DRAFT
Aquatic Specialist Assessment

CES

ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

EDENDALE QUARRY, R56, MATATIELE LOCAL MUNICIPALITY, EASTERN CAPE PROVINCE.

DRAFT AQUATIC SPECIALIST ASSESSMENT

Prepared for:

SANRAL
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
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Prepared by:

CES
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EAST LONDON

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REVISIONS TRACKING TABLE

CES Report Revision and Tracking Schedule

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	DRAFT AQUATIC BIODIVERSITY SPECIALIST ASSESSMENT		

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Contents of the Specialist Report

The contents of this specialist report complies with the legislated requirements as described in the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (GN R. 320 of 2020).

SPECIALIST REPORT REQUIREMENTS FOR AQUATIC BIODIVERSITY ACCORDING TO GN R. 320			SECTION OF REPORT
2.1	The assessment must be prepared by a specialist registered with the South African council for natural Scientific Professionals (SACNASP), with expertise in the field of aquatic sciences.		
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.		
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:		
	2.3.1	A description of the aquatic biodiversity and ecosystems on the site, including: (a) Aquatic ecosystem types; and (b) Presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;	Chapter 5
	2.3.2	The threat status of the ecosystem and species as identified by the screening tool	Chapter 5
	2.3.3	An indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area of sub catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); and	Chapter 5
	2.3.4	A description of the ecological importance and sensitivity of the aquatic ecosystem including: (a) The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and (b) The historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).	Chapter 6
2.4	The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.		Chapter 6
2.5	Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:		Chapter 8
	2.5.1	Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Chapter 5
	2.5.2	Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	Chapter 5

SPECIALIST REPORT REQUIREMENTS FOR AQUATIC BIODIVERSITY ACCORDING TO GN R. 320			SECTION OF REPORT
	2.5.3	How with the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This much include: (a) Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); (b) Will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement meandering river mouth or estuary, flooding or sedimentation patterns); and (c) To what extent will the risks associated with water uses and related activities change;	Chapter 8
	2.5.4	How will the proposed development impact on the functioning of the aquatic feature? This must include: (a) Base flows (e.g. too little or too much water in terms of characteristics and requirements of the system); (b) Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over-abstraction or instream or off-stream impoundment of a wetland or river); (c) Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland); (d) Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); (e) Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and (f) The loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);	Chapter 8
	2.5.5	How will the proposed development impact on key ecosystems regulating and supporting services especially: (a) Flood attenuation; (b) Streamflow regulation; (c) Sediment trapping; (d) Phosphate assimilation; (e) Nitrate assimilation; (f) Toxicant assimilation; (g) Erosion control; and (h) Carbon storage?	Chapter 8
	2.5.6	How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Chapter 8

SPECIALIST REPORT REQUIREMENTS FOR AQUATIC BIODIVERSITY ACCORDING TO GN R. 320			SECTION OF REPORT
2.6	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: (a) Size of the estuary; (b) Availability of sediment; (c) Wave action in the mouth; (d) Protection of the mouth; (e) Beach slope; (f) Volume of mean annual runoff; and (g) Extent of saline intrusion (especially relevant to permanently open systems).		N/A
2.7	The findings of the specialist assessment must be written up in a Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:		
	2.7.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page ii
	2.7.2	A signed statement of independence by the specialist;	Section 1.2
	2.7.3	A statement of the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2.4
	2.7.4	The methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Chapters 4 and 5
	2.7.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 2.4
	2.7.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Section 9.1.3
	2.7.7	Additional environmental impacts expected from the proposed development;	Chapter 8 and Section 9.1
	2.7.8	Any direct, indirect and cumulative impacts of the proposed development on site;	Chapter 8 and Section 9.1
	2.7.9	The degree to which the impacts and risks can be mitigated;	Chapter 8
	2.7.10	The degree to which the impacts and risks can be reversed;	
	2.7.11	The degree to which the impacts and risks can cause loss of irreplaceable resources;	
	2.7.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	Chapter 6
	2.7.13	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Chapter 8 and Section 9.2
	2.7.14	A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate;	N/A
	2.7.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Chapter 9
	2.7.16	Any conditions to which this statement is subjected.	Section 9.2
2.8	The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report,		✓

SPECIALIST REPORT REQUIREMENTS FOR AQUATIC BIODIVERSITY ACCORDING TO GN R. 320		SECTION OF REPORT
	including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	
2.9	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Refer to Section1.2

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LIST OF ACRONYMS AND ABBREVIATIONS

ADU	Animal Demography Unit
BA	Basic Assessment
BAR	Basic Assessment Report
BSP	Biodiversity Spatial Plan
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CITES	Convention on International Trade in Endangered Species
CR	Critically Endangered
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries
DMR	Department of Minerals Resources
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
ECBCP	Eastern Cape Biodiversity Conservation Plan
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
GIS	Geographical Information System
GN	Government Notice
Ha	Hectares
HGM	Hydro-geomorphic
IBA	Important Bird Area
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
LC	Least Concern
LM	Local Municipality
NBA	National Biodiversity Assessment
NBF	National Biodiversity Framework
NBSAP	National Biodiversity Strategy and Action Plan
NEM:BA	National Environmental Management: Biodiversity Act
NEM:PAA	National Environmental Management: Protected Areas Act
NEMA	National Environmental Management Act
NFA	National Forest Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
NBA	National Biodiversity Assessment
NT	Near Threatened
NWA	National Water Act
NWCS	National Wetland Classification System
PA	Protected Area
PES	Present Ecological State
PNCO	Provincial Nature Conservation Ordinance

POSA	Plants of Southern Africa
PPP	Public Participation Process
SANBI	South African National Biodiversity Institute
SANLC	South African National Land-Cover
SANRAL	The South African National Roads Agency SOC Limited
SCC	Species of Conservation Concern
TOPS	Threatened or Protected Species
VU	Vulnerable
WMA	Water Management Area
WUA	Water Use Authorisation

1 PROJECT TEAM

1.1 DETAILS AND EXPERTISE OF THE SPECIALISTS

Ms Hlumela Mduduma *(Role: Aquatic Specialist)*

Hlumela is an environmental consultant. She holds a Master's Degree in Geology (Hydrogeology) from the University of KwaZulu- Natal. In addition, Hlumela holds a BSc degree with majors in Geology and Chemistry and a BSc Honours degree in Geology from the University of Fort Hare. Hlumela's Masters dissertation focused on the Hydrochemical Characterization of the Northern KwaZulu-Natal historic coal mining districts, where she investigated the success of the governments' groundwater rehabilitation strategy on northern KwaZulu-Natal's abandoned coal mines. She has assisted in a number of aquatic as well as vegetation specialist studies and has experience in a number of Water Use license Related Applications, Basic Assessment Reports, Environmental Management Plans as well as Public Participation Processes. Hlumela is interested in all aspects of environmental quality management.

Ms Jaclyn Smith *(Role: Report Review)*

Jaclyn is an environmental specialist with a BSc with majors in Environmental Science and Geology from Rhodes University, as well as a BSc (Hons) in Geology from Nelson Mandela Metropolitan University. Jaclyn's honours dissertation looked at the sediment disturbance depth over two beaches in the Port Elizabeth. Jaclyn has over 7 years' experience as an environment consultant and has undertaken various environmental impact studies. She has undertaken and assisted aquatic specialists with a number of aquatic and wetland impact assessments.

Wetland Training: Rhodes University, Tools for Wetland Assessment (certified competent Wetland Assessment Practitioner). Jaclyn is registered with the South African Council of Natural Scientific Professionals (SACNASP).

1.2 DECLARATION

Role on Study Team	Declaration of independence
Report production	• I, Hlumela Mduduma, declare that, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amended Environmental Impact Assessment Regulations, 2017; • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity;

	• I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this report are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act. ..... 18 March 2021 ..... SIGNED DATE
Report Reviewer & Final Sign-off	• I, Jaclyn Smith, declare that, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amended Environmental Impact Assessment Regulations, 2017; • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this report are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act. 18 March 2021 .... SIGNED DATE

2 INTRODUCTION

2.1 PROJECT DESCRIPTION AND LOCATION

The South African National Roads Agency SOC Limited (SANRAL) is proposing to develop a weathered gravel quarry adjacent to an existing privately-owned quarry on Edendale Farm 185, between the towns of Cedarville and Matatiele, on the R56 within the Matatiele Local Municipality (Figure 2.1). The purpose of the quarry is to provide SANRAL with weathered gravel (sandstone) material for the fill and subbase layer works associated with the upgrading of the R56 between Matatiele and Cedarville. The existing commercial quarry is situated on a dolerite intrusion and does not produce the weathered gravel material that is required. As such, SANRAL intend to develop their own quarry.

This site was chosen due to the suitability of the material, the landowner's willingness to grant permission for a second quarry on their land, as well as the locality, which is adjacent to an existing quarry (Figure 2.2) thereby minimising the overall impacts of developing a quarry on a greenfields site. The commercial quarry operates under a mining right that was granted by the Department of Minerals Resources (DMR) in 2015. The road upgrade was subject to a separate environmental assessment process, which was authorised by the National Department of Environment, Forestry and Fisheries (DEFF), previously known as the Department of Environmental Affairs (DEA), in 2016.

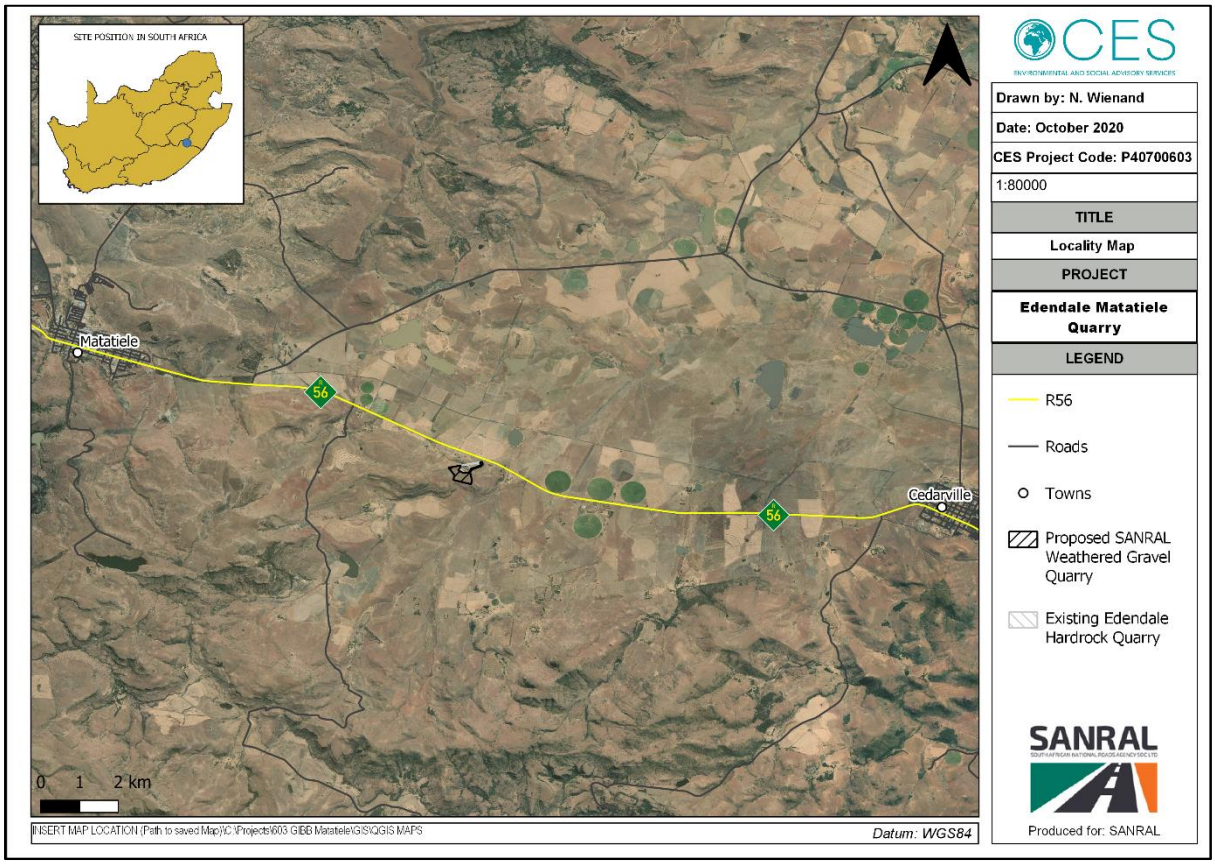

Figure 2-1 Locality Map of the proposed Edendale Quarry

CES has been appointed by GIBB Engineers, on behalf of SANRAL, to apply for Environmental Authorisation (EA) in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998 and subsequent amendments) Environmental Impact Assessment (EIA) Regulations (2014 and

subsequent amendments) by means of conducting a Basic Assessment (BA) Process, inclusive of the relevant specialist studies. This Aquatic Biodiversity Specialist Assessment forms part of the BA Process for the proposed Edendale Quarry.

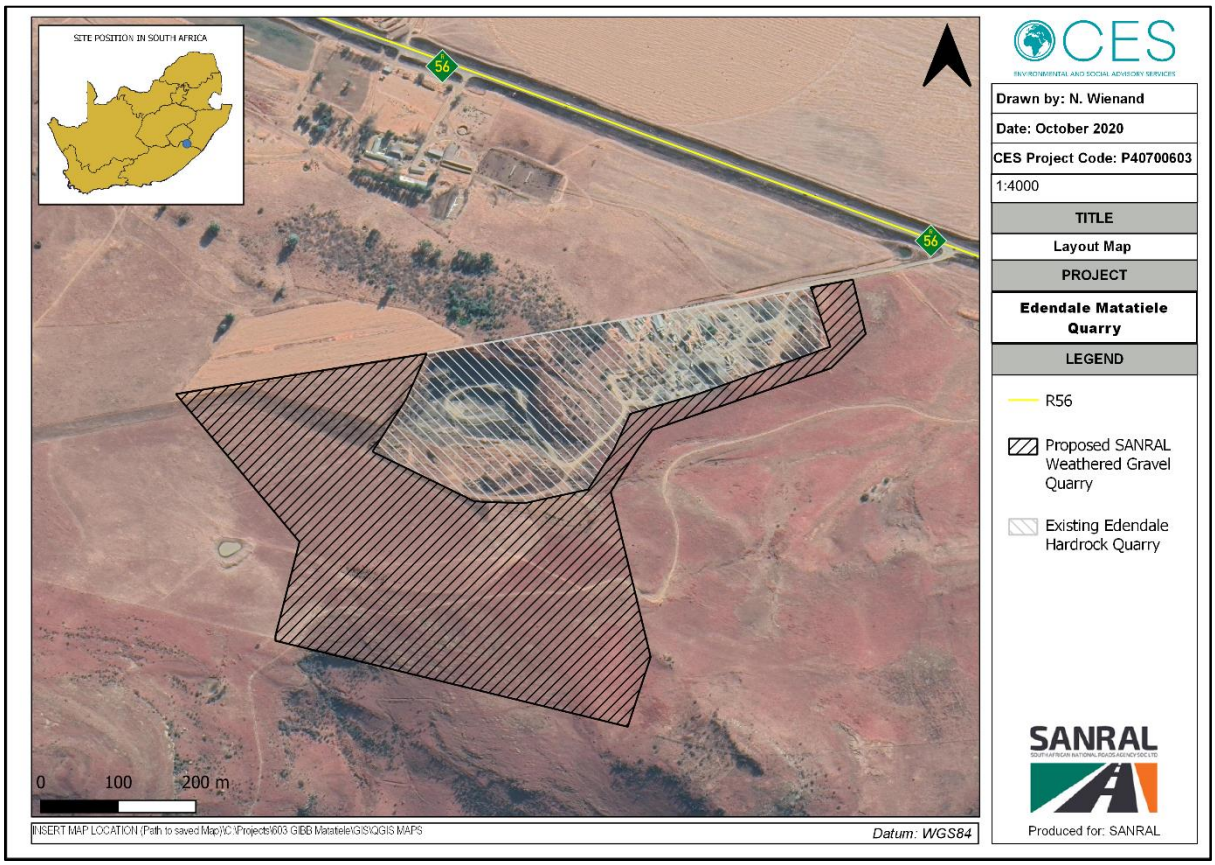

Figure 2-2 Layout Map of the proposed Edendale Quarry.

2.2 Site Sensitivity Verification and Minimum Report Content Requirements

In terms of the Protocol for the Specialist Assessment and Minimum Reporting Content Requirements for Environmental Impacts on Aquatic Biodiversity (GN R. 320 of 2020), prior to the commencement of a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool, must be confirmed by undertaking a site sensitivity verification. The results of the screening tool, together with the site sensitivity verification, ultimately determines the minimum report content requirements.

According to the results of the Screening Report generated for the proposed Edendale Quarry site, the relative aquatic biodiversity theme sensitivity is classified as VERY HIGH due to the site occurring within a Critical Biodiversity Area (CBA) (ECBCP, 2019), Freshwater Ecosystem Priority Area Quaternary Catchments and a NPAES Focus Area for land-based protected areas expansion. CBAs are terrestrial and aquatic features in the landscape that are critical for the conservation of biodiversity and the maintenance of ecosystem functioning. The preliminary desktop assessment of the site, together with the site visit conducted on the 13th of October, verified the findings of the Screening Report as the site, although invaded and over grazed in areas, still boasts indigenous vegetation and supports valuable ecological process, critical for the provision of ecosystem services. According to Section 3 (1)

of GN R. 320, '*an applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "very high sensitivity" for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment*'.

Due to the high sensitivity rating of the site, a full **Aquatic Biodiversity Specialist Assessment** (this report) has been undertaken as part of the BA Process for the proposed Edendale Quarry.

2.3 Objectives and Terms of Reference

The main objective of this report is to determine the baseline aquatic ecological environment of the study site and to assess the potential impacts the proposed development may have on the terrestrial habitat.

The following terms of reference were used for the objectives of this study:

- Identify the presence of wetlands and riparian habitats within the general project area;
- Delineate wetlands and the riparian habitat in areas affected by the development;
- Provide a general description of the status of the surface water resources of the area according to published literature;
- Assess the state and sensitivity of nearby watercourses (including wetlands);
- Provide Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) information of affected and nearby watercourses (based on desktop PES and EIS data, if available);
- Provide a sensitivity map and define and map No-Go areas;
- Provide an assessment of the potential direct, indirect and cumulative impacts resulting from the proposed development on any watercourses during construction and operation. This includes the scope, scale and significance of impacts;
- Provide recommendations and mitigation measures that may be applied to reduce impacts;
- Identify rehabilitation measures that can be applied at completion of construction;
- Describe the implications of the No-Go option;
- Identify any fatal flaws associated with the project;
- Describe any assumptions made and any uncertainties or gaps in knowledge; and
- Provide any recommendations on any future specialist inputs required.

2.4 Quality And Age Of Base Data

The quality of the base data used for this specialist report has been described in Table 2.1 below. It should be noted that only datasets and base data relevant to the study area and affected environmental features have been discussed below.

Table 2-1 Base data used and quality thereof

BASE DATASET	DATA AGE	DATA QUALITY
Aquatic CBA Classification according to the Eastern Cape Biodiversity Conservation Plan (ECBCP)	2019	Aquatic CBAs were identified on the basis of sub-quaternary catchments, addressing the linkages between catchments, important rivers and sensitive estuaries. Priority areas were

		identified through a systematic conservation planning analysis.
Department of Water and Sanitation (DWS) Desktop Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) Model.	2014	A combination of expert knowledge and available information on SQR level were used to derive the Desktop PES and EIS model. The objective of the PESEIS is to provide desktop level information on ecological issues as it relates to the protection and management of SQRs. For management purposes this refers specifically to the consideration of ecological reserve issues, water use licensing issues and EWRM (including the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP) activities) and the determination of priorities for monitoring. The PESEIS relates specifically to Rivers (Instream & Riparian aspects) and limited aspects of Valley Bottom Wetlands. Endorheic Wetlands are not addressed. The DWS model has been compiled by the RQIS-RDM; a Planning and Information Branch of the DWS and is the most up to date data set available.
Department of Water Affairs and Forestry: Level 2 River Ecoregional Classification System for South Africa, Lesotho and Swaziland.	2007	The delineation of Ecoregions for SA has been derived from terrain and vegetation data, with altitude, rainfall, runoff variability, air temperature, geology and soil data. The data has been compiled by the RQIS; a Planning and Information Branch of the DWS. DWS will not accept any responsibility for the accuracy of this data -- the outlines may change as the owner incorporates more data sets. Note that transition zones between regions are about 5km wide. The Ecoregions Level 2 document is still in draft form.
The National Freshwater Ecosystem Priority Areas (NFEPA) project	2011-2014	NFEPA was originally completed in 2011 and was updated in 2014. FEPAs were determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. FEPAs were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries, described in detail in

		the NFEPA Technical Report. The data was compiled by a large number of authors/specialists for the Water Research Commission of SA and is the most recent data available.
The National Wetland Classification System (NWCS)	2017	The NWCS uses hydrological and geomorphological traits to distinguish the direct factors that influence wetland function. This is presented as a 6 tiered structure with four spatially nested primary levels that are applied in a hierarchical manner between different wetland types on the basis of these direct factors. This Classification system was undertaken by SANBI together with specialists and stakeholders. This data is the most recent data available.
DWAF Wetland Delineation	2005	The DWAF (2005) guidelines for *"a practical field procedure for delineation of wetlands and riparian areas"* are recommended in Gazette No. 19182, Notice No. 1091 of the National Water Act, 1998. This guideline explains the field indicators and methods for determining whether an area is a wetland or a riparian area, and how to find its boundaries.
WET-Health Wetland Management Series and WET-Ecoservices	2007, 2008	WET-Ecoservices (*Kotze et al., 2008*) is used to assess the goods and services that individual wetlands provide, thereby aiding informed planning and decision making. The tool provides guidelines for scoring the importance of a wetland in delivering each of 15 different ecosystem services.
National Biodiversity Assessment Wetland Map 5 (NBA) (SANBI, 2018)	2018	NBA (2018) provides information on the ecosystem types and pressures on wetland and river systems. It builds on and improves spatial data available for river and wetland systems. It provides the National Wetland Map 5 (NVM 5) which provides improvements to the NWM 4 from NFEPA (2014).
South Africa's Strategic Water Source Areas (CSIR)	2013	CSIR provides mapping of the strategic water source areas in South Africa. These are areas that provide a disproportionate amount of mean annual runoff to a geographical region and have the potential to contribute significantly to overall water quality and supply.

2.5 Assumptions and Limitations

This report is based on the information available at the time of compiling the report and, as a result, is subject to the following assumptions and limitations:

- The report is based on the project description and the site layout provided to CES by the Proponent;
- Descriptions of the natural and social environments are based on limited fieldwork and available literature. However, the time available in the field was sufficient to provide enough information to make a decision on the status of the affected area;
- The report is based on a combination of desktop and on-site analysis;
- Site-visits were undertaken during the dry and wet seasons;
- Sampling was carried out at two stages in the annual or seasonal cycle – in this case late winter and mid-summer. Therefore, it is possible that some spring flowing plant species may have gone undetected;
- A separate Terrestrial Biodiversity Impact Assessment was undertaken as part of the BA Process for the proposed Edendale Quarry. As such, this report does not cover aspects relating to the terrestrial environment of the study site; and
- The information, as presented in this document, only has reference to the study site as indicated on the project maps. Therefore, this information cannot be applied to any other area without a detailed investigation being undertaken.

2.6 Public Consultation

The Public Participation Process (PPP) followed to date has been described in detail in the Draft Basic Assessment Report. The Draft BAR, together with the Draft Aquatic Biodiversity Specialist Assessment Report, will be made available for a 30-day commenting and public review period. Any comments received on the Draft Aquatic Biodiversity Specialist Assessment Report will be included in the Final Aquatic Biodiversity Specialist Assessment Report.

3 Relevant Legislation

Environmental legislation relevant to the biodiversity assessment of the proposed development is summarised in Table 3-1 below. Biodiversity Plans and Programmes are discussed in Chapter 5 where they are used to describe the desktop ecological conditions of the study area.

Table 3-1 Environmental legislation considered in the preparation of the Aquatic Biodiversity Specialist Assessment for the proposed Edendale Quarry.

LEGISLATION/POLICY	DESCRIPTION
The Constitution (Act 108 of 1996)	The Constitution of the Republic of South Africa is the supreme law of the land. As a result, all laws, including those pertaining to this Management Plan, must conform to the Constitution. The Bill of Rights - Chapter 2 of the Constitution, includes an environmental right (Section 24) according to which, everyone has the right: *a) To an environment that is not harmful to their health or well-being; and*

LEGISLATION/POLICY	DESCRIPTION
	b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that: *i. Prevent pollution and ecological degradation;* *ii. Promote conservation; and* iii. *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*
National Environmental Management Act (NEMA) (Act 108 of 1998), and its subsequent amendments. NEMA Amended EIA Regulations (GNR. 326) (2017)	Relevant Sections of the Act: Section 2, 23, 24, 24-1, 28-33 • Application of the NEMA principles (e.g. need to avoid or minimise impacts, use of the precautionary principle, polluter pays principle, etc.) • Application of fair decision-making and conflict management procedures are provided for in NEMA. • Application of the principles of Integrated Environmental Management and the consideration, investigation and assessment of the potential impact of existing and planned activities on the environment; socio-economic conditions; and the cultural heritage. NEMA introduces the duty of care concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal prosecution and may lead to the prosecution of managers or directors of companies for the conduct of the legal persons. In addition, NEMA introduced a framework for environmental impact assessments, the Amended EIA Regulations (2017). The NEMA EIA Regulations aim to avoid detrimental environmental impacts through the regulation of specific activities that cannot commence without prior environmental authorisation. Authorisation either requires a Basic Assessment or a Full Scoping and Environmental Impact Assessment, depending on the type of activity. These assessments specify mitigation and management guidelines to minimise negative environmental impacts and optimise positive impacts.
National Environmental Management: Biodiversity Act (Act 10 of 2004), and its subsequent amendments. Threatened Ecosystems Threatened and Protected Species Alien Invasive Species Regulations, 2014.	The National Environmental Management: Biodiversity Act (NEMBA), No. 10 of 2004, aims to assist with the management and conservation of South Africa's biological diversity through the use of legislated planning tools. These planning tools include the declaration of bioregions and the associated bioregional plans as well as other mechanisms for managing and conserving biodiversity. The objectives of the Act include inter alia: To provide for: • The management and conservation of biological diversity within the Republic and of the components of such biological diversity; • The use of indigenous biological resources in a suitable manner; • The fair and equitable sharing of benefits arising from bio-prospecting of genetic material derived from indigenous biological resources; and • To give effect to ratified international agreements relating to biodiversity which are binding on the Republic. • To provide for co-operative governance in biodiversity management and conservation; and • To provide for a South African National Biodiversity Institute to assist in achieving the objectives of the Act. In addition to this, Sections 50-62 of the Act provide details relating to the protection of threatened or protected ecosystems and species, while Sections 63-77 of the Act provide details relating to alien and invasive species with the

LEGISLATION/POLICY	DESCRIPTION
	purpose of preventing their introduction and spread, managing, controlling and eradicating of alien and invasive species. The NEMBA Alien and Invasive Species List (Government Notice 599 of 2014) lists Alien and Invasive species that are regulated by the NEMBA Alien and Invasive Species Regulations (Government Notice 98 of 2014).
Conservation of Agricultural Resources Act, (Act 43 of 1983).	The Conservation of Agricultural Resources Act, No. 43 of 1983 aims to control over-utilisation of the natural agricultural resources to promote the conservation of soil, water sources and vegetation through the combat of weeds and invader plants. Regulations 15 and 16 under this Act, which relate problem plants were amended in March 2001. *It should be noted that the CARA regulations for the legal obligations regarding alien invasive plants in South Africa have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which was promulgated on 1 October 2014. However, CARA has not been repealed and is still included as a reference point to use in terms of the management of AIS where certain species may not be included in the NEM:BA AIS list.*
National Forest Act (Act 84 of 1998) and its subsequent amendments.	The NFA provides the legal framework for the protection and sustainable use of South Africa's indigenous forests. Any area that has vegetation which is characterised by a closed and contiguous canopy and under storey plant establishment is defined as a 'forest' and as a result falls under the authority of the Department of Environmental Affairs, Forestry and Fisheries (DEFF): Forestry sector.
National Water Act (Act 36 of 1998)	The purpose of this Act (Section 2) is to ensure that the Nation's water resources are protected, used, developed, conserved and controlled in ways that take into account, including: (a) Promoting sustainable use of water (b) Protection of aquatic and associated ecosystems and their biological diversity (c) Reducing and preventing pollution and degradation of water resources <u>Protection of Water Resources (Sections 12-20)</u> Provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality. With respect to the establishment of water quality objectives, objectives may relate to (Section 13): • the presence and concentration of particular substances in the water • the characteristics and quality of the water resource and the in-stream and riparian habitat • the characteristics and distribution of aquatic biota • the regulation and prohibition of in-stream and land-based activities which may affect the quantity and quality of the water resources <u>Section 19 deals with Pollution Prevention (Part 4)</u> The person (including a municipality) who owns, controls occupies or uses the land in question, is responsible for taking reasonable measures to prevent pollution of water resources. If such measures are not taken, the catchment management agency concerned, may itself do whatever is necessary to prevent the pollution or remedy its effects and recover all reasonable costs from the persons responsible for the pollution. The 'reasonable measures' which have to be taken may include measures to:

LEGISLATION/POLICY	DESCRIPTION
	• Cease, modify or control any act or process causing the pollution; • Comply with any prescribed waste standard or management practice; • Contain or prevent the movement of pollutants; • Eliminate any source of the pollution; • Remedy the effects of the pollution; and • Remedy the effect of any disturbance to the bed and banks of a watercourse. With respect to pollution of rivers, the following definition is relevant when considering the potential impacts of development on water resources. Pollution may be deemed to occur when the following are affected: • the quality, pattern, timing, water level and assurance of instream flow; • the water quality, including the physical, chemical and biological characteristics of the water; • the character and condition of the in-stream and riparian habitat; • the characteristics, condition and distribution of the aquatic biota. The Act defines 'instream habitat' as including the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse. <u>Riparian Ecosystems</u> 'Riparian habitat' includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species and physical structure distinct from those of adjacent land areas. <u>Section 21 deals with the Use of Water</u> Section 21 (a-k) describes activities defined as a water use under the Act. These activities may only be undertaken subject to the application for, and issue of, a water use licence.
National Environmental Management: Protected Areas Amendment Act (No. 31 of 2004)	The purpose of this Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The objectives of this Act are- • To provide, within the framework of national legislation, including the National Environmental Management Act, for the declaration and management of protected areas; • To provide for co-operative governance in the declaration and management of protected areas; • To effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity; • To provide for a representative network of protected areas on state land, private land and communal land; • To promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas; • To promote participation of local communities in the management of protected areas, where appropriate; and • To provide for the continued existence of South African National Parks.
Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on	This Protocol provides the criteria for the assessment and reporting of impacts on terrestrial and aquatic biodiversity for activities requiring Environmental Authorisation (EA). The assessment and minimum reporting requirements outlined in the Protocol are based on the outcomes of the environmental sensitivity identified by the national web based Environmental Screening Tool.

LEGISLATION/POLICY	DESCRIPTION
Terrestrial and Aquatic Biodiversity (GN R. 320 March 2020)	The relative sensitivity of the site, as identified by the national web-based Screening Tool and the site sensitivity verification, ultimately determines the minimum report content requirements for environmental impacts on aquatic and terrestrial biodiversity. For a site identified as being 'very high sensitivity' in terms of aquatic and/or terrestrial biodiversity, an Aquatic and/or Terrestrial Biodiversity Specialist Assessment must be undertaken, respectively, while for a site identified and confirmed as 'low sensitivity' in terms of aquatic and/or terrestrial biodiversity, an Aquatic and/or Terrestrial Biodiversity Compliance Statement can be compiled.
Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species (GN R. 1150 October 2020)	The Protocol provides the criteria for the assessment and minimum report content requirements for impacts on terrestrial plant species for activities requiring Environmental Authorisation (EA) and replaces the requirements outlined in Appendix 6 of the EIA Regulations. The assessment and minimum reporting requirements outlined in the Protocol are based on the outcomes of the environmental sensitivity identified by the national web based Environmental Screening Tool and the site sensitivity verification undertaken by a qualified Environmental Assessment Practitioner (EAP) or a specialist.

4 Assessment Methodology

4.1 Aquatic Assessment Approach

The aim of this assessment is to identify the aquatic importance of the rivers affected by the project and to evaluate the sensitivity of these features.

A desktop assessment of the project area was conducted in terms of current surface water classifications and biodiversity programmes and plans. This included the consideration of:

- Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019);
- Department of Water and Sanitation Desktop Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) Model (2014);
- Department of Water Affairs and Forestry: Level 2 River Ecoregional Classification System for South Africa, Lesotho and Swaziland (2005);
- The National Freshwater Ecosystem Priority Areas (NFEPA) project (2011 - 2014);
- The National Wetland Classification System (NWCS) (2017);
- DWAF (2005) Wetland Delineation: "a practical field procedure for delineation of wetlands and riparian areas";
- WET-Health Wetland Management Series (Macfarlane et al., 2007) and WET-Ecoservices (Kotze et al., 2008); and
- The National Biodiversity Assessment Wetland Map 5 (NBA) (SANBI, 2018);

Thereafter a site visit was conducted on 8 September 2020 in order to determine the actual condition of the rivers and wetlands within the proposed study area.

4.2 Wetland Assessment

"*Wetland*" is a name given to a variety of ecosystems ranging from rivers, springs, seeps and mires in upper catchments, to midland marshes, pans and floodplains, coastal lakes, mangrove swamps and estuaries at the bottom of a catchment. These ecosystems all share the common primary driver of water and its prolonged presence is a fundamental determinant of soil characteristics, vegetation and animal life (DWAF, 2005).

The National Water Act (Act No. 36, 1998 as amended in 2013) defines wetlands as:

"*Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*."

Thus wetlands must have one or more of the following characteristics:

- **Hydromorphic soils**: characteristic soils of prolonged saturation;
- **Hydrophytes**, at least occasionally: highly saturated plants; and
- **High water table**: a high water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

Wetlands are formed from a combination of geology, hydrology and topography. These landforms form in parts of a catchment where the movement of water is slowed down or obstructed, causing soil to become temporarily, seasonally or permanently waterlogged.

Wetland Importance

South Africa is a Contracting Party to the Ramsar Convention on Wetlands and has thus committed itself to the intergovernmental treaty, which provides the framework for the national protection of wetlands and the resources they could provide. The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the planet. Wetland conservation in South Africa is now driven by SANBI under the requirements of the National Environmental Management: Biodiversity Act (NEMBA, 10, 2004).

In natural capital terms, wetlands may be seen as a significant economic investment. This monetary value is rooted to the fact that the primary tasks of a wetland are to process water and regulate runoff. This is important as the South African economy is heavily dependent on water and yet the climatic variability of the country has meant that for the most part rainfall occurs as intermittent, high intensity storms. The inherent value of wetlands is that they protect and regulate this water source by acting like sponges, soaking up water during flood events and releasing it during dry periods (DWAF, 2005). By regulating water flows during floods, wetlands may reduce flood damage and help prevent soil erosion. As natural filters wetlands help to purify water by trapping pollutants such as heavy metals and disease causing organisms.

The most common ecosystem services provided by wetlands (in general) are:

- Improved water quality;
- Flood attenuation;
- Sediment trapping;
- Reduce number of water borne diseases;
- Herbal medicine; and
- Water storage.

These ecosystem services are provided at very little cost but with significant payback for the South African economy.

Despite being classified as the third most significant life support system on earth (IUCN, 1980), wetlands are some of the most threatened habitats in the world today. Breen & Begg (1989) reported that more than 50% of the wetland inventory in South Africa had disappeared. The main issues have been draining wetlands for crops and pastures, poorly managed burning and grazing resulting in headcut and donga erosion, planting alien invasive vegetation, mining, pollution and urban development. These have been significant as they alter the natural flow of water in wetlands and as water is the driver of wetland formation it follows that any changes would be damaging. A buffer around a wetland is usually recommended in order to protect the wetland from development in close proximity to it.

Aside from the negative impacts of construction in the vicinity of a watercourse or wetland, a major impact that needs to be considered should be the geotechnical competence of soil which is often waterlogged and prone to flooding. Wetland soils are usually high in clay and prone to wet and dry periods, allowing for expansion and contraction of soils. The wetland and watercourse buffers are therefore also important with regards to the demarcation of areas that are not suitable for

construction due to the high soil moisture content and unstable soils. Developing solutions to these problems would be expensive and may not be sustainable in the long term.

4.3 Tools Available To Define Wetlands And Watercourses

4.3.1 National Freshwater Ecosystem Priority Areas (NFEPA)

The NFEPA programme provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or FEPAs. The system comprises a hierarchical classification process of defining a wetland based on the principles of the hydro-geomorphic (HGM) approach at higher levels, with structural features being included at the finer levels (SANBI, 2009).

Wetland ecosystem types were used by NFEPA for representing natural examples of the diversity of wetland ecosystem types across South Africa. Wetlands of the same ecosystem type are expected to share similar functionality and ecological characteristics. The biodiversity target for freshwater ecosystems in South Africa is 20%, which means that we should keep at least 20% of each wetland ecosystem type in a natural or near-natural condition. This serves to conserve many common species and communities, and the habitats in which they evolve. Information used to classify wetlands as FEPAs included:

- Ramsar status;
- Known threatened frog and waterbird occurrences; and
- Expert knowledge on biodiversity importance.

For the purposes of this study Version 4 of the National Wetland Classification System (NWCS) was used as baseline information, as per SANBI's BGIS interactive tool.

The NWCS uses hydrological and geomorphological traits to distinguish the direct factors that influence wetland function. This is presented as a 6 tiered structure with four spatially nested primary levels that are applied in a hierarchical manner between different wetland types on the basis of these direct factors (SANBI, 2009).

- **Level 1:** Distinguishes between marine, estuarine and inland ecosystems based on the degree of connectivity the systems have with the ocean.
- **Level 2:** Categorises the regional wetland setting using a combination of biophysical attributes at the landscape level.
- **Level 3:** Assesses the topographical position of inland wetlands.
- **Level 4:** Concerns the hydrogeomorphic (HGM) units as defined as follows:
  - *Landform* - considering the shape and localised setting of the wetland;
  - *Hydrological characteristics* - nature of water movement into, through and out of the wetland; and
  - *Hydrodynamics* - the direction and strength of flow through the wetland.

The HGM unit is considered the focal point for NWCS as the upper levels mean to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, whilst the lower levels provide more descriptive detail.

As wetlands are formed under the influence of geology, hydrology and topography it is necessary to note these features when delineating a wetland.

- **Geology:** Geology influences the formation of a wetland by geological obstructions such as erosion resistant rock or impervious material close to the surface forcing groundwater to move close to or onto the soil surface.
- **Hydrology***:* The water transfer mechanisms such as source, movement and exit are important features of a wetland.
- **Topography:** The topography of the landscape influences the likelihood of whether a wetland will form. For instance, under the right conditions wetlands may form in floodplains, valley bottoms, hillslopes, depressions and coastal flats.

A range of 'hydro-geomorphic' types can be defined by considering the above features. Six HGM units are defined for South African inland wetlands (SANBI, 2009):

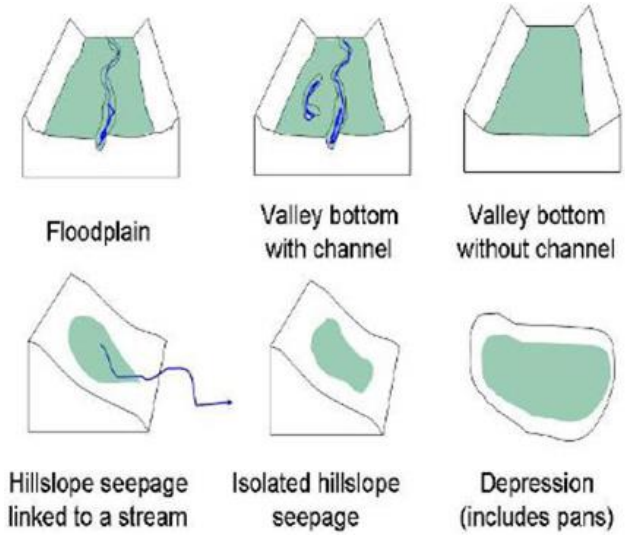

Figure 4-1 The HGM types for South African Inland wetlands (SANBI, 2009).

Important rivers are also classified according to the NFEPA rivers maps. These rivers are considered Freshwater Ecosystem Priority Areas (FEPAs). FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs are an essential part of an equitable and sustainable water resource strategy meaning that they need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This means that the areas should be supported by good planning, decision-making and management to ensure that human use does not impact on the aquatic ecosystem.

4.3.2 WET-Health and Present Ecological State

Incorporation of the HGM approach in this system is significant as it has been adopted throughout aquatic assessment with regards to Present Ecological State and WET-Health assessments. These systems can then be easily integrated using the HGM approach in-line with Eco-classification process of river and wetland reserve determinations used by the Department of Water and Sanitation (DWS). The Ecological Reserve of a river or wetland is used by DWS to assess the water resource allocations when assessing water use licence applications (WULAs).

The WET- range of tools were developed to assist those wishing to undertake wetland rehabilitation, in terms of current and future human activities in Environmental Impact Assessments (EIA) or to determine the Present Ecological State (PES) of a wetland in an Ecological Reserve Determination (ERD). These tools were developed as part of a nine-year research programme on wetland management which was initiated in 2003 by the Water Research Commission (WRC) and a range of

partners that examines wetland rehabilitation, wetland health and integrity and the sustainable use of wetlands (WRC Project No. K5/1408).

As wetlands are formed under the influence of geology, hydrology and topography it is necessary to note these features when delineating a wetland. The HGM unit is then classified using these features (Figure 4-1).

The materials and methods of WET-Health Wetland Management Series (Macfarlane et al., 2007) establish the current ecological health of a wetland. This assessment defines wetland health "as a measure of the deviation of wetlands structure and function from the wetland's natural reference condition" (Macfarlane et al., 2007).

A Level 1 Rapid Assessment would involve evaluating specific indicators pertaining to three categories of hydrological, geomorphological and vegetation health (Figure 4.2). The purposes of WET-Health are to aid users in understanding the ecological condition of the wetland and to identify the causes of degradation. The assessment criteria and information are specific to South Africa. The three categories (hydrological, geomorphological and vegetation) are assessed by taking into account the extent, intensity and magnitude of an impact which then produces a health score. Evaluation scores within each category are then combined to produce an overall impact of activities on the wetland system which corresponds to a Present State health category that provides an impact score scale of 0-10 and associated health category (ecological state) from A-F (Figure 4-2), based on Kleynhans (1996, 1999). Such categories represent natural, largely natural, moderately modified, largely modified, extensively modified, and critically modified.

The WET-Health Assessment also considers the likely trajectory of change based on the threats to or vulnerability of a wetland. Five categories of the Trajectory of Change include: large improvement, slight improvement, remains the same, slight decline and rapid decline. Overall health of the wetland is then presented by the calculated Present Ecological State scores and the most likely Trajectory of Change.

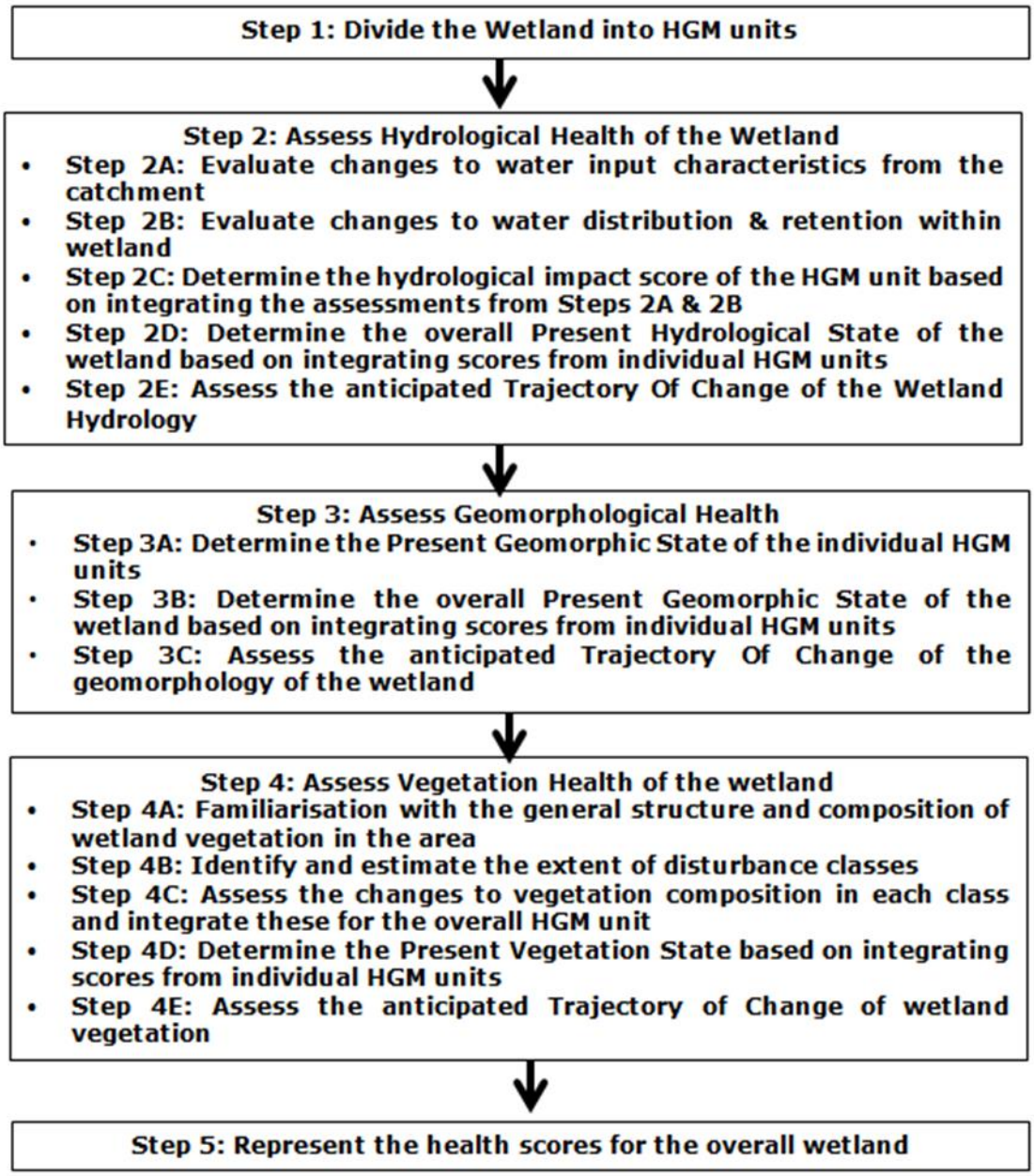

Figure 4-2 The steps involved in the WET-Health Level 1 rapid assessment (MacFarlane et al. 2007).

Table 4-1 Description of A-F ecological categories based on Kleynhans (1996, 1999).

PES Description	Combined impact score	PES Category	Level of disturbance
Unmodified, natural.	0-0.9	**A**	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of	1-1.9	**B**	Some human-related disturbance, but mostly of low impact potential

PES Description	Combined impact score	PES Category	Level of disturbance
natural habitats and biota may have taken place.			
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	C	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D	
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	F	

4.3.3 Tools available for wetland delineation

DWAF (2005) wetland delineation

The DWAF (2005) guidelines for "a practical field procedure for delineation of wetlands and riparian areas" are recommended in Gazette No. 19182, Notice No. 1091 of the National Water Act, 1998. This guideline explains the field indicators and methods for determining whether an area is a wetland or a riparian area, and how to find its boundaries. Although the primary driver of a wetland is water, due to its dynamic nature water is not a very useful parameter for identifying the outer boundary of a wetland. What is needed is a method of identifying the indirect indicators of prolonged saturation by water. This includes wetland plants (hydrophytes) and wetland (hydromorphic) soils. Their presence or absence implies the frequency and duration of saturation and is a satisfactory indicator to classify the area as a wetland (DWAF, 2005).

In wetland delineation there are three zones which are distinguished according to a changing frequency of saturation. These are the permanent, seasonal and temporary zone. The primary objective of wetland delineation is usually to define the outer edge of the temporary zone as it marks the boundary between the wetland and the adjacent terrestrial zone. There are four important indicators that are used to define the boundaries of a wetland. The most important one is the soil wetness indicator with terrain unit, soil form and vegetation acting as confirmation. The point where wetland indicators are not present is regarded as the edge of the wetland.

The permanently wet zone is characterised by dark grey, clay soil, caused by a lack of oxygen required for the oxidation of minerals such as iron in the soil. The seasonally wet zone is characterised by grey soils with lots of orange and black mottles. It is generally recommended that there should be a 100m

buffer zone between the edge of the delineated temporary zone and any development. Important indicators of each zone are as follows:

- **Wetland vegetation**

In order to tolerate the anaerobic conditions of seasonal or permanent flooding, hydrophytes (water loving plants) have evolved a number of adaptations. Their presence can therefore indicate a moist soil habitat and thus provide a potential boundary of a wetland's seasonally flooded or permanent flooded zones (Macfarlane et al., 2007).

  - The **temporary zone** of a wetland will show mainly grasses, some woody species and some sedges.
  - The **seasonal zone** will begin to show more hydrophytic (or water loving) sedges with tall grasses (over 1m).
  - The **permanent zone** will be noticeable by emergent reeds and sedges, bulrushes or floating and submerged plants. Woody species will have adaptations for permanent wetness such as prop roots (Mangroves).

- **Wetland soils**

Low oxygen levels result in a reduced rate of organic matter decomposition within the soil, where sulphur tends to exist in its reduced form, hydrogen sulphide (H2S), noticeable by its tell-tale rotten-egg smell. These conditions also serve as a catalyst for the metals in the soil to become soluble and begin leaching (DWAF, 2005). The metals produce rich colours of yellow, orange and reds.

  - The temporary or seasonal zone of a wetland, where there is more seasonal flooding, produces mottling of colours, as the metals are still in the process of precipitating. These mottles occur within a grey matrix where the metals have already leached.
  - The permanent zone of a wetland, where there is more permanent flooding of the soil, produces leaching of metals, with soils remaining a grey ("gleyed") colour.
  - It is recommended by DWAF (2005) that soils be sampled on the surface (0-10cm) and between 40 and 50cm.

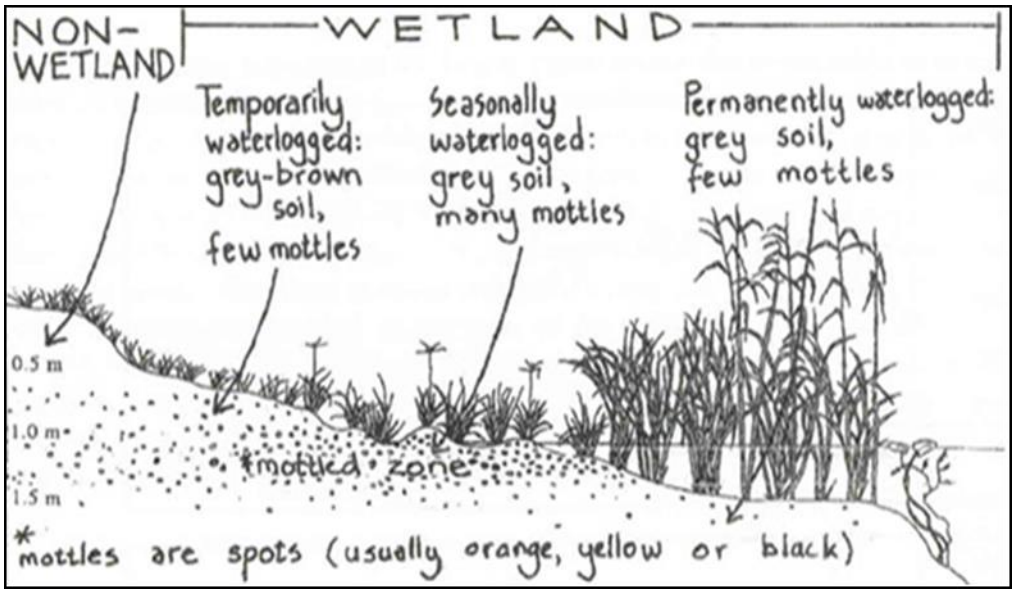

Figure 4-3 A cross-section through a wetland, indicating how the soil wetness and vegetation indicators change as one moves along a gradient of decreasing wetness, from the middle to the

edge of the wetland (DWAF, 2005).

4.3.4 WET_Ecoservices

WET-Ecoservices (Kotze et al., 2008) is used to assess the goods and services that individual wetlands provide, thereby aiding informed planning and decision making. The tool provides guidelines for scoring the importance of a wetland in delivering each of 15 different ecosystem services. The first step is to characterise wetlands according to their hydrogeomorphic setting. Ecosystem service delivery is then assessed either at Level 1, based on existing knowledge or at Level 2, based on a field assessment of key descriptors.

Where there are characteristics relating to effectiveness and opportunity WET-Ecoservices calculates an average for each of the groups and an overall score is calculated from these averages. The overall score is then rated according to the table below. The Ecoservices that are assessed are illustrated in Table 4.2.

Table 4.2 Classes for determining the likely extent to which a benefit is being supplied based on the overall score of that benefit

Score	<0.5	0.5-1.2	1.3-2.0	2.1-2.8	>2.8
Rating of the likely extent to which a benefit is being supplied	Low	Moderately low	Intermediate	Moderately high	High

Table 4-2 Ecosystem services included in, and assessed by, WET-Ecoservices (Kotze et al., 2008)

Ecosystem services supplied by wetlands	Indirect benefits	Regulating and supporting benefits	Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream
			Streamflow regulation	Sustaining streamflow during low flow periods
			Water quality enhancement benefits: Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
			Water quality enhancement benefits: Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
			Water quality enhancement benefits: Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
			Water quality enhancement benefits: Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff waters
			Water quality enhancement benefits: Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation.
			Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter
	Direct benefits		**Biodiversity maintenance[2]**	Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity
		Provisioning benefits	Provision of water for human use	The provision of water extracted directly from the wetland for domestic, agriculture or other purposes
			Provision of harvestable resources	The provision of natural resources from the wetland, including livestock grazing, craft plants, fish, etc.
			Provision of cultivated foods	The provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage	Places of special cultural significance in the wetland, e.g. for baptisms or gathering of culturally significant plants
			Tourism and recreation	Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research	Sites of value in the wetland for education or research

4.4 IMPACT ASSESSMENT

CES has developed the following impact rating methodology which has been developed in line with Appendix 6 and the impact ratings required in Appendix 1 and 3 of the EIA Regulations (2014, as amended).

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	**Negative**	Beneficial/positive impact.
	Positive	Detrimental/negative impact.
Type	**Direct**	Direct interaction of an activity with the environment.
	Indirect	Impacts on the environment that are not a direct result of the project or activity.
	Cumulative	Impacts which may result from a combination of impacts of this project and similar related projects.
Duration	**Short term**	Less than 5 years.

CRITERIA	CATEGORIES	EXPLANATION
	Medium term	Between 5-20 years.
	Long term	More than 20 years.
	Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Extent	Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
	Study area	The proposed site and its immediate environments.
	Municipal	Impacts affect the municipality, or any towns within the municipality.
	Regional	Impacts affect the wider district municipality or the Eastern Cape Province as a whole.
	National	Impacts affect the entire country.
Consequence	Slight	Slight impacts or benefits on the affected system(s) or party(ies).
	Moderate	Moderate impacts or benefits on the affected system(s) or party(ies).
	Severe/Beneficial	Severe impacts or benefits on the affected system(s) or party(ies).
Probability	Definite	More than 90% sure of a particular fact. Should have substantial supportive data.
	Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
	Possible	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
	Unsure	Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.
Reversibility	Reversible	The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.
	Irreversible	The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.
Irreplaceable Loss	Resource will not be lost	The resource will not be lost/destroyed provided mitigation measures are implemented.
	Resource may be partly lost	The resource will be partially destroyed even though mitigation measures are implemented.
	Resource will be lost	The resource will be lost despite the implementation of mitigation measures.

CRITERIA	CATEGORIES		EXPLANATION
Mitigation Potential	Easily achievable		The impact can be easily, effectively and cost effectively mitigated/reversed.
	Achievable		The impact can be effectively mitigated/reversed without much difficulty or cost.
	Difficult		The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.
	Very Difficult		The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.
Impact Significance	Low negative	Low positive	Largely of HIGH mitigation potential, after considering the other criteria.
	Moderate negative	Moderate positive	Largely of MODERATE or partial mitigation potential after considering the other criteria.
	High negative	High positive	Largely of LOW mitigation potential after considering the other criteria.

5 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

5.1 BIODIVERSITY INDICATORS

South Africa's policy and legislative framework for biodiversity is well developed, providing a strong basis for the conservation and sustainable use of biodiversity. South Africa is one of the few countries in the world to have a Biodiversity Act and a National Biodiversity Institute.

Key components of the national policy and legislative framework for biodiversity include:

- The White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997);
- The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA);
- NEMBA List of Ecosystems in need of Protection;
- NEMBA List of Threatened or Protected Species;
- NEMBA List of Alien Invasive Species;
- The National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPAA);
- The National Biodiversity Assessment (NBA) (2018);
- The National Biodiversity Framework (2008) (NBF);
- The National Protected Area Expansion Strategy (2008) (NPAES); and
- Important Bird Areas (2015) (IBA).

In addition to national legislation, some of South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996). The Eastern Cape Biodiversity Conservation Plan (ECBCP) covers the entire Eastern Cape Province.

5.7.1 Provincial - Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019)

The ECBCP (2019) replaces the ECBCP (2007) in its entirety and provides a map of important biodiversity areas, outside of the Protected Areas network, which can be used to inform land use and resource-use planning and decision making. The objectives of the ECBCP (2019) are to:

1) Identify the minimum spatial requirements needed to maintain a living landscape that continues to support all aspects of biodiversity and retain/maintain essential ecological infrastructure. This is achieved through the selection of areas, based on achieving targets, which represent important biodiversity pattern AND ecological processes;
2) Serve as the primary source of biodiversity information for land use planning and decision-making; and
3) Inform conservation and restoration action in important biodiversity areas.

The aim of the ECBCP were to map biodiversity priority areas through a systematic conservation planning process. The main outputs of the ECBCP include Protected Areas (PA), Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA), Other Natural Areas (ONA) and No Natural Habitat Remaining (NNR) for both terrestrial and aquatic ecosystems.

The ECBCP has been adopted by DEDEAT as a systematic biodiversity plan for the Eastern Cape Province. According to the ECBCP (2019), the study site occurs within an aquatic ESA 1 (Figure 5-1).

In terms of the aquatic sensitivity of the site, based on the results of the Screening Tool report the aquatic biodiversity of the site is classified as high due to the location of the site within a Freshwater Ecosystem Priority Area quaternary catchments.

The management requirements of the biodiversity priority areas in which the study site occur are outlined in Table 5-1 below.

Table 5-1: Management requirements of the biodiversity priority areas identified by the ECBCP (2019).

Biodiversity Priority Area	Management requirements

ESA 1	Maintain ecological function within the localised and broader landscape. A functional state in this context means that the area must be maintained in a semi-natural state such that ecological function and ecosystem services are maintained.
	
	For areas classified as ESA1, the following objectives apply:
	• These areas are not required to meet biodiversity targets, but they still perform essential roles in terms of connectivity, ecosystem service delivery and climate change resilience.
	• These systems may vary in condition and maintaining function is the main objective, therefore:
	  ○ Ecosystems still in natural, near natural state should be maintained.
	  ○ Ecosystems that are moderately disturbed/degraded should be restored.

Table 5-2 Matrix of recommended land use management guidelines for Aquatic based activities in the Eastern Cape (ECBCP, 2019)

			Instream Rivers and Wetlands		Catchments and buffers	
LAND USE TYPE	ASSOCIATED LAND USE ACTIVITIES	CORRESPONDING SPLUMA LAND USE PURPOSE	CBA1	CBA2	ESA1	ESA2
Quarrying and mining	Quarrying and open-cast mining (surface mining, dumping and dredging)		N	N	N	R
	Hydraulic fracturing (fracking)		N	N	N	R

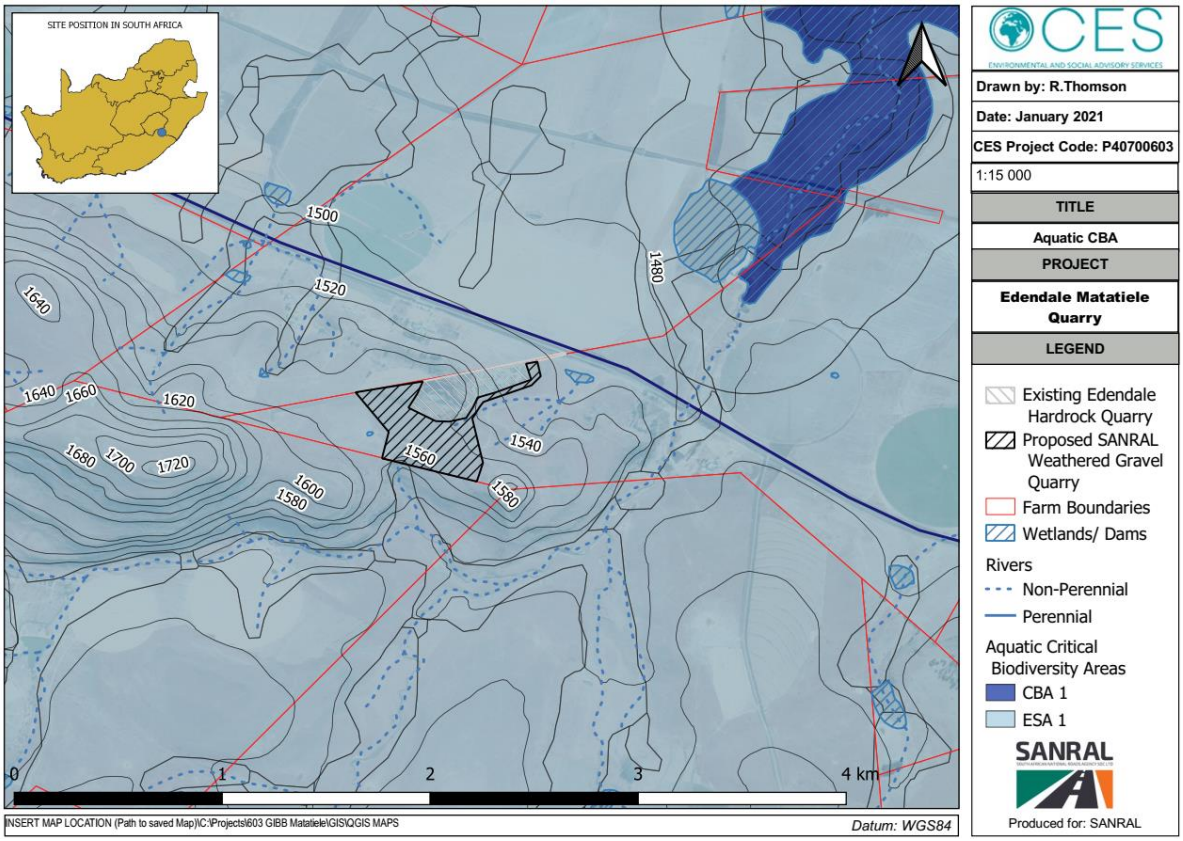

Figure 5-1 Aquatic Critical Biodiversity Areas (ECBCP, 2019).

5.2 Desktop Investigation

5.2.1 Climate

The information provided herewith is based on the climate data for Matatiele, the nearest urban area in close proximity to the study site. The climate of Matatiele is moderate with maximum temperatures reaching an average of 26°C in January and dropping to an average low of around 5°C in July. Frost occurs on more than 75 days a year, particularly in the mountainous areas south of Matatiele and north eastern parts of the border region. Rainfall occurs in the summer months, typically from October through till April, with an average annual rainfall of approximately 550 mm to 1000 mm (Integrated Development Plan (IDP) Matatiele Local Municipality 2016/17 to 2021/22).

5.2.2 Topography

The topography of the broader area varies from very steep gradients of 1:1.5 to relatively gentle slopes of less than 1:7 at mountain foothills and river plains. The very steep gradients mainly occur in the western and south-eastern boundary of the Matatiele LM due to the extension of the Drakensberg Mountain Range (IDP Matatiele Local Municipality 2016/17 to 2021/22). The study site is located at an altitude of approximately 1502-1570 m above sea-level (asl), decreasing gently in elevation towards the north-east of the site and more sharply towards the south (Figure 5-2).

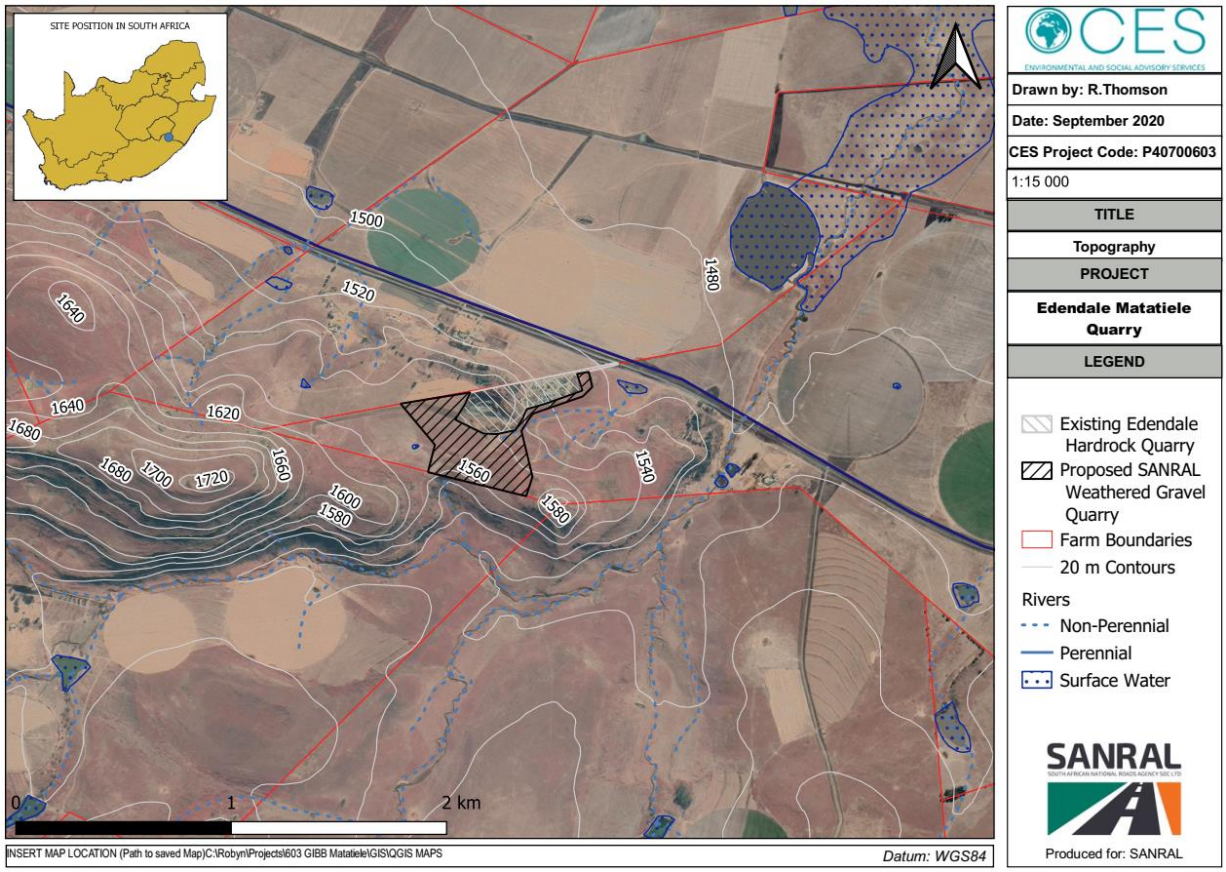

Figure 5-2 Contour Map of the study area.

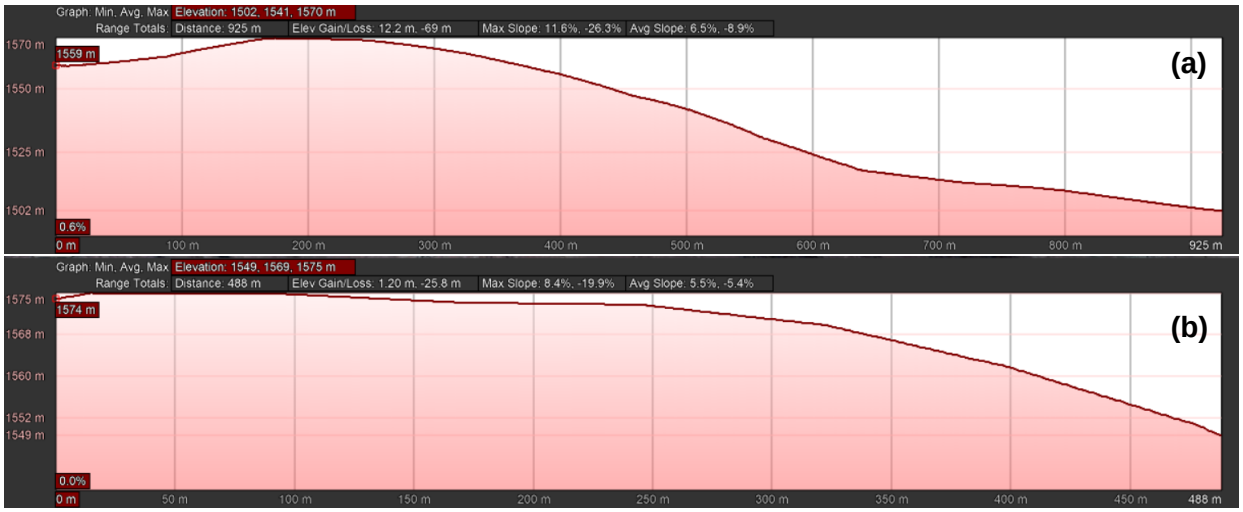

Figure 5-3 Elevation profile of the study site from (a) south-west to north-east and (b) north to south.

5.2.3 Geology and Soils

The broader Matatiele area is located on Karoo sediments (IDP Matatiele Local Municipality 2016/17 to 2021/22). According to SOTER (1995), the soils underlying the majority of the study area are classified as Dystric Regosols, with a portion of the study site underlain by Eutric Gleysols (Figure 5-4). Regosols are typically 'young' soils with poorly developed horizons, except for an ochric (surface) horizon which is generally thin and low in organic matter. These soils are highly permeable and have a low water

holding capacity making them unfavourable for agricultural purposes and sensitive to drought. Regosols are prone to erosion, particularly on sloping surfaces, and often form a hard surface crust during dry periods that prevents the infiltration of water and the emergence of seedlings. These soils are typically used for extensive grazing. Gleysols are wetland soils and are typically well saturated within 50 cm of the surface of the soil for extended periods of time (Sposito *et al*., 2008).

The geology underlying the study area consists of sedimentary deposits including fine-grained sandstone and mudstone of the Tarkastad Subgroup (Beaufort Group) (Figure 5-5).

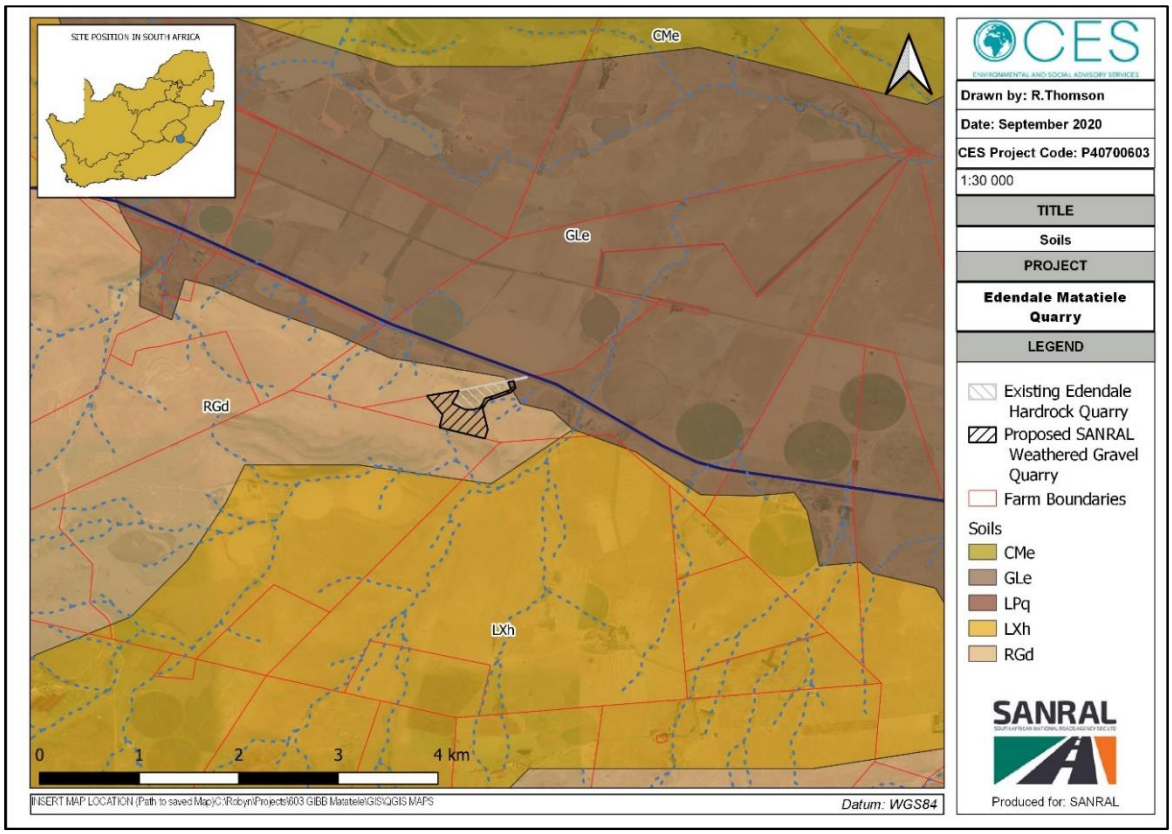

Figure 5-4 Soil Map of the study area.

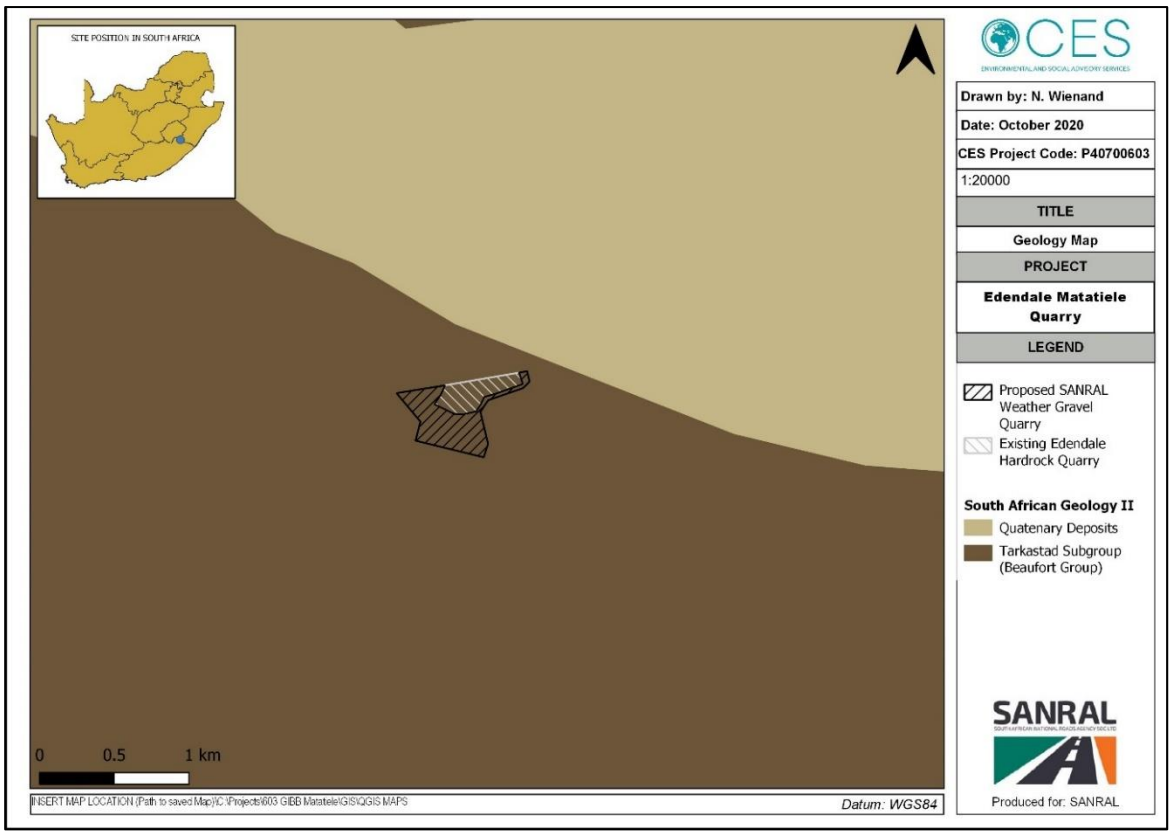

Figure 5-5 Geology Map of the study site.

5.2.4 Land Cover

According to the SA National Land-Cover Map (SA NLC, 2018) the broader area surrounding the study site comprises mostly of *Natural Grassland* and *Commercial Annual Crops*. *Large Herbaceous Wetlands* are also located within close proximity to the site and the existing Edendale Hardrock Quarry is recognised as *Mines: Extraction Sites: Open Case and Quarries Combined* by the SA NLC (2018). The land cover class in which the study site occurs is *Natural Grassland* (Figure 5-6) which corresponds to the East Griqualand and Mabela Sandy Grassland vegetation of the study site (Figure 5-7).

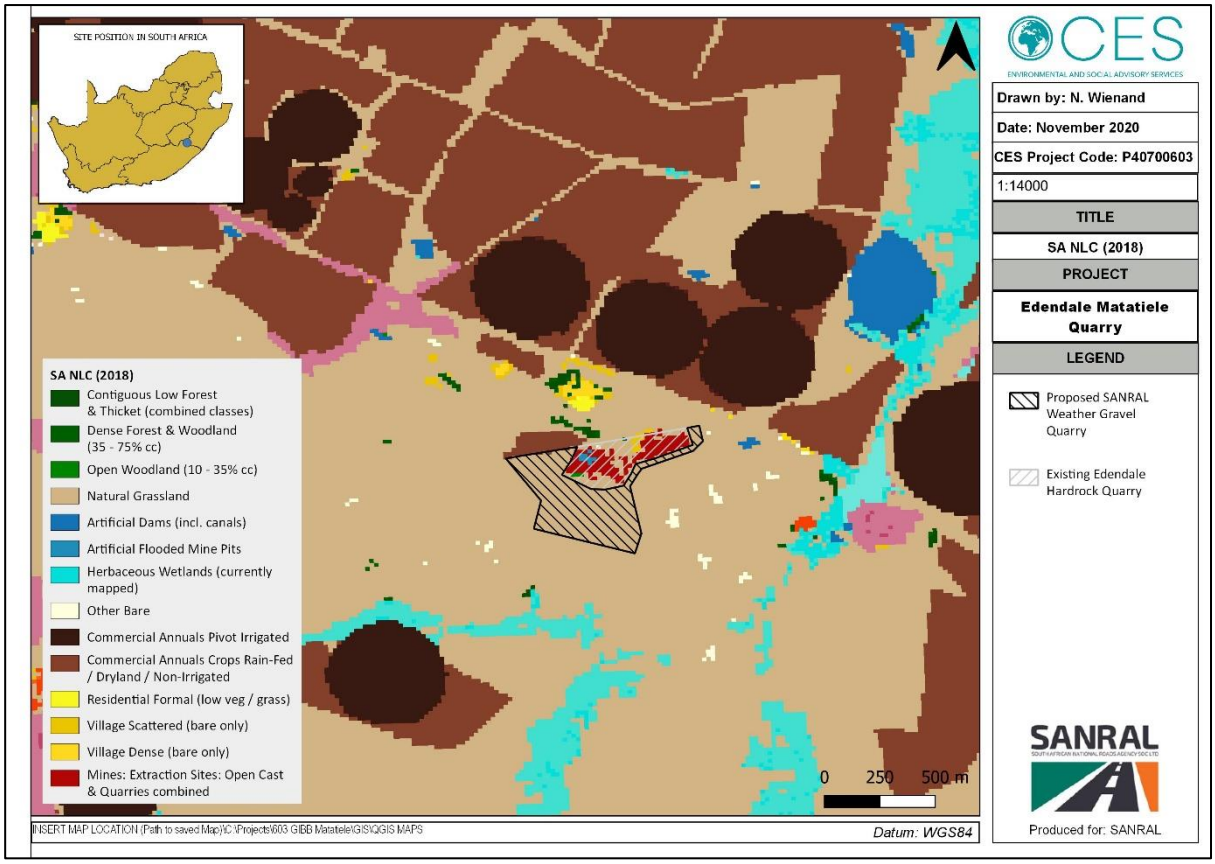

Figure 5-6 South African National Land-Cover (SANLC, 2018) Map of the project area.

5.2.5 Vegetation

According to the South African Vegetation Map (SA VEGMAP) of 2018 the project area falls within the grassland biome and the vegetation type of the majority of the study site is East Griqualand Grassland while a small portion of the study site occurs within Mabela Sandy Grassland (Figure 5-7). A detailed description of the vegetation and floristics of the study area is included in the associated Terrestrial Biodiversity Specialist Report.

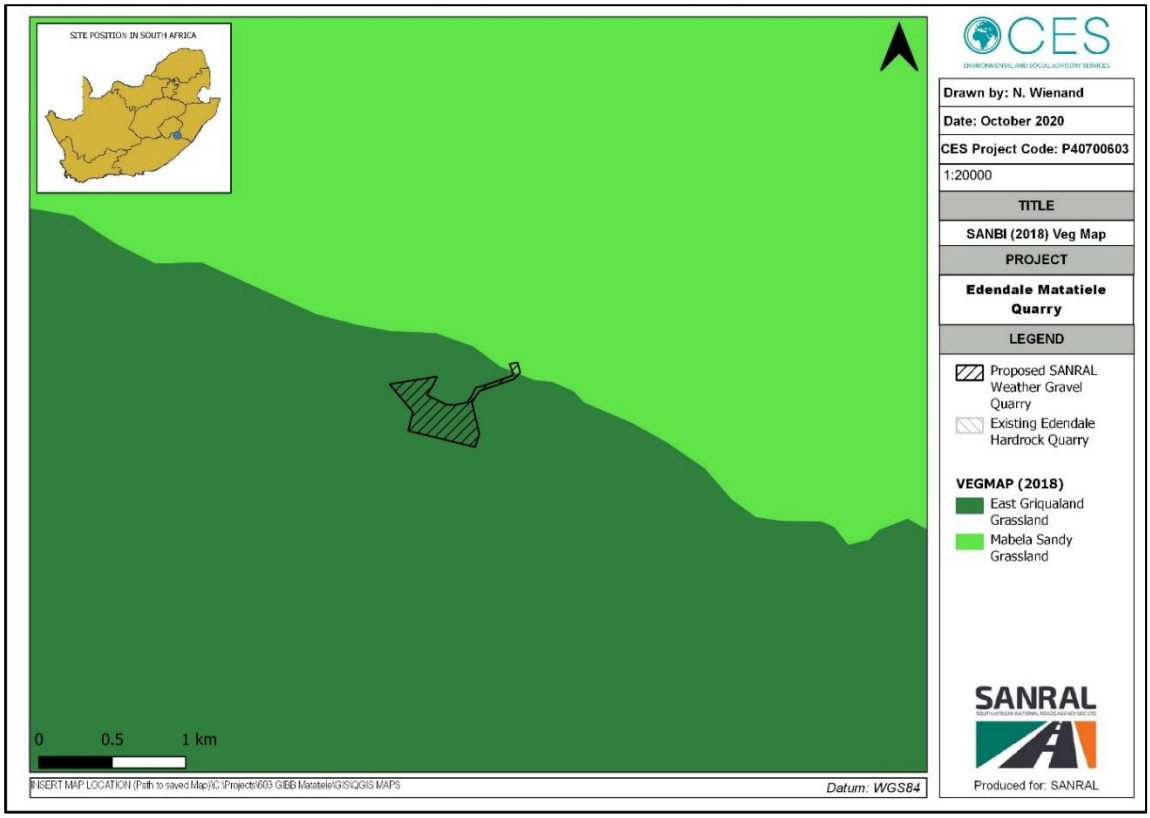

Figure 5-7 South African (2018) Vegetation Map of the project area.

5.2.6 Quaternary Catchment and Water Management Area

Figure 5-8 and Figure 5-10 below illustrate the general hydrology of the area surrounding the study site. The proposed Edendale Quarry falls within the T31F quaternary catchment of the Mzimvubu River associated with the Grootvlei River system. The catchment is within the Mzimvubu to the Tsitsikama Water Management Area (WMA 7).

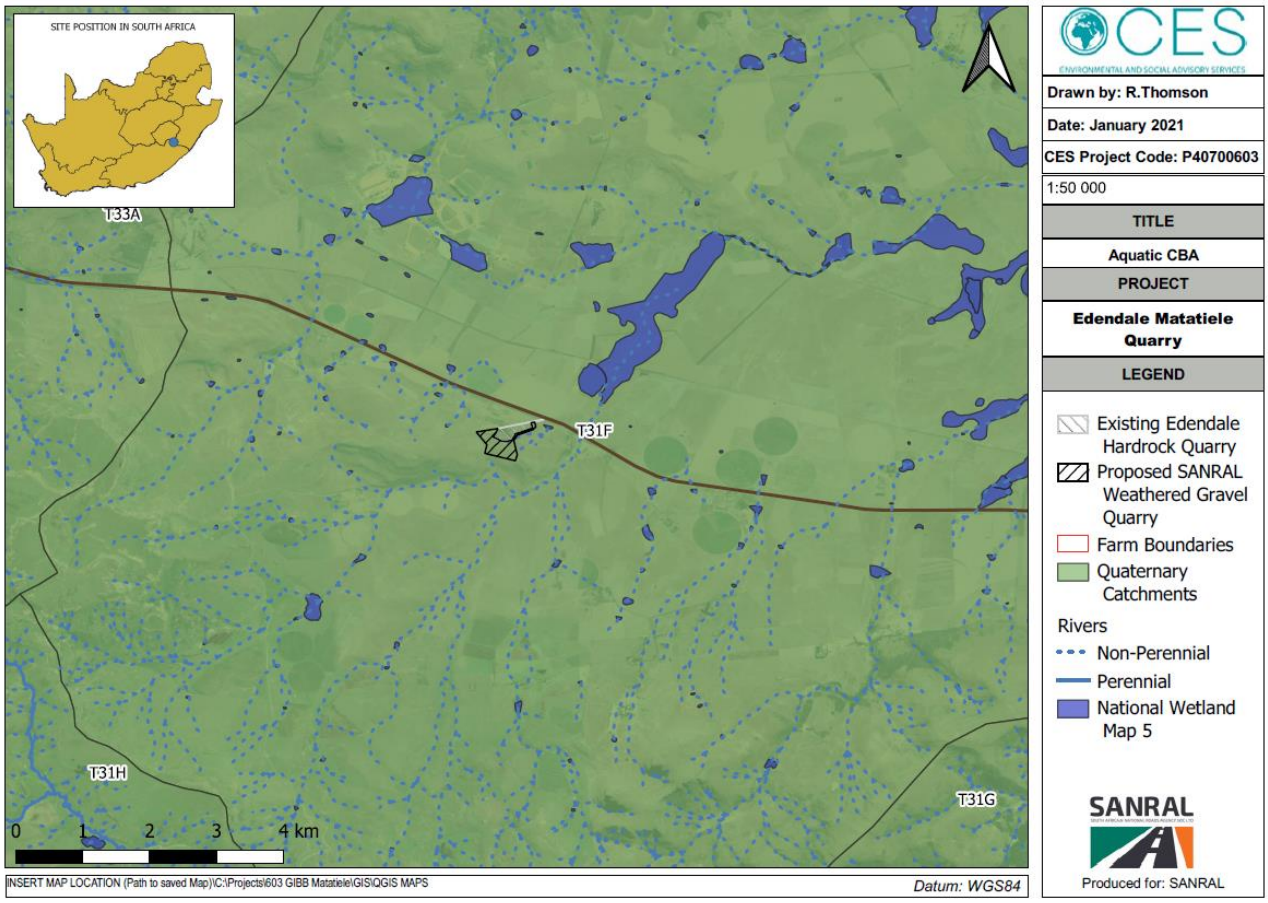

Figure 5-8 Quaternary water catchment locality

While the Edendale quarry site itself is not located within the Eastern Cape Drakensberg strategic water source area (SWSA) footprint, the surrounding area is classified as such (Figure 5-9). The main rivers within the Eastern Cape Drakensberg SWSA are the Mzimvubu, Orange, Bokspruit and Mthatha rivers.

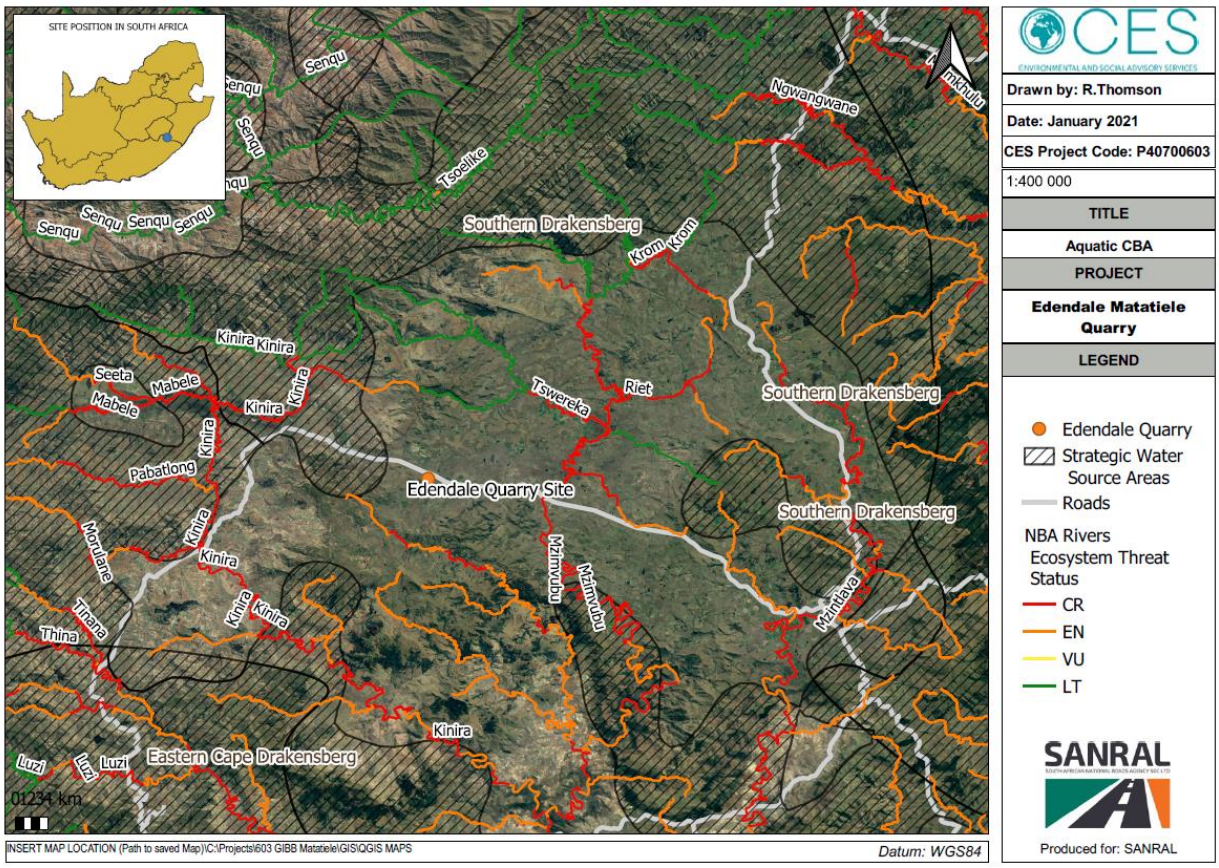

Figure 5-9 Strategic Water Source Areas (WRC, 2017)

5.2.7 Rivers

The development site occurs within 100 m of three (3) non-perennial rivers and within 600m of a NFEPA Wetland. The Screening Report, classifies the relative aquatic biodiversity sensitivity of the site as VERY HIGH as the site falls within a freshwater ecosystem priority area quaternary catchments.

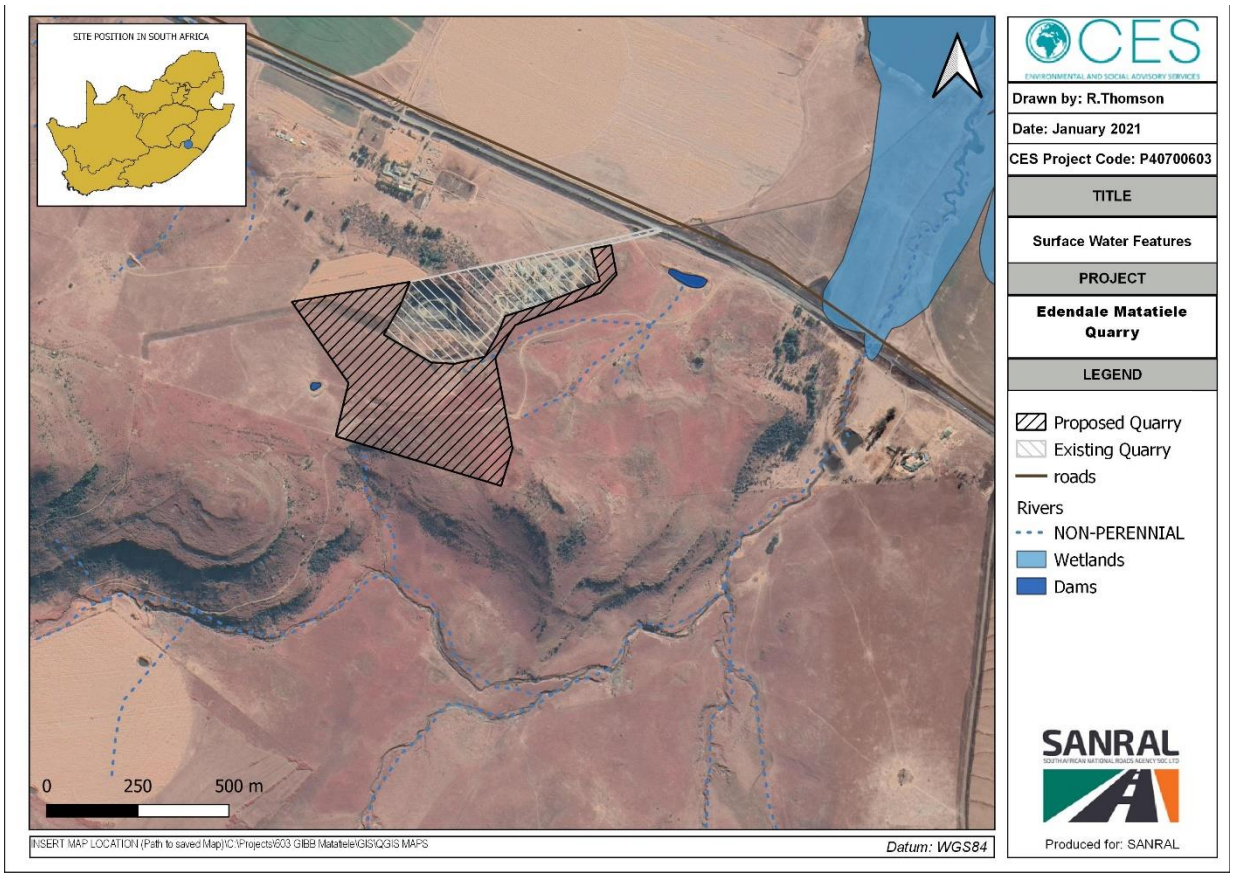

Figure 5-10 Surface water features within and surrounding the proposed study site.

5.2.7.1 The National Biodiversity Assessment (2018)

The National Biodiversity Assessment (NBA) of 2018 is a framework document within which fine-scale conservation planning in identified priority areas should occur. The NBA has gone through several iterations since its introduction in 2004, including an update in 2011 and the most recent version being published in 2018. The NBA integrates terrestrial, river, marine, estuarine and wetland ecosystems using available spatial data, relevant conservation planning software and a series of expert and stakeholder workshops. It is important to note that the NBA was conducted at a national scale (1:250 000), and thus can only provide a general context for biodiversity assessments at a local level.

An important tool used in the NBA is conservation status. Conservation status aims at identifying threatened ecosystems, and is based on the classification scheme developed by the IUCN to categorise species. Of the 222 river ecosystem types in South Africa that have been classified using this categorisation, 43 % are critically endangered, 19 % are endangered, 2 % are vulnerable and 36 % are least threatened. Of the 135 wetland ecosystem types in South Africa that have been classified using this categorisation, 61 % are critically endangered, 9 % are endangered, 9 % are vulnerable and 29 % are least threatened.

The non-perennial water courses, in proximity to the proposed quarry, ultimately drain into the Mzimvubu River, situated 17 km east of the study area. The Mzimvubu River is listed as **CRITICALLY**

ENDANGERED in terms of NBA (2018). Critically endangered ecosystems are ecosystem types that have very little of their original extent (measured as area, length or volume) left in natural or near-natural condition. Most of the ecosystem type has been heavily, severely or critically modified from its natural state. Any further loss of natural habitat or deterioration in condition of the remaining healthy examples of these ecosystem types must be avoided, and the remaining healthy examples should be the focus of urgent conservation action.

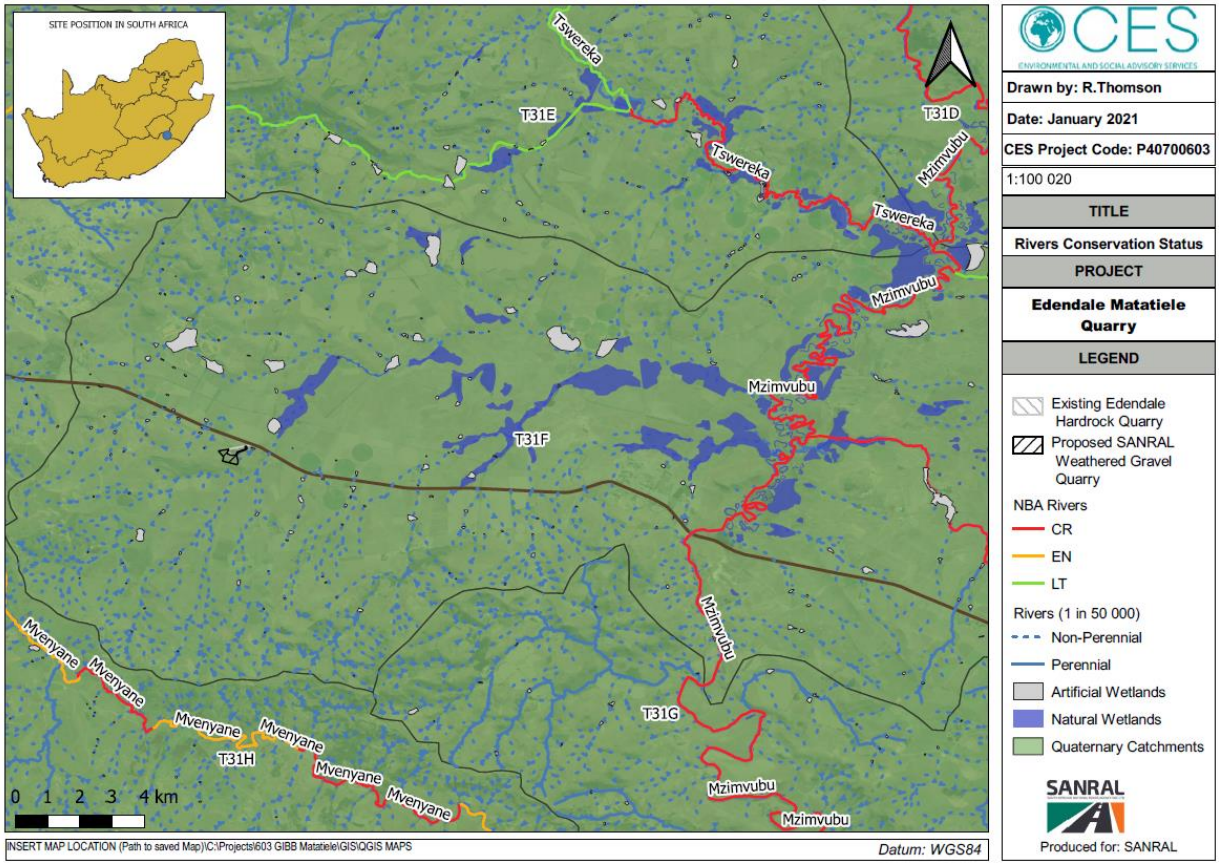

Figure 5-11 NBA Conservation Status of Rivers within the study area.

5.2.7.2 National Freshwater Ecosystem Priority Areas (NFEPA), 2011-2014

The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or 'FEPAs'.

FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers;
- Maintenance of water supply areas in areas with high water yield;
- Identification of connected ecosystems;
- Representation of threatened and near-threatened fish species and associated migration corridors; and
- Preferential identification of FEPAs that overlapped with:
    - Any free-flowing river;
    - Priority estuaries identified in the National Biodiversity Assessment 2011; and

- Existing protected areas and focus areas for protected area expansion identified in the National Protected Area Expansion Strategy.

NFEPA has classified the Mzimvubu River and its associated sub-quaternary catchment as a Freshwater Ecosystem Priority Area (

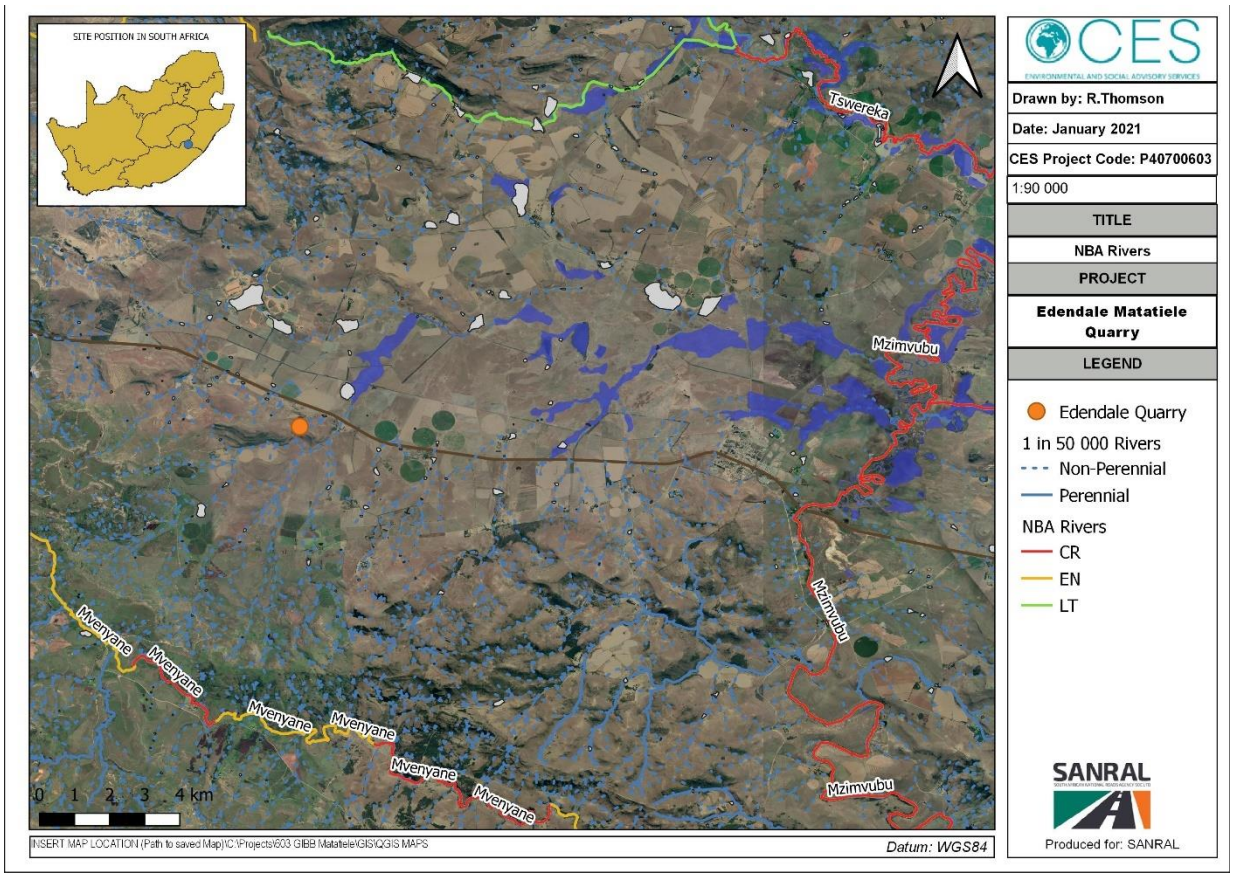

Figure 5-12). River FEPA's achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species,and were identified in rivers that are currently in good condition (A or B ecological category). Their FEPA status indicated that they should remain in a good condition in order to contribute to the biodiversity goals of the country. Upstream Management Areas are rivers and sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream River FEPA's and Fish Support Areas.

According the NFEPA implementation manual mining or prospecting should not take place in any form in sub-quaternary catchments associated within a FEPA area. There are, however, mitigating circumstances with regard to this requirement and the environmental acceptability of the proposed quarry.

These are as follows:

1. The proposed quarry site is adjacent to the R56 road, which is planned to be upgraded. The road falls within the same catchment as the proposed quarry and as such any alternative material supply source along the road route would also be located within the catchment;
2. The proposed quarry is adjacent to an existing commercial quarry. It is more favourable to have impacting activities sited together, so that only one general area is impacted, as opposed to several sites impacting on additional areas;

3. The proposed quarry is temporary and will be closed and rehabilitated once the road upgrade has been completed; and
4. The water course downstream of the quarry is non-perennial and flows into an existing dam which forms an artificial barrier to entry into the downstream wetland area. The quarry is at the highest point above this dam and as such there is no risk of water, other than localised stormwater, moving through the quarry, as there is no upstream source. This dam will act as a stormwater retention pond preventing sedimentation and siltation downstream.

The Mvenyane River to the South and the Tswereka River to the North of the quarry site are Upstream Management Areas. It is noted however, that while the Mvenyane and Tswereka Rivers are described here, they do not fall within the same quaternary catchment as the quarry site and such it is unlikely that the quarry would have an adverse impact on these rivers.

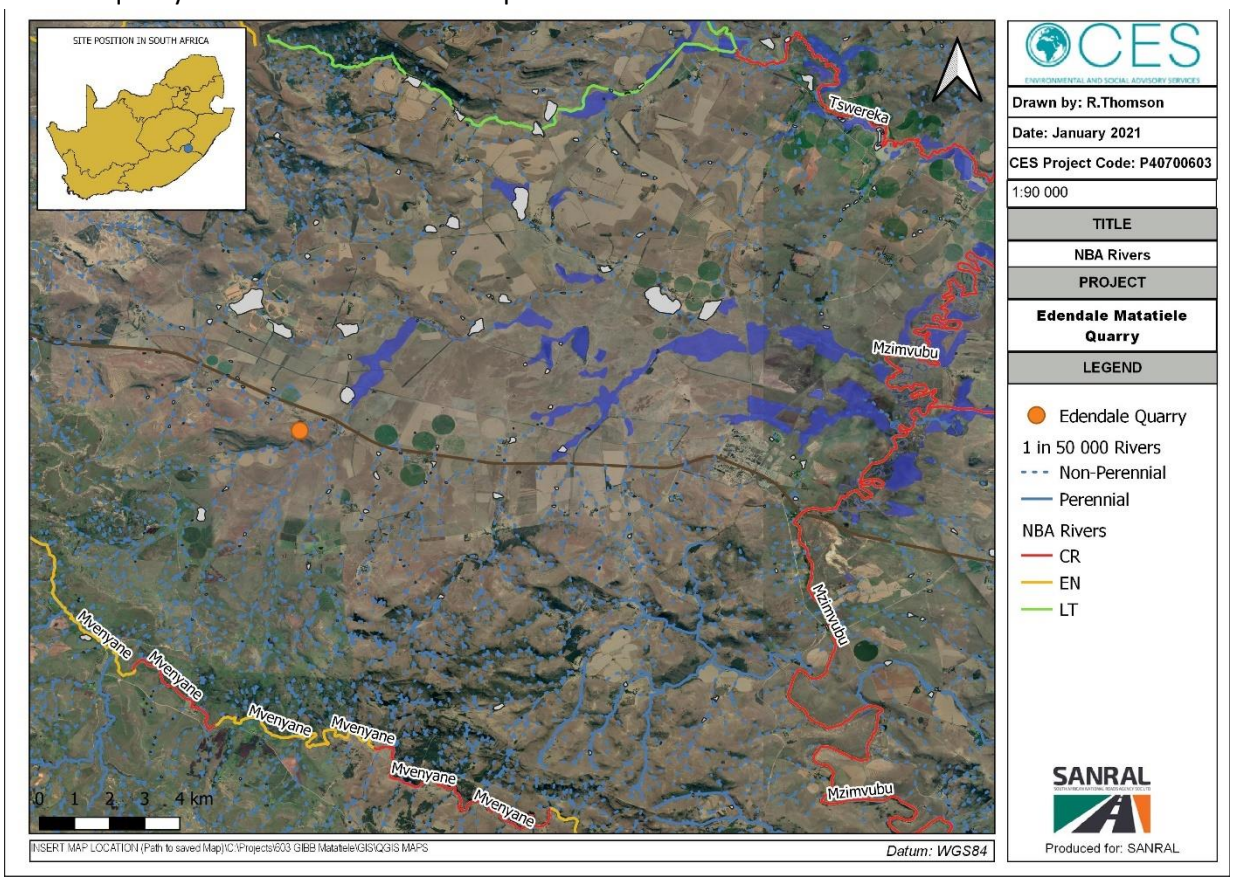

Figure 5-12 NBA status of the rivers in the study area.

5.2.7.3 Present Ecological State

According to DWS PESEIS (2014) the PES of the reaches of the Mzimvubu River which could be affected by the project is classified as **B: Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.**while the EI is rated as **moderate** and the ES is rated as **moderate.** The management perspective for a Category B: natural system is as follows:

- Protected systems;
- relatively untouched by human hands; and
- no discharges or impoundments allowed

The tables provided in Appendix A indicate the Present Ecological State, Ecological Importance and Ecological Sensitivity classification of the reaches of the Mzimvubu River assessed by the DWS as part of the Desktop PESEIS (2014).

5.2.8 Ecoregions

South Africa is a geologically, geomorphologically, climatically and ecologically complex country, and this has resulted in a diverse range of ecosystems, including rivers. River ecoregional classification or typing allows the grouping of rivers according to similarities based on a top-down nested hierarchy. The principle of river typing is that rivers grouped together at a particular level of the typing hierarchy will be more similar to one another than rivers in other groups. Ecological regions are regions within which there is relative similarity in the mosaic of ecosystems and ecosystem components (biotic and abiotic, aquatic and terrestrial).

According to Department of Water Affairs and Forestry (2005) Level 2 River Ecoregional Classification System, the road upgrade route falls within **Level 2 Ecoregion 16.04: South-Eastern Uplands** of the **Level 1 Ecoregion 16: South Eastern Uplands.**

This Level 1 Ecoregion has the following characteristics:

- Mean annual precipitation: Generally high.
- Coefficient of variation of annual precipitation: Mostly moderate to low.
- Drainage density: Medium in the north, tending towards low in the south.
- Stream frequency: Low to medium in the south, tending towards medium high in the north.
- Slopes <5%: <20% (central areas), 20-50% (northern areas) and 50-80% (southern areas).
- Median annual simulated runoff: Moderate to high.
- Mean annual temperature: Moderate to moderately high.

Table 5-3 provides attributes of the Level 2 Ecoregion.

Table 5-3 Attributes of the Level 2 Ecoregion (16.04) South-Eastern Uplands

Main Attributes	South Eastern Upland 16.04
Terrain Morphology: Broad division	Closed Hills, Mountains; moderate and high relief, Lowlands, hills and mountains; moderate and high relief, Plains; low relief, Open hills, lowlands, mountains; moderate to high relief.
Terrain Morphology	Low Mountains, Strongly undulated lowlands with hills, Plains, Undulating hills and lowlands.
Vegetation types (dominant types in bold) (Primary)	Moist Upland Grassland, Afromontane Forest, Valley Thicket, North- eastern Mountain Grassland.
Altitude (m a.m.s.l.)	1300 - 1900
MAP (mm)	600 - 700
Coefficient of variation (% of annual precipitation)	25 - 30
Rainfall concentration index	50 - 55
Rainfall seasonality	Mid Summer
Mean annual temp (°C)	12 - 16
Mean daily max temp (°C) February	22 - 26
Mean daily max temp (°C) July	16 - 20
Mean daily min temp (°C) February	10 16

Main Attributes	South Eastern Upland 16.04
Mean daily min temp (°C) July	4 - 6
Median annual simulated runoff (mm) for quaternary catchment	60 - 250

5.2.9 Wetlands

Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the National Wetland Map 5 (NBA, 2018). Due to the broad-scale nature of the NFEPA map it is not spatially accurate and, therefore, some error is expected. The location of NFEPA wetlands was derived from the National Land Cover 2000 (Van Den Berg et al., 2008) and inland water features from the Department of Land Affairs' Chief Directorate: Surveys and Mapping (DLA-CDSM). All wetlands are classified as either 'natural' or 'artificial' water bodies.

The NFEPA wetland map identifies important or sensitive wetlands and wetland clusters. A wetland cluster is a group of wetlands all within 1 km of each other and which are surrounded by relatively natural vegetation. Wetland clusters allow for important ecological processes such as the migration of insects and frogs between the wetlands.

There are **no wetland clusters** within proposed mining area.

According to NFEPA there are no wetlands occurring directly within the quarry site however there a number of artificial (water storage dams) within 500m of the quarry and an natural wetland is located approximately 600m downstream of the quarry site (refer to

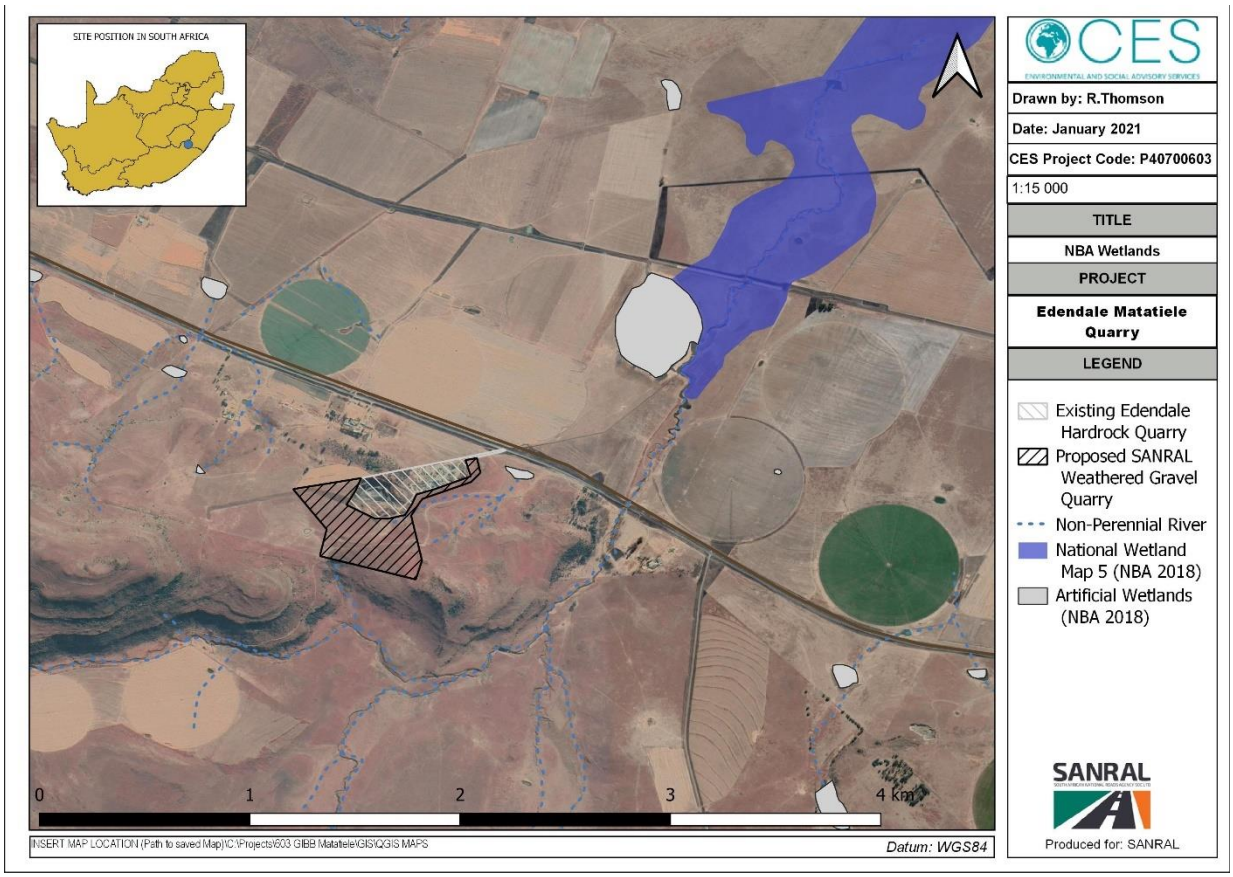

Figure 5-13).

According to NBA (2018) there are no natural wetlands within 500m of the quarry site, however there is one artificial wetland (water storage dam) within 500m of the quarry site. NBA (2018) identifies an unchanneled valley-bottom wetland more than 500m and downstream of the quarry site. This wetland appears to be associated with the non-perennial system occurring south of the quarry site.

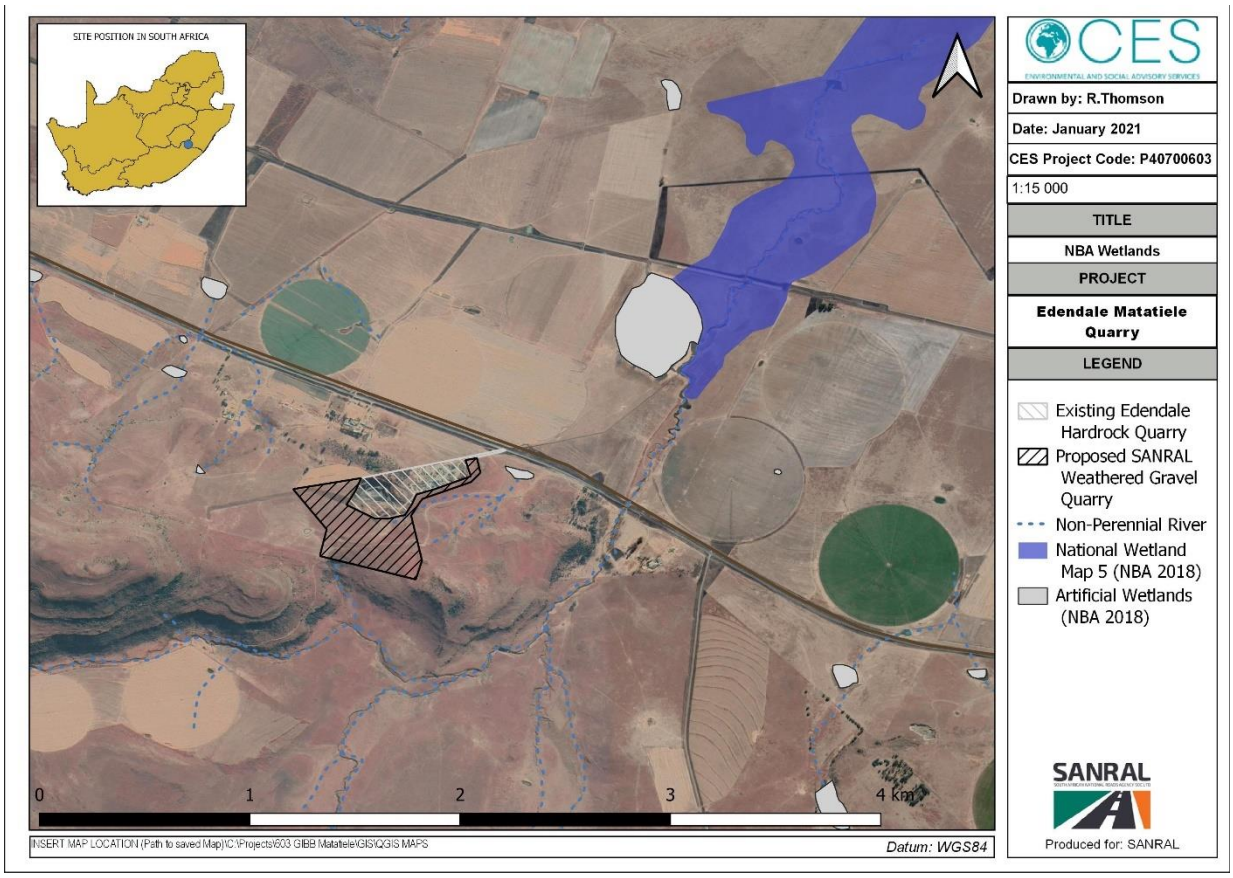

Figure 5-13 Wetlands surrounding the study area.

5.3 SITE SURVEY

Site surveys were conducted on 13 October 2020 and 8 February 2020. The purpose of the site visits were to gather data regarding the surrounding watercourses, ground truth the desktop study, delineate wetlands and assess the state of the aquatic and wetland environment. This includes identifying any potential impacts that the quarry may have on the aquatic and wetland environment and the significance of those impacts.

5.3.1 Site Photographs

Site photographs were taken during the site surveys and are shown in Table 5-4 and Table 5-5 below. Photographs were taken in the direction faced, which is indicated in each plate description. Photograph positions are shown in Figure 5-14 below.

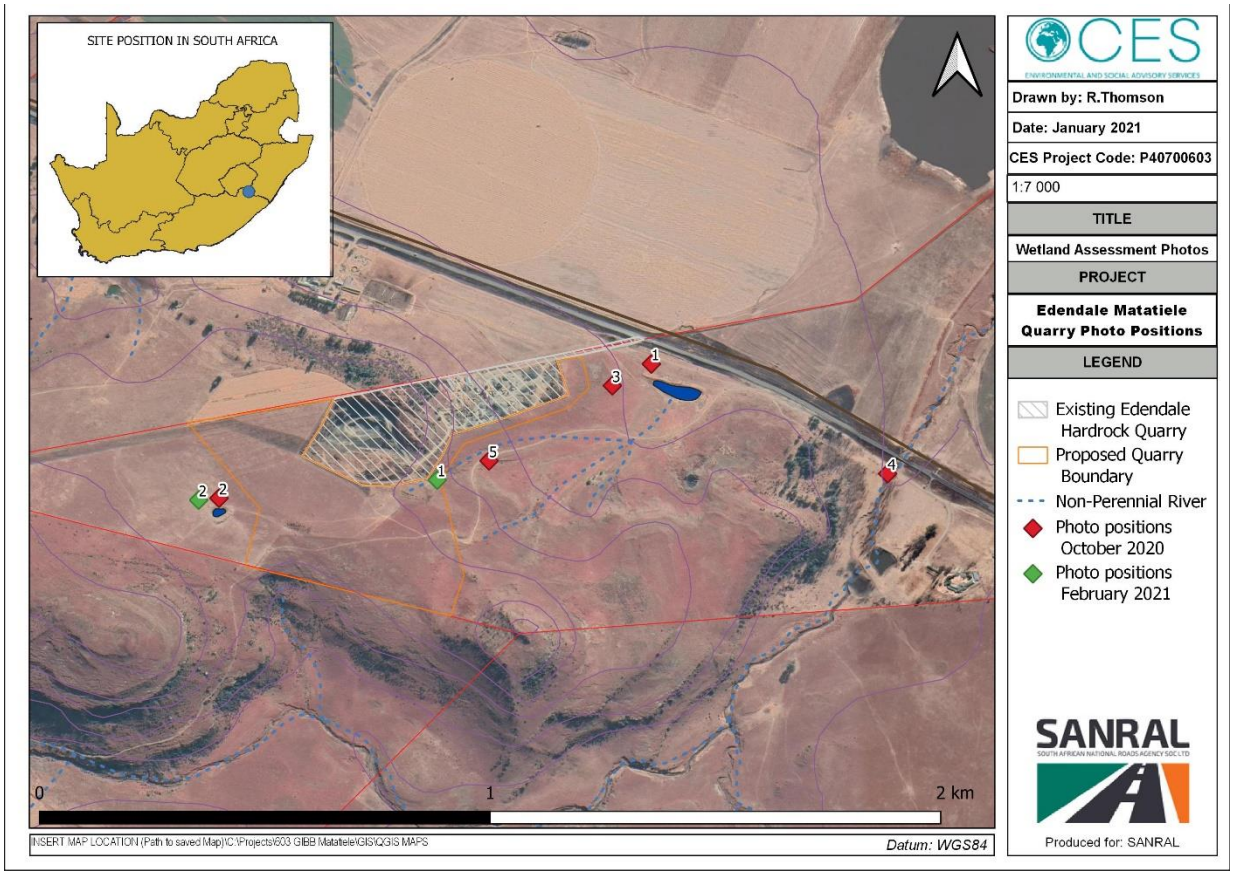

Figure 5-14 Photo positions

Table 5-4 Site photos September 2020

	
Photo position 1 Plate 1: (North East) Dam associated with the wetland system situated approximately 600m east of the quarry site.	Photo position 2 Plate 2: Farm dam (South) for stock watering.

	
Photo position 3 Plate 3: Farm dam (East) for stock watering.	Photo position 4 Plate 4: R56 bridge (North) crossing over the non-perennial drainage line approximately 650m south east of the quarry access road.
	
Photo position 3 Plate 5: Small causeway associated with the internal farm road, located 25m south of the bridge shown in plate 4.	Photo position 5 Plate 6: Seepage wetland system drainage line (North) located south east of the existing quarry.

Table 5-5 Site photos February 2021

	
Photo position 1	Photo position 1 Plate 8: River channel (aerial view)

Plate 7: Base of soil stockpile (West) at the head of the river	
 Photo position 1 Plate 9: River bank (South bank)	 Photo position 1 Plate 10: River bank (North bank)
 Photo position 2 Plate 11: Seepage wetland system (South West)	 Photo position 2 Plate 11: Farm dam (South) used for livestock watering

5.3.2 Rivers

The site investigation identified one non-perennial river system occurring west of the proposed quarry boundary and another occurring east of the proposed quarry boundary. The non-perennial river system occurring east of the proposed quarry boundary has a small incised channel and very little to no riparian area (intact riparian vegetation). This non-perennial river system has been affected to some degree by existing mining operations on the adjacent land, by the development of gravel roads and some alien invasive vegetation.

5.3.3 Wetland classification and delineation

The site investigation identified two natural seepage wetland systems occurring within 500m of the quarry boundary. The wetland system on the western side traverses a small corner on the south western side of the proposed quarry boundary, however, this has been declared a no-go area and the quarry boundary will be amended. Therefore both wetland systems fall outside of the quarry boundary and are unlikely to be affected by the mining operations provided the mitigation measures in this report are implemented. These seepage wetlands are likely to provide ecosystem services such as erosion control,

nitrate removal and toxicant removal as well as flood regulation and stream flow regulation to some extent.

A number of artificial wetlands (water storage dams) occur within 500m of the quarry boundary, however, these are unlikely to be affected by any adverse impacts associated with the mining operations provided the mitigation measures in this report are implemented.

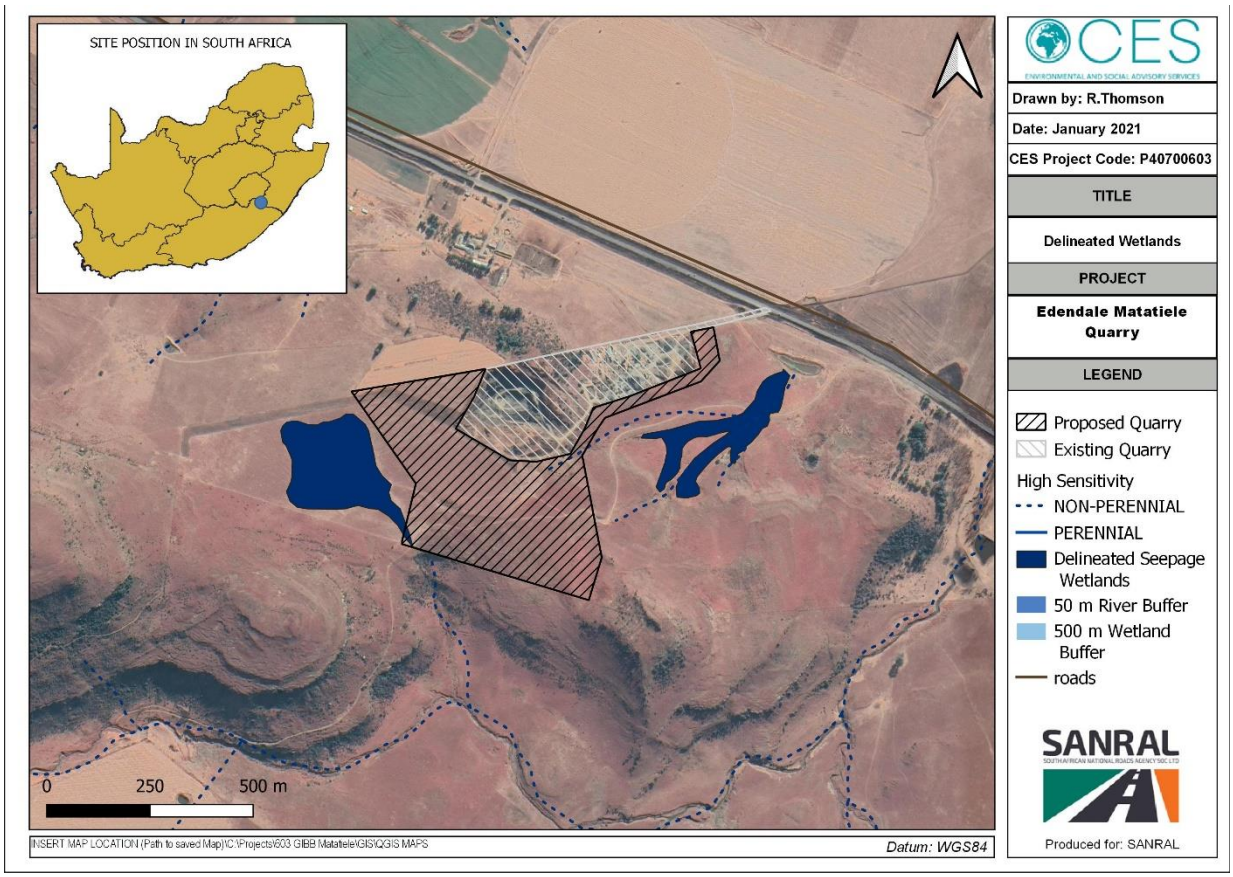

Figure 5-15 Delineation of the natural wetlands within 500m of the quarry

Table 5-6 Wetland Classification according to Ollis et al. (2013).

Wetland	Level 2 Regional Setting	Level 3 Landscape Unit	Level 4 HGM Unit
Seepage wetlands	South-eastern Uplands	Slope	Seepage wetlands

5.3.3.1 Ecosystem services of natural seepage wetlands

Ecosystem services provided by the seepage wetlands include erosion control and nitrate removal as well as flood attenuation and toxicant removal to some extent.

5.3.3.2 Present Ecological State of seepage wetland

The seepage wetland system east of the study site (and most likely if at all to be affected by the development proposals) has been classified as having a **PES of B** whereby the wetland is largely natural with a few modification. A slight change in ecosystem processes is discernible and a small loss of natural habitats has taken place but the natural habitat remains predominantly intact.

Seepage wetland	Hydrology		Geomorphology		Vegetation	
	Impact score	**Change score**	**Impact score**	**Change score**	**Impact score**	**Change score**

	1,0	0,0	0,1	0,0	1,8	0,0
PES Category	B	→	A	→	B	→
Overall PES score	**B**					

The ecological state of the seepage wetland has been transformed predominantly from the development of gravel roads/informal pathways, alien invasive plant infestation and development of a dam within the wetland and the development of a quarry and roads within the wetland catchment. Although the seepage wetland has been impacted to some degree, it has resulted in relatively minor adverse impacts on the wetland and the wetland still remains predominantly intact and functional.

It was observed during the site investigation that the quarry site has two artificial wetlands within 500m of the site, however, there are no wetlands located directly in the mining area. These artificial wetlands are dams that have been built for livestock watering. These artificial wetlands will not be directly affected by the proposed mining activities (i.e these will not be excavated), however there is the potential for water runoff from the mine to enter the dam. The wetland system is located approximately 600m east of the quarry site on the northern side of the R56. The R56 acts as a barrier between the wetland system and the quarry site, however, during high rainfall events, stormwater will collect and run along the south side of the road crossing under the bridge located approximately 650m south of the quarry access road (see plate 4 below) before flowing into the wetland system.

5.3.4 Wetland and riparian vegetation

The following indigenous plant species were observed within the riparian and wetland areas:

- Wahlenbergia species;
- Helichrysium species;
- Rhus species; and
- Verbena species

The following alien invasive plant species observed on site:

- Cirsium vulgare,
- Tagetes minuta (naturalised exotic weed),

5.3.5 Observations

The following observations were made with regards to existing threats/impacts on the wetland and river surrounding the study site:

- The beginnings of erosion surrounding watercourse to the east and down gradient of the proposed quarry site;
- Erosion centralised around the R56 road and bridge infrastructure; and
- Road/culvert infrastructure crossing a number of watercourses.

6 SITE SENSITIVITY

A sensitivity map (Figure 6-1 below) was developed based on desktop and site information gathered, and was classified into areas of high, moderate and low sensitivity.

High Sensitivity

- All natural delineated wetlands, delineated riparian zones of rivers and tributaries of the rivers affected by the activity.

All activities within high sensitivity areas must be closely monitored by a qualified ECO to ensure that all proposed mitigation measures are implemented to manage and minimize potential impacts on the watercourse.

Moderate Sensitivity

- All artificial wetlands;
- Areas within 50m of natural wetlands, artificial wetlands, and rivers.
- Moderate sensitivity areas act as buffers for the high sensitivity areas. Activities that may have an indirect impact on high sensitivity areas must not occur within these buffer areas. Such activities would include:
    - Stockpiling of topsoil, subsoil, etc;
    - Temporary ablution facilities;
    - Site camp establishment;
    - Temporary laydown areas for equipment/materials;
    - Overnight parking of heavy machinery/vehicles;
    - Concrete batching; and
    - Storage of chemicals/hazardous substances.

Low Sensitivity

- 500 m low sensitivity area placed around wetlands (regulated by DWS).

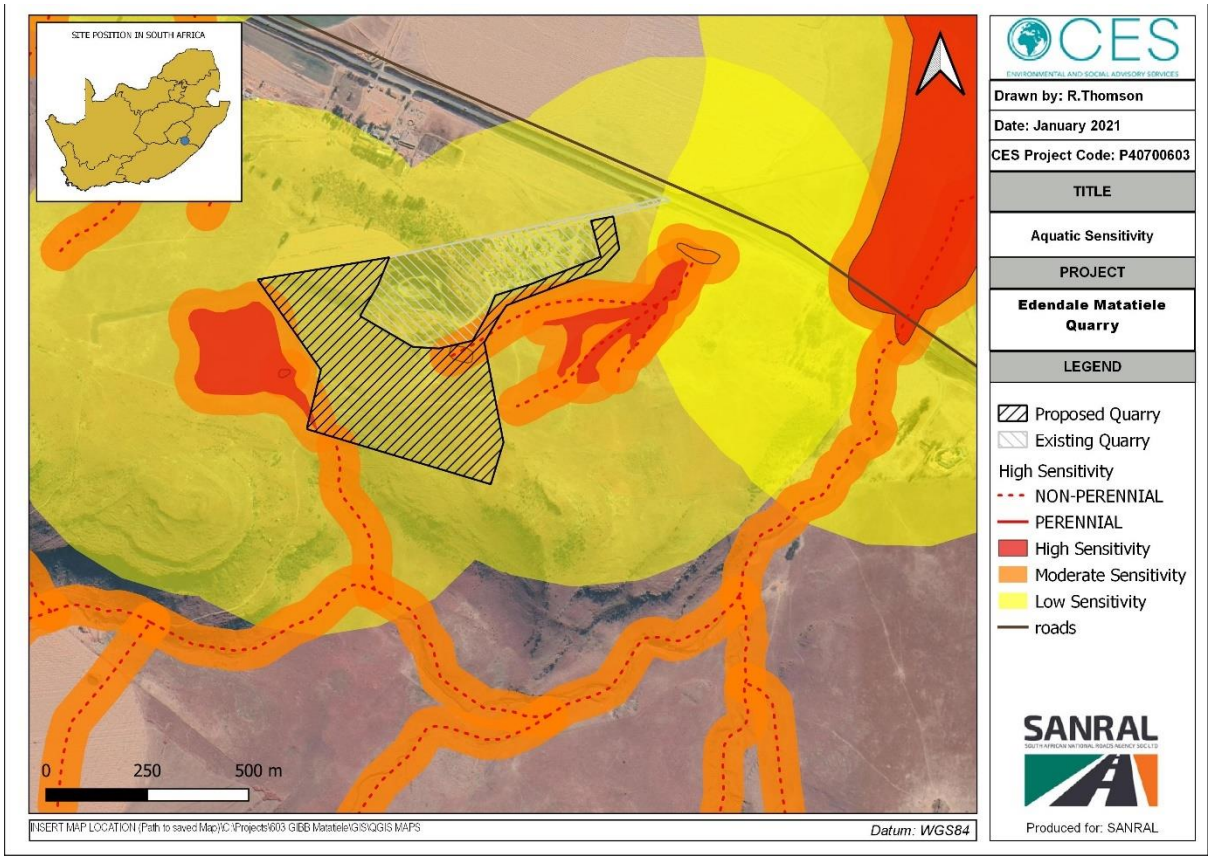

Figure 6-1 Aquatic sensitivity map

7 MANNER IN WHICH THE ENVIRONMENT MAY BE AFFECTED

Impacts that could be a direct or indirect result of the proposed activity were identified for the Planning and Design, Construction and Operation Phase. These included the consideration of direct, indirect and cumulative impacts that may occur, and also considers the no-go or existing impacts.

Table 7-1 below provides a summary of the potential issues identified and their applicability to each phase of the proposed activity.

Table 7-1 Potential issues identified that could result from the proposed development.

Theme	Potential issues	Source of issue	Potential receptors	Phase			
				Planning and Design	Construction	Operation	Mine Decommissioning
Legislative Environment	Legal and policy compliance	• Licensing and Authorisations	• SANRAL	X	X	X	
Aquatic and wetland environment	Scheduling of construction	• Inappropriate construction scheduling	• Rivers and wetlands		X		
	Stormwater Management	• Inappropriate design of stormwater infrastructure		X	X	X	
	Material stockpiling	• Inappropriate stockpiling of material during construction.			X		
	Invasion of alien species	• Failure to plan for removal and management of alien vegetation			X	X	
	Disturbance of aquatic and wetland vegetation and habitat	• Placement of culverts and bridges during planning. • Uncontrolled vegetation clearance during construction.		X	X		X
	Changes to fluvial geomorphology and hydrology	• Inappropriate placement of infrastructure during planning • Earthworks • Vegetation clearance during construction.		X	X	X	X
	Erosion and sedimentation	• Vegetation clearance during construction.			X		
	Water quality	• Accidental spillages and pollution during construction.			X		
	Maintenance	• Poor maintenance of infrastructure				X	

8 IMPACT IDENTIFICATION AND ASSESSMENT

Table 8-1 Impacts and mitigation measures for the Planning and Design, Construction and Operation Phases of the Quarry.

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
PLANNING AND DESIGN PHASE													
Legislative Environment													
Legal and policy compliance	During the planning and design phase non-compliance with the legal requirements and policies of South Africa as they pertain to the aquatic environment could lead to damage to the aquatic environment, unnecessary delays in construction activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.	**Negative**	**DIRECT**	**Severe**	**Study area**	**Short-term**	**Possible**	**Completely reversible**	**Resource will not be lost**	**Achievable**	**High**	• All legal matters pertaining to permitting must be completed prior to any construction or mining activity. • In particular, all necessary Water Use Licences must be in order for any of the following activities: - Construction activities within the 1:100 year floodline, (or within the riparian zone of watercourse) and within 500 m of a wetland or where infrastructure will traverse rivers or drainage lines (if applicable).	**Low**
Aquatic and wetland environment													
Stormwater management	During the planning and design phase inappropriate design of stormwater infrastructure may result in increased levels of erosion,	**Negative**	**DIRECT**	**Severe**	**Study area**	**Long-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Appropriate stormwater structures must be designed to minimise erosion and sedimentation of watercourses. • All road sections situated on slopes must incorporate stormwater diversion. • Stormwater design must be in line with and DWS requirements.	**Low**

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
	sedimentation and pollution of the watercourses.											• Appropriate stormwater structures must be designed around all mining areas to minimise erosion and sedimentation of watercourses. • Appropriate stormwater diversion measures must be put in place to capture and control runoff from mining areas.	**Low**
Disturbance of riparian and wetland vegetation and habitat	During the planning and design inappropriate placement and design of the mining area in proximity to watercourses and wetlands may result in adverse impacts on the integrity of these watercourses and downstream rivers and wetlands.	**Negative**	**Direct**	**Moderate**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource may be partly lost**	**Achievable**	**Moderate**	• Mining must not take place within the high sensitivity areas of the Aquatic and Wetland Assessment Report as far as possible as these areas fall within Upstream Management Areas. • A stormwater management plan should be compiled in order to prevent stormwater from entering the riparian areas to the west and south east of the quarry site. All stormwater must be diverted to the north eastern section of the site, adjacent to the proposed access road. • Care must be taken to reduce the risk of aquifer penetration. • No mining activities should take place within the high sensitivity areas identified in Figure 6.1.	**Low**
Changes to fluvial geomorphology and hydrology	During the planning and design phase inappropriate design of the access road which crosses over a no-perinnial water course may result in erosion of the water course and changes to the hydrology of the watercourses.	**Negative**	**Direct**	**Moderate**	**Study area**	**Long-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• The river crossing should not further impede or divert natural baseflows or increase upstream flood inundation. • A stormwater management plan must be compiled in order to prevent erosion.	**Low**
CONSTRUCTION & OPERATION PHASE													
Legislative Environment													

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Legal and policy compliance	During the construction phase non-compliance with the legal requirements and policies of South Africa s they pertain to the aquatic environment could lead to damage to the aquatic environment, unnecessary delays in construction activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.	**Negative**	**Direct**	**Severe**	**Localised**	**Short-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Severe**	• All construction related conditions in the Environmental Authorisation must be adhered to. • All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required). • All conditions in any other permits must be adhered to. • An ECO must be appointed to oversee construction activities.	**Low**
Aquatic and Wetland Environment													
Scheduling of construction/ site establishment	Inappropriate construction scheduling that does not take into account seasonal requirements of the aquatic environment could lead to short-term impacts on the aquatic environment such as excessive sediment mobilization.	**Negative**	**Indirect**	**Moderate**	**Study area**	**Short term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Site establishment should be undertaken during the driest part of the year to minimize downstream sedimentation of watercourses from sediment-laden runoff during rainfall events. • When not possible, suitable stream diversion structures must be used to ensure the water course is not negatively impacted by construction activity.	**Low**
Stormwater management	During the construction & operation phase the inappropriate routing of stormwater runoff may lead	**Negative**	**Direct**	**Moderate**	**Localised**	**Short-term**	**Possible**	**Reversible**	**Resource will not be**	**Achievable**	**Moderate**	• Stormwater must be managed effectively to minimize the ingress of debris and sediment-laden stormwater into surrounding watercourses.	**Low**

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
	to debris entering watercourses and sedimentation and erosion of surrounding watercourses, adversely affecting the aquatic environment											• Stormwater measures such as interceptor ditches should be installed around mining areas to capture and control stormwater runoff.	
Material stockpiling	During the construction & operation phase, stockpiling of construction materials within moderate and high sensitivity areas could result in erosion and mobilisation of the materials into the nearby watercourses, resulting in sedimentation and a decrease in water quality and aquatic habitat.	**Negative**	**Direct, Indirect**	**Moderate**	**Localised**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• No construction material must be stored within the moderate and high sensitivity areas indicated in Figure 6-1 of the Aquatic and Wetland Assessment Report. • Material stockpiles must not be placed within the moderate or high sensitivity areas indicated in the Aquatic and Wetland Assessment Report. • Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the nearest watercourse. • Stockpiles should not exceed 1.5 m in height. • Stockpiles should be covered during windy periods.	**Low**

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Invasion of alien species	Failure to remove and manage alien vegetation could result in the invasion of alien vegetation in riparian and wetland areas during the construction and operation phase. This would have an adverse impact on the aquatic ecosystem. The removal of existing vegetation creates 'open' habitats that will inevitably be colonised by pioneer plant species. While this is part of a natural process of regeneration, which would ultimately lead to the re-establishment of a secondary vegetation cover, it also favours the establishment of undesirable alien species in the area. These species colonise areas of disturbance and once established, they are typically very difficult to eradicate and can pose a threat to the ecosystem.	**Negative**	**Indirect**	**Moderate**	**Localised**	**Medium-term**	**Probable**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• A Rehabilitation and Alien Vegetation Management Plan must be developed and implemented during the construction and operation phase to reduce the establishment and spread of undesirable alien plant species. • Construction vehicles and machinery must not encroach into areas outside/surrounding the planned mining footprint. • Alien plants must be eradicated from the impacted areas as they appear. • Monitor the project area for any new growth of invasive plants until completion of operation activities. • Short-term monitoring must take place for alien invasive plant species growth for a period of 12 months after operation has been completed should be conducted.	**Low**

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Disturbance of riparian and wetland vegetation and habitat	During the construction phase indiscriminate removal or unnecessary encroachment into riparian and wetland vegetation may lead to disturbance of the aquatic ecosystem.	**Negative**	**Direct, Indirect**	**Severe**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Removal of any riparian and wetland vegetation must take place under the supervision of an ECO. • Removal of alien vegetation should be prioritised. • Banks must be artificially stabilised as soon as possible if riparian vegetation is removed. • Vehicles and machinery must not encroach into areas outside/surrounding road upgrade footprint.	**Low**
Changes to fluvial geomorphology and hydrology	The inappropriate placement of infrastructure, earthworks within the watercourse and prolonged coffer dams/diversion structures may alter natural flow patterns	**Negative**	**Direct, cumulative**	**Severe**	**Localised**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Damage to bed and banks of the watercourse must be avoided other than to complete specific works within the watercourse. • No material, sediment or debris from access road construction must be left or allowed to build up in the watercourse.	**Low**
Erosion and sedimentation	During the construction phase, vegetation clearance and lack of implementation of erosion control measures may result in deterioration of the surrounding habitat as a result of erosion of banks, slopes and bed of watercourse and resultant sedimentation.	**Negative**	**Indirect, Cumulative**	**Severe**	**Study area**	**Long-term**	**Probable**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• Vegetation clearing must be kept a minimum and only to the site footprint. • Erosion controls and sediment trapping measures must be put in place. • All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated. • Disturbed areas must be constantly monitored for erosion channels and these must be rehabilitated immediately.	**Low**

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Water quality	During the construction phase, accidental spillages of wet concrete and chemical/hazardous substances in the vicinity of watercourses may result in water pollution, adversely affecting the aquatic ecosystem.	**Negative**	**Direct, indirect**	**Severe**	**Study area**	**Short-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**High**	• No concrete mixing must take place within 32m of any watercourse. • No machinery must be parked overnight within 50 m of the rivers/wetlands. • All stationary machinery must be equipped with a drip tray to retain any oil leaks. • Chemicals used for mining must be stored safely on bunded surfaces in the construction site camp. • Emergency plans must be in place in case of spillages onto road surfaces or within water courses. • No ablution facilities must be located within 50 m of any river or wetland system. • Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution. • Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it. • All general waste and refuse must be removed regularly around site and stored in a windproof temporary storage area before being disposed of at a registered landfill site.	**Low**

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Decommissioning phase													
Inadequate Rehabilitation and Maintenance of Disturbed Areas	During the decommissioning phase, failure to rehabilitate disturbed areas and restore natural topography to the disturbed areas.	**Negative**	**Direct**	**Moderate**	**Study area**	**Medium-term**	**Possible**	**Reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• Rehabilitation must be implemented during the decommissioning of the mining areas. • All disturbed mining areas must be restored to their natural topography and must be self-draining. • Re-vegetation must take place as soon as possible during the mine decommissioning process. • Rehabilitated areas should be monitored for a period of 12 months by the ECO for the regrowth of alien invasive vegetation, especially around surrounding watercourses where alien invasive vegetation was not present before and has infested these areas as a result of mining activities. • Should any alien invasive vegetation be present this vegetation must be manually removed. • Should any erosion channels develop during the rehabilitation phase, these must be backfilled, compacted and re-vegetated.	**Low**

Table 8-2. Assessment and mitigation of impacts identified in the No-Go alternative.

POTENTIAL ISSUES	SOURCE OF ISSUE	Nature	Type	Consequence	Extent	Duration	Probability	Reversibility	Irreplaceable loss	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Employment Opportunities	The proposed quarry associated with the R56 Section 8 road upgrade will create unskilled and semi-skilled employment opportunities. Should the no-go alternative be the preferred alternative, no employment opportunities will be created and the opportunity to create employment will be lost.	**Negative**	**DIRECT**	**Moderate**	**Study area**	**Short-term**	**Defenite**	**Completely reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• N/A	**Moderate**
Limited material available for the upgrading of the R56 Section 8	The upgrading the R56 Section 8 will not be possible without material sources.	**Negative**	**INDIRECT**	**Severe**	**Study area**	**Long-term**	**Defenite**	**Completely reversible**	**Resource will not be lost**	**Achievable**	**High**	• N/A	**High**
No mining on the site	Should the project not proceed, the current land use will remain the same and aquatic features will remain intact.	**Positive**	**INDIRECT**	**Moderate**	**Study area**	**Long-term**	**Possible**	**Completely reversible**	**Resource will not be lost**	**Achievable**	**Moderate**	• N/A	**Moderate**

8.1 ASSESSMENT OF CUMULATIVE IMPACTS

In terms of Environmental Impact Assessments, a cumulative impact is defined as:

"The past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities".

To assess the cumulative impacts that the quarry will have on the aquatic ecology of the site, it is necessary to assess this at a broader level by looking at other developments in the area such as the adjacent quarry.

The cumulative impacts associated with the project will include the following:

- Loss of aquatic communities at a regional scale could be exacerbated;
- Increase in downgradient sedimentation as well as water quality;
- Invasion of alien plant species in riparian areas may be exacerbated;
- Habitat Fragmentation and disruption of ecosystem function and process may be exacerbated.

The cumulative impact associated with the construction and operation of the quarry, is likely to be of moderate significance prior to the implementation of mitigation measures and of low significance after implementation of mitigation measures, provided the quarry and associated infrastructure avoid areas of high sensitivity. To limit the significance of any adverse impacts on the surrounding aquatic environment, it is important that an Alien Invasive Management and Monitoring Plan and Rehabilitation Plan is implemented, existing roads are used where feasible, and the mitigation measures mentioned in this report are implemented.

9 IMPACT STATEMENT, RECOMMENDATIONS AND CONCLUSION

9.1 CONCLUSIONS

The South African National Roads Agency SOC Limited (SANRAL) is proposing to develop a weathered gravel quarry adjacent to an existing privately-owned quarry on Edendale Farm 185, between the towns of Cedarville and Matatiele, on the R56 within the Matatiele Local Municipality (Figure 2.1). The purpose of the quarry is to provide SANRAL with weathered gravel (sandstone) material for the fill and subbase layer works associated with the upgrading of the R56 between Matatiele and Cedarville. The existing commercial quarry is situated on a dolerite intrusion and does not produce the weathered gravel material that is required. As such, SANRAL intend to develop their own quarry.

CES was appointed by GIBB Consulting Engineers on behalf of SANRAL to complete an Aquatic and Wetland Impact Assessment that will provide input into the Basic Assessment Process and Water Use Licence Application process.

This study assessed the aquatic impacts associated with the proposed Edendale Quarry. Analysis of the project description and layout plan of the proposed Edendale Quarry indicates that a total of 18.8 ha surface are will be disturbed. This has the potential to cause down gradient impacts on water resources outside of the quarry site. The lifespan of the proposed quarry is anticipated to be approximately 10 years, after which the facility will be decommissioned, and the project area rehabilitated in accordance with the EMPr and the Mine Rehabilitation Plan.

The proposed Edendale Quarry is located within 500 m of two (2) artificial wetlands (dams) and traverses a non-perennial stream. The water course drains into the wetland system to the north, which is 600 m away, and ultimately into the Mzimvubu River, which is 17 km to the east. The water course shows signs of erosion and preventative erosion measures, in the form of small stone walls to dissipate flow, were put in place historically. Topsoil has been stockpiled at the head of this watercourse, which has contributed to sediment flow downstream. Although a small degree of degradation and disturbance to the watercourse was noted, measures have been put in place to prevent further loss of the resource. As such, the watercourse is still considered to be maintaining some form of ecological functioning.

The non-perennial river on the south east of the site is considered to be of moderate ecological importance. Adverse impacts on site and to the watercourse could negatively impact the watercourses and downstream river and wetland systems. Care must be taken to limit the impact on the artificial wetlands identified adjacent to the study area as they provide ecosystem services to the surrounding communities in the form of water storage and livestock watering.

It should also be noted that the Tora River, Mgwali River and their associated tributaries are considered Upstream Management Areas. Therefore, appropriate mitigation measures in this report must be properly enforced to limit any adverse impacts on these rivers and the downstream systems.

The potential for these adverse impacts can be reduced by limiting the mining activities associated with the development (except those required for access, ie. the watercourse crossing) to areas outside of areas indicated as MODERATELY sensitive, unless absolutely necessary and under the guidance of a qualified ECO.

The HIGH pre-mitigation impacts relate to water quality, erosion, sedimentation, changes to fluvial geomorphology and hydrology of the aquatic systems and disturbance of wetland and riparian habitat

during the mining operation. These HIGH pre-mitigation impacts can be mitigated to a LOW post-mitigation impact by application of the proposed mitigation measures.

Table 9-1: Summary of impacts identified for the proposed Edendale Quarry.

IMPACT	PRIOR TO MITIGATION	POST-MITIGATION	NO-GO ALTERNATIVE
PLANNING AND DESIGN PHASE			
Impact 1: Legal and Policy Compliance	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 2: Stormwater management	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 3: Disturbance of aquatic and wetland vegetation and habitat	**MODERATE (-)**	**LOW (-)**	**N/A**
Impact 4: Changes to fluvial geomorphology and hydrology	**MODERATE (-)**	**LOW (-)**	**N/A**
CONSTRUCTION & OPERATION PHASE			
Impact 5: Legal and Policy Compliance	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 6: Scheduling of construction/ site establishment	**MODERATE (-)**	**LOW (-)**	**N/A**
Impact 7: Stormwater management	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 8: Material stockpiling	**MODERATE (-)**	**LOW (-)**	**N/A**
Impact 9: Establishment of Alien Plant Species	**MODERATE (-)**	**LOW (-)**	**MODERATE (-)**
Impact 10: Disturbance of aquatic and wetland vegetation and habitat	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 11: Changes to fluvial geomorphology and hydrology	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 12: Erosion and sedimentation	**HIGH (-)**	**LOW (-)**	**N/A**
Impact 13: Water quality	**HIGH (-)**	**LOW (-)**	**N/A**
DECOMMISSIONING PHASE			
Impact 14: Inadequate Rehabilitation and Maintenance of Disturbed Areas	**MODERATE (-)**	**LOW (-)**	**N/A**

9.1.1 Existing Impacts

A baseline analysis of the present condition of the study site indicated that some degree of disturbance/degradation of the aquatic environment on the site has occurred, most likely due to historical grazing by livestock. Consequently, the water course shows signs of erosion. As such the following existing impacts have been identified:

- Loss of vegetation; and
- Erosion.

9.1.3 No-go Areas

Although no-go areas have been identified within the boundary of the proposed site for the Edendale Quarry, it is critical that vegetation clearance and construction activities associated with the proposed development are restricted to the delineated boundaries of the development footprint as indicated in Figure 6-1.. It is recommended that the boundaries of the development footprint be clearly demarcated prior to the clearing of vegetation to prevent the encroachment of activities into the surrounding natural areas.

9.2 WATER USE LICENCE

A Water Use Authorisation (WUA) is required for any construction activity within the extent of a watercourse (i.e. riparian and instream habitat or within 100 m of the watercourse); within the 1:100 year floodline; or within 500 m of a wetland in terms of the following triggers from the National Water Act (No. 36 of 1998):

- Section 21 (c) - impeding or diverting the flow of water in a watercourse; and
- Section 21 (i) - altering the bed, banks, course or characteristics of a watercourse.

It is recommended that DWS is consulted regarding requirements for WULA'S which must be secured for all mining activities affecting the watercourses.

9.3 RECOMMENDATIONS FOR THE PROPOSED ACTIVITY

All the mitigation measures provided below are to be implemented in the Planning and Design, Construction, Operation and Decommissioning Phases of the proposed activities.

9.3.1 Planning and Design

- All legal matters pertaining to permitting must be completed prior to any construction or mining activity. In particular, all necessary Water Use Licences must be in order for any of the following activities:
  - Construction activities within the 1:100-year floodline, (or within the riparian zone of watercourse) and within 500 m of a wetland or where infrastructure will traverse rivers or drainage lines (if applicable).
- Appropriate stormwater structures must be designed to minimise erosion and sedimentation of watercourses.
- All road sections situated on slopes must incorporate stormwater diversion.
- Stormwater design must be in line with and DWS requirements.
- Appropriate stormwater diversion measures must be put in place to capture and control runoff from mining areas.
- Mining must not take place within the high sensitivity areas of the Aquatic and Wetland Assessment Report as far as possible as these areas fall within Upstream Management Areas.
- Care must be taken to reduce the risk of aquifer penetration.
- Scour countermeasures must be incorporated in the design of all bridges and all culverts in the study areas.

- All culverts must be designed in such a manner so as to not impede or divert natural baseflows or increase upstream flood inundation.
- Box culverts should be selected over pipe culverts, as they are less restrictive in terms of flow and also aid in reducing habitat fragmentation.
- Bridges should span the entire width of the river if the width of the river is sufficiently narrow.
- The number of piers placed within the river should be limited to as much as possible to limit the disturbance to the bed and banks of the river.
- All culverts/bridges should be designed to be above the 1:100 year floodline or major flood event.

9.3.2 Construction

- All construction related conditions in the Environmental Authorisation must be adhered to.
- All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required).
- All conditions in any other permits must be adhered to.
- An ECO must be appointed to oversee construction activities.
- Wherever possible, construction activities should be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc.
- When not possible, suitable stream diversion structures must be used to ensure the river is not negatively impacted by construction activity.
- Stormwater must be managed effectively to minimize the ingress of construction debris and sediment-laden stormwater into surrounding watercourses.
- Stormwater must be managed effectively to minimize the ingress of construction debris and sediment-laden stormwater into surrounding watercourses.
- Stormwater measures such as interceptor ditches should be installed around mining areas to capture and control stormwater runoff.
- No construction material must be stored within the moderate sensitivity area indicated in Figure 6.1 of the Aquatic and Wetland Assessment Report.
- Stockpiles must not be placed within the moderate sensitivity area indicated in the Aquatic and Wetland Assessment Report.
- Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the nearest watercourse.
- Stockpiles should not exceed 1.5 m in height.
- Stockpiles should be covered during windy periods.
- A Rehabilitation and Alien Vegetation Management Plan must be developed and implemented clearly to construction activities, to reduce the establishment and spread of undesirable alien plant species.
- Construction vehicles and machinery must not encroach into areas outside/surrounding the planned project footprint.
- Alien Management Plan must be implemented during the construction phase.
- Alien plants must be eradicated from the impacted areas as they appear.

- Monitor the project area for any new growth of invasive plants until completion of construction.
- Short-term monitoring must take place for alien invasive plant species growth for a period of 12 months after construction has been completed should be conducted.
- Removal of any riparian and wetland vegetation must take place under the supervision of an ECO.
- Removal of alien vegetation should be prioritised.
- Banks must be artificially stabilised as soon as possible if riparian vegetation is removed.
- Vehicles and machinery must not encroach into areas outside/surrounding road upgrade footprint.
- Damage to bed and banks of the watercourses must be avoided other than to complete specific works within the watercourse.
- No material, sediment or debris from bridge/culvert construction must be left or allowed to build up in the watercourse.
- Coffer dams and any temporary diversions should not be in place for more than 30 days if possible.
- Construction activities within watercourses should take place within the dry season, when the flows are at their lowest, where possible.
- Vegetation clearing must be kept a minimum and only to the site footprint.
- Erosion controls and sediment trapping measures must be put in place.
- All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated.
- Disturbed areas must be constantly monitored for erosion channels and these must be rehabilitated immediately.
- No concrete mixing must take place within 32m of any watercourse.
- No machinery must be parked overnight within 50 m of the rivers/wetlands.
- All stationary machinery must be equipped with a drip tray to retain any oil leaks.
- Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp.
- Emergency plans must be in place in case of spillages onto road surfaces or within water courses.
- No ablution facilities must be located within 50 m of any river or wetland system.
- Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution.
- Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it.
- All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site.

9.3.3 Operation

- All operational related conditions in the Environmental Authorisation must be adhered to.
- All conditions in the Water Use Licence must be adhered to especially relating to water monitoring etc (if required).

- All condition stipulated in any other additional permits must be adhered to.
- Stormwater infrastructure must be maintained and monitored for effectiveness with respect to controlling and minimising erosion and sedimentation of watercourses.
- An alien vegetation removal and rehabilitation plan must be implemented post-construction.
- The effectiveness of this plan should be monitored on a biannually for the first year following construction or until such time as the ECO deems the rehabilitation sufficient.
- Alien plants must be removed from aquatic environments through appropriate methods such as hand pulling, cutting etc. This must be done under the supervision of the ECO.
- All infrastructures such as culverts, bridges etc. must be maintained and monitored on a regular basis to check for failure of infrastructure.

9.3.4 Decommissioning

- Rehabilitation must be implemented during the decommissioning of the mining areas.
- All disturbed mining areas must be restored to their natural topography and must be self-draining.
- Re-vegetation must take place as soon as possible during the mine decommissioning process.

9.4 FATAL FLAWS

It is the opinion of the specialist that NO FATAL FLAWS exist with the proposed development.

10 REFERENCES

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APPENDIX A

Present Ecological State, Ecological Importance and Sensitivity data for the reach of the Toro River most likely to be affected by the development.

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
T12E-06802	Tora	22.94	2	Y		MODERATELY MODIFIED	C

MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (DEC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)
MODERATE	MODERATE	C	0.00

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	NONE	FISH SPP/SQ	2.00	INVERT TAXA/SQ	39.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	LARGE	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	2.79	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD ACT.	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	VERY LOW	INVERT REPRESENTIVITY PER SECONDARY, CLASS	VERY HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	VERY LOW	INVERT RARITY PER SECONDARY: CLASS	VERY HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	LOW	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW

POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	**ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING**	LOW	**HABITAT DIVERSITY CLASS**	VERY LOW	**STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION**	LOW
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	MODERATE	**HABITAT SIZE (LENGTH) CLASS**	LOW	**RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION**	**LOW**
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	**INSTREAM MIGRATION LINK CLASS**	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	MODERATE		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	MODERATE		
				INSTREAM HABITAT INTEGRITY CLASS	MODERATE		

Present Ecological State, Ecological Importance and Sensitivity data for the reach of the Mgwali River most likely to be affected by the development.

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
T12F-06661	Mgwali	44.66	3	Y		LARGELY MODIFIED	D

MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (DEC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)
MODERATE	MODERATE	C	0.00

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ	3.00	INVERT TAXA/SQ	33.00	FISH PHYS-CHEM SENS DESCRIPTION	MODERATE
RIP/WETLAND ZONE CONTINUITY MOD	LARGE	FISH: AVERAGE CONFIDENCE	1.67	INVERT AVERAGE CONFIDENCE	1.06	FISH NO-FLOW SENSITIVITY DESCRIPTION	MODERATE
POTENTIAL INSTREAM HABITAT MOD ACT.	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT REPRESENTIVITY PER SECONDARY, CLASS	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	LARGE	FISH REPRESENTIVITY PER SECONDARY: CLASS	LOW	INVERT RARITY PER SECONDARY: CLASS	HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	MODERATE	FISH RARITY PER SECONDARY: CLASS	MODERATE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	LOW
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	LOW	HABITAT DIVERSITY CLASS	VERY LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	LOW

RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	MODERATE	**HABITAT SIZE (LENGTH) CLASS**	MODERATE	**RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION**	**LOW**
RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	**INSTREAM MIGRATION LINK CLASS**	VERY HIGH		
		RIPARIAN-WETLAND ZONE MIGRATION LINK	MODERATE		
		RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	MODERATE		
		INSTREAM HABITAT INTEGRITY CLASS	MODERATE		

11 APPENDIX E – CURRICULUM VITAE OF THE PROJECT TEAM

Province of the
EASTERN CAPE
ECONOMIC DEVELOPMENT, ENVIRONMENTAL AFFAIRS & TOURISM

DETAILS OF EAP AND DECLARATION OF INTEREST IN TERMS OF REGULATIONS 12 AND 13 OF THE AMENDMENTS TO THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 AS AMENDED.

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for environmental authorization in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amendments to Environmental Impact Assessment Regulations, 2014

PROJECT TITLE

Edendale Quarry, R56, Matatiele Local Municipality, Eastern Cape Province

Specialist:	JS Environmental Consulting (Pty) Ltd		
Contact person:	Ms Jaclyn Smith		
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Professional affiliation(s) (if any)	SACNASP Professional Natural Scientist (No. 120693)		
Project Consultant:	CES - Environmental and social advisory services		
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Province of the
EASTERN CAPE
ECONOMIC DEVELOPMENT,
ENVIRONMENTAL AFFAIRS & TOURISM

E-mail: r.thomson@cesnet.co.za.

4.2 The specialist appointed in terms of the Regulations_

I, Jaclyn Smith, declare that

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence and is punishable in terms of section 24F of the Act.

Signature of the specialist:

JS Environmental Consulting (Pty) Ltd
Name of company (if applicable):

12/03/2021
Date:

Signature of the Commissioner of Oaths:

Date: 12/03/2021

Designation: Chartered Accountant

Official stamp (below)
Version 1 of April 2017

COMMISSIONER OF OATHS
Ref: 9/1/82
MARK J. WORSTER
CHARTERED ACCOUNTANT
Membership No: 08077382
Date: 12/03/2021
Certified A True Copy Of The Original