footprint and disturbed areas are to be kept as small as possible and the areas cleared of natural vegetation must be kept to a minimum. • In areas where screening topography and vegetation are absent, natural looking constructed landforms and vegetative or architectural screening may be used to minimise visual impacts. Care should however be taken to	Medium

Activity	Potential Impact	Possible Mitigation Measures	Mitigation Efficiency
		avoid additional surface disturbance.	
Construction	Impact due to nighttime lighting	• Construction activities should be restricted to daylight hours as far as possible, in order to limit the need for bright floodlighting and the potential for sky glow. • Lighting fixtures must be selected and placed so that they direct their light on the intended area only, to avoid light spill and offsite light trespass. • Light sources must be shielded by physical barriers. • The use of low-pressure sodium lamps, yellow LED lighting or an equivalent reduces sky glow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects, and is associated with other human physiological issues.	Medium to High
All RDs	Flooding of heritage sites 24 and 25 (Eastern) and site 26 (Western), leading to the silting-up or severe erosion and destruction of the sites	• Control of flow velocities and erosion, as indicated before. • Regular monitoring of sites for early detection of any damage.	Medium
Construction	Accidental damage to heritage sites in close proximity to construction works	• Clearly demarcate identified sites within 100m of any construction works. • Access to the sites shall be restricted to the responsible person(s).	High
Construction	Recovery of sub-surface sites during construction	• A qualified archaeologist shall monitor construction activities until completion thereof. • Construction activities shall cease immediately upon any discovery of cultural and heritage resources and a qualified archaeologist informed to do further assessment and reporting. • Identified sites of cultural and heritage significance shall be demarcated until such time that an instruction to resume work is provided to the contractor in writing, following consultation with the regulating authorities.	Not Efficient
Social aspects	Increase in available employment opportunities locally	• Source the maximum number of employees from the local area, based on a skills matching strategy. • Implement skills development programmes in the areas where most job opportunities will be created. • Make available bursary opportunities to build skill capital in the region. • Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people. • Implement portable skills development programmes. • Implementation of programmes to minimize and mitigate the impact of downscaling and retrenchment.	Not Efficient
Social aspects	Increase in skills development programmes and therefore skill levels of the local communities		Not Efficient
Social aspects	Empowerment of local business through procurement and capacity building	• Establish a database of local businesses; utilize this database to establish partnerships between local and larger service providers as well as locally preferred work packages. • Consultation and feedback on results on a regular basis. • Implementation of capacity building programmes to minimize and mitigate the impact of mine downscaling and closure.	Not Efficient
Residual (latent) impacts	Impact on ecosystem	• Since effective mitigation through avoidance, impact minimisation and rehabilitation is deemed unlikely to adequately limit the impact on the receiving ecology, it is deemed important that an ecological offset initiative be initiated to contribute to the conservation of the area.	Not Efficient

9.9 Motivation where no Alternative Sites were Considered

The mining footprint is determined by the economic viability and the coal quality. The area to the east of the pit is a no-coal area; therefore the pit position can't be moved to avoid the stream from being diverted.

9.10 Statement Motivating the Alternative Development Location

The final proposed layout is shown in Figure 28, overlain on the sensitive receptors.

The final selected infrastructure positioning took into consideration the sensitive areas and protected species and species of conservation concern, as determined by the specialist studies, and has been laid out and engineered to best suit the topography and mining schedule, with the least possible impact on existing homesteads, cultural resources and ecologically sensitive areas and habitats, including wetland systems. The final infrastructure layout further avoids all identified cultural and heritage sites.

The main impact is associated with the Flood Protection Berm, with specific mention of the degraded floodplain wetland system. The berm would however serve as a robust barrier protecting the Limpopo River in case of emergency discharges or flooding of the current and future mining activities and would therefore likely enhance the overall protection and ecological integrity of the catchment, despite the localised impacts. Further, it is important to note that the impacts on the wetland will be no longer be applicable if the authorised mining activities take place before the stream diversions are implemented, which will involve the conversion of the wetland into an opencast pit, leading to a total loss of habitat.

A number of mitigation measures are possible to avoid, reverse, mitigate or manage any residual potential impacts, as listed in Table 12.

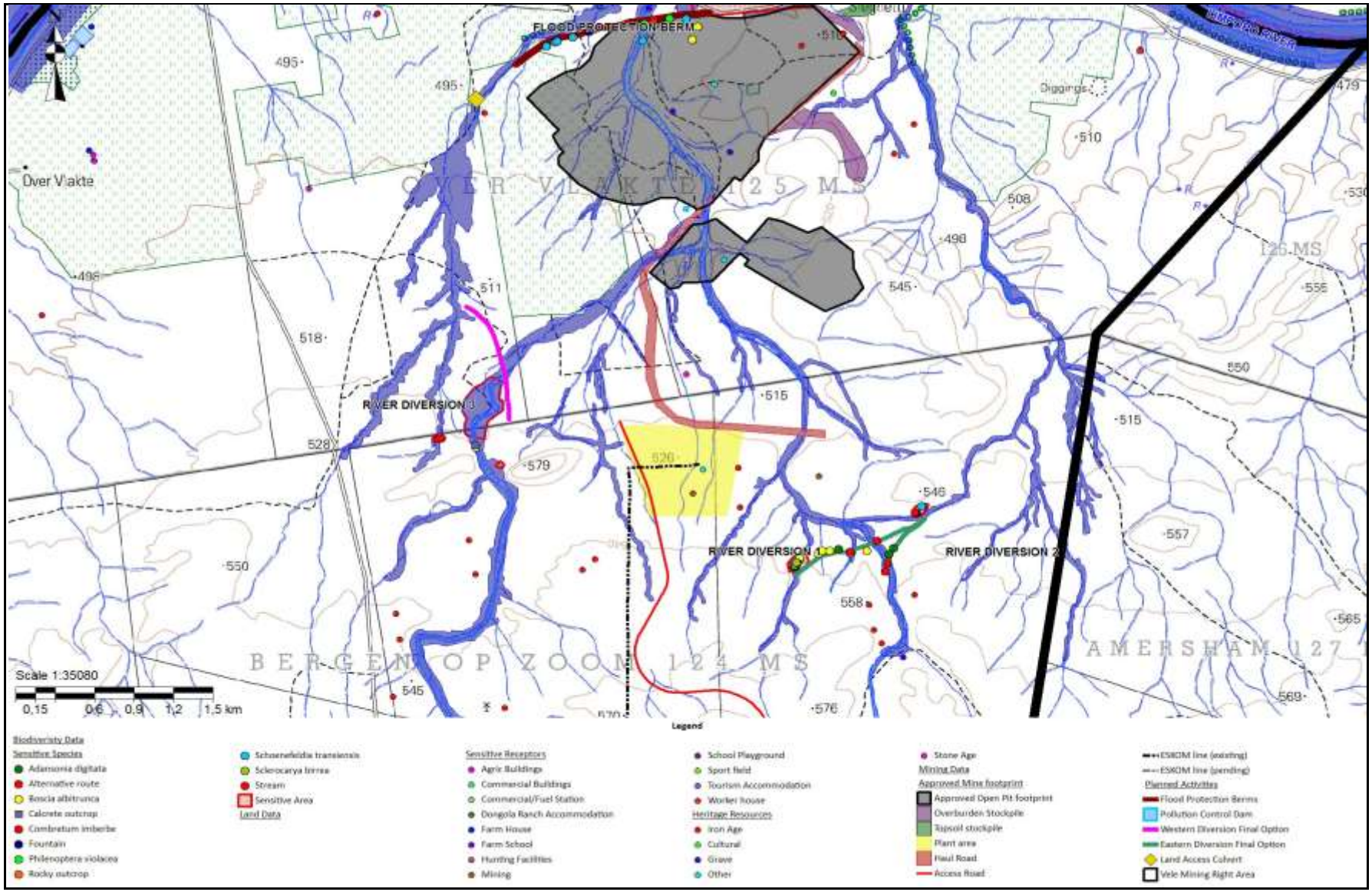

Figure 28: Final proposed layout plan overlain on the sensitive receptors and sensitive habitats

10. FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL POSE ON THE PREFERRED SITE

10.1 Risk Assessment Methodology

According to the NEMA Regulations, 'significant impact means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment'. In line with the Regulations, and based on the qualitative findings of the activities undertaken, each potentially significant impact will be assessed with regard to:

- the nature and status of the impact;
- the extent and duration of the impact;
- the probability of the impact occurring;
- the effect of significance on decision-makings;
- the weight of significance; and
- the mitigation efficiency.

10.1.1 Impact Significance

10.1.1.1 Nature and Status

The 'nature' of the impact describes what is being affected and how. The 'status' is based on whether the impact is positive, negative or neutral.

10.1.1.2 Spatial Extent

'Spatial Extent' defines the spatial or geographical scale of the impact.

Category	Rate	Descriptor
Site	1	Site of the proposed development
Local	2	Limited to site and/or immediate surrounds (500m zone of influence)
District	3	Musina Local Municipal Area
Region	4	Vhembe District Municipal Area
Provincial	5	Limpopo Province
National	6	South Africa
International	7	Beyond South African borders

10.1.1.3 Duration

'Duration' gives the temporal scale of the impact.

Category	Rate	Descriptor
Temporary	1	0 – 1 years
Short term	2	1 – 5 years
Medium term	3	5 – 15 years
Long term	4	Where the impact will cease after the operational life of the activity either because of natural process or by human intervention
Permanent	5	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such a time span that the impact can be considered as transient

10.1.1.4 Probability

The 'probability' describes the likelihood of the impact actually occurring.

Category	Rate	Descriptor
Rare	1	Where the impact may occur in exceptional circumstances only
Improbable	2	Where the possibility of the impact materialising is very low either because of design or historic experience
Probable	3	Where there is a distinct possibility that the impact will occur
Highly probable	4	Where it is most likely that the impact will occur
Definite	5	Where the impact will occur regardless of any prevention measures

10.1.1.5 Intensity

'Intensity' defines whether the impact is destructive or benign, in other words the level of impact on the environment.

Category	Rate	Descriptor
Insignificant	1	Where the impact affects the environment is such a way that natural, cultural and social functions and processes are not affected. Localised impact and a small percentage of the population is affected
Low	2	Where the impact affects the environment is such a way that natural, cultural and social functions and processes are affected to a limited extent
Medium	3	Where the affected environment is altered in terms of natural, cultural and social functions and processes continue albeit in a modified way
High	4	Where natural, cultural or social functions or processes are altered to the extent that they will temporarily or permanently cease
Very High	5	Where natural, cultural or social functions or processes are altered to the extent that they will permanently cease and it is not possible to mitigate or remedy the impact

10.1.1.6 Ranking, Weighting and Scaling

The weight of significance define the level or limit at which point an impact changes from low to medium significance, or medium to high significance. The purpose of assigning such weights serves to highlight those aspects that are considered the most critical to the various stakeholders and ensure that the element of bias is taken into account. These weights are often determined by current societal values or alternatively by scientific evidence (norms, etc.) that define what would be acceptable or unacceptable to society and may be expressed in the form of legislated standards, guidelines or objectives.

The weighting factor provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Spatial Extent	Duration	Intensity / Severity	Probability	Weighting factor	Significance Rating (SR - WOM) Pre-mitigation	Mitigation Efficiency (ME)	Significance Rating (SR-WM) Post Mitigation
Site (1)	Short term (1)	Insignificant (1)	Rare (1)	Low (1)	Low (0 – 19)	High (0.2)	Low (0 – 19)
Local (2)	Short to Medium term (2)	Minor (2)	Unlikely (2)	Low to Medium (2)	Low to Medium (20 – 39)	Medium to High (0.4)	Low to Medium (20 – 39)
District (3)							
Regional (4)	Medium term (3)	Medium (3)	Possible (3)	Medium (3)	Medium (40 – 59)	Medium (0.6)	Medium (40 – 59)
Provincial (5)	Long term (4)	High (4)	Likely (4)	Medium to High (4)	Medium to High (60 – 79)	Low to Medium (0.8)	Medium to High (60 – 79)
National (6)							
International (7)	Permanent (5)	Very high (5)	Almost certain (5)	High (5)	High (80 – 110)	Low (1.0)	High (80 – 110)

10.1.1.7 Impact significance without mitigation (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

10.1.1.8 Effect of Significance on Decision-makings

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required.

Rating	Rate	Descriptor
Negligible	0	The impact is non-existent or insignificant, is of no or little importance to decision making.
Low	1-19	The impact is limited in extent, even if the intensity is major; the probability of occurrence is low and the impact will not have a significant influence on decision-making and is unlikely to require management intervention bearing significant

Rating	Rate	Descriptor
		costs.
Low to Medium	20 – 39	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels. The impact and proposed mitigation measures can be considered in the decision-making process
Medium	40 – 59	The impact is significant to one or more affected stakeholder, and its intensity will be medium or high; but can be avoided or mitigated and therefore reduced to acceptable levels. The impact and mitigation proposed should have an influence on the decision.
Medium to High	60 -79	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
High	80 – 110	The impact could render development options controversial or the entire project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor and must influence decision-making.

10.1.2 Mitigation

"Mitigation" is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures, amongst others, to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts because of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated:

- Avoid/prevent impact: can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels.

- Minimise (reduce) impact: can be done through utilisation of alternatives that will ensure that impacts on biodiversity and eco-services provision are reduced. Impact minimisation is considered an essential part of any development project.

- Rehabilitate (restore) impact is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation toll as even with significant resources and effort rehabilitation that usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the

setting of a project. Practical rehabilitation should consist of the following phases in best practice:

- Structural rehabilitation which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;

- Functional rehabilitation, which focuses on ensuring that the ecological functionality of the ecological resources on the subject property supports the intended post-closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;

- Biodiversity reinstatement that focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community of community suitable for supporting the intended post closure land use; and

- Species reinstatement that focuses on the re-introduction of any ecologically important species, which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.

- Offset impact: refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered a last resort to compensate for residual negative impacts on biodiversity.

According to the DMR (2013) “Closure” refers to the process for ensuring that mining operations are closed in an environmentally responsible manner, usually with the dual objectives of ensuring sustainable post-mining land uses and remedying negative impacts on biodiversity and ecosystem services.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity, the residual impacts should be considered to be of very high significance and when residual impacts are considered to be of very high significance, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have medium to high significance, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance, no biodiversity offset is required.

10.1.2.1 Impact significance with mitigation measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it is necessary to re-evaluate the impact.

10.1.2.2 Mitigation Efficiency (ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact. Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2: Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency (ME)

Mitigation Efficiency is rated out of 1 as follows:

Category	Rate	Descriptor
Not Efficient (Low)	1	Mitigation cannot make a difference to the impact
Low to Medium	0.8	Mitigation will minimize impact slightly
Medium	0.6	Mitigation will minimize impact to such an extent that it becomes within acceptable standards
Medium to High	0.4	Mitigation will minimize impact to such an extent that it is below acceptable standards
High	0.2	Mitigation will minimize impact to such an extent that it becomes insignificant

10.1.2.3 Significance Following Mitigation (SFM)

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

11. ASSESSMENT OF IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

Table 13: Impact Risk Matrix for Preferred Location

{RD: River Diversion; FPB: Flood Protection Berm; PCD: Pollution Control Dam}

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
1	All RDs FPB	Loss of soil depth (volume), fertility and organic carbon content	Soils	Construction	Low to Medium	• The available topsoil will be stripped prior to construction for final rehabilitation. • Soil analysis will be performed prior to seeding (post rehabilitation) and the soil fertility rectified (if necessary) to facilitate vigorous growth. • Organic fertilisers will be used as far as possible.	Low
2	All RDs FPB	Impact on species of conservation concern	Fauna Flora	Construction	Medium to High	• The final routes should be verified on ground to minimize the impact on protected and rare plant species. • A protected and RDL floral relocation, monitoring and management plan will be designed and implemented by a suitably qualified specialist and should address all species which can be successfully rescued and relocated. • A flora rescue operation will be undertaken prior to construction during the growing season. • A rescue and relocation programme for fauna species will be developed and implemented with the assistance of specialists in this field. • An environmental awareness campaign will be launched, both internally and externally.	Medium
3	All RDs FPB	Impact on protected tree species in terms of the NFA and rare tree species	Flora	Construction	Medium to High	• The final routes should be verified on ground to minimize the impact on protected and rare plant species. • Protected trees such as *Boscia albitrunca* (Shepherds' tree) and *Combretum imberbe (*Leadwood) should be avoided and care should be taken not to damage these trees during construction. • Seedlings of *Philenoptera violacea* (Apple Leaf) should be transplanted where possible, or kept in the nursery. • Obtain necessary permits for destruction and/or relocation where these species cannot be avoided.	Medium
4	RD 1&3	Impact on sensitive habitats riparian habitats and rocky	Sensitive habitats	Construction	Medium to High	• Re-alignment of RD 1 & 3 as discussed in Section 9.1 of the BAR.	Low to Medium

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
		outcrops				• Special care should be taken within the sensitive riverine and riparian habitats associated with the streams, especially on the augmented systems.	
5	RD 1 FPB	Impact on rare grass species, *Sclerocarya birrea*	Flora	Construction Operational	Medium	• The newly discovered population of *Schoenefeldia transiens* needs to be actively conserved and demarcated to ensure no planned or accidental anthropogenic disturbance can take place in its direct vicinity. • A population study of *Schoenefeldia transiens* should be initiated to determine the extent of the impact on this rare species.	Low to Medium
6	Construction Rehabilitation	Spreading of alien / invasive species	Flora	Construction Operational	Medium	• The ongoing eradication and control of declared weed and invader plant populations in and around the mine area and its associated infrastructure must be common practice as part of the general environmental management of the mine. • Regular, effective biodiversity and veld condition monitoring by professionals of the natural environment surrounding Vele Colliery, including the recording of alien / invasive species.	Low to Medium
7	Construction	Disturbance of natural vegetation	Flora	Construction	Medium to High	• Avoidance of unnecessary disturbance of natural vegetation during construction. • Transplanting specimens that are likely to survive and are in danger of being destroyed into similar localities in nature. • Transplanting specimens into a nursery until it can be relocated or used in the rehabilitation phase. • Regular, effective biodiversity and veld condition monitoring by professionals of the natural environment surrounding Vele Colliery. • Mineworkers and contractors to the mine should not be allowed to exploit the natural environment surrounding the mine in any way. This includes the removal of plants, collecting of firewood, etc. • Wherever possible, any soil that can serve as a growth medium for plants must be stripped and stockpiled for future rehabilitation purposes and used as soon as possible after “harvesting” to ensure that seed sources does not become worthless due to decomposition of the seed.	Low to Medium
8	Construction	Disturbance of faunal species	Fauna	Construction	Medium to High	• Construction activities should be restricted to daylight hours to prevent any disturbance such as floodlights. • Fencing should be friendly to faunal species allowing for movement between areas. This can be achieved by applying culverts and an open mesh. • A management plan and awareness training to prevent the	Low to Medium

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
						employees from harassing or poaching the faunal species should be developed and implemented. The awareness training should include information on fauna assemblages and the correct procedures to follow should fauna be found within the site. • As much of the natural vegetation as possible should be left intact in order to maintain ecological corridors for the movement of faunal species. • The development area should be rehabilitated and re-vegetated as soon as possible using an appropriate rehabilitation plan that incorporates indigenous plant species. • Should the faunal species need to be removed from the study area, a faunal capture and relocation plan should be developed and implemented.	
9	Construction vehicles	Killing of animals and avifauna on the roads, especially nocturnal animals/birds	Fauna	Construction	Medium to High	• Maintaining vehicle low speeds. • Construction limited to daylight hours. • Implementation of an Environmental Awareness Programme for contractors and employees.	Medium
10	All RDs FPB	Loss of wetland and riparian habitat and ecological and socio-cultural service provision	Wetlands Aquatic habitats	Permanent	Medium to High	• No dumping of waste should take place within the riparian zone. If any spills occur, they should be immediately cleaned up. • Implement alien vegetation control program within wetland areas with special mention of water loving tree species. • Ongoing wetland monitoring to determine any deterioration in the Present Ecological State (PES) of the wetland systems. • Biodiversity offset programmes should include wetland offsets where appropriate.	Medium
11	All RDs	Increased erosion and siltation due to increased flow velocities in receiving streams	Surface water	Permanent	Medium to High	• Design and install appropriate outlet structures to retard flow velocity. • Construct energy dissipating structures along steep slopes. • Side slopes of earth berms / canals to be designed to 1:3 and protected & vegetated to prevent erosion. • Erosion protection (dump rock/riprap) to be placed on both the upstream slope of the berm and toe of the berm to prevent scour. • During construction, problem areas must be identified and additional protective measures put in place where required. • Cross-sectional gabions structures to be constructed within the diversion channels on calculated to reduce flow velocities, minimize erosion, attenuate flow velocities and act as silt traps. Specified intervals for positioning of erosion	Low to Medium

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
						gabion structures: o Western diversion berm - 62m intervals = 10 structures o Eastern diversion berm No. 1 - 50m intervals = 20 structures o Eastern diversion berm No. 2 - 25m intervals = 14 structures • Final topsoiling and re-vegetation according to the rehabilitation plan.	
12	All RDs FPB	Impact on watercourses and wetland systems due to increase in erosion	Wetlands Aquatic habitats	Permanent	Medium to High	• Infrastructure near or over such watercourses should be constructed in such a way that it is ensured that erosion will be kept to a minimum and that the natural flow of water is not restricted. • Ensure that all berms and/or stockpiles are fitted with hessian sheets to prevent excessive erosion and sedimentation. • Watercourses being augmented by the diversions must be monitored for erosion and incision.	Low to Medium
13	All RDs FPB	Reduced recharge resulting in moisture stressed systems, terrestrial vegetation encroachment and a change in species structure	Wetlands Aquatic habitats	Permanent	Medium to High	• No use of clean surface water or groundwater, which potentially recharges the watercourses in the area, should take place. • Use of water must be minimised as far as possible in order to minimise the loss of recharge of the Limpopo River. • Monitor all affected riparian systems for moisture stress. • Monitor all potentially affected riparian zones for changes in riparian vegetation structure.	Medium to High
14	All RDs	Impact on the REC class of the augmented (receiving) systems	Wetlands Aquatic habitats	Construction Operational	Medium to High	• Infrastructure near to the diversions and flood berm must be kept to an absolute minimum and must be placed as far from these water courses as possible. • Ongoing aquatic ecological monitoring must take place on a 6 monthly basis by an SA RHP Accredited assessor, of the direct diversions and wetland around the berm as well as the Limpopo River before and after the confluences of the tributaries.	Low to Medium
15	Construction	Impact on sensitive wetland systems during construction	Wetlands Aquatic habitats	Construction	Medium	• Ensure that as far as possible all construction infrastructure is placed outside of wetland areas and streams. • Limit the footprint area of the construction activity to what is essential in order to minimise the loss of clean water runoff areas and the concomitant recharge of streams in the area and minimise environmental damage. • Permit only essential construction personnel within 32m of all riparian systems. • Keep all demarcated sensitive zones outside of the	Low to Medium

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
						construction area off limits during the construction phase of the development. • All vehicles should remain on designated roads with no indiscriminate driving through adjacent wetland areas.	
16	Construction PCD All RDs	Impact on water quality	Surface and groundwater	Construction Operational	Medium to High	• Very clear and well managed clean and dirty water separation must take place in line with the requirements of GN704. • The PCD must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs. • Dirty water dams (PCDs) to be plastic lined (HDPE) to prevent groundwater contamination. • Ensure that the current and future mine process water system is managed in such a way as to prevent discharge to the receiving environment and to prevent discharge of dirty water. • Regular assessment of erosion and sedimentation must take place. • Excessive silt deposition downstream of the berms should be removed in the dry season taking care not to remove natural sediments in the system. • The gabion silt traps must be cleaned of silt on a regular basis, after the wet season.	Medium
17	Construction All RDs FPB	Changes to Wetland Ecological and Socio-cultural Service Provision	Wetlands Aquatic habitats	Construction Operational	Medium to High	• The construction footprint area must be limited to what is essential in order to minimise environmental damage. • The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • Impacts on the affected wetland features should be managed to minimise impacts on wetland areas not directly affected by or falling within the proposed development. • Edge effects of activities including erosion and alien / weed control need to be strictly managed in these areas. • Implement alien vegetation control program within wetland areas with special mention of water loving tree species. • Revegetate all disturbed areas with indigenous tree species and make use of indigenous species with an affinity for riparian zones such as *Combretum imberbe*, *Faedherbia albida* and *Xanthocercis zambesiaca* as well as fig species. • Develop a detailed closure plan in order to ensure that latent impacts are minimised to ensure that an ongoing acceptable level of functioning and biodiversity occurs in the	Medium

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
						area and in such a way as to ensure that post-closure sustainability is reached.	
18	All RDs	Potential of flooding of downstream cultivated areas	Land use	Permanent	High	• Confirmation of design flood peaks to ensure sufficient safety factor – completed. • Construction of Land Access Culvert to ensure safe access to irrigation fields. • In the event that regular flooding is experienced, the necessary attenuation structures must be implemented in consultation with immediate downstream land users.	Medium
19	Construction hazardous chemicals and waste	Pollution as a result of accidental spillages of chemicals and hazardous material	Soils Surface and groundwater	Construction	Low to Medium	• Strict control of chemical ablution facilities and/or sewage water treatment during construction must take place. • Develop and implement hydrocarbon management procedure to prevent accidental spillages. • Bulk facilities and chemical stores to be concrete lined and bunded to a capacity of 110%. • Spillages must be cleaned up immediately in line with the Spill Management procedure.	Low
20	Construction	Increased dust levels as a result of construction	Air quality	Construction	Low to Medium	• Set the speed limit for hauling vehicles and vehicles in general to 40 km/h and enforce the speed limits specified. • Include speed bumps to control the speed limits. • Implement a program of wet-suppression of the unpaved roads with major vehicle activity.	Low
21	Construction	Potential for noise impact during construction	Ambient noise	Construction	Low to Medium	• Construction to be restricted to daylight hours. • Use of low-noise generation plant and equipment. • All plant, equipment and vehicles are to be kept in good repair. • Maintaining vehicle low speeds.	Low
22	FPB	Visual intrusion, impacting on the sense of place	Aesthetics Sense of place	Permanent	High	• The development footprint and disturbed areas are to be kept as small as possible and the areas cleared of natural vegetation must be kept to a minimum. • In areas where screening topography and vegetation are absent, natural looking constructed landforms and vegetative or architectural screening may be used to minimise visual impacts. Care should however be taken to avoid additional surface disturbance.	Medium to High
23	Construction	Impact due to nighttime lighting	Aesthetics Sense of place	Construction	Medium	• Construction activities should be restricted to daylight hours as far as possible, in order to limit the need for bright floodlighting and the potential for sky glow. • Lighting fixtures must be selected and placed so that they direct their light on the intended area only, to avoid light spill and offsite light trespass.	Low to Medium

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
						• Light sources must be shielded by physical barriers. • The use of low-pressure sodium lamps, yellow LED lighting or an equivalent reduces sky glow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects, and is associated with other human physiological issues.	
24	All RDs	Flooding of heritage sites 24 and 25 (Eastern) and site 26 (Western), leading to the silting-up or severe erosion and destruction of the sites	Heritage	Permanent	Medium to High	• Control of flow velocities and erosion, as indicated before. • Regular monitoring of sites for early detection of any damage.	Medium
25	Construction	Accidental damage to heritage sites in close proximity to construction works	Heritage	Construction	Medium	• Clearly demarcate identified sites within 100m of any construction works. • Access to the sites shall be restricted to the responsible person(s).	Low
26	Construction	Recovery of sub-surface sites during construction	Heritage	Construction	Medium	• A qualified archaeologist shall monitor construction activities until completion thereof. • Construction activities shall cease immediately upon any discovery of cultural and heritage resources and a qualified archaeologist informed to do further assessment and reporting. • Identified sites of cultural and heritage significance shall be demarcated until such time that an instruction to resume work is provided to the contractor in writing, following consultation with the regulating authorities.	Medium
27	Social aspects	Increase in available employment opportunities locally Increase in skills development programmes and therefore skill levels of the local communities	Social	Construction Operational	Medium to High {positive}	• Source the maximum number of employees from the local area, based on a skills matching strategy. • Implement skills development programmes in the areas where most job opportunities will be created. • Make available bursary opportunities to build skill capital in the region. • Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people. • Implement portable skills development programmes. • Implementation of programmes to minimize and mitigate the impact of downscaling and retrenchment.	Medium to High {positive}
28	Social aspects	Empowerment of local business through procurement and capacity building	Social	Construction Operational	Medium to High {positive}	• Establish a database of local businesses; utilize this database to establish partnerships between local and larger service providers as well as locally preferred work packages. • Consultation and feedback on results on a regular basis. • Implementation of capacity building programmes to	Medium to High {positive}

No	Activity	Potential Impact	Aspects Affected	Phase	Impact Significance (without mitigation)	Mitigation Type	Impact Significance (with mitigation)
						minimize and mitigate the impact of mine downscaling and closure.	
29	Residual (latent) impacts	Impact on ecosystem	Biodiversity Ecosystems	Permanent	High	• Since effective mitigation through avoidance, impact minimisation and rehabilitation is deemed unlikely to adequately limit the impact on the receiving ecology, it is deemed important that an ecological offset initiative be initiated to contribute to the conservation of the area.	High

The detail impact assessment is attached as Appendix 14.

12. SUMMARY OF SPECIALIST REPORTS

Table 14: Summary of Specialist Reports

Specialist study	Recommendations	Included (√)	EMPr Reference (No in Table 7)
Vegetation Diversity Assessment with specific reference to Threatened or Protected Species Environment Research Consulting, 2014	• Injudicious and unnecessary destruction of any natural vegetation should be avoided.	√	7
	• The habitat of Red Data, TOPS and protected plant species should be conserved as far as possible by means of: o Avoidance of unnecessary disturbance of natural vegetation during construction; o Transplanting specimens that are likely to survive and are in danger of being destroyed into similar localities in nature; or o Transplanting specimens into a nursery until it can be relocated or used in the rehabilitation phase. o *Note*: The necessary permits for relocation and/or destruction of the protected plant species should be obtained prior to taking such action.	√	2
	• A population study of Red Data, TOPS and other regionally or locally rare plant species such as *Schoenefeldia transiens* in the total mining lease area and beyond its boundaries will aid in the determination of the severity of the local and regional impact that activities with regards to the mine will have on the population size of these species in the area. If viable populations are found outside the areas that will be directly impacted by the mine these areas need to be actively conserved in order to conserve a viable, non-fragmented gene pool of these species in its original state. If no other viable populations are found the environmental management of the mine will have to find a way to conserve the currently known population at all costs.	√	5
	• The newly discovered population of *Schoenefeldia transiens* needs to be actively conserved and demarcated to ensure no planned or accidental anthropogenic disturbance can take place in its direct vicinity.	√	5
	• The ongoing eradication and control of declared weed and invader plant populations in and around the mine area and its associated infrastructure must be common practice as part of the general environmental management of the mine. A plan for the prevention of the establishment of new populations and the further spread of current populations should be developed and strictly enforced. In terms of the amendments to the regulations under CARA landowners are legally responsible for the control of invasive alien plants on their properties.	√	6
	• Wherever possible, any soil that can serve as a growth medium for plants must be stripped and stockpiled for future rehabilitation purposes and used as soon as possible after "harvesting" to ensure that seed sources does not become worthless due to decomposition of the seed.	√	1
	• Infrastructure near or over watercourses should be constructed in such a way that it is ensured that erosion will be kept to a minimum and that the natural flow of water is not restricted.	√	11, 12

Specialist study	Recommendations	Included (√)	EMPr Reference (No in Table 7)
	• Mineworkers and contractors to the mine should not be allowed to pollute or otherwise exploit the natural environment surrounding the mine in any way. This includes the removal of plants, collecting of firewood, etc.	√	7
	• Regular, effective biodiversity and veld condition monitoring by professionals should be conducted.	√	6
Faunal Specialist Report on TOPS, Avifauna, Herpetofauna and Mammalia Zoological Consulting Services, 2014	• No natural watercourses should be disturbed by the development.	X	N/A
	• Construction activities should be restricted to daylight hours to prevent any disturbance such as floodlights.	√	8
	• Fencing should be friendly to faunal species allowing for movement between areas. This can be achieved by applying culverts and an open mesh.	√	8
	• Construction personnel and employees should be informed of the Animal Protection Act No. 71 and encouraged not to harm any wildlife.	√	2, 8
	• Construction personnel and employees should undergo awareness training regarding fauna assemblages and the correct procedures to follow should fauna be found within the site. They should be encouraged not to harm any wildlife. They should also be informed of any policies and procedures applicable for fauna and the environment.	√	8
	• As much of the natural vegetation as possible should be left intact in order to maintain ecological corridors for the movement of faunal species.	√	8
	• A management plan to prevent the construction personnel and employees from harassing or poaching the faunal species should be developed and implemented.	√	8
	• The development area should be rehabilitated and re-vegetated as soon as possible using an appropriate rehabilitation plan which incorporates indigenous plant species.	√	8
	• Should the faunal species need to be removed from the study area, a faunal capture and relocation plan should be developed and implemented.	√	8
Wetland and Aquatic Ecological Assessment Scientific Aquatic Services, 2016	• The pioneer layer of the diversion berms within the drainage features should be porous to allow some baseflow through the system and allow recharge of downstream areas.	X	#Note below
	• Ensure that as far as possible all construction infrastructure is placed outside of wetland areas and streams. Permit only essential construction personnel within 32m of all riparian systems.	√	15
	• Access into wetland areas not directly affected by or falling within the proposed development footprint, particularly by vehicles, is to be strictly controlled. All vehicles should remain on designated roads with no indiscriminate driving through adjacent wetland areas.	√	15, 17
	• Limit the footprint area of the construction activity to what is absolutely essential in order to minimise the loss of clean water runoff areas and the concomitant recharge of streams in the area. The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas.	√	15
	• No use of clean surface water or any groundwater which potentially recharges the watercourses in the area should take place.	√	13

Specialist study	Recommendations	Included (√)	EMPr Reference (No in Table 7)
	• Very strict control of water consumption must take place and detailed monitoring must take place. All water usage must continuously be optimised.	√	13
	• Dewatering boreholes should be utilised to minimise the creation of dirty water in open pits and this clean water should be used to recharge the natural systems downstream/downgradient of the mining footprint area.	X	N/A
	• All hazardous chemicals must be stored on bunded surfaces; ensure that all spills are immediately cleaned up and treated accordingly.	√	19
	• Keep all demarcated sensitive zones outside of the construction area off limits during the construction phase of the development.	√	15
	• Implement alien vegetation control program within wetland areas with special mention of water loving tree species.	√	17
	• Edge effects of activities including erosion and alien/ weed control need to be strictly managed in these areas.	√	17
	• Very clear and well managed clean and dirty water separation must take place in line with the requirements of regulation GN704 of the NWA.	√	16
	• Pollution control dam should be off stream structures and not within the natural drainage system of the area, thereby minimising impacts loss of instream flow and downstream recharge.	√	Placement
	• Pollution control dam must be adequately designed to contain a 1:50 24 hour storm water event.	√	16 (GN704)
	• All pollution and attenuation dams must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs.	√	16
	• Ensure that all berms and/or stockpiles are fitted with hessian sheets to prevent excessive erosion and sedimentation.	√	12
	• Watercourses being augmented by the diversions must be monitored for erosion and incision.	√	12
	• Regular assessment of erosion and sedimentation must take place.	√	16
	• Excessive silt deposition downstream of the berms should be removed in the dry season taking care not to remove natural sediments in the system.	√	16
	• Ongoing aquatic ecological monitoring must take place on a 6 monthly basis by an SA RHP Accredited assessor, of the direct diversions and wetland around the berm as well as the Limpopo River before and after the confluences of the tributaries.	√	14
	• Monitor all affected riparian systems for moisture stress.	√	13
	• Monitor all potentially affected riparian zones for changes in riparian vegetation structure.	√	13
	• Revegetate all disturbed areas with indigenous tree species and make use of indigenous species with an affinity for riparian zones such as *Combretum imberbe*, *Faedherbia albida* and *Xanthocercis zambesiaca* as well as fig species.	√	17

Specialist study	Recommendations	Included (√)	EMPr Reference (No in Table 7)
Ecological Report: Identification of Rare and Protected Plants and Sensitive Areas Ysterberg Environmental Services, 2014	**Flood Protection Berm** • Protected trees such as *Boscia albitrunca* (Shepherds' tree) and *Combretum imberbe* (Leadwood) fall outside the route and demarcated side and care should be taken not to damage these trees. • Seedlings of *Philenoptera violacea* occur on the route and should be transplanted if necessary. This area is also near the drainage line that will have an impact on floods if blocked. • A sensitive aquatic system is also on the route and blocking of this system will damage the sponge area as well as block a natural flow of water. This should be prevented. • The location of route should be verified on ground to see if alternative areas exist to prevent flooding of mining activities. The large area of the rocky outcrop seems to be outside the flood plains. • The population of rare grass such as *Schoenefeldia transiensis* should be protected. **River Diversion Works** • Protected trees such as *Boscia albitrunca* (Shepherds' tree), *Sclerocarya birrea* (Marula), *Adansonia digitata* (Baobab) and *Combretum imberbe* (Leadwood) occur inside the route and some trees may fall just outside. Care should be taken not to damage these trees near the construction area. • Sensitive areas are the stream crossings in Routes 1, 2 and 3 and soils that are highly erodible. Mitigation will be necessary to prevent erosion. This will include possible negative impacts down streams as higher volume of water in smaller drainage lines will increase erosion risks. • The location of a population of large *Sclerocarya birrea* (start of Route 1) and rocky outcrops (start of route 3 and end of route 1) can be regarded as sensitive and this area should be avoided. Diversion is necessary. • The surveyor may plot the final route that can differ slightly from the GPS coordinates. If this is the case, a walk through will be needed to see if any protected trees occur where the route divert form the original route that was evaluated. • A holistic approach is necessary to evaluate the location flood plain Berm and impact of stream diversions to the low laying areas as additional flooding will have a negative impact on the system. These impacts should take sensitive areas also into account and a system approach will be needed.	√ √ X X √ √ √ √ √	3 2, 3 N/A N/A 5 2, 3 4 4 2, 3 4
Independent Review of Diversion Infrastructure Design Report and Flood Peak Evaluation WSM Leshika, 2016	• Recommendations for designs viz. the impact of high flow velocities; the need for adequate scour protection; erosion potential and sediment loads, as discussed in Section 9.1.2 of this report. • The gabion silt traps must be cleaned of silt on a regular basis, after the wet season.	√ √	11 16
Heritage Specialist Declaration: R&R Cultural Resource Consultants, 2015	• None specific to the Vele River Diversion Project		

Notes: N/A – Deemed not appropriate for or related to the specific activities.

[#]Allowing for a porous pioneer layer could impact on the integrity of the structure, and is therefore not feasible from an engineering perspective.

13. ENVIRONMENTAL IMPACT STATEMENT

The final layout plan overlain on the sensitive receptors is shown in Figure 28, and a large-scale copy attached in Appendix 1.

Below a summary of the positive and negative impacts identified for this layout, together with the impact significance thereof after the implementation of the mitigation measures proposed in Table 12.

Potential Impact	**Impact Significance (with mitigation)**
Impact on species of conservation concern	Medium
Impact on protected tree species in terms of the NFA and rare tree species	Medium
Impact on sensitive habitats riparian habitats and rocky outcrops	Low to Medium
Impact on rare grass species, *Sclerocarya birrea*	Low to Medium
Spreading of alien / invasive species	Low to Medium
Disturbance of natural vegetation	Low to Medium
Disturbance of faunal species	Low to Medium
Killing of animals and avifauna on the roads, especially nocturnal animals/birds	Medium
Loss of wetland and riparian habitat and ecological and socio-cultural service provision	Medium
Increased erosion and siltation due to increased flow velocities in receiving streams	Low to Medium
Impact on watercourses and wetland systems due to increase in erosion	Low to Medium
Reduced recharge resulting in moisture stressed systems, terrestrial vegetation encroachment and a change in species structure	Medium to High
Impact on the REC class of the augmented (receiving) systems	Low to Medium
Impact on sensitive wetland systems during construction	Low to Medium
Impact on water quality	Medium
Changes to Wetland Ecological and Socio-cultural Service Provision	Medium
Potential of flooding of downstream cultivated areas	Medium
Pollution as a result of accidental spillages of chemicals and hazardous material	Low
Increased dust levels as a result of construction	Low
Potential for noise impact during construction	Low
Visual intrusion, impacting on the sense of place	Medium to High
Impact due to nighttime lighting	Low to Medium
Flooding of heritage sites 24 and 25 (Eastern) and site 26 (Western), leading to the silting-up or severe erosion and destruction of the sites	Medium
Accidental damage to heritage sites in close proximity to construction works	Low
Recovery of sub-surface sites during construction	Medium
Increase in available employment opportunities locally Increase in skills development programmes and therefore skill levels of the local communities	Medium to High {positive}
Empowerment of local business through procurement and capacity building	Medium to High {positive}
Latent (residual) impact on ecosystem	High

Effective mitigation through avoidance, impact minimisation and rehabilitation is deemed unlikely to adequately limit the cumulative impact on the receiving ecology in respect of the full mining operation; the latent (residual) impact significance on this aspect remains high even with the mitigation proposed. It is therefore deemed important that an ecological offset initiative be initiated to contribute to the conservation of the area.

In this respect, a Biodiversity offset agreement (BoA) has been concluded between Coal of Africa Limited, the Department of Environmental Affairs and SANParks on on 14 October 2014, which seeks to maintain and protect the integrity of the Mapungubwe World Heritage Site. Projects include the following:

- Biodiversity Conservation
    - Land Acquistion and protection
- Cultural Heritage Management
    - Archaeological and Rock art sites restoration, rehabilition and development
    - Development of an Archaeological Research Centre and Artefact Storage
- Tourism Development
    - Mapungubwe National Park road network upgrade and maintenance

14. PROPOSED MANAGEMENT OBJECTIVES AND IMPACT MANAGEMENT OUTCOMES

The proposed management objectives for the Vele River Diversion Project are to:

- Minimise the loss of ecological and riparian habitats;
- Limit the increase of erosion and downstream sedimentation;
- Prevent any impacts on threatened and/or protected fauna and flora species and species of conservation concern;
- Mitigate the potential ecosystem degradation through ecosystem corridor migration maintenance;
- Minimise flooding and/or stream flow disruption during heavy rains;
- Prevent surface and groundwater pollution;
- Re-establish indigenous vegetation in disturbed and rehabilitated areas; and
- Prevent any impact on identified and unidentified heritage and cultural resources.

The following management outcome for the proposed activities is recommended:

- The wetland and three systems to be diverted should be maintained to have a REC of a Class C; and
- The features into which the systems will be diverted (augmented systems) should retain a Class A status.

Structures	VEGRAI Ecostatus	Wetland PES Classes	EIS Class	REC Class
Floodplain wetland	D	C/D	B	C
Diverted systems	A	A	C	C
Augmented systems	A	A	C	A

Appropriate monitoring should be implemented to ensure compliance to the management objectives and outcome as proposed.

15. ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

It is essential that all the mitigation measures as listed in Table 13 be implemented. The following are considered critical to minimise the negative impacts associated with the proposed activities:

- ***Design***
    - Cross-sectional gabions structures to be constructed within the diversion channels to reduce flow velocities, minimize erosion, attenuate flow velocities and act as silt traps.
    - Construction of Land Access Culvert to ensure safe access to irrigation fields.
    - In the event that regular flooding is experienced, the necessary attenuation structures must be implemented in consultation with downstream land users.
- ***Pre-construction activities***
    - The final routes should be verified on ground to minimize the impact on protected and rare plant species.
    - A protected and RDL floral relocation, monitoring and management plan must be designed and implemented by a suitably qualified specialist and should address all species which can be successfully rescued and relocated.
- ***Construction activities***
    - Construction activities should be restricted to daylight hours to prevent any disturbance such as floodlights.
    - Fencing should be friendly to faunal species allowing for movement between areas. This can be achieved by applying culverts and an open mesh.
    - A qualified archaeologist shall monitor construction activities until completion thereof.
- ***Monitoring & Maintenance***
    - Ongoing aquatic ecological monitoring must take place on a 6 monthly basis by an SA RHP Accredited assessor, of the direct diversions and wetland around the berm as well as the Limpopo River before and after the confluences of the tributaries.
    - Monitor all affected riparian systems for moisture stress.
    - Monitor all potentially affected riparian zones for changes in riparian vegetation structure.
    - Ongoing eradication and control of declared weed and invader plant populations in and around the mine area and its associated infrastructure. The alien vegetation control program should be expanded to the wetland areas with special mention of water loving tree species.

- Regular assessment of erosion and sedimentation must take place.
- The gabion silt traps must be cleaned of silt on a regular basis, after the wet season.
- Excessive silt deposition downstream of the berms should be removed in the dry season taking care not to remove natural sediments in the system.
- Regular monitoring of heritage sites 24-26 for early detection of any damage because of flooding and/or sedimentation.

16. DESCRIPTION OF ASSUMPTIONS, UNCERTAINTIES AND KNOWLEDGE GAPS

Although all possible measures were undertaken to ensure all wetland features, riparian zones and drainage lines were assessed and delineated, some smaller ephemeral drainage lines may have been overlooked. However, if the watercourse map is consulted during the planning phases of the mine the majority of wetland habitat considered sensitive and of importance will be safeguarded (SAS, 2016).

Due to the majority of drainage features being ephemeral within the region, very few areas were encountered that displayed more than one wetland characteristic as defined by the DWA (2005) method. As a result, identification of the outer boundary of temporary wetland zones and riparian zones proved difficult in some areas and in particular in the areas where wetland conditions and riparian zones are marginal. Therefore, the wetland delineation as presented in this report is regarded as a best estimate of the wetland boundary based on the site conditions present at the time of assessment (SAS, 2016).

Wetlands and terrestrial areas form transitional areas where an ecotone is formed as vegetation species change from terrestrial species to facultative wetland species. Within this transition zone some variation of opinion on the wetland or riparian zone boundary and the occurrence of a true riparian zone may occur. However, if the DWA 2005 method is followed, all assessors should get largely similar results (SAS, 2016).

Aquatic, wetland and riparian ecosystems are dynamic and complex. Some aspects of the ecology of these systems, some of which may be important, may have been overlooked. The findings of this study were largely based on a single site visit undertaken late in the low flow season at a time when extremely low flows were being experienced. A more reliable assessment would have required that seasonal assessments take place with at least one assessment in the high flow season also undertaken (SAS, 2016).

The final alignment of River Diversions 1 and 3 have been revised since the TOPS surveys performed by Ysterberg Environmental Services in 2014. The final routes must still be verified in the field and will depend on the lay of the land, as well as the position of large protected tree species. A further TOPS survey along the final routes is therefore proposed.

17. REASONED OPINION AS TO WHETHER THE ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

To be concluded once comments are received on Consultation BAR.

18. PERIOD FOR WHICH ENVIRONMENTAL AUTHORISATION IS REQUIRED

The Environmental Authorisation is required for a minimum period of 20 years.

It must be noted that the Aquatic Specialist recommended that the river diversion systems be installed permanently and not be decommissioned with the mining activities (SAS, 2016). The same would apply for the Flood Protection Berm.

19. UNDERTAKING

19.1 Undertaking regarding correctness of information

I, Maria Catharina Eksteen, herewith undertake that the information provided in the foregoing report is correct and that the comments and inputs from stakeholders and IAPs have been correctly recorded in the report.

Signature of EAP

Date:

19.2 Undertaking regarding level of agreement

I, Maria Catharina Eksteen, herewith undertake that the information provided in the foregoing report is correct and that the level of agreement with IAPs and stakeholders has been correctly recorded and reported herein.

Signature of EAP

Date:

20. FINANCIAL PROVISION

The 2015 Financial Provision estimation is attached as Appendix 12 (ENVASS, 2015).

The total unscheduled closure liability was calculated to be R50.526 million inclusive of VAT.

The current financial provision provided with the DMR is R62 million.

Please note that this report is deemed of confidential nature and will not be made available to the general public, only to the relevant authorities.

21. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

21.1 Compliance with the provisions of Sections 24(4)(a) and (b) read with Section 24(3)(a) and (7) of the NEMA

21.1.1 Impact on the Socio-Economic Conditions of any directly affected person

Refer to Section 9.5.2.1 that describes the social impacts and benefits associated with the report. Section 9.5.1.4 deals with the potential flooding impacts on downstream land users.

21.1.2 Impact on any National Estate referred to in Section 3(2) of the NHRA

Refer to Section 9.5.2.2 of this report.

21.2 Other matters required in terms of Sections 24(4)(a) and (b) of the Act

This report adheres to the requirements stipulated in the NEMA and the recently published EIA Regulations, 2014. The DMR guidelines were used as framework.

22. APPENDICES

Appendix 1: Locality Plan (Master Plan)

Appendix 2: EAP Curriculum Vitae

Appendix 3: Public Participation Records

Appendix 4: Engineering Design Reports – Element Consulting Engineers (May 2015 & February 2016) and PG Consulting (PCD design criteria)

Appendix 5: Hydrological Review – WSM Leshika Consulting (March 2016)

Appendix 6: Wetland and Aquatic Ecological Assessment – Scientific Aquatic Services (March 2016)

Appendix 7: Vegetation Diversity Assessment with specific reference to Threatened or Protected Species – Environment Research Consulting (2014)

Appendix 8: Faunal Specialist Report on TOPS, Avifauna, Herpetofauna and Mammalia – Zoological Consulting Services (2014)

Appendix 9: Ecological Report: Identification of Rare and Protected Plants and Sensitive Areas – Ysterberg Environmental Services (2014)

Appendix 10: Heritage Specialist Declaration: R&R Cultural Resource Consultants (2015)

Appendix 11: Groundwater Specialist Declaration – WSM Leshika Consulting (2015)

Appendix 12: Mine Closure and Liability Report – Environmental Assurance (March 2015)

Appendix 13: Socio-Economic Baseline Report (2016)

Appendix 14: Detail Risk Impact Assessment (EAP, 2016)