63 Wessel Road, Rivonia, 2128 PO Box 2597, Rivonia, 2128 South Africa
Tel: +27 (0) 11 803 5726 **Fax:** +27 (0) 11 803 5745 **Web:** www.gcs-sa.biz

Application for Integrated Environmental Authorisation: Wastewater Treatment Plant and Co-Disposal Facility for Maquasa East Operations.

Final Environmental Impact Report

Version – **FINAL**

4 December 2024

Kangra Coal (Pty) Ltd

GCS Project Number: 22-0161

DMR Reference: MP 30/5/1/23/2/1/133 EM

Client reference: KC/003/22

GCS (Pty) Ltd. **Reg No:** 2004/000765/07 Est. 1987
Offices: **Johannesburg** (Head Office) | Durban | Gaborone | Maseru | Windhoek | Ostrava
Directors: AC Johnstone (CEO) | DA Kriel | W Sherriff (Financial) | N Marday (HR) | H Botha) | CR Goodspeed

Integrated Environmental Authorisation Application: Wastewater Treatment Plant and Co-Disposal Facility for Maquasa East Operations

FINAL

12 November2024

DOCUMENT ISSUE STATUS

Report Issue	FINAL		
GCS Reference Number	22-0161		
Client Reference	KC/003/22		
Title	Integrated Environmental Authorisation Application: Wastewater Treatment Plant and Co-Disposal Facility for Maquasa East Operations.		
	Name	**Signature**	**Date**
Author	Reneé Steele *Pr. Sci. Nat: 008920* *EAPASA: 2022/4847*		4 December 2024
Environmental Manager	Gerda Bothma *Pr. Sci. Nat: 117348*		4 December 2024

EXECUTIVE SUMMARY

The Applicant, Kangra Coal (Pty) Ltd (Kangra), holds approved Environmental Management Programmes (EMPr) for their Maquasa East (MQE), Maquasa West (MQW), and Nooitgesien mining areas, situated approximately 40km west of the town of Piet Retief, Mpumalanga Province. These documents were combined into one EMPr during the application process undertaken by GCS (Pty) Ltd (GCS) in terms of Section 102 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) in 2013.

Kangra intends to construct a wastewater treatment plant (WWTP) for the treatment of contaminated water, and a new Co-Disposal Facility (CDF), including supporting and associated infrastructure, at their MQE Operations (Department of Mineral Resources and Energy (DMRE) reference number: MP 30/5/1/23/2/1/133 EM).

An overview of the proposed projects is provided below:

Wastewater Treatment Plant

The purpose of the proposed WWTP is to treat decant water as well as surplus contaminated water within the mining operations. MQE is currently decanting clear groundwater from old underground workings at an average rate of 1 800m^3/d. The WWTP will employ active treatment of the wastewater as it was found that passive treatment is not feasible nor possible due to the decant point's location, the high flow rates, and the discharge quality required. Treated effluent from the WWTP will be discharged to the Heyshope Dam via an underground pipeline. Access to the WWTP and associated pipelines will be via existing roads. The implementation of the proposed active treatment of decant will entail the following:

- Upgrade of the decant/contamination dam: Formalising the dam wall to increase the storage capacity and lining the dam to prevent seepage;
- Upgrade of the decant point by drilling a row of eight (8) boreholes into the new dam wall at the decant dam in order to create a borehole well curtain (cut off) to cut off ground seepage water potentially entering the Heyshope Dam;
- Constructing a WWTP to treat decant and other mine contaminated water; and
- Constructing a Brine Pollution Control Dam (Brine PCD) and a Brine Treatment Plant.

Brine produced at the WWTP will initially be pumped to the proposed new Brine PCD. The Brine PCD was initially proposed for the evaporation of brine from the WWTP. However, during the detailed design process currently being undertaken, it became evident that naturally evaporating brine at the site would not be efficient due to the projected inflow rate of brine to the proposed PCD/evaporation dam. It is therefore necessary to construct a Brine Treatment Plant to remove water from the brine, thereby converting it to a dry filter cake that can be disposed of on the proposed CDF.

Brine Treatment Plant

A Brine Treatment Plant, with an anticipated throughput of 15m^3/hr, or 285m^3/day if pumping 19 hrs/day, will be constructed. The modular plant will cover an area of less than 0.06ha and will be skid mounted or containerised. The modular system allows for simpler expansion or alterations in the future should it be required.

The addition of the proposed Brine Treatment Plant to the development will reduce the risk of insufficient storage space for brine, reduce the risk of overflows from the Brine PCD and allows for sludge/filter cake quantities to be disposed of to be accurately quantified each month.

The proposed technology is a system that comprises a combined evaporator and crystalliser in a single step. Brine which is pumped into the Brine Treatment Plant will first pass through a pre-heating stage to raise the temperature before entering the brine recirculation system. The process removes water from the brine through the creation of water vapour, which exits at the top. Brine is continuously recirculated in the system causing the concentration of the recirculated brine to gradually rise until it crystallises and forms solids. It is anticipated that the clean water produced will comply with the South African National Standards (SANS) 241 potable water limits before being discharged. The remaining salts/filter cake will be directly transported to the CDF for disposal.

Co-Disposal Facility

The proposed CDF falls within the exact footprint of the previously authorised (Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA) Ref: 17/2/3/GS-240) MQE Discard Dump (DD). A Waste Management Licence (WML) was issued for this DD and associated PCD and stormwater management infrastructure on 23 February 2024 (DMR Ref: (MP) 30/5/1/3/3/1/ (133) Environmental Authorisation (EA)). This WML, however, authorises the disposal of discard only.

The CDF will accommodate discard produced at the beneficiation plant, slurry/filter cake, and potentially brine from the WWTP.

The CDF's design will be like the authorised DD: a three-compartment side hill-type facility with a footprint of approximately 65ha. A phased development approach, over a period of 20 years, is envisaged: Phase 1 – 7 years; Phase 2 – 7 years and Phase 3 – 6 years capacity. Associated and supporting infrastructure includes haul roads, PCDs, stormwater management measures, various pipelines, etc.

Environmental Authorisation Applications

To enable the implementation of the proposed projects, Kangra needs to acquire the necessary environmental approvals. GCS Water and Environment (Pty) Ltd (GCS) has been appointed as the independent Environmental Assessment Practitioner (EAP) to compile and

submit the required documentation for the Integrated Environmental Application by Kangra Coal (Pty) Ltd for:

- An Integrated Environmental Authorisation (IEA) and WML through a Scoping and Environmental Impact Reporting (S&EIR) process and the compilation of an Environmental Management Programme (EMPr), in terms of the NEMA, National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA), and Environmental Impact Assessment (EIA) Regulations (2014, as amended) (IEA Application);
- An Integrated Water Use Licence (IWUL), in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA).

Scoping and Environmental Impact Report Process

A S&EIR Process has two (2) distinct phases: The S&EIR Process. The Scoping Phase was concluded with the acceptance of the Final Scoping Report by the Competent Authority on the 13th of August 2024.

This Environmental Impact Report illustrates the risk assessment undertaken of potential biophysical and socio-economic aspects and impacts of the proposed development on the receiving environment. This Report summarises the risks and findings of various specialist studies undertaken and outlines avoidance, mitigation and management actions which will assist in minimising the impact of the project during construction and operations as far as possible.

The Environmental Impact Phase concludes with the submission of the Final Environmental Impact Report to the Competent Authority (CA) for consideration, thereafter the application will be granted or rejected.

Public Participation Process

All Interested and Affected Parties (I&APs) were encouraged to register as stakeholders to enable them to comment during the Public Participation Process (PPP) of the entire project. This PPP provided an opportunity to comment and raise any concerns or suggestions with respect to the project.

As per the requirements of the NEMA EIA Regulations (2014, as amended), the Draft Scoping Report (DSR) was available for comment for 30 days from 24 November 2023 to 16 January 2024 and the Draft EIR was issued for public comment from 18 September to 18 October 2024.

All comments received during PPP were recorded and addressed in the Comments and Responses Report (CRR),the Final Scoping Report and this EIR.

Environmental Impact Statement

The assessments undertaken during the EIA Process have not identified any fatal flaws which would preclude the authorisation of the proposed project. The EAP is confident that all major

negative impacts associated with the proposed development has been adequately described and can be mitigated to acceptable levels.

The goal of the proposed project is to mitigate the negative impacts of decant on the environment and continue contributing to the local economy by allowing the full Life of Mine (LoM) to be realised.

It is the opinion of the EAP that the proposed WWTP and CDF and related infrastructure should be authorised, provided that the proposed mitigation measures are implemented effectively and in line with the EMPr and any site-specific conditions outlined within the IEA and WML.

CONTENTS PAGE

LIST OFAPPENDICIES

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CDF	Co-Disposal Facility
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESR	Environmental Scoping Report
DMRE	Department of Mineral Resources and Environment
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
ELWU	Existing Lawful Water Use
EMP	Environmental Management Plan
GA	General Authorisation
GSDM	Gert Sibande District Municipality
GNR	Government Notice Regulation
HGM	Hydrogeomorphic
I&AP	Interested and Affected Parties
IBA	Important Bird and Biodiversity Areas
IHAS	Invertebrate Habitat Assessment System
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Wastewater Management Plan
LoM	Life of Mine
MAE	Mean Annual Evaporation
mamsl	Metres above mean sea level
MAR	Mean Annual Runoff
mbgl	Metres below ground level
MDEDET	Mpumalanga Department of Economic Development and Eco Tourism
MPRDA	Minerals and Petroleum Resource Development Act
MRA	Mining Right Area
Mtpa	Million tonnes per annum
NEM: WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)

NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PPP	Public Participation Process
PCD	Pollution Control Dam
PES	Present Ecological Status
PSLM	Pixley ka Seme Local Municipality
ROD	Record of Decision
RoM	Run of Mine
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
SASS	South African Scoring System
SAWS	South African Weather Service
SAWQG	South African Water Quality Guidelines
SWMP	Storm Water Management Plan
TDS	Total Dissolved Solids
WWTP	Waste Water Treatment Plant

STRUCTURE AND CONTENT OF THIS REPORT

This Environmental Impact Assessment Report has been prepared in compliance with Appendix 3, Regulation 28 of the EIA Regulations (2014, as amended) and is divided into various chapters and appendices, the contents of which are outlined below.

REFERENCE	CONTENTS OF THE ENVIRONMENTAL IMPACT REPORT	RELEVANT SECTION IN THE REPORT
1(a)	**Details of:**	See below
(i)	*The EAP who prepared the report; and*	Section 1.4
(ii)	*The expertise of the EAP, including a curriculum vitae*	Section 1.4 & Appendix A & B
1(b)	***The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:***	Section 1.5
(i)	*the 21-digit Surveyor General code of each cadastral land parcel;*	Section 1.5
(ii)	*where available, the physical address and farm name; and*	Section 1.5
(iii)	*where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties*	Section 1.5
1(c)	***A plan which locates the proposed activity, or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is—***	Section 1.5: Figure 1-2
(i)	*a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;*	N/A
(ii)	*on land where the property has not been defined, the coordinates within which the activity is to be undertaken;*	Section 1.5: Figure 1-2
1(d)	***A description of the scope of the proposed activity, including—***	See below
(i)	*all listed and specified activities triggered and being applied for; and*	Section 3.2
(ii)	*a description of the associated structures and infrastructure related to the development;*	Section 2
1 (e)	***A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;***	Section 3
1 (f)	***A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;***	Section 4
1 (g)	***A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;***	Section 5.1
1 (h)	***A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:***	See below
(i)	*details of the development footprint alternatives considered;*	Section 5.1
(ii)	*details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;*	Section 9 & Appendix C
(iii)	*a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;*	Appendix C
(iv)	*the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*	Section 6

REFERENCE	CONTENTS OF THE ENVIRONMENTAL IMPACT REPORT	RELEVANT SECTION IN THE REPORT
(v)	*the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts—* *(aa) can be reversed;* *(bb) may cause irreplaceable loss of resources; and* *(cc) can be avoided, managed or mitigated;*	Section 9.2
(vi)	*the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;*	Section 9.1
(vii)	*positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*	Section 9.2
(vii)	*the possible mitigation measures that could be applied and level of residual risk;*	Section 9.2 & Appendix D
(ix)	*if no alternative development footprints for the activity were investigated, the motivation for not considering such; and*	Section 5
(x)	*a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;*	Section 5.6
1 (i)	***A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including—***	Section 9
(i)	*a description of all environmental issues and risks that were identified during the environmental impact assessment process; and*	Section 10 & Appendix D
(ii)	*an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;*	Section10 & Appendix D
1 (j)	***An assessment of each identified potentially significant impact and risk, including—***	Section 10 & Appendix D
(i)	*cumulative impacts;*	Section 10 & Appendix D
(ii)	*the nature, significance and consequences of the impact and risk;*	Section 10 & Appendix D
(iii)	*the extent and duration of the impact and risk;*	Section 10 & Appendix D
(iv)	*the probability of the impact and risk occurring;*	Section 10 & Appendix D
(v)	*the degree to which the impact and risk can be reversed;*	Section 10 & Appendix D
(vi)	*the degree to which the impact and risk may cause irreplaceable loss of resources; and*	Section 10 & Appendix D
(vii)	*the degree to which the impact and risk can be mitigated;*	Section 10 & Appendix D
1 (k)	***Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have recommendations have been included in the final assessment report;***	Section 7
1 (l)	***An environmental impact statement which contains—***	Section 12
(i)	*a summary of the key findings of the environmental impact*	Section 12.1

REFERENCE	CONTENTS OF THE ENVIRONMENTAL IMPACT REPORT	RELEVANT SECTION IN THE REPORT
	assessment:	
(ii)	*a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and*	Figure 12-1
(iii)	*a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;*	Section 12
1 (m)	***Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;***	Sections 7, 9 & 12
1 (n)	***The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;***	Section 5.6
1 (o)	***Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;***	Section 12.4
1 (p)	***A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;***	Section 11
1 (q)	***A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;***	Section 12.2
1 (r)	***Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;***	N/A Inclusive of Operational Phase
1 (s)	***An undertaking under oath or affirmation by the EAP in relation to—***	Section 15
(i)	*the correctness of the information provided in the reports;*	Section 15
(ii)	*the inclusion of comments and inputs from stakeholders and I&APs;*	Section 15
(iii)	*the inclusion of inputs and recommendations from the specialist reports where relevant; and*	Section 15
(iv)	*any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;*	Section 15
1 (t)	This was deleted by GN 517 of 11 June 2021	N/A
1 (u)	***An indication of any deviation from the approved scoping report, including the plan of study, including—***	Section 2.1.2
(i)	*any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and*	N/A
(ii)	*a motivation for the deviation;*	N/A
1 (v)	***Any specific information that may be required by the competent authority; and***	Section 13
1 (w)	***Any other matters required in terms of section 24(4)(a) and (b) of the Act.***	N/A

1 INTRODUCTION

1.1 Background

Kangra Coal (Pty) Ltd.'s (Kangra) Maquasa mining operation is located near Piet Retief within the Mpumalanga Province. The mining area is situated approximately 45km west of Piet Retief and just off the N2 national road on a secondary road leading to the Heyshope Dam. The Maquasa mining operations is made of the following mining areas:

- Maquasa East (MQE);
- Maquasa West (MQW); and
- Nooitgesien.

All these activities are undertaken and authorised under Mining Right (MR) MP30/5/1/23/2/1/133EM from the Department of Mineral Resources and Energy (DMRE). Refer to **Figure 1-1** for a regional locality map.

All mining and project related infrastructure is located at MQE and includes a coal washing plant and associated infrastructure. This plant is used for the processing of all coal mined from Twyfelhoek and Balgarthen mining area. No mining is taking place at MQE and west as all of the coal reserves have already been mined.

The following infrastructure is located at MQE:

- Offices;
- Workshop and ancillary buildings;
- Existing DD;
- Beneficiation Plant;
- ENPROTEC Plant;
- Diesel Storage Facilities;
- Dirty water containment facilities;
- MQE Adit;
- Haul roads;
- Powerlines;
- Conveyors and associated service roads (transporting mined coal to the MQE processing plant);
- Access Roads;
- Pipeline (transporting water to the MQE underground storage area);

- Crushers;
- Washing and screening plant; and
- Overburden and stockpile (i.e. topsoil, Run-of-Mine (ROM) ore, product) dumps.

Kangra intends to construct a wastewater treatment plant (WWTP) for the treatment of contaminated water, and a new CDF, including supporting and associated infrastructure, at their MQE Operations.

To enable the implementation of the proposed projects, Kangra needs to acquire the necessary environmental approvals. GCS Water and Environment (Pty) Ltd (GCS) has been appointed as the independent Environmental Assessment Practitioner (EAP) to compile and submit the required documentation for the Integrated Environmental Application (IEA) by Kangra Coal (Pty) Ltd for:

- An IEA and Waste Management Licence (WML) through a Scoping and Environmental Impact Reporting (S&EIR) process and the compilation of an Environmental Management Programme (EMPr), in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA), National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA), and EIA Regulations (2014, as amended) (IEA Application); and
- An Integrated Water Use Licence (IWUL), in terms of the National Water Act, 1998 (Act no, 36 of 1998) (NWA).

1.2 Project Overview

An overview of the proposed projects is provided below.

1.2.1 Wastewater Treatment Plant

The purpose of the proposed WWTP is to treat decant water as well as surplus contaminated water within the mining operations. MQE is currently decanting clear groundwater from old underground workings at an average rate of 1 800m^3/d. The WWTP will employ active treatment of the wastewater as it was found that passive treatment is not feasible nor possible due to decant point's location, the high flow rates and the discharge quality required.

The implementation of the proposed active treatment of decant will entail:

- Upgrade of the decant/contamination dam: Formalising the dam wall to increase the storage capacity and lining the dam to prevent seepage;
- Upgrade of the decant point by drilling a row of eight (8) boreholes into the new dam

wall at the decant dam in order to create a borehole well curtain (cut off) to cut off ground seepage water potentially entering the Heyshope Dam;

- Constructing a WWTP to treat decant and other mine contaminated water; and
- Constructing a Brine Pollution Control Dam (PCD) and a Brine Treatment Plant.

Treated effluent from the WWTP will be discharged to the Heyshope Dam via an underground pipeline. Access to the WWTP and associated pipelines will be via existing roads.

Brine produced at the WWTP will initially be pumped to the proposed new Brine PCD. The Brine PCD was initially proposed for the evaporation of brine from the WWTP. However, during the detailed design process currently being undertaken, it became evident that naturally evaporating brine at the site would not be efficient due to the projected inflow rate of brine to the proposed PCD/evaporation dam. It is therefore necessary to construct a Brine Treatment Plant to remove water from the brine, thereby converting it to a dry filter cake that can be disposed of on the proposed CDF.

1.2.2 Brine Treatment Plant

A Brine Treatment Plant, with an anticipated throughput of 15m^3/hr, or 285m^3/day if pumping 19 hrs/day, will be constructed. The modular plant will cover an area of less than 0.06ha and will be skid mounted or containerised. The modular system allows for simpler expansion or alterations in the future should it be required.

The addition of the proposed Brine Treatment Plant to the development will reduce the risk of insufficient storage space for brine, reduce the risk of overflows from the Brine PCD and allows for sludge/filter cake quantities to be disposed of to be accurately quantified each month.

The proposed technology is a system that comprises a combined evaporator and crystalliser in a single step. Brine which is pumped into the Brine Treatment Plant will first pass through a pre-heating stage to raise the temperature before entering the brine recirculation system. The process removes water from the brine through the creation of water vapour, which exits at the top. Brine is continuously recirculated in the system causing the concentration of the recirculated brine to gradually rise until it crystallises and forms solids. It is anticipated that the clean water produced will comply with the SANS 241 potable water limits before being discharged. The remaining salts/filter cake will be directly transported to the CDF for disposal.

1.2.3 Co-Disposal Facility

The proposed Co-Disposal Facility (CDF) falls within the exact footprint of the previously

authorised (MDARDLEA Ref: 17/2/3/GS-240) MQE Discard Dump (DD). A WML was issued for this DD and associated PCD and stormwater management infrastructure on 23 February 2024 (DMR Ref: (MP) 30/5/1/3/3/1/ (133) EA). This WML, however, authorises the disposal of discard only.

The CDF will accommodate discard produced from the beneficiation plant, slurry, filter cake from the Brine Treatment Plant and potentially brine from the WWTP.

The CDF's design will be like to the authorised discard dump: a three-compartment side hill-type facility with a footprint of approximately 65ha. A phased development approach, over a period of 20 years, is envisaged: Phase 1 – 7 years; Phase 2 – 7 years and Phase 3 – 6 years capacity.

1.3 Authorisations Related to the Project

The following list is a summary of the authorisations currently held by Kangra in respect of the MQE Operations. (Please note, other, non-related authorisations have not been included in this list):

- Kangra Maquasa Operations MR (Reference No.: MP30/5/1/23/2/1/133EM) issued by the Mpumalanga DMRE on the 13th of August 2014.
- An IWUL (Licence No. 11/W51B/ACGIJ/4718) issued in terms of the NWA, by the Department of Water and Sanitation (DWS), on the 23rd of October 2017 for:
    - Section 21(a) – Taking of water from a water resource;
    - Section 21(b) – Storing of water;
    - Section 21(c) – Impeding or diverting the flow of water in a watercourse;
    - Section 21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource;
    - Section 21(i) – Altering the bed, banks, course or characteristics of a watercourse; and
    - Section 21(j) - Removing, discharging or disposing of water found underground.
- An IWUL (Licence No. 11/W51B/CGI/4938) issued in terms of the NWA, by the DWS on the 4th of April 2018 for the new DD for:
    - Section 21(c) – Impeding or diverting the flow of water in a watercourse;
    - Section 21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource;

- Section 21(i) – Altering the bed, banks, course or characteristics of a watercourse.

- Environmental Authorisation (EA) (Reference No.: 17/2/3 GS-240) for the MQE Discard Dump, issued by the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA) on the 14th of June 2016.
- A WML was issued for the disposal of discard onto the DD, as well as the associated PCD and stormwater management infrastructure on 23 February 2024 (DMR Ref: (MP) 30/5/1/3/3/1/ (133) EA).

1.4 Details of Applicant and Environmental Assessment Practitioner

1.4.1 Applicant

The details of the Applicant are provided in **Table 1-1** below.

Table 1-1: Details of the Applicant

ITEM	DETAILS
Company Name	Kangra Coal (Pty) Ltd
Company Representative	Paul Redelinghuys
Contact Person	Mahlatse Monareng
Telephone No.	+27 (17) 730 6200
Facsimile No.	+27 (17) 826 5284
Email Address	mahlatse.monareng@kangracoal.co.za
Postal Address	Kangra Group (Pty) Ltd, P.O. Box 745, Piet Retief

1.4.2 Environmental Assessment Practitioner

GCS has been appointed as the independent EAP by Kangra Coal (Pty) Ltd to undertake the environmental applications required for the proposed projects on behalf of the Applicant. The contact details of the EAP are provided in **Table 1-2** and the EAP's CV is attached as **Appendix B**.

Table 1-2: Details of the EAP

ITEM	DETAILS
Company Name	GCS Water and Environmental (Pty) Ltd
Company Representative	Gerda Bothma
EAP	Reneé Steele
Telephone No.	+27 (0)11 803 5726
Facsimile No.	+27 (0)11 803 5745
Email Address	gerdab@gcs-sa.biz
Postal Address	PO Box 2597, Rivonia, 2128

Mrs Bothma is the Environmental Unit Manager at GCS since 2019 has over 25 years' experience within the environmental and waste management field. Mrs Bothma has been involved in several engineering projects as the EAP as well as the Environmental Control Officer during construction, working closely with the Occupational Health and Safety Officer. She also has been involved in projects where waste licensing and water use licensing processes formed an integral part of the services offered and has extensive experience in environmental auditing and compliance monitoring. Mrs Bothma is the Project Manager overseeing the quality control in respect of the application processes.

Reneé Steele is an Environmental Scientist, registered as a Professional Natural Scientist (Pri. Sci. Nat. 008920) with the South African Council for Natural Scientific Professions. Reneé is registered EAP (Reg. No. 2022/48470) with the Environmental Assessment Practitioners Association of South Africa.

Ms Steele has 17 years' experience as an EAP. Reneé has been involved in a wide range of environmental related projects, including environmental impact assessments; mining right, mining permit, prospecting permit applications; water use licence applications; environmental performance auditing and Environmental Control Officer (ECO) work.

GCS has no conflict of interest related to the contents of this Report. GCS has no personal financial interests in the property and/or activity being assessed in this report. GCS has no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the property or activity, other than fair remuneration for professional services rendered for this Report to the CA. GCS declares that the opinions expressed in this Report are independent and a true reflection of their professional expertise. As such, GCS meets the requirements of an independent EAP as per the EIA Regulations 2014.

1.5 Project Location

As mentioned previously, MQE Operations is located within the Mpumalanga Province and operates under one (consolidated) MR, within which the proposed projects are located. The MR area fall within the jurisdiction of the Mkhondo Local Municipality (MLM) and Pixley Ka Seme Local Municipality (PSLM) of the Gert Sibande District Municipality (GSDM). Refer to **Figure 1-1** below. **Table 1-3** provide further information regarding the location of the proposed projects and their affected properties including the Surveyor General (SG) 21-digit site information for the parent farms, whilst **Figure 1-2** provides a visual representation of their location.

Table 1-3: Property, SG & Ownership Details

PROJECT	PROPERTY	SG CODE	OWNER ON TITLE DEED
Wastewater Treatment Plant (WWTP), Brine Treatment Plant, Brine PCD & pipeline	Remaining Extent (RE) of the farm Roodekraal 21HT	T0HT00000000002100000	Kangra (Pty) Ltd
WWTP discharge pipeline	Farm Roodekraal 21 HT	T0HT00000000002100000	Kangra (Pty) Ltd
	RE of the farm Roodekraal 21HT	T0HT00000000002100000	
Co-Disposal Facility (CDF)	RE of the farm Rooikop 18HT	T0HT00000000001800000	Kangra (Pty) Ltd
	RE of the farm Maquasa 19HT	T0HT00000000001900000	
CDF pipelines & external haul roads	RE of the farm Rooikop 18HT	T0HT00000000001800000	Kangra (Pty) Ltd
	RE of the farm Roodekraal 21HT	T0HT00000000002100000	Kangra (Pty) Ltd

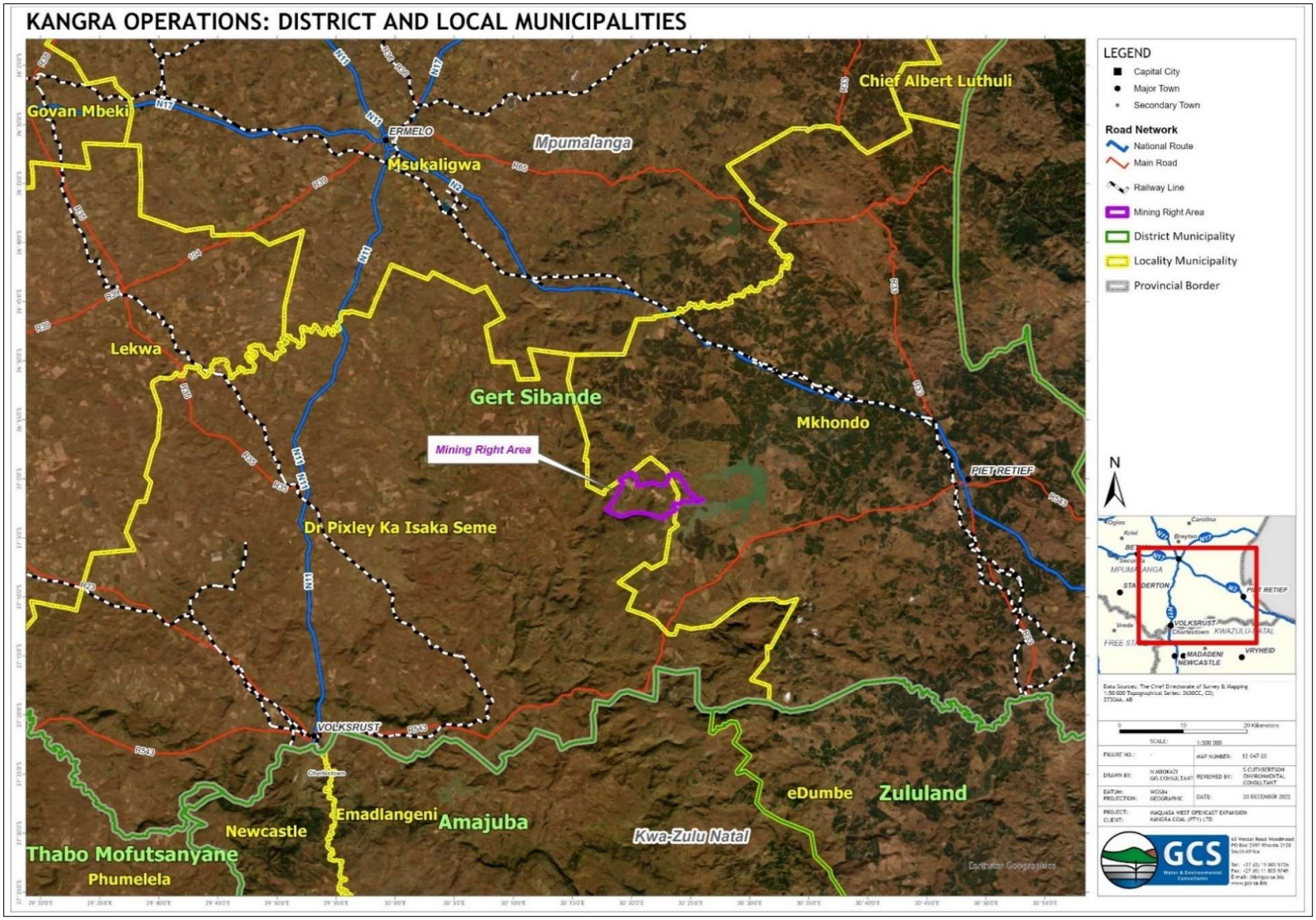


Figure 1-1: Regional Locality of Kangra Operations

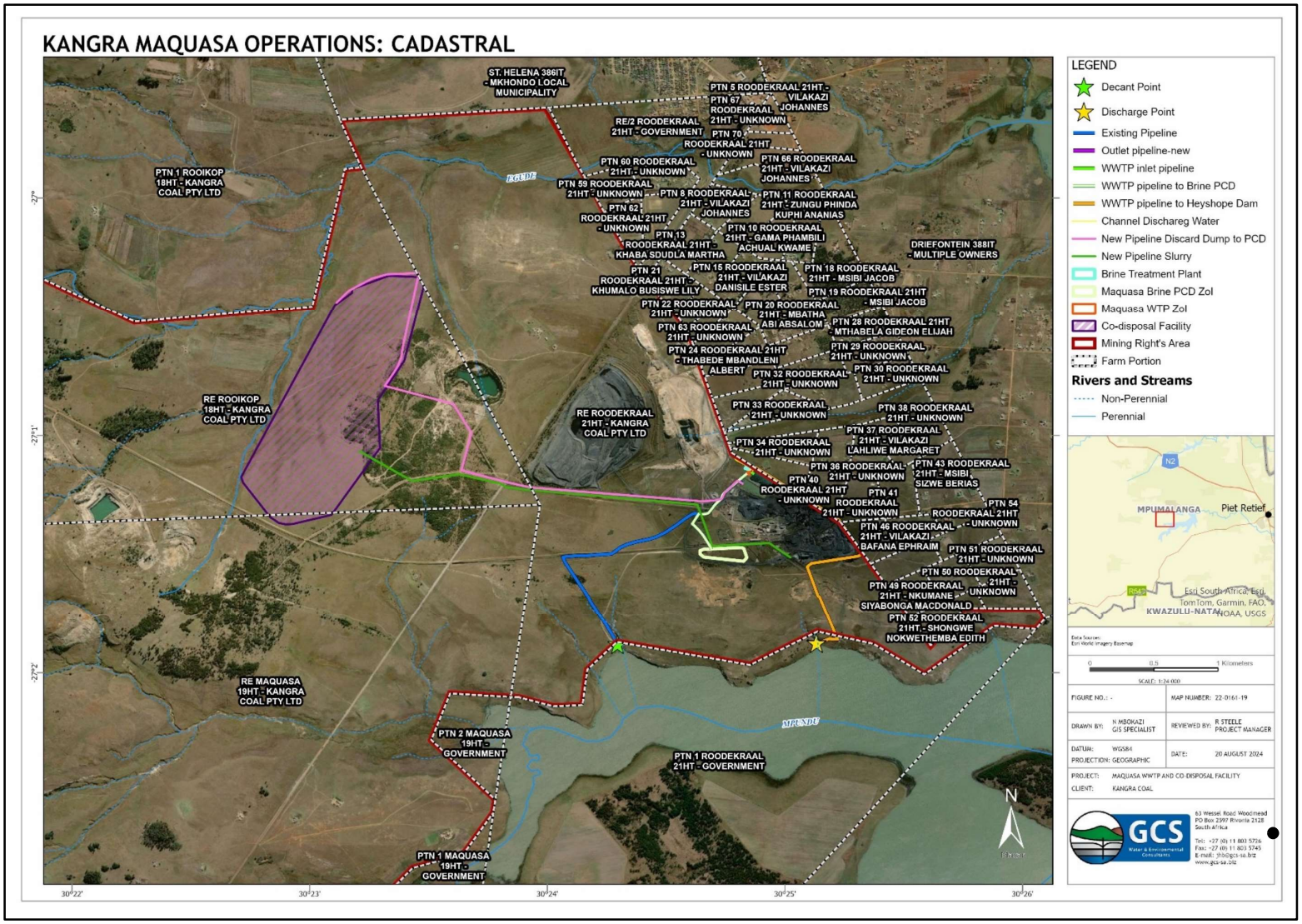


Figure 1-2: Property Details: MQE Projects

2 PROJECT DESCRIPTION

As indicated in Section 1.2, MQE intends to construct a WWTP and CDF, with associated infrastructure, at their MQE site. Further details are provided below.

2.1 Proposed WWTP & Associated Infrastructure

The information regarding the proposed WWTP and associated infrastructure has been obtained from the design reports compiled by GFK Consulting Engineers, attached under Appendix A2 and A3.

2.1.1 Overview of the Proposed WWTP

Decant is currently occurring via borehole "GCS016" in the form of clear groundwater, which has elevated sulphate levels, emanating from the old underground workings at MQE. This decant is observed at an elevation range of approximately 1303 to 1306 mamsl. Currently, the decanting water collects in an unlined contamination/decant dam next to the Heyshope Dam, depicted in **Figure 2-1** and **Figure 2-2** below. This dam is created by an existing earth berm to the south of the decant point, which allows for the collection of decant water and the diversion of the majority of clean water around the dam. Water from this dam is continuously pumped to PCDs to prevent overflows into the Heyshope Dam. The 2018 Numerical Model Update (GCS, 2018) indicated that there is seepage entering the Heyshope Dam in addition to the decant currently taking place.

The 2018 Numerical Model Update report identified potential decant management actions, namely: passive treatment (constructed wetland system), evaporation over PCDs and active treatment. Active treatment is considered the most feasible solution due to the decant point location, high contaminated water flow rates and required discharge water quality. Refer to section 5.2.1 for a detailed assessment of the alternatives.

The implementation of the proposed active treatment of decant will entail upgrading the decant point and decant dam; constructing a WWTP, a Brine PCD and a Brine Treatment Plant. A Brine PCD was initially proposed for the evaporation of brine from the WWTP. However, during the detailed design process currently being undertaken, it became evident that naturally evaporating brine at the site would not be efficient due to the projected inflow rate of brine to the proposed PCD/evaporation dam. It is therefore necessary to construct a Brine Treatment Plant to remove water from the brine, thereby converting it to a dry filter cake that can be disposed of on the proposed CDF. The proposed Brine Treatment Plant will be a modular plant within the proposed development footprint, covering an area of less than 600m^2 (0.06ha) and will be phased in a later stage of the development.

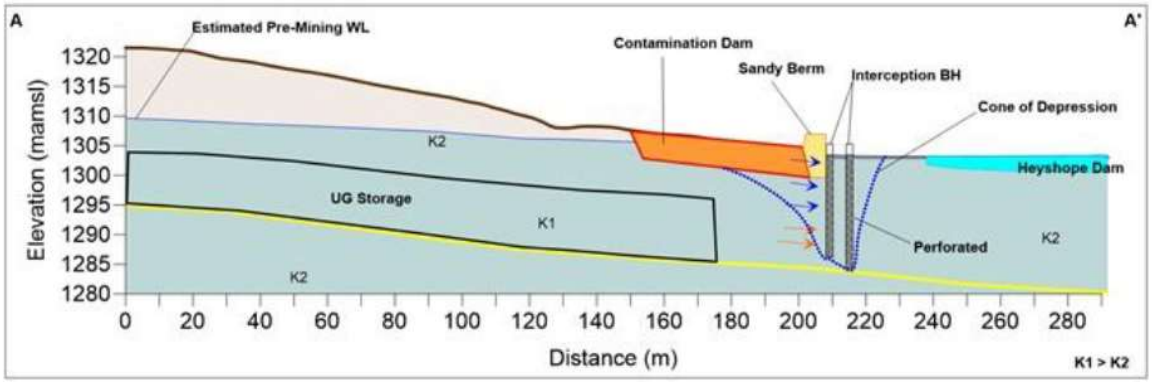


Figure 2-1: Unlined contamination/decant dam

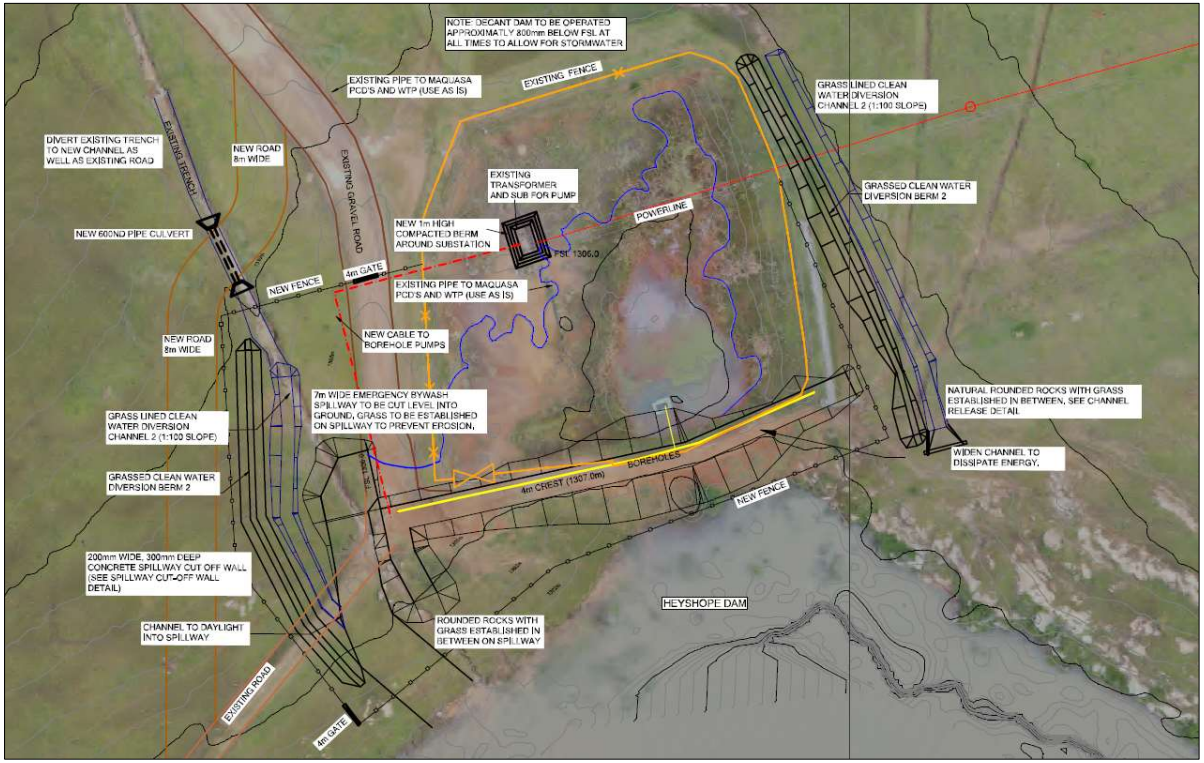


Figure 2-2: Decant point and Contamination/Decant Dam layout

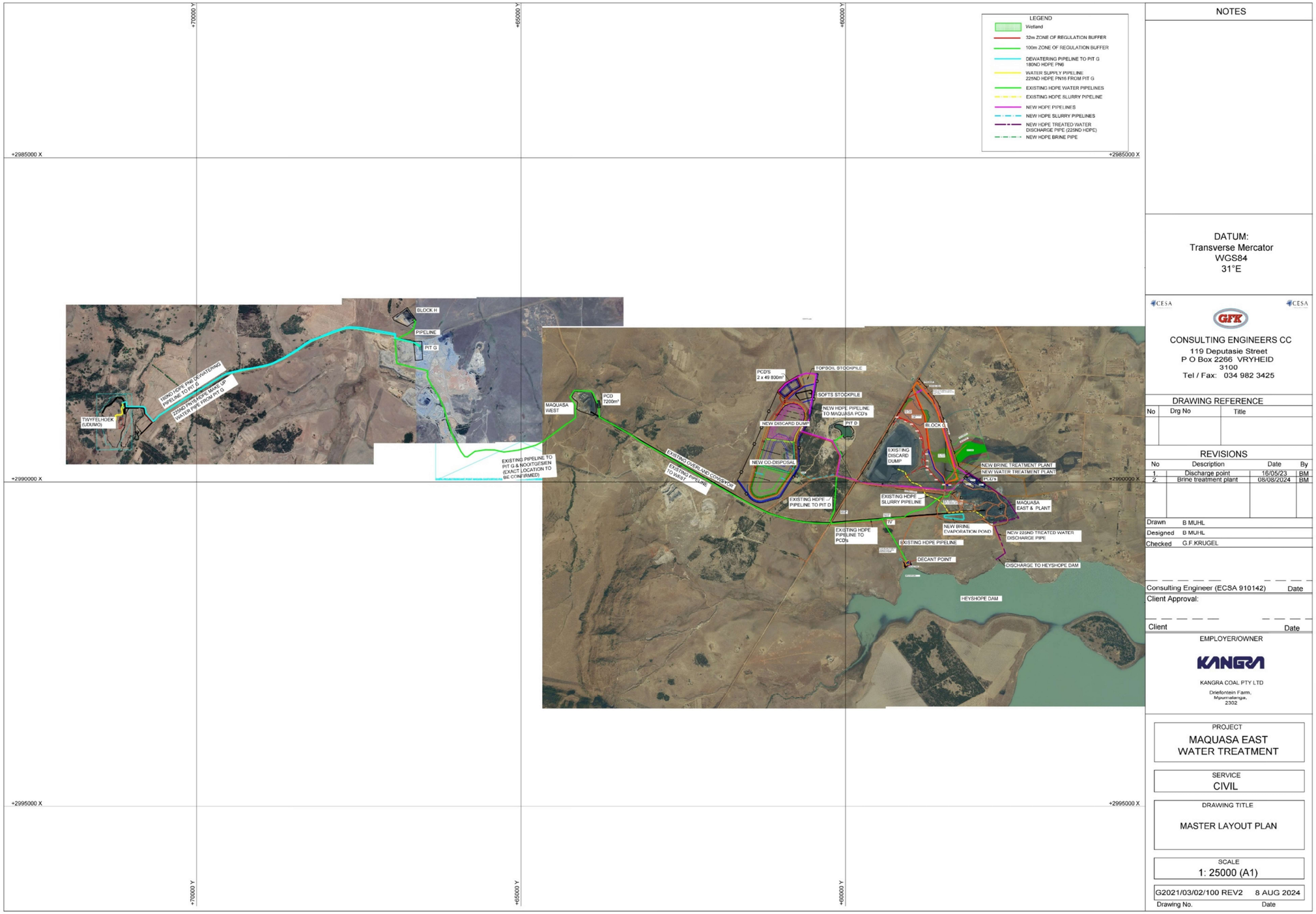


Figure 2-3: MQE Water Treatment Master Layout Plan

2.1.2 Description of the Proposed WWTP & Associated Infrastructure

Decant Point

The decant point will be upgraded by creating a borehole well curtain (cut off) to cut off ground seepage water potentially entering the Heyshope Dam, as indicated on **Figure 2-2** and **Figure 2-4** below. As mentioned previously, the decant dam is created by an existing earth berm to the south of the decant point (refer to **Figure 2-1)**. This berm will be upgraded to form a dam wall. Boreholes will be installed in this dam wall and drilled into the underground sandstone. A row of eight (8) boreholes will be installed, spaced at 10m centres. Due to the close proximity to the Heyshope Dam, the risk exists that clean water can also be dewatered. Therefore, only one row will be drilled, as far as practically possible from the Heyshope Dam.

To further reduce the risk of dewatering of the clean water in the Heyshope Dam, a concrete wall approximately 15m deep is proposed between the boreholes and the Heyshope Dam.

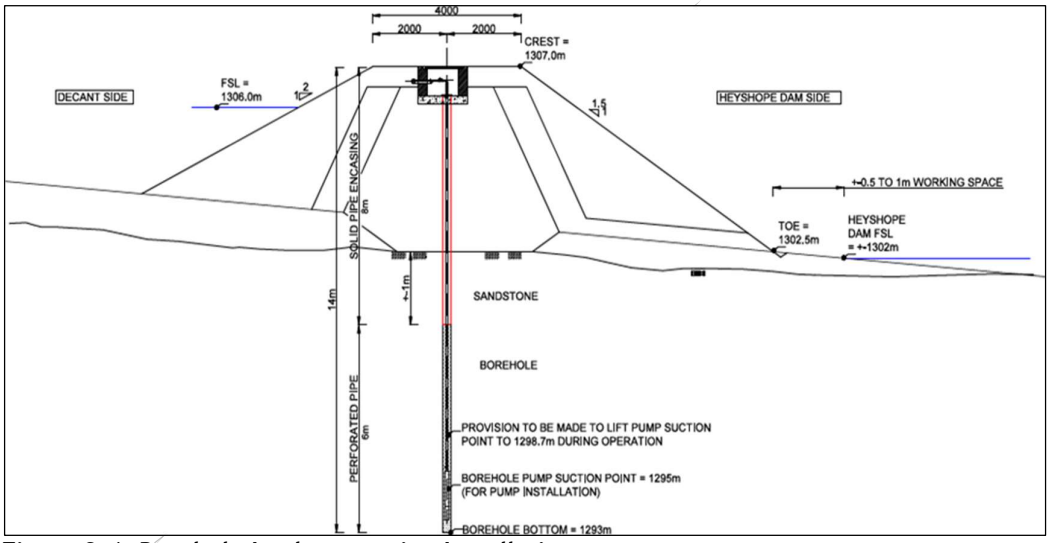


Figure 2-4: Borehole Implementation Installation

All the boreholes will be connected by a 75ND HDPE pipe running along the top of the dam wall. Each borehole will be fitted with a stainless-steel submersible pump and level probes set to start pumping when the water in the borehole reaches the following conditions:

- Starting condition: the pump will start when the liquid level in the water well is at 1299.7m, which is above Lower probe; and
- Stop condition: the pump will stop when the liquid level in the water well is at 1295.5m, which is below the Lower probe.

The level probes will prevent continuous pumping and subsequent dewatering of clean water

from the Heyshope Dam. A pump flow rate of 5l/s has been used in the design.

A water metre will be installed to measure quantities pumped from the borehole. This metre functions separately from the water metre already installed at the decant point which measures how much surface decant water is pumped out on a monthly basis.

The existing gravel road will continue to be used for access to the decant point. A small portion approximately 110m long will be diverted from the existing road where a new road will be constructed. The new diverted road will be 8m wide with standard v-drains (500mm deep) on either side. This diverted road will cross an existing trench, where a 600ND pipe culvert will be installed.

Decant Dam/Contamination Dam

The upgrade of the decant dam will entail increasing the capacity to prevent overflow and lining the dam in accordance with any conditions imposed by the DWS in order to prevent seepage into the Heyshope Dam.

The additional capacity will be created by increasing the dam wall. A portion of the existing earth berm indicated on **Figure 2-1** and **Figure 2-2** and the existing fence on the northern side of the decant dam will be kept as is, with a new dam wall and two diversion channels to be constructed. All clean stormwater and dirty decant water will be separated. With the stormwater diversion channels and berms in place, only direct rainfall and the actual decanting water will be stored in the decant dam.

Additionally, the dam wall will serve as protection to prevent cross-contamination of clean and dirty water during flooding periods and peak rainfall seasons. The Full Supply Level (FSL) of the decant dam (1360m) is 3m higher than the FSL of the Heyshope Dam (1303m). The following details are applicable to the raised dam wall and upgraded decant dam:

- FSL: 1306m;
- Crest Level: 1307ml; and
- Dam capacity at FSL: 1530m^3.

The stormwater diversion channels will be constructed in accordance with the design report, which sized them using predicated 1:50 year flood intensities (refer to Table 4 of the design report attached under Appendix A2). Siltation of the stormwater diversion channels is expected to be minimal as the clean stormwater runoff area is mostly from grasslands. The channels will be lined with Kikuyu or grass of similar properties. Kikuyu grass can handle a velocity up to 2.3m/s which is in line with the channel design velocities of 2m/s. The channels are to be constructed at a slope of 1:150 or flatter to ensure subcritical flow conditions are maintained.

Fairly clean stormwater will discharge into the Heyshope Dam via dispersion and erosion control structures downstream of the channels. Shallow sandstone is observed near the water edge of the Heyshope Dam. Erosion at the stormwater outlets is thus expected to be minimal.

WWTP

The detailed design of the proposed WWTP is currently being undertaken and a containerised reverse osmosis (RO) package plant is proposed; located next to the existing MQE PCDs. Refer to the proposed layout in **Figure 2-6** below. Access to the WWTP and associated pipelines will be via existing roads.

The WWTP needs to accommodate surplus contaminated water from the entire mining operation. In accordance with the mine wide water balance, flow rates of 4 500m^3 per day (52l/s) of contaminated water is to be treated at the WWTP to limit spills from the existing and proposed PCDs to less than once in 50 years, in compliance with Government Notice (GN) 704 of the NWA. Refer to **Figure 2-3** above for an overview of the site-wide MQE water treatment as depicted in the MQE Master Layout Plan compiled by GFK Consulting Engineers (DWG Reference No.: G2021/03/02/100 REV1).

The general RO process is provided in the diagram in **Figure 2-5**. The WWTP will produce treated water, which will be treated to the proposed quality provided in **Table 2-1** of this report, dewatered primary sludge, dewatered gypsum sludge and brine. The treated/product water will be discharged into the Heyshope Dam, the dewatered sludge will be disposed of on the CDF and the brine will be pumped to the Brine PCD.

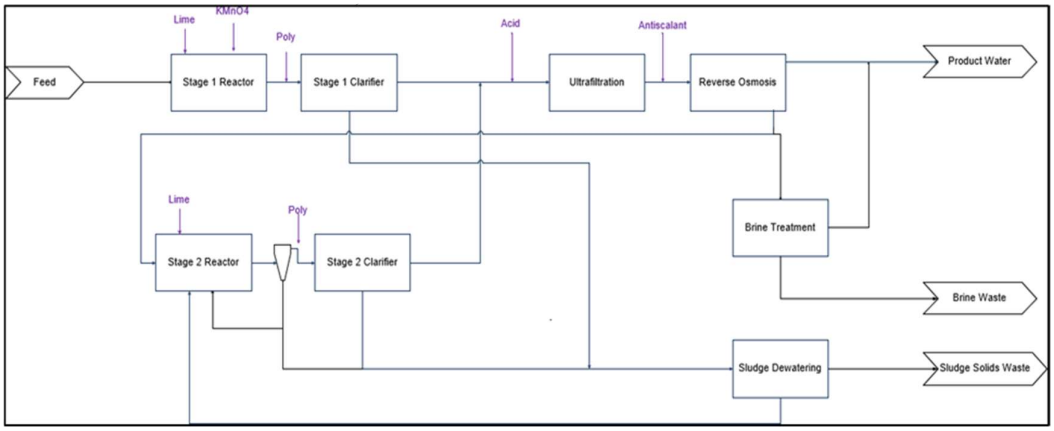


Figure 2-5: RO Plant Process (Nafasi Water Technologies,2023)

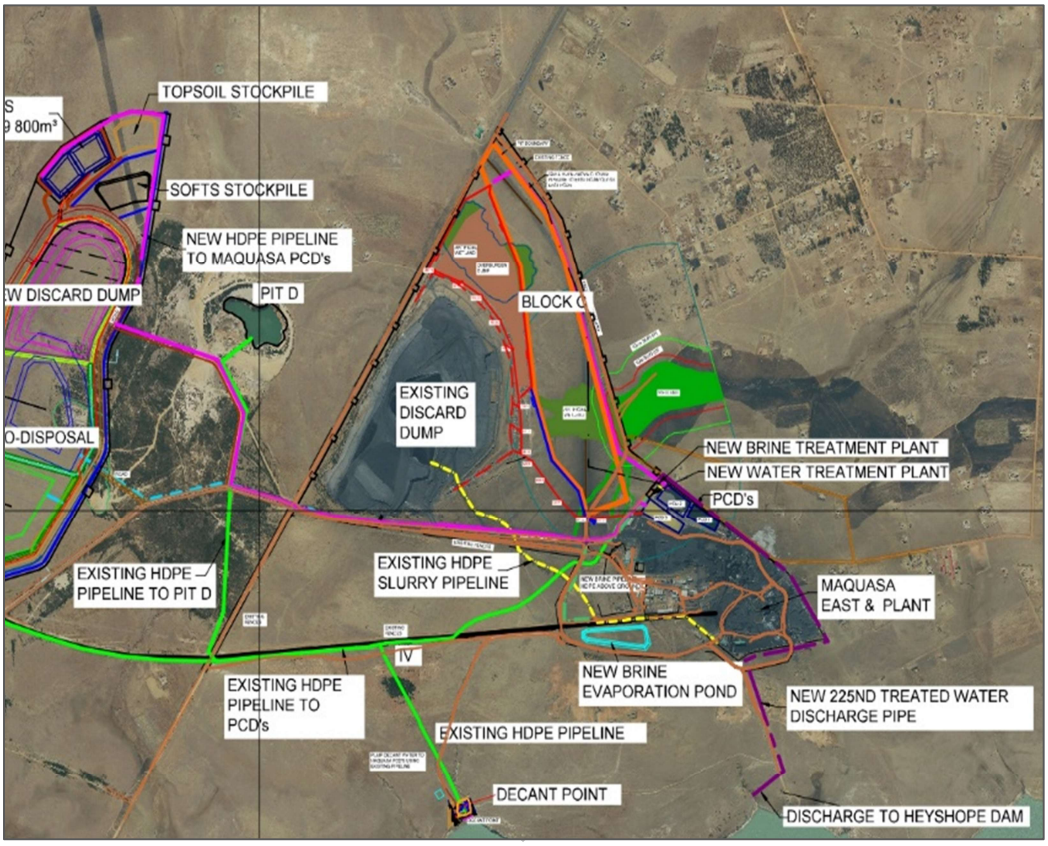


Figure 2-6: WWTP & BTP layout

Treated Water

Due to the high volumes of contaminated water being treated, discharging the treated effluent directly at the WWTP location is not feasible as it will potentially result in significant erosion, disturbance to human settlements in close proximity and significant ecological degradation of the sensitive wetland ecosystems identified within 500m from the WWTP.

It is therefore proposed that treated effluent be discharged to the Heyshope Dam via an underground pipeline, with erosion protection and energy dissipation in the form of a concrete and stone pitching headwall at the point of inflow into the dam. Refer to **Figure 2-6** above.

As there are currently no Resource Quality Objectives (RQO) for the Usuthu Catchment Management Area, the proposed discharge water quality as tabulated in **Table 2-1** below, for the design of the WWTP has been based on the following:

- South African Water Quality Guidelines (DWS, 1996).
- SANS: 241:2015.
- World Health Organisation standard.

- Aquatic standard EPA.
- Baseline river quality in nearby streams not affected by mining.
- Current Heyshope Dam water quality.
- Block C Water Use Licence as a guideline to what has previously been approved by DWS for the Kangra Operations.
- MQE Water Use Licence as a guideline to what has previously been approved by DWS for the Kangra Operations.

Table 2-1: Recommended Effluent Quality

DETERMINANT	UNITS	DOMESTIC STANDARDS		Maquasa Operations WUL water quality (groundwater)	Block C WUL water quality (groundwater). Table 3	Baseline river at Balgarthen (Based on data range from 2010-2020 at monitoring points 963,966)	Heyshope dam point	MAXIMUM RECOMMENDED FOR DAM.
		SANS 241	WHO					
pH	pH units	5-9.7		6.5-8	6.5-9	5.7-8.9	7.5	6.5-8
Dissolved Oxygen (DO)/BOD	mg/ℓ					80% -120% of saturation		80% -120% of saturation
Electrical Conductivity	mS/m	170		27	23	22	14.72	40
Chloride	mg Cl/ℓ	300	250	3	3	14	7.04	100
Ammonia as N	mg N/ℓ	1.5	1.5			0.11	0.05	0.9
Ammonia	mg NH3/ℓ					N/A		0.2
Ammonium	mg NH4/ℓ					N/A		Test not required
Chromium IV	µg CR IV/ℓ					N/A		7
Cyanides Free and Total	µg Cn/ℓ	200	70			200		2
Dissolved Aluminium	µg Al/ℓ	300		620		2230	1.26	10
Dissolved Antimony	µg Sb/ℓ	20	20			N/A		20
Dissolved Arsenic	µg As/ℓ	10	10	1		N/A		10
Dissolved Beryllium	µg Be/ℓ	700				N/A		700
Dissolved Barium	µg Ba/ℓ					N/A		100
Dissolved Boron	µg B/ℓ	2400	2400			N/A		500
Dissolved Cadmium	µg Cd/ℓ	3	3	10		N/A		0.2
Dissolved Calcium	mg Ca/ℓ	150		29	27	73	10.54	58
Dissolved Cobalt	µg Co/ℓ	500				N/A		5
Dissolved Copper	µg Cu/ℓ	50	50			N/A		0.3
Dissolved Chromium	µg Cr/ℓ	2000	2000			N/A		100
Dissolved Iron	µg Fe/ℓ	2000	2000	2330	300	380	310	300
Dissolved Lead	µg Pb/ℓ	10	10	10		N/A		10
Dissolved Lithium	µg Li/ℓ					N/A		2500
Dissolved Manganese	µg Mn/ℓ	400	400	220	200	470	10	180
Dissolved Magnesium	mg Mg/ℓ			9	82	9.22	6.54	82
Dissolved Mercury	µg Hg/ℓ	6	6			6		1.3
Dissolved Nickel	µg Ni/ℓ	70	70			N/A		30
Dissolved Potassium	mg K/l	50		3		3.2	2.44	50
Dissolved Selenium	µg Se (vi)/ℓ	40	10			10		10
Disolved Sodium	mg Na/ℓ	200	50	21		9.1	7.57	50
Disolved Uranium	µg U/ℓ	30				30		30
Dissolved Vanadium	µg V/ℓ	200				200		200
Dissolved Zinc	µg Zn/ℓ	5000	3000	20				2
Fluoride	mg F/ℓ	1.5	1.5	0.31	0.3	0.92	0.07	0.75
Nitrogen as N	mg N/ℓ					0.5		0.5
Nitrate	mg NO_3/ℓ	11	50	0.24	0.5	1.1	0.26	11
Nitrite	mg NO2/ℓ	0.9				0.7		0.9
Phosphorus as P	mg P/ℓ					N/A		0.03
Phosphate (ortho phosphate)	mg PO4/ℓ					N/A		0.1
Sulphate	mg SO4/ℓ	500		45	25	45	16.9	45
Total Alkalinity	mg CaCO3/ℓ			100	93	68	50.86	100
Total Dissolved Solids	mg/ℓ 180°C	1200		177	130	148	97.43	130

Brine Disposal

The brine resulting from the WWTP will be pumped to the proposed new Brine PCD (lined with Class C liner), located in a previously disturbed area (**Figure 2-7**). As mentioned previously, naturally evaporating brine at the site would not be efficient due to the projected inflow rate to the proposed PCD/evaporation dam. This would require an unrealistically large dam to be constructed. A Brine Treatment Plant is therefore required as a long-term management measure.

The Brine PCD will be constructed as a complex of adjacent ponds, which will allow for the cleaning of a pond while the others are in use. The Brine PCD area will make provision for a year's worth of brine before the ponds would need to be emptied to accommodate more brine.

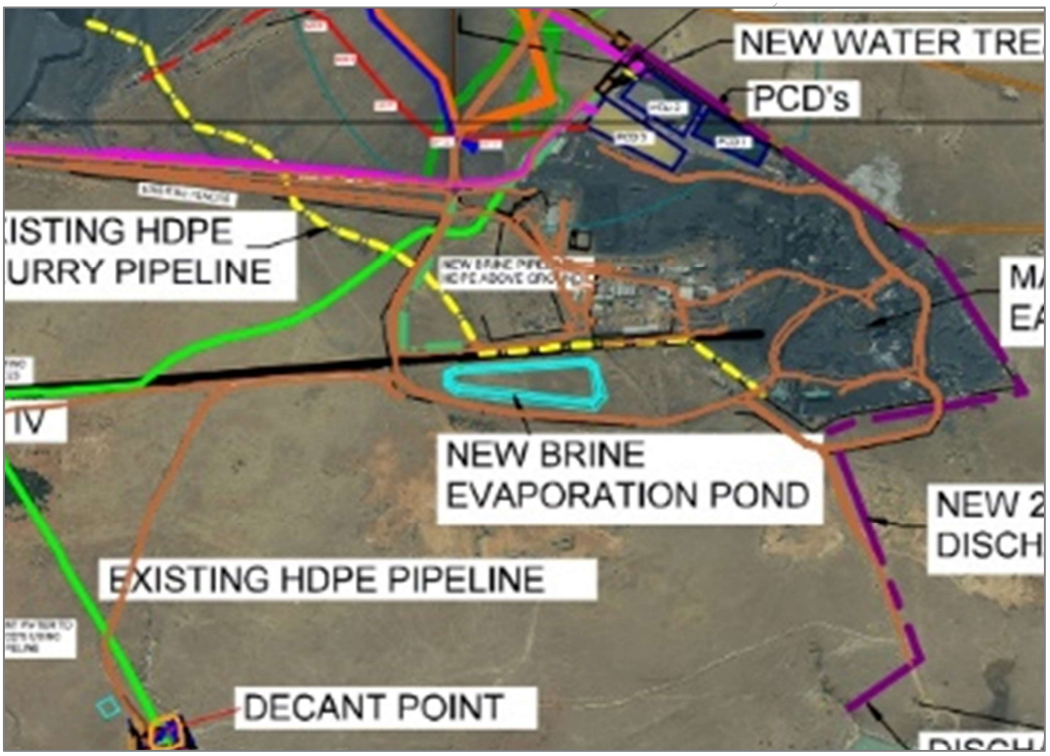


Figure 2-7: Brine PCD and pipeline layout

A Brine Treatment Plant, with an anticipated throughput of 15m^3/hr, or 285m^3/day if pumping 19 hrs/day, will be constructed. The modular plant will cover an area of less than 0.06ha and will be skid mounted or containerised. The modular system allows for simpler expansion or alterations in the future should it be required.

The addition of the proposed Brine Treatment Plant to the development will reduce the risk

of insufficient storage space for brine, reduce the risk of overflows from the Brine PCD and allows for sludge/filter cake quantities to be disposed of to be accurately quantified each month.

The proposed technology is a system that comprises a combined evaporator and crystalliser in a single step. Brine which is pumped into the Brine Treatment Plant will first pass through a pre-heating stage to raise the temperature before entering the brine recirculation system. The process removes water from the brine through the creation of water vapour, which exits at the top. Brine is continuously recirculated in the system causing the concentration of the recirculated brine to gradually rise until it crystallises and forms solids. It is anticipated that the clean water produced will comply with the SANS 241 potable water limits before being discharged into the Heyshope Dam via a pipe. The remaining salts/filter cake will be loaded onto dump trucks to be transported to the CDF for disposal.

2.1.3 Location of the Proposed WWTP & Associated Infrastructure

The WWTP and associated infrastructure will be located on the farm Roodekraal 21 HT and the Remaining Extent of the farm Roodekral 21HT, within the Mkhondo Local Municipal area, which falls under the current MQE MR and is owned by Kangra Coal (Pty) Ltd. The SG 21-digit site information for the affected properties are provided in **Table 1-3**.

The Global Positioning System (GPS) coordinates for the proposed WWTP and associated infrastructure is provided in the **Table 2-2** and the approximate location is presented **in Figure 2-8**.

The proposed location was selected based on the following:

- The proximity to the PCDs: The existing network of pipes conveys water from the decant dam, Pit D, Block C and other operations on the greater Maquasa Operations to the existing MQE PCD's;
- The existing pipe network allows all water to the managed at a centralised location, which will allow for better control and monitoring;
- The WWTP will be in close proximity to the mine offices allowing for easy maintenance access and closely controlled security; and
- Electricity is already available at the proposed location, with only minor upgrades to meet the plant's electrical requirements.

Table 2-2: WWTP and Associated Infrastructure Coordinates

	LATITUDE	LONGITUDE
WWTP Corner Point 1	27° 1'8.67"S	30°24'51.19"E
WWTP Corner Point 2	27° 1'9.11"S	30°24'51.72"E
WWTP Corner Point 3	27° 1'9.93"S	30°24'50.83"E
WWTP Corner Point 4	27° 1'9.51"S	30°24'50.32"E
WWTP Centre Point	27° 1'9.28"S	30°24'51.05"E
WWTP Inlet Pipeline Start	27° 1'9.76"S	30°24'52.19"E
WWTP Inlet Pipeline End	27° 1'9.24"S	30°24'51.51"E
WWTP Outlet Pipeline Start	27° 1'8.76"S	30°24'51.23"E
WWTP Outlet Pipeline End	27° 1'7.95"S	30°24'52.59"E
Pipeline to Brine PCD Start	27° 1'9.61"S	30°24'50.43"E
Pipeline to Brine PCD Middle	27° 1'15.99"S	30°24'43.92"E
Pipeline to Brine PCD Turn Point	27° 1'22.31"S	30°24'36.59"E
Pipeline to Brine PCD End	27° 1'28.73"S	30°24'41.40"E
Brine PCD Corner Point 1	27° 1'28.23"S	30°24'49.05"E
Brine PCD Corner Point 2	27° 1'28.53"S	30°24'49.62"E
Brine PCD Corner Point 3	27° 1'30.79"S	30°24'50.40"E
Brine PCD Corner Point 4	27° 1'31.76"S	30°24'49.54"E
Brine PCD Corner Point 5	27° 1'30.65"S	30°24'39.48"E
Brine PCD Corner Point 6	27° 1'29.94"S	30°24'38.57"E
Brine PCD Corner Point 7	27° 1'29.06"S	30°24'38.51"E
Brine PCD Corner Point 8	27° 1'28.71"S	30°24'39.43"E
Brine Treatment Plant	27° 1'09.61"S	30°24'51.12"E
WWTP & BTP Treated Water Discharge Pipeline Start	27° 1'7.95"S	30°24'52.59"E
WWTP & BTP Treated Water Discharge Pipeline Turn Point 1	27° 1'21.20"S	30°25'13.86"E
WWTP & BTP Treated Water Discharge Pipeline Turn Point 2	27° 1'30.56"S	30°25'20.19"E
WWTP & BTP Treated Water Discharge Pipeline Turn Point 3	27° 1'32.04"S	30°25'8.19"E
WWTP & BTP Treated Water Discharge Pipeline Turn Point 4	27° 1'33.55"S	30°25'5.56"E
WWTP & BTP Treated Water Discharge Pipeline Turn Point 5	27° 1'48.44"S	30°25'12.42"E
WWTP & BTP Treated Water Discharge Pipeline End	27° 1'51.45"S	30°25'7.53"E

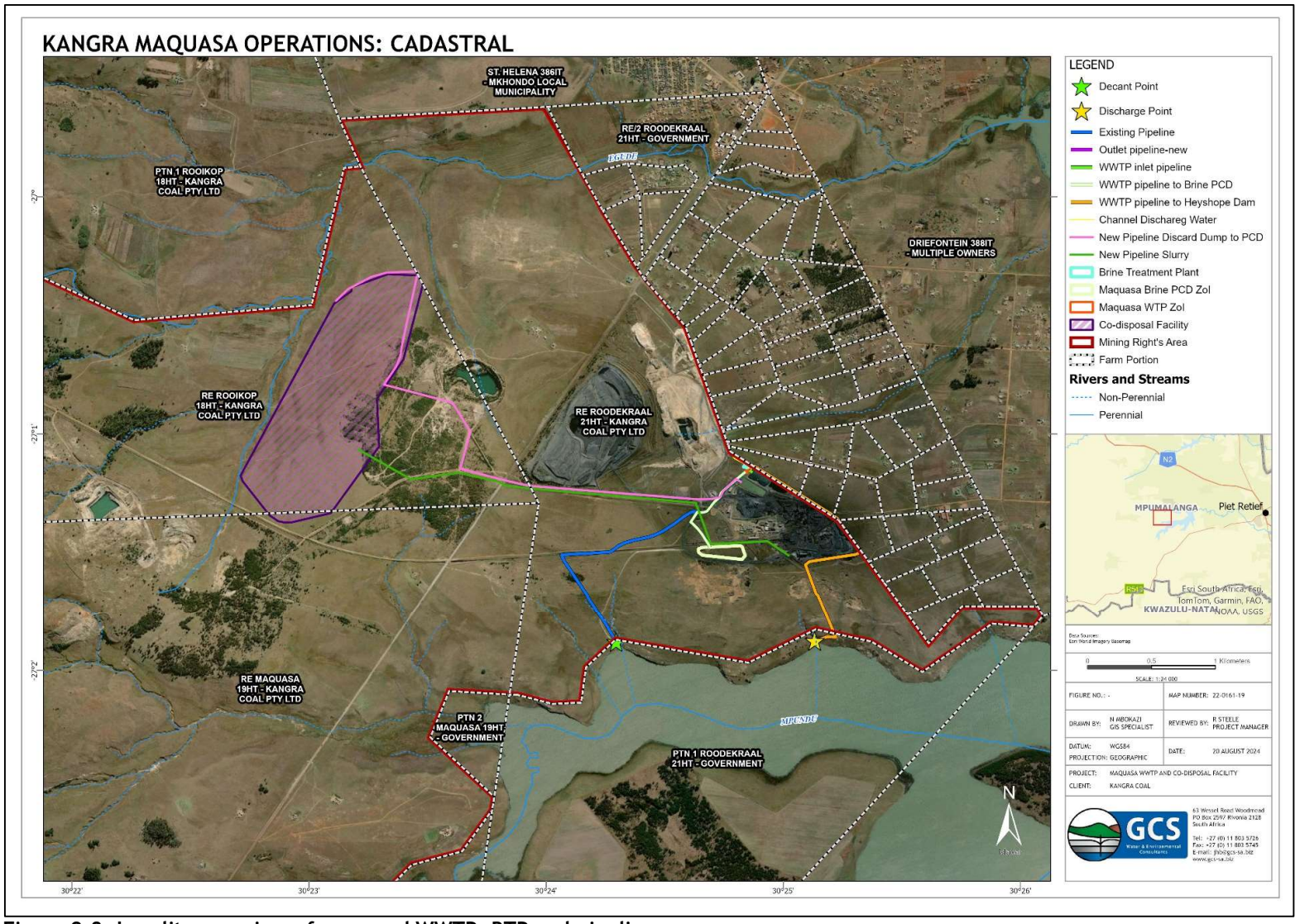


Figure 2-8: Locality overview of proposed WWTP, BTP and pipelines

2.2 Proposed Co-Disposal Facility & Associated Infrastructure.

The proposed 75ha CDF will be designed to accommodate 20 million tonnes of discard, comprising a volume of 10 million m^3 over a period of 20 years. The proposed new CDF complex will be approximately 131ha in extent and include the disposal facility, various material stockpiles, a PCD, haul roads, new slurry and contaminated water pipelines, and stormwater management infrastructure such as trenches, channels and berms.

Further details are provided within this section and was extracted from the "Kangra Coal (Pty) Ltd Maquasa East proposed New Discard Dump: Environmental Scoping Report" (DD ESR) compiled by GCS in August 2014; and the GFK Consulting Engineers' Conceptual Design for the CDF (DWG Reference: G2023/06/05-100). Construction and operation of the discussed infrastructure will trigger listed activities that will require authorisation.

2.2.1 Description of Proposed Co-Disposal Facility

Layout and Required Infrastructure:

The conceptual layout of the proposed CDF is presented in **Figure 2-9**. The CDF complex footprint extent and locality are provided in **Figure 2-10** and it presents the preliminary boundary fence of the entire CDF complex.

At this stage, it is envisaged that the following infrastructure will be required:

- Boundary fence;
- Internal haul roads;
- Lined DD;
- Catchment Paddocks;
- Two (2) compartment, lined PCD (one compartment to be operated as empty);
- HDPE Slurry pipeline;
- HDPE Contaminated water pipeline;
- Topsoil & Softs Stockpiles; and
- Stormwater management infrastructure, such as berms and trenches.

Dimensions and Life of the Facility

The dimensions of the proposed new CDF which will be applied to the detailed design of the facility are presented in **Table 2-3**.

Table 2-3: Dimensions of the proposed CDF

DESCRIPTION	DIMENSIONS
Life of facility	20 years
Extent of Discard Dump	75 ha
Capacity of discard dump	5 280 000m^3
Final Volume of fines (slimes)	1 896 000m^3
Final height of Discard Dump	30-32m
Deposition rate	≅ 50ton/hour, 620 operating hours/month*
Estimated required capacity of PCD	100 000m^3

*Preliminary estimation based on figures obtained from MQE.

Proposed Disposal Methodology

According to the conceptual designs, the preferred disposal methodology (refer to the project alternatives in section 5 of this report) is integrated 'dry' disposal.

This involves mixing the low moisture "filter cake" fine discard material with the coarse discard material in layers as per the conventional disposal methods. The integrated discard "dry" technique will reduce the permeability of the coarse discard and therefore have a reduction in Acid Mine Drainage (AMD). The discard material will be trucked to the dump via the gravel haul road to be constructed.

Seepage Control

Seepage control will be required to prevent groundwater contamination from the proposed CDF:

- The CDF will be lined with a Class C type liner, in accordance with the stipulations of the WUL, once issued by the DWS;
- The coarse discard material will be graded and shaped to obtain controlled runoff for the collection of dirty water;
- Rehabilitation of the dump will be ongoing to reduce the dirty water catchment areas;
- A filter drain will be contracted around the perimeter of the dump to collect seepage, which will be directed to the lined PCD.

The efficiency of the seepage control system will be monitored by means of groundwater monitoring.

Access to the Facility

The CDF complex will be accessed via a 16m wide gravel haul road around the perimeter of the facility leading back to the coal washing plant at MQE.

Concurrent Rehabilitation

The rehabilitation of the dump will be ongoing during the operation of the proposed new CDF.

Rehabilitation will include the placement of topsoil and grass on the dump side slopes. The soil cover required will be specified in the final design report to be included in the EIA Report. The CDF will be graded and shaped to achieve a suitable long-term profile. Following the completion of topsoiling and vegetating, the dirty water drainage from the exposed discard step-ins will be modified to clean water drainage.

Stormwater Management

A conceptual stormwater management plan (SWMP) has been compiled GCS. A total of five (5) small stormwater sub-catchments were delineated for the project area, three (3) of which are considered potentially dirty water areas (i.e. areas associated with the PCDs, and runoff from the CDF) (refer to **Figure 2-11**).

Considering the proposed activities, the calculated peak flows and the Ecological Sensitivity of the Project area, a mixture of free drainage from upstream catchments, interception of clean runoff water and capturing of poor quality runoff and seepage from the CDF and PCDs, as well as dedicated stormwater conveyance and capture systems, is proposed.

As the draft designs already have these systems in place, it is only recommended that the outlet drains of the clean water diversion trench be regulated by rock rip rap or vegetated covers, to decrease peak flows and capture sediment that makes it into the trench. The conceptual stormwater system is shown in **Figure 2-12**.

As the proposed WWTP and brine pond are situated in areas with existing stormwater systems, as well as in dirty areas, these were not included in this investigation.

2.2.2 Location of Proposed Co-Disposal Facility & Associated Infrastructure

The proposed CDF and its associated infrastructure will be located on the Remaining Extent of the farms Rooikop 18HT and Maquasa 19HT within the Pixley Ka Seme Local Municipal area, both properties falling under the current MQE MR, owned by Kangra Coal (Pty) Ltd. The SG 21-digit site information for the affected properties are provided in **Table 1-3.**

The GPS coordinates for the CDF are provided in **Table 2-4,** and the approximate locations are shown **Figure 2-10.**

Table 2-4: CDF and Associated Infrastructure Coordinates

	LATITUDE	LONGITUDE
CDF Corner Point 1	27° 0'18.91"S	30°23'26.69"E
CDF Corner Point 2	27° 0'21.26"S	30°23'28.09"E
CDF Corner Point 3	27° 0'42.04"S	30°23'23.57"E
CDF Corner Point 4	27° 0'51.76"S	30°23'17.42"E
CDF Corner Point 5	27° 1'4.23"S	30°23'17.83"E
CDF Corner Point 6	27° 1'19.90"S	30°23'6.71"E
CDF Corner Point 7	27° 1'22.52"S	30°22'55.23"E
CDF Corner Point 8	27° 1'11.55"S	30°22'42.71"E
CDF Corner Point 9	27° 0'26.60"S	30°23'5.23"E
CDF Corner Point 10	27° 0'23.12"S	30°23'9.65"E
CDF Corner Point 11	27° 0'22.21"S	30°23'9.30"E
CDF Corner Point 12	27° 0'18.89"S	30°23'18.64"E
CDF Centre Point	27° 0'49.19"S	30°23'6.74"E
CDF Slurry Pipeline Start	27° 1'30.81"S	30°25'1.46"E
CDF Slurry Pipeline Turn Point 1	27° 1'27.07"S	30°24'55.93"E
CDF Slurry Pipeline Turn Point 2	27° 1'27.92"S	30°24'41.55"E
CDF Slurry Pipeline Turn Point 3	27° 1'17.45"S	30°24'37.78"E
CDF Slurry Pipeline Turn Point 4	27° 1'9.78"S	30°23'37.78"E
CDF Slurry Pipeline Turn Point 5	27° 1'11.49"S	30°23'25.68"E
CDF Slurry Pipeline End	27° 1'3.91"S	30°23'12.40"E
CDF Contaminated Water Pipeline (CWP) Start	27° 0'26.40"S	30°23'6.76"E
CDF CWP Turn Point 1	27° 0'18.95"S	30°23'27.57"E
CDF CWP Turn Point 2	27° 0'47.52"S	30°23'19.00"E
CDF CWP Turn Point 3	27° 0'52.03"S	30°23'36.22"E
CDF CWP Turn Point 4	27° 0'59.48"S	30°23'40.85"E
CDF CWP Turn Point 5	27° 1'8.76"S	30°23'38.33"E
CDF CWP Turn Point 6	27° 1'13.20"S	30°23'55.71"E
CDF CWP Turn Point 7	27° 1'16.03"S	30°24'43.98"E
CDF CWP Turn Point 8	27° 1'11.46"S	30°24'47.94"E
CDF CWP End	27° 1'12.17"S	30°24'49.10"E
CDF External Haul Road 1 Start	27° 1'11.28"S	30°23'24.10"E
CDF External Haul Road 1 End	27° 1'6.46"S	30°23'15.27"E
CDF External Haul Road 2 Start	27° 1'8.87"S	30°23'38.00"E
CDF External Haul Road 2 Middle	27° 0'54.75"S	30°23'37.52"E
CDF External Haul Road 2 End	27° 0'47.88"S	30°23'18.41"E

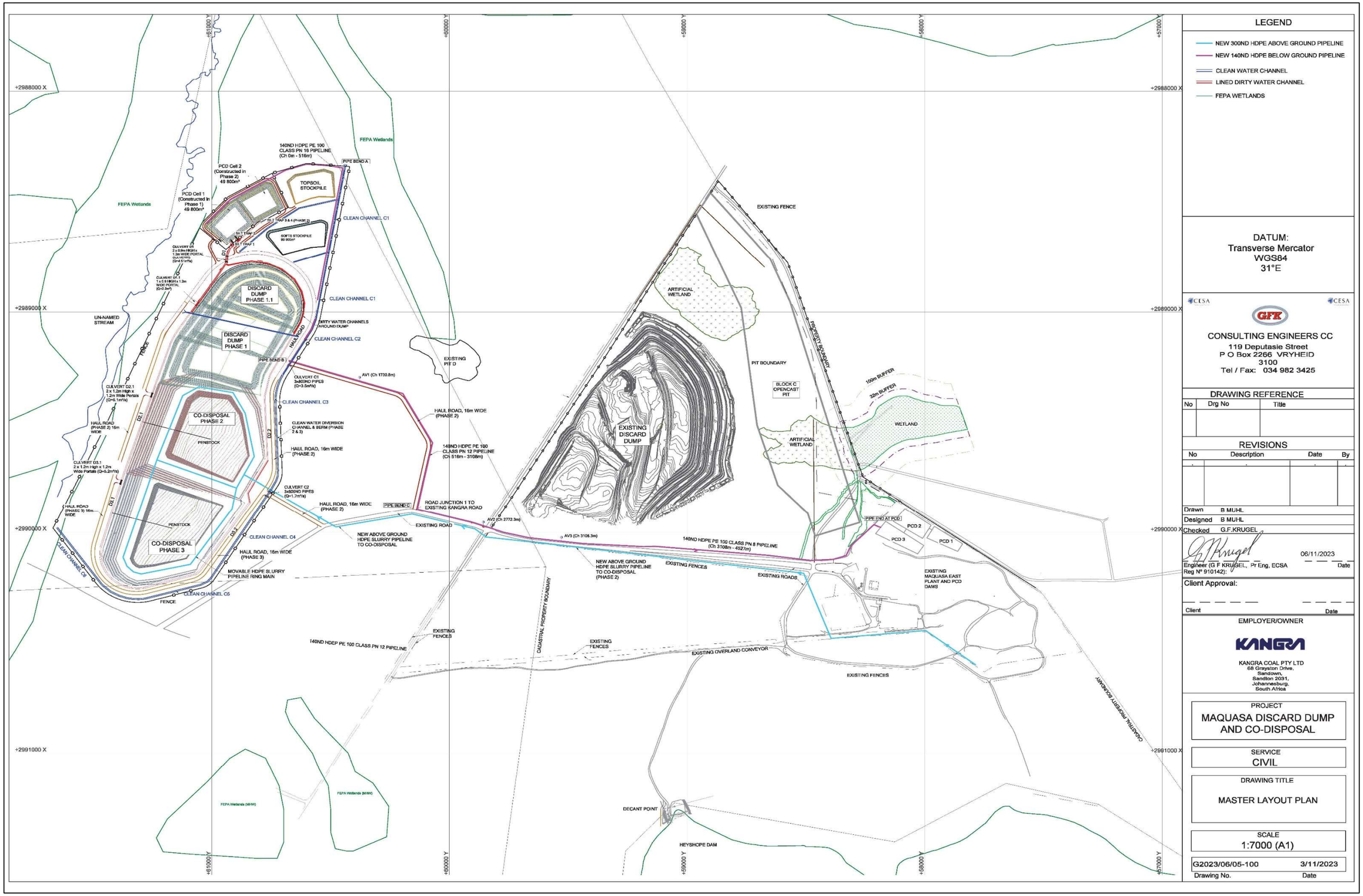


Figure 2-9: CDF Conceptual Layout

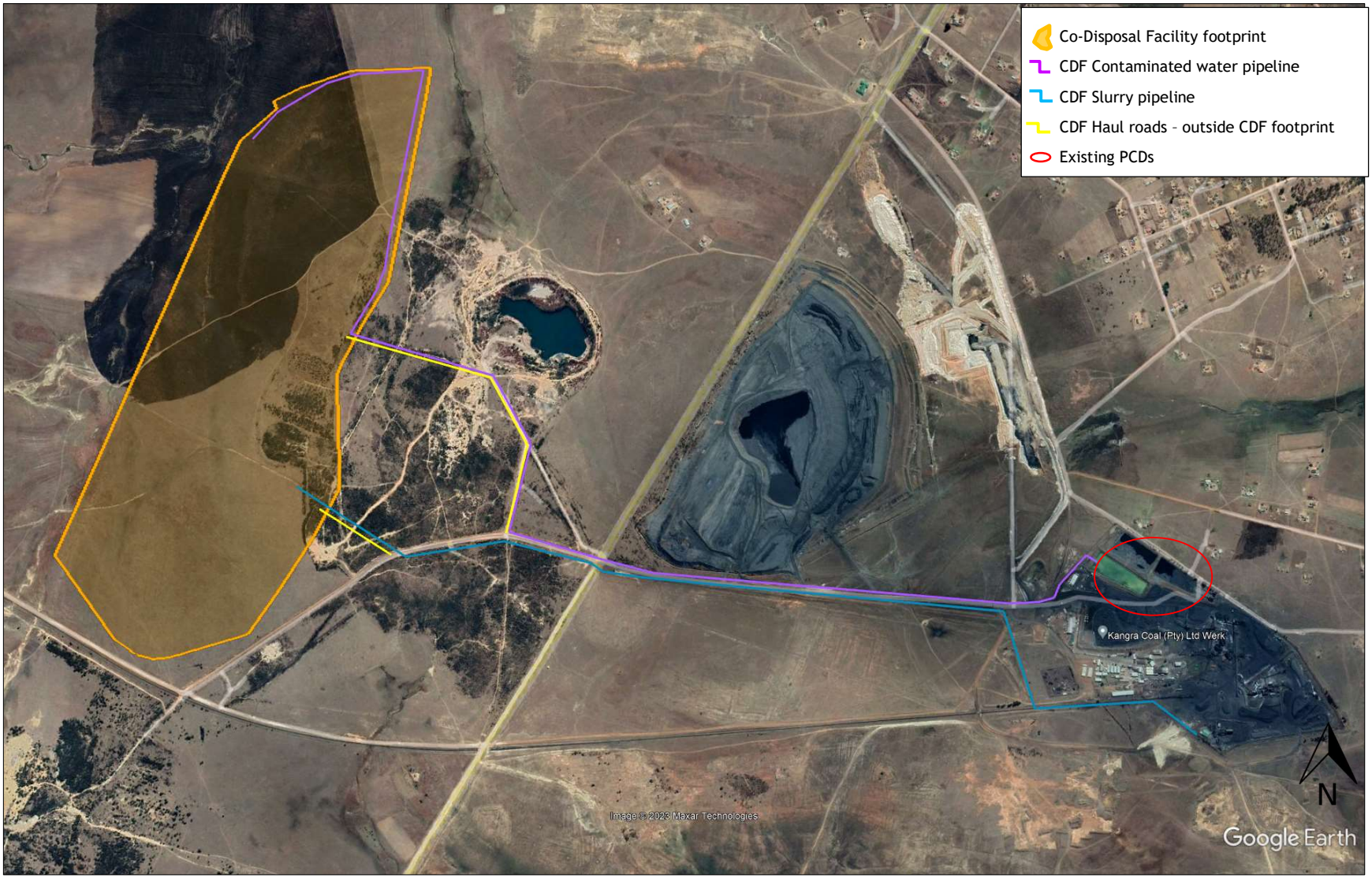


Figure 2-10: Locality of proposed Co-Disposal Facility

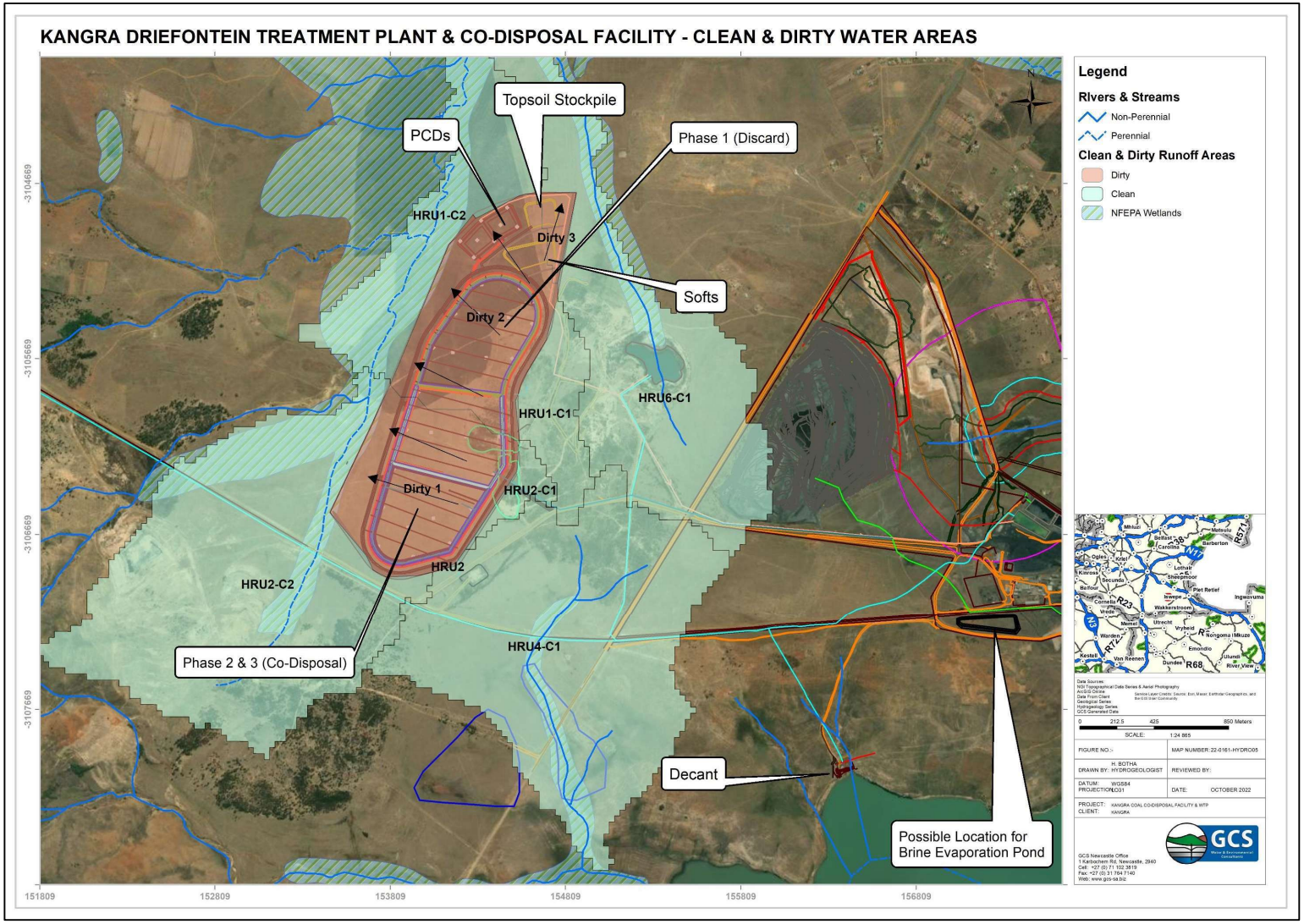


Figure 2-11: Dirty and Clean Water Catchments

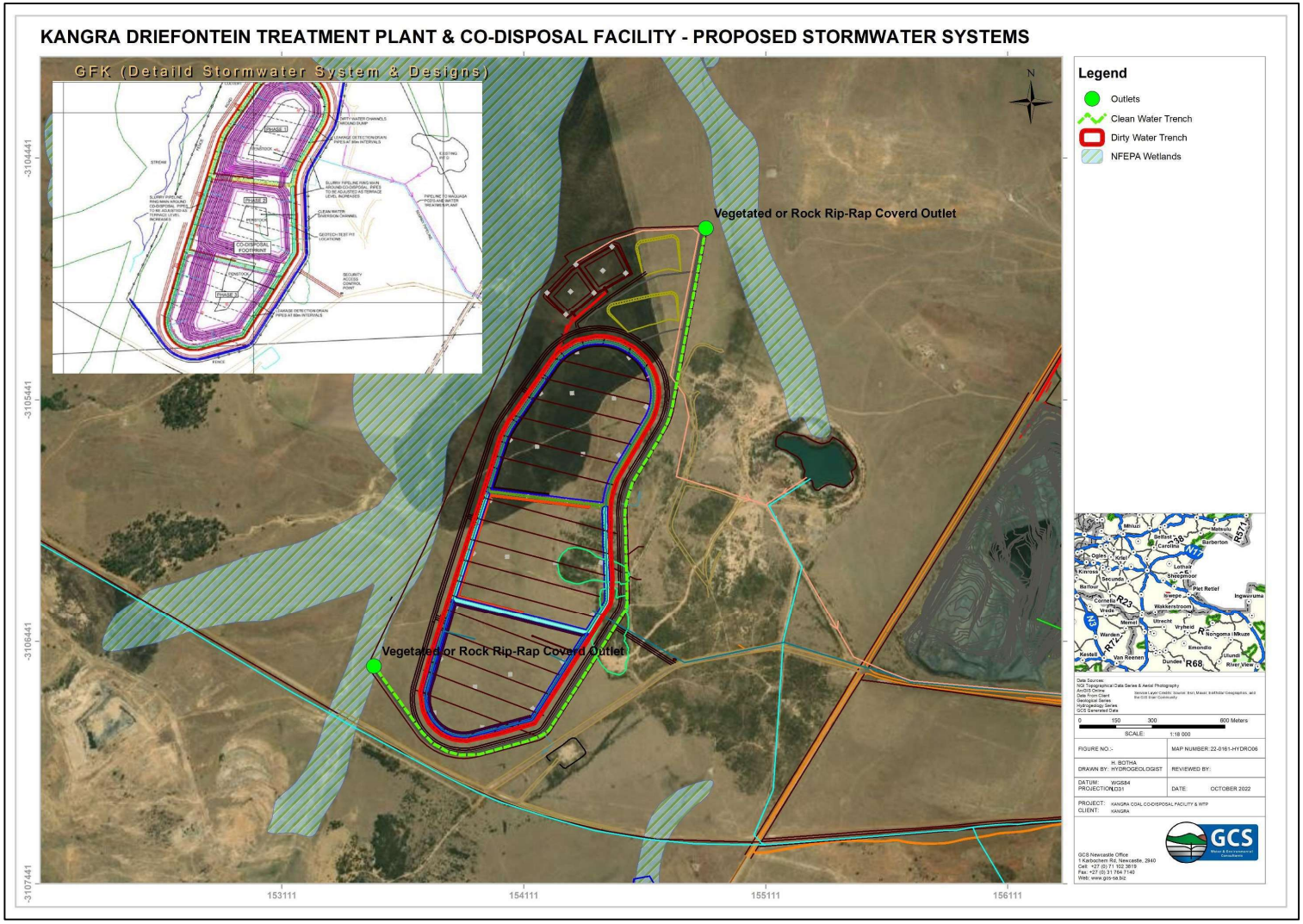


Figure 2-12: Conceptual SWMP

3 LEGAL FRAMEWORK

This chapter details applicable legal provisions and aims to provide a review of relevant national and provincial legislation and regulations, and policy documents, which apply to, or have implications for, the proposed activities.

3.1 General Overview

The policy and legislative context applicable to MQE and the proposed projects is summarised in **Table 3-1**.

Table 3-1: Legislation applicable to the proposed projects at MQE

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
LEGISLATION	
Constitution of the Republic of South Africa (Act 108 of 1996)	The Constitution is the supreme law governing all other legislation. Environmental legislation is shaped by the Bill of Rights set out in the Constitution. It sets out the rights for every citizen of South Africa and aims to address past social injustices. With respect to the environment, section 24 of the Constitution states that: "*Everyone has the right:* *a) To an environment that is not harmful to their health or wellbeing.* *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".* In fulfilment of its constitutional mandate to take reasonable legislative measures that give effect to Section 24, the government has promulgated several environmental laws. These laws provide a legal framework that embodies internationally recognised legal principles. The principal act governing activities that affect the environment is NEMA. The Constitution itself has no permitting requirements. However, the way the environmental right is applied implies that environmental impacts associated with developments should be considered separately and cumulatively. Furthermore, Section 24 includes the notion that justifiable economic and social development should be promoted, through using natural resources and ecologically sustainable development. ***MQE must ensure that significant environmental impacts are avoided; and where impacts cannot altogether avoided, they must be minimised and mitigated throughout the lifecycle of the proposed projects.***
Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000)	• Administrative law is all about the pursuit of administrative justice – it is a subset of constitutional law, and an instance of the public law. • Administrative justice connotes the idea that in the implementation of legislation, the public administration (making up a large part of the executive branch of government) must act within the law, fairly and reasonably, and must be able to justify their decisions, including by providing written reasons therefore on request. o The right to administrative justice is protected in section 33 of the Constitution. o The right to administrative justice is given effect by the Promotion of Administrative Justice, 2000 (Act 3 of 2000) (PAJA). • To act lawfully, as required by the right to administrative justice, officials who make administrative decisions must act within the powers given to them by the relevant legislation. For instance: o The official must consider relevant considerations and not take into account considerations that are irrelevant; o The correct official must act (the official to whom the power has been given);

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	○ The official must follow any processes required by the law; and ○ The official must correctly interpret the powers given to him/her. • When officials fail to act within the powers given to them by the relevant legislation (they act ultra vires) their conduct may be declared invalid and reviewed and set aside by a court on one or more of the grounds provided for in s 6 of PAJA. • To act reasonably in administrative decision-making about the environment as required by the right to administrative justice, officials must act rationally (there must be a link between a legitimate purpose of the decision and the decision itself, as well as a rational link between the information and the decision on which it was based) and reasonably, the decision should not have a disproportionate impact on environmental rights. • When officials act irrationally or unreasonably in their administrative actions, their conduct may be declared invalid, and reviewed and set aside by a court on one or more of the grounds provided for in s 6 of PAJA. ***As with the Constitution, all environmental officials must act lawfully. Should the decisions not be lawful, administrative justice i.e. their decisions be declared invalid and be set aside by the court.***
Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)	• Access to information is a right, not a privilege. • S 32 of the Constitution protects the right to access to information, and applies vertically, in that it imposes a duty on the state to provide access to information to someone requesting the information, and horizontally, in that it imposes a duty on natural and juristic persons to provide access to information. • In the case of natural and juristic persons, the information must be required by the requester for the protection of the right, but this restriction does not apply where information is requested from the state. • The Promotion of Access to Information Act, 2000 (Act 2 of 2000) (PAIA) was enacted to give effect to the right, in pursuit of a culture of openness, transparency and justification in South Africa, shifting away from a culture of secrecy and authoritarianism. ***The act assists the public in requesting information, and all have the right to access information.***
Environmental Conservation Act, 1989 (73 of 1989) (ECA), as amended	The ECA has now largely been replaced by the NEMA but certain provisions remain in force. The National Noise Control Regulations[1] (NCR) were promulgated in terms of Section 25 of the ECA, relating to noise, vibration and shock. The NCRs were revised.[2] to make it obligatory for all authorities to apply the regulations. Under the ECA, the following SANS for assessing and controlling noise include: • 10328:2008 “Methods for environmental noise impact assessments”; and • 10103:2004 “The measurement and rating of environmental noise with respect to annoyance and speech communication”. ***The proposed projects are likely to increase ambient noise levels during the construction (temporary) and operational phases. Noise impacts are closely related to construction activities and heavy traffic volumes. The SANS published under ECA will be consider for the purposes of the noise impact assessment in the EIA and the EMPr will include mitigation measures relating to the mitigation of noise impacts.***
National Environmental	NEMA is the framework law giving effect to the constitutional environmental right and for regulatory tools with respect to

[1] GNR 154 in Government Gazette No. 13717 dated 10 January 1992
[2] Under GN155 of 10 January 1992

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
Management Act, 1998 (Act 107 of 1998) (NEMA), as amended.	environmental impacts. Section 28(1) includes a statutory duty of care, providing that *"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment"*. In terms of sections 24(2) and 24D of NEMA, the then Minister of Environmental Affairs promulgated certain listed activities that may not commence without an EA. Activities promulgated in terms of GN983 and GN9835 require a Basic Assessment process, while activities promulgated in terms of GN984 require that a full scoping and EIA Process be conducted.[3]. Section 24C(2A) of NEMA indicates that "*where listed activities are directly related to the extraction and primary processing of a mineral resource*" the Minister of Mineral Resources and Energy is the CA or official/s at the DMRE and which power he has delegated to the relevant Regional Managers (RMs). The National Environmental Laws Amendment Act, 2022 (Act 2 of 2022) (NEMA Amendment Act) was promulgated on 24 June 2022. It will introduce a major shift in South Africa's environmental legislation on a date to be fixed and proclaimed by the President (which has yet to occur). This includes: • Residue stockpiles and residue deposits (RS) will be excluded from NEMWA and will therefore no longer be regarded as waste for which a WML is required. Instead, RS and deposits will be regulated under NEMA. • The RMs will be the CA "*where the listed or specified activity is a mining activity*". ***Please refer to Table 3-4 in Section 3.2.1 for identified listed activities applicable to the proposed projects.*** ***Note that, should the NEMA Amendment Act commence prior to construction, Kangra would no longer require a WML for the CDF and it would be governed under NEMA.***
NEMA EIA Regulations, 2014 (GNR 326, as amended)	Chapter 6 of the 2014 EIA Regulations provides for the requirements for public participation, which must be carried out as part of the EA and WML application process. In terms of Regulations 21 and 23, the outcome of the PPP must be reported in the Final Scoping Report (FSR) and EIR submitted to the CA. The PPP, "*must give all potential or registered parties (I&APs), including the CA, a period of at least 30 days to submit comments on each of the EMPr, S&EIRs, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times*" (Regulation 40 (1)). PPP will be undertaken in accordance with Chapter 6 of the EIA Regulations, 2014. It must: • provide access to all information that reasonably has or may have the potential to influence any decision regarding an application; • involve consultation with the CA, every state department that administers a law relating to the environment relevant to the application, all relevant organs of state, and all I&APs; and • provide an opportunity for I&APs to comment on reports and plans prior to submission of an application and once an application has been submitted to the CA. The process must include: • notification of the application to all I&APs, as stipulated in Regulation 41;

[3] GNs 983, 984 and 985 are promulgated under NEMA in GG 38282 of 4 December 2014 (as amended).

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	• registration of all I&APs, as required in Regulations 42 and 43; and • a CRR and records of meetings of and with I&APs, as outlined in Regulation 44. Regulation 39 of the EIA Regulations, 2014 requires that: "*(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.* *(2) Sub-regulation (1) does not apply in respect of—* *(b) activities constituting, or activities directly related to prospecting … of a mineral …resource or extraction and primary processing of a mineral…resource."*
NEMA and MPRDA: Financial Provision (FP)	NEMA requires *inter alia* mining right holders to hold in place FP for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. FP assessments were previously governed by the MPRDA and the quantum calculated according to the DMRE published rates. On 20 November 2015, the NEMA Financial Provisioning Regulations, 2015[4] (2015 FP Regulations) were promulgated, resulting in significant changes from the MPRDA's requirements. Five (5) further draft updated iteration's of the 2015 NEMA FP Regulations were published by the DFEE, with the last iteration published in 2022. The 2015 FP Regulations were immediately applicable to applicants for a new mineral right but not to mineral rights holders where the right was granted before the commencement of the 2016 FP Regulations. Under the 2015 FP Regulations' transitional provisions, holders of a mineral right granted prior to the commencement of the 2015 NEMA FP Regulations (Existing Holders) were able to elect to comply either within three (3) months of their financial year-end or 15 months from the promulgation of the 2015 FP Regulations. Various extensions of this transitional period have subsequently been published, with the latest extension date being 19 September 2023. ***Kangra will comply with the relevant FP Regulations when required to do so.*** ***The DMRE will require that FP be provided by Kangra before issuing it with an EA / WML.***
Department of Forestry, Fisheries and the Environment (DFFE) Web Based Screening Tool	In terms of Regulation 16(1)(b)(v), read with Regulation 21 of the 2014 EIA Regulations, it is compulsory for an EIA application to include a sensitivity report generated by the national web based environmental screening tool[5] (DFFE Screening Tool). The content of specialist reports for certain of the themes is prescribed in the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes[6] (Assessment Protocols); and Appendix 4 of the EIA Regulations will not be applicable to such themes. Two Assessment Protocols have been gazetted, in March and October 2020. ***Specialist studies have been undertaken to verify the sensitivity themes as identified in the DFFE Screening Tool. Specific requirements for the content of the EIA specialist reports are included in the Assessment Protocols and these specialist reports will comply with the aforesaid for purposes of the EIA.***
National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA),	The NEMWA's purpose is to: assist in regulating waste management; ensure the protection of human health; and prevent pollution and

[4] GN 1147 of 20 November 2015: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations (GG 39425)
[5] GN R960 of GG 42561, dated 5 July 2019
[6] In terms of in terms of sections 24(5)(a) and (h) and 44 of NEMA and GN R320 of GG 43110 on 20 March 2020 and GN R1150 of GG 43855 on 30 October 2020

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
as amended	environmental degradation through sound waste management principles and guidelines. The NEMWA defines waste broadly.[7] It furthermore provides for: • national norms and standards for regulating waste management by all spheres of government; • licensing and control of waste management activities; • remediation of contaminated land; • a national waste information system; and • provision for compliance and enforcement. The NEMWA imposes a general duty upon waste holders to take reasonable measures to avoid waste generation and, where this is impossible, to: minimise the toxicity and quantities of waste generated; reuse, reduce, recycle and recover waste; and ensure that it is treated and disposed of in an environmentally sound way. Failure to do so is a criminal offence, with a maximum fine of R10 million or imprisonment of up to 10 years, or both.
Regulations published under NEMWA in GN 921 of Government Gazette 37083 on 29 November 2013 (2013 WML Regulations)	It is necessary to hold a WML for defined waste management activities. The 2013 WML Regulations, provide that a WML is required for undertaking certain waste management activities ("Waste Listed Activities"). The Waste Listed Activities are separated into three (3) categories, namely Category A, B and C. Category A and B Waste Listed Activities require a WML, for which either a Basic Assessment or an EIA Process needs to be undertaken that complies with the 2014 EIA Regulations. Category C activities do not require a WML but must comply with *inter alia* the Norms and Standards for Storage of Waste, 2013.[8] ***On commencement of the NEMA Amendment Act, RS will be excluded from NEMWA and will therefore no longer be regarded as waste for which a WML is required. Instead, RS will be under NEMA.*** ***As the NEMA Amendment Act has still not commenced, Kangra has submitted an application for a WML for the proposed RS (i.e., the CDF), which is a Category B Waste Listed Activities in the 2013 WML Regulations, which is part of the S&EIR Process.***
NEMWA Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, published in GN 632 of GG 39020 on 24 July 2015 (Residue Regulations)	The Residue Regulations provide the tools for and correspond to the statutory provision relating to managing RS in the manner prescribed in section 43A of the NEMWA. They regulate the planning, management and reporting of RS, including: • The assessment of impacts and analyses of risks relating to the management of RS; • Characterisation and classification of RS; • Conducting feasibility studies for the investigation and the selection of a site for RS, including geotechnical and hydrological

[7] *(a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or*
(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste—
(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;
(iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or
(iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

[8] Published in GN 926 of GG 37088 on 29 November 2013

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	investigations, by competent persons and a registered professional civil / mining engineer; • Design of the RS;[9] • Impact management; • Duties of the holder of the right or permit; • Monitoring and reporting systems; • Dust management and control; and • Decommissioning, closure and post closure management requirements. When the NEMA Amendment Act commences, the Residue Regulations [10] will remain operational and shall be deemed to have been made under NEMA.[11]
NEMWA Waste Classification and Management Regulations (Waste Classification Regulations) and other Regulations.	Classification of certain waste streams is required in terms of the Waste Classification and Management Regulations,[12] to ensure that the correct waste management standards and disposal methods are implemented. The National Norms and Standards for the Assessment of Waste for Landfill Disposal and the National Norms and Standards for the Disposal of Waste to Landfill[13] provide the norms and standards for disposal of waste to landfill. ***A Waste Classification was undertaken, based on the current prescribed criteria. It was concluded that the waste streams classify as a Type 3 (low risk) waste, which requires a Class C liner (pollution barrier).*** ***When the NEMA Amendment Act commences none of these Regulations will be applicable to RS.***
National Waste Information Regulations[14]	These Regulations regulate the collection of data and information to fulfil the objectives of the national waste information system, as set out in section 61 of the NEMWA, and include reporting obligations. A registered person must keep a record of the information submitted to the South African Waste Information System or the DFFE. ***Kangra will comply with these regulations.***
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEM: AQA)	NEMAQA was promulgated to ensure the protection and regulation of air quality and provide measures that will prevent pollution and sustainability. Under NEMAQA, the Minister of Environmental Affairs, Forestry and Fisheries must identify substances in ambient air which present a threat to health, wellbeing or the environment and establish national standards for ambient air quality, including the permissible quantity or concentration of each substance in ambient air. The "Listed Activities and Associated Minimum Emission Standards"[15], list activities that could result in atmospheric emissions requiring an atmospheric emissions licence (AEL) before being undertaken.

[9] Including the general layout; type of deposition method used; rate of rise; design of the pollution control barrier system; stormwater control; freeboard; pooling; required factor of safety; control of decanting of excess water; retention of polluted water; design of the penstock; outfall pipe, under-drainage system and return water dams; height of the phreatic surface; slope angles and method of construction of the outer walls and their effects on shear stability; slope erosion by wind and water, and its control by vegetation, berms or catchment paddocks; and the potential for pollution.
[10] Published in Government Notice R632 in Government Gazette 39020 on 24 July 2015.
[11] Proposed by section 86 of the NEMLA IV Bill.
[12] Published in GN634 of GG 36784 on 23 August 2013
[13] Published under GN R635 and GN R636 respectively in GG 36784 of 23 August 2013
[14] Published in GN 625 of GG 35583 on 13 August 2012
[15] Published in GN 893 of GG 37054 on 22 November 2013

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	The "National Dust Control Regulations"[16], provide that an acceptable dust fallout rate for a non-residential area is considered more than 600mg/m^2/day but less than 1200mg/m^2/day (30-day average), with maximum allowable two exceedances per year, provided these exceedances do not take place in consecutive months. Where the dust fallout rate is exceeded, a prescribed dust fallout monitoring programme must be developed and include: • the establishment of a network of dust monitoring points, using method ASTM D1739:1970 (or an equivalent standard), sufficient in number to: establish the contribution to dust fallout in residential and non-residential areas near the premises; monitor identified or likely sensitive receptor locations; and establish the baseline dust fall for the district; and • a schedule for submitting to the air quality officer dust fallout monitoring reports annually or at more frequent intervals, if requested by the air quality officer. Greenhouse gases have been declared priority pollutants under the "Declaration of Greenhouse Gases as Priority Air Pollutants"[17]. ***An AEL will not be required for the proposed projects; however, a duty of care should be employed during construction and operation to minimise air pollution as far as possible. MQE must take all reasonable measures to minimise the generation of dust and ensure compliance with the Dust Control Regulations.***
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA)	In line with the Convention on Biological Diversity, NEMBA aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. NEMBA creates a basic legal framework for the formation of a national biodiversity strategy and action plan and identification of biodiversity hotspots and bioregions, which may then be given legal recognition. It imposes obligations on landowners (state or private) regarding alien invasive species (AIS). NEMBA requires that provision be made by a site developer to remove any aliens which have been introduced to the site or are present on the site. The NEMBA also provides for listing of threatened or protected ecosystems in one of four (4) categories: critically endangered, endangered, vulnerable or protected. Threatened ecosystems are listed to reduce the rate of ecosystem and species extinction, by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value. Section 53 of NEMBA provides that: *"(1) The Minister may, by notice in the Gazette, identify any process or activity in a listed ecosystem as a threatening process.* *(2) A threatening process identified in terms of subsection (1) must be regarded as a specified activity contemplated in section 24(2)(b) of the NEMA and a listed ecosystem must be regarded as an area identified for the purpose of that section."* No notices have been published yet under this section. Picking parts of, or cutting, chopping off, uprooting, damaging or destroying, any specimen of a listed threatened or protected species is a restricted activity under NEMBA. A permit is required for a restricted activity involving a listed threatened or protected (TOPS) species without a permit. Chapter 7 of the NEMBA regulates the process for the application of a permit under NEMBA. The following notices have been published in terms of section 56(1) of NEMBA: • National List of Ecosystems that are Threatened and in need of protection (TOPS List),[18] which contains the National List of

[16] Published in GN 827 of GG 36974 on 1 November 2013
[17] Published in GN 710 of GG 40996 on 21 July 2017
[18] Published under GN1002 in GG34809 of 9 December 2012

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	Ecosystems that are threatened and in need of protection. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems and preserving witness sites of exceptionally high conservation value. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. • Lists of Critically Endangered, Endangered, Vulnerable and Protected Species;[19] and • Threatened and Protected Species Regulations.[20] Chapter 5 of NEMBA pertains to AIS and provides that a person may not carry out a restricted activity involving a specimen of an AIS without a permit issued in terms of Chapter 7 of NEMBA. Such permit can only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted AIS are contained within the Alien and Invasive Species List 2020.[21] The NEMBA Alien and Invasive Species Regulations[22] categorises the different types of alien and invasive plant and animal species and how they should be managed. The Revised National Biodiversity Framework 2019 – 2024 was recently published.[23] ***It is not anticipated that the proposed projects will disturb more than 10ha of indigenous vegetation, with the project area mainly being in already disturbed areas or low biodiversity sensitive areas, within the MQE MR surface infrastructure area.*** ***MQE must control and eradicate AIS in line with the NEMBA Alien and Invasive Species Regulations.***
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)	In terms of CARA, landowners are legally responsible for the control of weeds and alien vegetation. CARA makes provision for three (3) categories of AIS: • Category 1a: must immediately be removed and destroyed; • Category 1b: need to be immediately removed and contained; • Category 2: requires a permit to retain the species on-site and it must be ensured that they do not spread. All category 2 plants in riparian zones need to be removed; and • Category 3: require a permit to retain these species. All category 3 plants in the riparian zone need to be removed. CARA also regulates the conservation of soil and states that degradation of the agricultural potential is illegal. It furthermore requires the protection of land against soil erosion and the prevention of water logging and associated salinisation. Permissions/permits are required under CARA for the 'cultivation' of 'virgin soil'; cultivation and/or draining vlei(s), marshes or water sponges; and cultivation of an area within a watercourse's flood area. ***MQE will comply with CARA in relation to AIS control and soil conservation.*** ***No permits under CARA are envisaged to be required for the proposed projects.***
National Veld and Forest Fire Act, 1998 (Act 101 of 1998) (NVFFA)	The NVFFA's purpose is to prevent and combat veld, forest and mountain fires throughout South Africa. It applies to the open countryside beyond the urban limit and puts in place a range of requirements. The NVFFA sets out the responsibilities of landowners or persons in control of the land which includes: • Prepare and maintain firebreaks on their side of the boundary if there is a reasonable risk of veld fire. The NVFFA sets out the

[19] Published under GNR151 in GG 29567 of 23 February 2007
[20] Published under GNR152 in GG 29657 of 23 February 2007
[21] Published under GNR 1003 in GG 43726 of 18 September 2020
[22] Published under GNR1020 dated 25 September 2020
[23] In terms of GN 2423 of 26 August 2022,

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	procedure in this regard and the role of neighbouring landowners and the fire protection association: • Have such equipment, protective clothing and trained personnel for extinguishing fires as are prescribed (in the regulations); • If there are no regulations, reasonably required in the circumstances, take all reasonable steps to notify the FPO of the local FPA (if there is one) when a fire breaks out; and • Do everything in their power to stop the spread of the fire. Landowners must ensure that: (i) firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring property, (ii) that it does not cause soil erosion; and (iii) it is reasonably free of inflammable material capable of carrying a veldfire across it. ***The projects are in the countryside beyond the urban limit, and thus the provisions of the Act are applicable. Measures to mitigate the risk of veld fires will be included in the EMPr.***
National Forests Act, 1998 (Act 84 of 1998) (NFA)	In terms of section 15(3) of the NFA, the Minister published a list of protected tree species.[24] The effect thereof is that no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an Applicant and subject to such period and conditions as may be stipulated. ***Should MQE required any licence to disturb a protected tree, it will be duly applied for.***
National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA)	The protection and management of South Africa's heritage resources are controlled by the NHRA. The national enforcing authority for the NHRA is the South African Heritage Resources Agency (SAHRA). In terms of the NHRA, historically important features, such as graves, archaeology and fossil beds, are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of section 38 of the NHRA, a permit is required for certain categories of development as follows: *"(1) (a): The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;* *(c): Any development or other activity which will change the character of a site -* *i. exceeding 5 000 m² in extent;* *ii. involving three or more existing erven or subdivisions thereof;* *iii. involving three or more erven or divisions thereof which have been consolidated within the past 5 years; or* *iv. the costs of which will exceed a sum in terms of regulations by SAHRA or a provincial heritage resource authority."* In terms of Section 38(8) of the NHRA, section 38(1) approval from SAHRA is not required where an environmental impact assessment is undertaken under NEMA, including a HIA, and SAHRA's requirements are considered by the CA when granting the EA. Section 38(8) of the NHRA provides that: *"The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the ECA, or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act No. 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources*

[24] GN 536 of GG 41887 on of 7 September 2018

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent." Accordingly, provision is made for the assessment of heritage impacts as part of an environmental assessment process and, if such an assessment complies with the NHRA and SAHRA's requirements and the CA considers heritage impacts when granting the EA, a separate application for consent under the NHRA is not required. ***MQE should if any heritage finds or artefacts be discovered inform the South African Police or the Heritage Authority, as per the approved EMP for the proposed project.***
Hazardous Substance Act, 1973 (Act No. 15 of 1973) (HSA)	The HSA aims to control the production, import, use, handling and disposal of hazardous substances. Under the HSA, hazardous substances are defined as substances that are toxic, corrosive, irritant, strongly sensitising, flammable and pressure generating under certain circumstances and may injure, cause ill-health or even death in humans. Where hazardous substances from any of the 4 groups below are to be used, (see below) care must be taken that they are sourced, transported, handled and disposed of in compliance with HSA. • Group I: industrial chemicals (IA) and pesticides (IB); • Group II: 9 classes of wastes excluding Class 1: explosives and class 7: radioactive substances; • Group III: electronic products and group; and • Group IV: radioactive substances. The HSA provides for the: • Control of certain electronic products; • Division of such substances or products into the groups above in relation to the degree of danger, with licensing requirements for certain activities undertaken in respect of Groups I and III; • Prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products; and • Matters connected therewith. ***Hazardous substances may be stored, handled or transported as part of the proposed projects and include diesel and other liquid fuel, oil and hydraulic fluid, cement, etc. MQE will comply with the HSA, as required.***
National Water Act, 1998 (Act 36 of 1998) (NWA)	The NWA is the primary legislation controlling and managing the use of water resources and pollution thereof. It provides for fundamental reformation of legislation relating to water resource use. The NWA's preamble recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that water resources quality protection is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The NWA's purpose is stated in section 2 and enforced by the DWS. The NWA presents strategies to facilitate sound management of water resources; provides for the protection of water resources; and regulates use of water by means of Catchment Management Agencies (CMA), Water User Associations, Advisory Committees, and International Water Management. As the NWA is founded on the principle of trusteeship, the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest. Industry (including mines) can therefore only be entitled to use water if the use is permissible under the NWA. Section 19 of the NWA provides for pollution prevention and requires that a person who owns, controls, occupies, or uses the land in

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	question, is responsible for taking reasonable measures to prevent pollution of water resources. A CMA may take action to prevent or remedy the pollution and recover all reasonable costs from the responsible party. Under Section 21 of the NWA, certain consumptive and non-consumptive water uses are identified and can only commence once authorised. Water use is broadly defined in the NWA and includes taking and storing water; activities which reduce stream flow; waste discharges and disposals; controlled activities; altering a watercourse; removing water found underground for certain purposes; and recreation. Consumptive water uses include taking water from a water resource (section 21(a) of NWA) and storing water (section 21(b)). Non-consumptive water uses include impeding or diverting a watercourse's flow (section 21(c)); altering a watercourse's bed, banks, course or characteristic or impeding the flow of a watercourse (sections 21 (c) and (i)); and disposal of waste in a matter that may detrimentally impact on a watercourse (section 21(g)). Where a water use constitutes a Scheduled 1 Use (permissible use without an authorisation requirement); permissible water uses in terms of section 22 of the NWA; or is authorised in terms of a General Authorisation (GA), a WUL is not required.[25] ***The proposed projects will include sections 21 (c), (i) and (g) water uses. A Water Use Licence Application (WULA) will be submitted to the DWS to authorises these water uses.***
Government Notice 704 (GN 704), published in Government Gazette 20119, dated 4 June 1999.	GN 704, promulgated under section 26(1) of the NWA is specifically aimed at the protection of water resources associated with mining related activities. It provides minimum requirements which need to be adhered to for water resource protection on a mine. GN 704 regulates the use of water; management of dirty and clean water infrastructure; and related activities at mines. This includes minimum requirements for infrastructure that hold dirty water. A mine can apply for exemptions from these requirements and could be granted approval, should sufficient management measures be put in place to ensure environmental protection. Regulation 4 of GN 704 places some restrictions in terms of the locality of certain infrastructure which could have an impact on water resources. ***MQE will comply with GN 704. Certain exemptions from GN 704 may however be necessary, including for construction of certain infrastructure in proximity to watercourses. This will be included in the WULA process.***
Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA), as amended	The MPRDA governs mineral resources in South Africa, regulates mining and mining authorisations and has as one of its principal objectives the equitable access and the sustainable development of the South Africa's mineral resources. Section 5A of the MPRDA indicates that: *"No person may prospect for or remove, mine, conduct technical cooperation operations, reconnaissance operations, explore for and produce any mineral or petroleum or commence with any work incidental thereto on any area without – (a) an environmental authorisation (EA)"*. Section 37 of the MPRDA requires all mining and prospecting operations and related activities to be carried out in terms of the environmental management principles set out in Section 2 of NEMA. Social and environmental sustainability is enhanced through the requirement to submit a Social and Labour Plan (SLP), which records a mining company's obligations to improve social development. This includes a commitment to training and social investment, with the goal of transferring skills that can be used after mine closure. ***Kangra holds the MQE MR over the project area.*** ***It complies with the MPRDA and will continue to do so in respect of the proposed projects. A current SLP has been approved by***

[25] Various GAs have been published under the NWA, including for Sections 21(c),(i),(g), and (a) water uses. In respect of sections 21(c) and (i) water uses, activities can be conducted within 100m of a watercourse and 500m of a wetland without a WUL if the impacts to the watercourse / wetland are low. Water uses that will be conducted under a GA need to be registered with the DWS.

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	the DMRE for MQE. There will be no increases in production or extensions to the MQE MR Area and Kangra would therefore not be required to update the SLP for purposes of the proposed projects.
Mine Health and Safety Act, 1996 (Act 29 of 1996) (MHSA)	The MHSA aims to provide for protection of the Health and Safety (HS) of all employees and other personnel at RSA mines. Its main objectives are: • Protection of the HS of all persons at mines; • Requiring employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at mines; • Giving effect to the public international law obligations of South Africa that concern HS at all mines; • To promote: o a culture of HS in the mining industry; o training in HS in the mining industry; and o cooperation and consultation on HS between the State, employers, employees and their representatives. • Providing for: o employee participation in matters of HS through HS representatives and the HS committees at mines; o effective monitoring of HS conditions at mines; o enforcement of HS measures at mines; and o investigations and inquiries to improve HS at mines. ***MQE already complies with the MHSA and will continue to do so in respect of the proposed projects.*** ***It will conduct the required hazard assessment under the MHSA regarding potential HS impacts prior to commencing with construction of the proposed projects.***
MHSA: DMRE's Guideline for the Compilation of Mandatory Code of Practice ("COP") on Mine Residue Deposits, published in accordance with the MHSA ("RS COP Guideline")	The RS COP Guideline is published pursuant to the MHSA and contains requirements as to what a mine needs to include in its COP for RS. This includes that an employer must identify hazards; assess the HS risks to which employees, and as far as reasonably practicable to persons who are not employees, may be exposed while they are at work; and record the significant hazards identified and risks assessed ("Risk Assessment"), prior to commencing operations. The Risk Assessment must: be based on a site selection process (including input from I&APs); and a site-specific investigation (including that the site is geologically and geomorphologically stable); detail pre-existing natural contaminant levels and incremental levels arising from the RS; consider all MRDs on a site in an integrated system; consider the lifestyles /living conditions of persons potentially affected; and assess future events which can give rise to increased risks. The RS COP Guideline set outs the technical information required during the site investigation process and various technical reports that must be compiled as a basis the RS design, which mirror the RS Regulations in various respects. This includes a detailed investigation by a competent person of the RS's characteristics that may directly or indirectly affect the HS of mining and non-mining personnel in the vicinity of the site, and design requirements. It also requires a safety classification of the RS in accordance South African National Standards (SANS): COP, Mine Residue, SABS 10286: 1998 ("SABS 10286"), being the principal management guidance document for RS. SANS 10286 contains fundamental objectives, the

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	principles, and minimum requirements for best practice, all aimed at ensuring that no unavoidable risks, problems and/or legacies are left to future generations. It does not, however, address the Safety, Health and Environmental (SHE) concerns of tailings storage, but places more focus on the need for management throughout the project's lifecycle. SANS 10286 also requires RS to be classified as either High, Medium or Low Hazard based on generic "catch-all" guidelines for determining a Zone of Influence, which is used. ***Kangra will compile a Risk Assessment on HS risks prior to commencing with operation of the proposed projects, for submission to the DMRE Mine Health Inspectorate.*** ***The risks, potential impacts and mitigation measures regarding HS that are identified in the detailed design and EIA will be included in the baseline process for the Risk Assessment.***
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA)	The MHSA provides that OHSA is not applicable to any matter in respect of which any provision of the MHSA is applicable.
Compensation for Occupational Injuries and Diseases Act, 1993 (Act No. 130 of 1993) (COIDA)	Under COIDA, employers are not held liable for compensation for injuries sustained by employees or compensation to dependants due to the death of an employee which occurred during the course and scope of their employment. Compensation is paid out of a statutory fund, administered by the Compensation Commissioner ("CC") (appointed under COIDA), which is set in accordance with a tariff prescribed in COIDA. The fund is a trust fund that is controlled by the CC, which the employer contributes to. The CC is appointed to administer the fund and approve claims lodged by employees or their dependants. The CC compensates the employee or their dependants directly. ***MQE will take cognisance of the requirements of the COIDA as part of daily operations should incidents occur.***
Restitution of Land Rights Act, 1994 (Act 22 of 1994) (RLRA)	The RLRA governs land restoration claims. Initially, the RLRA only allowed land claims to be lodged until December 1998 (Initial Period). This Initial Period was amended with the promulgation of the Restitution of Land Rights Amendment Act of 2014 and the process for the lodgement of claims was extended to 2019. However, a few months thereafter, the Constitutional Court delivered a judgment, *Land Access Movement of South Africa and Others v Chairperson of the National Council of Provinces and Others* 2016 (5) SA 635 (CC) (LAMOSA).[26] In terms of the LAMOSA judgments, the Department of Rural Development and Land Reform is interdicted from processing those claims lodged after December 1998 until those lodged prior to December 1998 have been finalised. Under section 11(7), no person may sell, exchange, donate, lease, subdivide, rezone, or develop a land in respect of which a land claim has been published in a government gazette without giving the Regional Land Claims Commissioner (LCC) one month's written notice of the intention to do so. ***MQE shall duly notify the LCC prior to developing on the project area.***
Other National Legislation and Policy	Other policies, legislation and associated regulations (where applicable) considered as part of the application process include: • Disaster Management Act, 2002 (Act No. 57 of 2002). • Integrated Resource Plan 2019. • Local Government: Municipal Systems Act, 2000 (Act 32 of 2000). • National Development Plan 2030. • Protection of Personal Information Act, 2013 (Act 4 of 2013).

[26] which was followed by *Speaker of the National Assembly and Another v Land Access Movement of South Africa and Others (2019) ZACC 10.*

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE
	• Regulations of Gatherings Act, No. 205 of 1993. • Traditional and Khoi-San Leadership Act, 2019 (Act 3 of 2019). • Water Services Act, 1997 (Act 108 of 1997). • Promotion of Access to Information Act, 2000 (Act 2 of 2000). • Promotion of Access to Justice Act, 2000 (Act 3 of 2000). • Basic Conditions of Employment Act, 1997 (Act 75 of 1997). • Labour Relations Act, 1995 (Act 66 of 1995).
Provincial / Municipal Legislation and Policy	Provincial / Municipal policies, legislation, and associated regulations (where applicable) considered as part of the application process include: • Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998). • Spatial Development Framework 2019: Mpumalanga Province, as amended. • Gert Sibande District Municipality (GSDM) Spatial Development Framework 2009. • GSDM Noise Control By-Law, 2014. • GSDM Waste By-Laws, 2017. • Mkhondo Spatial Planning & Land Use Management By-Law, 2016.
Municipal Development Planning	The following municipal development planning documentation is relevant to the application process: • Gert Sibande District Municipality Integrated Development Plan (IDP) 2022/27 and supporting documents. • Mkhondo IDP 2022/2027.
OTHER STANDARDS AND GUIDELINES	
Standards and Guidelines	In addition to the abovementioned Acts and their associated Regulations, the following guidelines and reports have been taken cognisance of during the application process: • Guidelines for consultation with communities and interested and affected parties issued by the DMRE. • NEMA Implementation Guidelines: Sector Guidelines for EIA Regulation[27]. • Department of Environmental Affairs (DEA) (2011): A user friendly guide to the National Environmental Management: Waste Act, 2008. South Africa, Pretoria. • Department of Environmental Affairs and Tourism (2004): Criteria for determining Alternatives in EIA, Integrated Environmental Management, Information Series 11. • DFFE Integrated Environmental Management Guideline on Need and Desirability, 2017. • Guideline for Implementation: Public Participation in the EIA Process.[28] • Publication of Public Participation Guideline (GN 807 of 10 October 2012 GG No. 35769).

[27] Published under GN 654 in GG 3333 of 29 June 2010

[28] Published in under GN 807 in GG 35769 of 10 October 2012

LEGISLATION/GUIDELINE	OBJECTIVE & RELEVANCE

	• Mining and Biodiversity Guideline: mainstreaming biodiversity into the mining sector.
	• Department of Water and Forestry ("DWAF"), 2006. Groundwater Assessment II.
	• DWS, 2011 The Groundwater Dictionary – A comprehensive reference of groundwater related terminology, 2nd ed.
	• DWS, 2016 New Water management Areas, South Africa: Government Gazette No 40279.
	• South African Water Quality Guidelines (DWAF):
	  ○ South African Water Quality Guidelines (2nd Edition). Volume 4: Agricultural Use: Irrigation (1996a);
	  ○ Water Quality Guidelines - Volume 1: Domestic Use (1996b);
	  ○ South African Water Quality Guidelines (2nd Edition). Volume 5: Livestock Watering (1996c);
	  ○ Water Quality Guidelines Volume 7: Aquatic Ecosystems (1996d);
	  ○ Water Quality Guidelines Volume 2: Recreational Use (1996e); and
	  ○ Water Quality Guidelines Volume 3: Industrial Use (1996f).
	• Best Practice Guidelines (DWAF):
	  ○ G3: Water Monitoring Systems (2007);
	  ○ A5: Water Management for Surface Mines (2008b); and
	  ○ G4: Impact Prediction (2008).
	• SANS 10103 of 2008: The measurement and rating of environmental noise with respect to annoyance and to speech communication[29].
	• SANS 10210 of 2004: Calculating and predicting road traffic noise.
	• SANS 10357: 2004: The calculation of sound propagation by the Concave method.

[29] Published under GN 718 in Government Gazette No. 18022

3.2 NEMA EIA Regulations 2014 (as amended)

The NEMA is South Africa's overarching framework for environmental legislation. Regulations promulgated under NEMA include the EIA Regulations (2014) published under Government Notice Regulation (GNR) 982, as amended (EIA Regulations), and the associated Listing Notices Listing Notice 1, 2 and 3. Section 24(5) of NEMA stipulates that certain "listed activities" require environmental authorisation by way of either a Basic Assessment (BA) or a full Scoping and Environmental Impact Assessment (S&EIR), as defined in the Listing Notices. Activities listed under Listing Notice 1 and 3 require a BA process to be undertaken, while those listed under Listing Notice 2 require a full Scoping and S&EIR Process. **Table 3-2** and **Table 3-3** provides an assessment of the applicable listed activities in terms of NEMA and NEMWA respectively.

3.2.1 Applicable Listed Activities

The proposed MQE projects will require an IEA through a S&EIR Process, due to the following listed activities being triggered:

Table 3-2: Listed activities in terms of the 2014 NEMA EIA regulations, as amended

NOTICE	ACTIVITY	DESCRIPTION OF RELATED ACTIVITY	APPLICABILITY
1	9	The development of infrastructure exceeding 1 000m in length for the bulk transportation of water or stormwater— (i) with an internal diameter of 0,36m or more; or (ii) with a peak throughput of 120l/s or more; excluding where— (a) such infrastructure is for bulk transportation of water or stormwater or stormwater drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	The construction and operation of pipelines with a Ø of more than 0.36m and throughput of more than 120l/s, for water/stormwater reticulation for the Co-Disposal Facility.
1	10	The development and related operation of infrastructure exceeding 1 000m in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36m or more; or (ii) with a peak throughput of 120l/s or more; excluding where— (a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	The construction and operation of pipelines with a Ø of more than 0.36m and throughput of more than 120l/s, for process/waste/return water or effluent reticulation for the Co-Disposal Facility, the decant management system, the WWTP and the Brine Treatment Plant.
1	12	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100m^2; or (ii) infrastructure or structures with a physical footprint of 100m^2 or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse; excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in	The proposed projects are proposed within or in proximity to various watercourses; and their development footprints exceed 100m^2. However, an exclusion is relevant, as Activity 14 of LN 3 is applicable. ***This activity is therefore not applicable and will not be further addressed in this assessment.***

NOTICE	ACTIVITY	DESCRIPTION OF RELATED ACTIVITY	APPLICABILITY
		which case activity 26 in LN 2 of 2014 applies; (cc) activities listed in activity 14 in LN 2 of 2014 or activity 14 in LN 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of the development and where indigenous vegetation will not be cleared.	
1	19	The infilling or depositing of any material of more than 10m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10m^3 from a watercourse, but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies	The proposed projects are proposed within or in proximity to various watercourses; and their construction will result in the disturbance of more than 10m^3 of material within affected watercourses.
1	24	The development of a road- (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in GNR 387 of 2006 or activity 18 in GNR 545 of 2010; or (ii) with a reserve wider than 13.5m, or where no reserve exists where the road is wider than 8m; but excluding a road- (a) which is identified and included in activity 27 in LN 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.	Various new 16m wide haul roads is required for the proposed new CDF, and the total length of these roads will exceed 1km in length.
1	25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000m^3 but less than 15 000m^3.	The construction of a wastewater treatment plant to treat contaminated water, with a maximum throughput capacity of 4 500m^3/day.

NOTICE	ACTIVITY	DESCRIPTION OF RELATED ACTIVITY	APPLICABILITY
			The construction of a Brine Treatment Plant with a throughout capacity of 285m^3/day.
1	27	The clearance of an area of 1ha or more, but less than 20ha of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The total combined project footprint area is approximately 70ha in extent. Indigenous vegetation removal is likely to exceed 20ha; as such. exclusion is relevant, as Activity 15 of LN 2 is applicable. ***This activity is therefore not applicable and will be addressed as part of Activity 15 of LN 2.***
2	6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding— (i) activities which are identified and included in LN 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000m^3 or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50m^3/day.	The proposed new PCDs associated with the CDF and WWTP, as well as associated infrastructure will require authorisation in terms of Section 21 (a), (c), (i) and (g) of the National Water Act (Act 36 of 1989).
2	15	The clearance of an area of 20ha or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The total combined project footprint area is approximately 70ha in extent. As such, indigenous vegetation removal for the combined project area may exceed 20ha.
3	4	The development of a road wider than 4m with a reserve less than 13,5m. f. Mpumalanga i. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy (NPAES) Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;	MQE falls within a CBA, a NPAES Focus area and NFEPA Sub-catchment area. Establishment of new access and internal roads for the proposed projects would trigger this activity, however, as far as possible existing roads would be utilised.

NOTICE	ACTIVITY	DESCRIPTION OF RELATED ACTIVITY	APPLICABILITY
		(dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas (CBA) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; or (gg) Areas within 10km from national parks or world heritage sites or 5km from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such areas comprise indigenous vegetation; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.	
3	12	The clearance of an area of 300m^2 or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. f. Mpumalanga i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within CBAs identified in bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA.	MQE falls within a CBA and indigenous vegetation removal is highly likely to exceed 300m^2.
3	14	The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10m^2; or (ii) infrastructure or structures with a physical footprint of 10m^2 or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32m of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. f. Mpumalanga i. Outside urban areas:	MQE is located in a CBA and NPAES Focus area. The proposed projects are located within or in close proximity to various watercourses. The projects' zone of influence will affect these watercourses as the extent of the development footprints is in excess of 10m^2.

NOTICE	ACTIVITY	DESCRIPTION OF RELATED ACTIVITY	APPLICABILITY
		(aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) NPAES Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an international convention; (ff) CBAs or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; or (hh) Areas within 10km from national parks or world heritage sites or 5km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose	
3	18	The widening of a road by more than 4m, or the lengthening of a road by more than 1km. f. Mpumalanga i. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) NPAES Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; (ee) CBAs as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; or (gg) Areas within 10km from national parks or world heritage sites or 5km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.	MQE falls within a CBA, and a NPAES Focus area. Expansion of access and internal roads for the proposed projects, will trigger this activity.

Table 3-3: Listed activities in terms of the 2013 NEMWA Waste Listed Activities, as amended

CATEGORY	ACTIVITY	DESCRIPTION OF RELATED ACTIVITY	APPLICABILITY
B	7	The disposal of any quantity of hazardous waste to land.	The proposed CDF will accommodate discard produced from the beneficiation plant, slurry/filter cake and potentially brine from the WWTP. The waste streams has been classified as Type 3 and Class I & II, requiring a Class C barrier system for disposal.
B	10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	The construction of the CDF triggers this activity.
B	11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002).	The proposed CDF will accommodate discard produced from the MQE beneficiation plant, slurry/filter cake and potentially brine from the WWTP. If NEMLAA V commences prior to the proposed development commencing, this activity will however no longer be required, as a WML will no longer be required for residue stockpiles.

3.2.2 The S&EIR Process

A S&EIR Process has two distinct phases: The Scoping Phase and the Environmental Impact Reporting Phase. The Scoping Report identifies potential biophysical, social and health aspects and impacts of the proposed development on the receiving environment and invites comments from stakeholders in the identification of key issues and areas of concern, in order to inform the S&EIR Process. The main objectives of the Scoping Phase are as follows:

- Identify the relevant policies and legislation relevant to the activity;
- Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location and layout;
- Identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
- Identify and confirm the preferred site, through a detailed site selection process, which includes an identification of impacts and risks inclusive of identification of cumulative impacts and a ranking process of all the identified alternatives, focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
- Identify the key issues to be addressed in the EIA phase;
- Agree on the level of assessment to be undertaken; and
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

4 PROJECT MOTIVATION NEED AND DESIRABILITY

Kangra Coal (Pty) Ltd is an independent, coal operating mining company in South Africa.

Kangra is located approximately 45km west of the town of Piet Retief in Mpumalanga Province and produces about 2 million tonnes of ROM energy coal per annum. Kangra's wash abilities allow it to produce a range of thermal coal products for both international and domestic customers. The vast majority of Kangra's coal is exported through Richards Bay Coal Terminal for use by international power producers.

Kangra's consistent quality and secure production make it highly a sought-after supplier to key markets. Kangra's location, being close to Richards Bay, positions it well for both exports and to service the local South African markets.

Kangra was founded by Graham Beck in 1957 and became a founding member of Richards Bay Coal Terminal in 1974. Kangra acquired the mining rights for Savmore/Maquasa in 1995. Currently, mining is undertaken at the Twyfelhoek and Balgarthen Adits.

Kangra is a shareholder of Richards Bay Coal Terminal, the world's largest coal export

terminal which allows it to export about 1.6 million tonnes of coal per annum.

Kangra's Maquasa Operation is a dynamic undertaking, and as the mining progresses, the need for supporting infrastructure changes constantly.

As indicated in earlier investigations in support of the initial application for a new discard facility, Kangra is expanding their operations in the area, resulting in increased discard capacity requirements which is anticipated to reach its capacity by 2025.

Furthermore, in line with Kangra's commitment to minimising environmental degradation through the implementation of their various environmental policies and programmes and compliance focused corporate responsibility to minimise their negative impact on the environment and promote sustainable development, MQE seeks to improve their contaminated water management practices on-site. In this regard, it is proposed to construct and operate a WWTP, including associated infrastructure to improve MQE's decant, and excess process water management practices as explained in section 2 of this Report as well as constructing a water pipe to discharge into the Heyshope Dam.

Important to note, is that the proposed projects do not entail any expansion of current mining activities or production levels nor change to the mine area held under the MQE MR. The purpose of these projects is to provide supplementary infrastructure required for the enhancement of current mining activities.

The proposed projects are crucial for the continued operation of the Maquasa Operations. Should they not be approved, MQE's contaminated water management practices will not be improved, and the additional disposal capacity will not be achieved, resulting in the shortening of the expected Life of Mine (LoM) potentially reducing the positive socio-economic impacts provided by the current operations.

In accordance with the EIA Regulations, 2014(as amended), the need and desirability of the proposed projects have been considered while taking the strategic concept, broader socio-economic needs, public interest, and environmental impacts into account. The tables below (**Table 4-1** and **Table 4-2**) provide answers to a number of guiding questions as posed in the Department of Environmental Affairs' Guideline on Need and Desirability (DEA, 2017).

The answers provided below indicate that ample consideration has been given to the need and desirability of the proposed projects.

Table 4-1: Assessment of the proposed MQE projects in terms of securing ecological sustainable development and use of natural resources

NO.	QUESTION	ANSWER
1.1	How were the following considerations taken into account: • Threatened ecosystems; • Sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure; • CBAs and ESAs; • Conservation targets; • Ecological drivers of the ecosystem; • Environmental Management Framework; • Spatial Development Framework; and • Global and international responsibilities relating to the environment.	Considering that MQE is located in an environmentally sensitive CBA, the EIA Process would address all ecological and environmental considerations, with specific reference to the conservation importance of the area. Due diligence would be observed while undertaking the EIA to ensure that the process was in line with MQE's environmental principles, the area's environmental frameworks and all relevant guidelines.
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The projects will take place in an area largely characterised by mining activities. Some wetland habitats would be lost. In order to reduce the impact of the projects on the ecosystem, clean stormwater would be diverted around the project Areas. Several options were explored for the projects, with the proposed option being the best strategy. Implementation of the EMPr would ensure that negative impacts are avoided, managed, and mitigated as far as possible.
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The CDF would be lined, as per the current requirements of DWS. Seepage from the CDF is thus expected to be minimal. The projects are proposed within the MR area in previously disturbed areas, where very little indigenous vegetation remains. Implementation of the EMPr would ensure that negative impacts are avoided, managed, and mitigated as far as possible.
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely	The CDF would be a residue/discard storage facility. The waste that will be stored is a product of the processing of minerals, hence there are no further treatments that could be applied. The WWTP would generate brine which will initially be pumped to

NO.	QUESTION	ANSWER
	treat and/or dispose of unavoidable waste?	the proposed new Brine PCD. A Brine Treatment Plant will be installed at a later stage to remove water from the brine, thereby converting it to a dry filter cake that can be disposed of on the proposed CDF. Other waste products generated would enter the existing MQE waste management stream and be finally disposed of at licensed waste disposal facilities.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The project falls within an existing MR and active mining area. a Heritage and Palaeontological Sensitivity Verification will be undertaken during the EIA Phase. Implementation of the EMPr would ensure that negative impacts are avoided, managed, and mitigated as far as possible.
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	There is no foreseen additional demand on natural resources due to the proposed projects that would result in any significant depletion of natural resources. In respect of water supply, MQE would continue to recycle water at the mine in a closed system. The CDF and Brine PCD would be lined with an impermeable barrier system, and this would prevent any significant impact to the groundwater, with no impact on groundwater users being anticipated. There would be limited removal of indigenous vegetation.
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? • Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that	Appropriate mitigation measures would be included in the EMPr to minimise impacts to non-renewable natural resources. The extent of biodiversity impacts would be assessed and the necessity to offset this.

NO.	QUESTION	ANSWER
	settlements reduce their ecological footprint by using less material and energy demands and reducing the amount of waste they generate, without compromising their quest to improve their quality of life); • Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?); • Do the proposed location, type and scale of development promote a reduced dependency on resources?	
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts? • What are the limits of current knowledge? • What is the level of risk associated with the limits of current knowledge? • Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The impacts on ecology would be thoroughly investigated in the identified investigations. At this stage, it is unlikely that these gaps would result in a large increase in the risk. The precautionary principle was adopted during the preliminary design process while investigating the engineering solutions and seismicity in the area. Alternatives would be explored for the projects during the EIA Process and would similarly be applied by the specialists in the EIA phase.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following: • Negative impacts: e.g. access to resources, opportunity costs, loss of amenity, air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? • Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	A comprehensive suite of specialist studies to investigate the impacts of the proposed projects on the environmental rights of the community are being compiled. The proposed projects are likely to have minimal additional impacts in terms of amenity (as it is within the MQE MR Area and owned by Kangra), air and water quality, noise, health and visual. The implementation of the EMPr would assist in minimising or managing any impacts as far as possible.
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site,	Human wellbeing in the area is linked to livelihood, air quality and water quality. Should the development negatively impact any of these factors, this may result in linked socio-economic impacts. The impacts would be assessed, and further investigations would be

NO.	QUESTION	ANSWER
	opportunity costs, etc.)?	undertaken as necessary in this regard.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	It is likely that there would be little additional impacts on ecological integrity as the proposed projects would be located within the existing MQE MR Area, with existing mining activities and within an area where the MQE surface infrastructure is already situated.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	In considering project alternatives, it must be highlighted that the proposed projects are all located within an area classified as a "Brownfields Site" and there are various limiting factors pertaining to availability of suitable land and restrictions experienced due to biodiversity sensitivity in the area. Nevertheless, detailed scrutiny was undertaken of potential development options. Due to the nature and location of the current activities at MQE, the proposed projects are proposed to be positioned in the locations and on the properties on which they are needed and best located in accordance with current operational requirements and identified restrictions explained earlier.
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Positive: • The proposed projects are all located within a "Brownfields Site" and as such the potential environmental impact has been lowered. Negative: • Loss of topsoil and vegetation (habitat). • Potential pollution of soil and water resource through improper waste and hydrocarbon management. • Minor air quality impacts from dust and particulate matter. • Minor noise impacts. • Potential erosion and sedimentation of water resources, impacting water quality. • Potential groundwater pollution through seepage (this is unlikely due to the pollution barrier system (the liner) and other mitigation measures which would be put in place). • Permanent visibility of the projects in landscape, changing the

NO.	QUESTION	ANSWER
		topography. • Possible impact on the water quality.

Table 4-2: Assessment of the proposed MQE projects in terms of promoting justifiable economic and social development

NO.	QUESTION	ANSWER
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations: • The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area, • Spatial priorities and desired spatial patterns (e.g. need for integration of segregated communities, need to upgrade informal settlements, need for densification, etc.), • Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and • Municipal Economic Development Strategy ("Local Economic Development (LED) Strategy").	The area is characterised by high unemployment rates, with employment being driven largely by mining activities. The development is an expansion of activities, which are already underway, in a landscape dominated by mining. The IDP speaks of how mining has contributed 17-26% of the Mpumalanga Province's budget in recent years and identifies various opportunities in the mining sector. Thus, the development is in line with the IDP and other spatial priorities. The expansion of the facility would result in continued employment as the lifespan of the operations would be increased.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? • Will the development complement the local socio-economic initiatives (such as LED initiatives), or skills development programmes?	The proposed projects would result in continued employment; and continued direct, downstream, and macro-economic positive impacts from the MQE Mine, as its LoM would be maintained and benefits to the local communities arising from the MQE Social and Labour Plan (SLP) would continue. This is in line with the objectives of the GSDM and Local IDPs.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	The expansion projects would likely result in continued employment, as well as continued economic input from the operations, as the lifespan of the Mine would be increased and continued benefits to the local communities arising from the MQE SLP. This is in line with the objectives of the IDP.
2.4	Will the development result in equitable (intra- and intergenerational) impact distribution, in the short- and long-	The proposed projects would result in long-term benefits through maintaining the LoM; providing job opportunities to current and future generations, as most current

NO.	QUESTION	ANSWER
	term? Will the impact be socially and economically sustainable in the short- and long-term?	employees would likely retire before expected LoM is reached; ongoing benefits from SLP projects; and downstream socio-economic benefits.
2.5	In terms of location, describe how the placement of the proposed development will: • result in the creation of residential and employment opportunities in close proximity to or integrated with each other, • reduce the need for transport of people and goods, • result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport), • compliment other uses in the area, • be in line with the planning for the area, • for urban related development, make use of underutilised land available with the urban edge, • optimise the use of existing resources and infrastructure, • opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), • discourage "urban sprawl" and contribute to compaction/densification, • contribute to the correction of the historically distorted spatial patterns of settlements and the optimum use of existing infrastructure in excess of current needs, • encourage environmentally sustainable land development practices and processes, • take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), • the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area	The Mine is situated in a mining belt and is neighboured by several mines. It therefore complements these land uses in the area. There is existing transport for workers commuting from the surrounds. The proposed projects would be an environmentally sustainable land development and have a specific locational factor, being within the MQE MR and surface infrastructure area, largely on disturbed or non-sensitive areas. There would accordingly be optimal use of existing infrastructure. By continuing investments and development of MQE, continued socio-economic benefits can be generated.

NO.	QUESTION	ANSWER
	with high economic potential), • impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and • in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	
2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts? • What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? • What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? • Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Kangra has recently undertaken several socio-economic assessments and community engagements for previous EIAs, which lessens the risks of limits of current knowledge gaps. PPP with the surrounding communities is being undertaken as part of the EIA Process. The specialist would apply the precautionary principle and gaps noted would be discussed in the EIA. Mitigation measures for any socio-economic would be discussed under in the EIA and noted in detail in the EMPr.
2.7	How will the socio-economic impacts resulting from this development impact people's environmental rights in terms following: • Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? • Positive impacts. What measures were taken to enhance positive impacts?	Measures to enhance socio-economic positive impacts include prioritisation of recruitment from the local community, providing up-skilling opportunities to the local community employed for the projects, use of local and small-business goods and services and development of a communication strategy for the local community. Positive impacts would be enhanced through extensive public participation and involvement of the communities impacted by the development, thereby allowing suggestions and recommendations to guide the EIA Process. Issues would be addressed via the Comments and Response Register. The socio-economic specialist would recommend the appropriate measures to address negative impacts.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in	There are no additional long-term ecological impacts foreseen due to the socio-economic impacts. Current employees would continue to utilise natural resources at the same rate as they currently do.

NO.	QUESTION	ANSWER
	ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Socio-economic aspects were considered in the assessment of alternatives and the Best Practicable Environmental Option. The proposed development would result in the continuation of the MQE and the socio-economic impacts.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "Best Practicable Environmental Option" to be selected, or is there a need for other alternatives to be considered?	It is not anticipated that adverse environmental impacts would be distributed in a manner as to unfairly discriminate against any person. An extensive PPP is planned to guide the development of the EIR and EMPr. Comments and suggestions by neighbouring communities would assist in ensuring that this does not occur.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	The EIA Process and EMPr would take all stages of the project's life cycle into account and impacts specific to each phase would accordingly be addressed.
2.13	What measures were taken to: • ensure the participation of all interested and affected parties, • provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, • ensure participation by vulnerable and disadvantaged persons, • promote community wellbeing and empowerment through environmental education, the raising of environmental	An extensive PPP would be undertaken as part of the EIA Process. All impacted communities are invited to provide comments and suggestions. Notices of the application and projects are being relayed in several different formats. Summary documentation describing the application process and the projects, in English and the most prevalent additional language, is provided during the PPP process to ensure adequate understanding and efficient participation. The relevant documents in the EIA Process would be made available online and in public places near the neighbouring communities.

NO.	QUESTION	ANSWER
	awareness, the sharing of knowledge and experience and other appropriate means, • ensure openness transparency, and access to information in terms of the process, • ensure that the interests, needs and values of all interested and affected parties were taken into account and that adequate recognition was given to all forms of knowledge, including traditional and ordinary knowledge, and • ensure that the vital role of women and youth in environmental management and development was recognised and their full participation therein was promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	As previously stated, the projects are purely an expansion of existing activities. Therefore, it is unlikely that any additional opportunities would arise because of the projects, but it would ensure the continuation of socio-economic benefit. Current employees would benefit from extended job security and support for their dependents, who are from various segments of the community.
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Kangra MQE would undertake all activities under the guidance of the country's labour, employment and health/safety laws and its policies and procedures. The EMPr would further provide guidance for HS measures that must be implemented to ensure that employees are not subjected to adverse health conditions or dangers without the correct training, equipment, and supervision.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects: • the number of temporary versus permanent jobs that will be created, • whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), • the distance from where labourers will have to travel, • the location of job opportunities versus the location of	Temporary jobs would be created during the construction phase, ranging from 100 opportunities and local skilled labour would be encouraged. During the operational phase, minimal job opportunities would exist as the infrastructure would fit into the current operations and staff component.

NO.	QUESTION	ANSWER
	impacts (i.e. equitable distribution of costs and benefits), and • the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact 1000 agricultural jobs, etc.).	
2.17	What measures were taken to ensure: • that there was intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and • that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	The PPP invites comment and input from all levels of government relevant to the Proposed Project- including the local municipality and various other relevant government departments. For those government arms that have specific issues related to the development, consultation meetings would be arranged to resolve those. Comments from these government departments would be before the decision maker at the DMRE.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	An intensive EIA Process would be undertaken, including investigation into socio-economic factors, to ensure that the environment is protected as far as possible. This section on the need and desirability of the projects illustrates that it would be in the public interest and there would be beneficial use of environmental resources.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The EMPr would include implementable and realistic mitigation measures, which would allow for impacts to be mitigated and managed as far as possible. The proposed project would remain in place for the foreseeable future; however, rehabilitation measures would ensure that the legacy is minimised as far as possible.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling, or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	Kangra MQE would increase the financial provision as it understands potential liability under the polluter pays principle and its responsibilities under duty of care under NEMA and is committed to undertaking concurrent rehabilitation and adhering to its environmental management system requirements and EMPr conditions.
2.21	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the Best Practicable Environmental	Please refer to Chapter 5 of this Report wherein alternatives are discussed in detail.

NO.	QUESTION	ANSWER
	Option in terms of socio-economic considerations?	
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope, and nature of the project in relation to its location and other planned developments in the area?	Cumulative impacts of the Proposed projects include: • Additional temporary jobs and income during construction, in addition to other activities providing jobs in the landscape (positive). • Improved local employment and income, reduced poverty, and contribution to the local economy, in addition to other projects and activities in the landscape (positive). • Project-induced in-migration in addition to in-migration from other mining activities and projects, (negative). • Increased nuisance factors- as the projects and other industrial activities act as sources of traffic, dust, and noise pollution (negative). • Increased resource use (water and electricity) of the Projects, in conjunction with all other resource-users in the landscape (negative). • Impact on external costs to local communities caused by cumulative impact of projects (negative). • Community safety related to existing industrial activities, other mining activities in the area act as additional sources of traffic, dust and noise pollution (negative). Residual impacts include: • Temporary jobs and income during construction- up-skilled labour force (positive). • Project-induced in-migration- additional pressure on the provision of housing and related infrastructure and health, emergency, and safety services (negative). • Local employment and income- up-skilled labour force (positive). • Sense of place- the visual impact of the projects and the residual impact on the sense of place and environmental risks possibly impacting on the sense of place (negative). • Increased nuisance factors (dust and noise) and resultant potential health risks (negative). • Environmental pollution risks (negative).

5 PROJECT ALTERNATIVES

In accordance with the principles stipulated in NEMA, it is required that various alternatives be investigated when considering a development which may impact significantly on the environment, to implement the proposed developments. This means that the options will be assessed in such a manner that the alternative which has the most benefit or causes the least environmental damage to the natural environment is chosen. This option also needs to be of such a nature that the capital and social costs incurred will be acceptable to society.

Biophysical and socio-economic aspects are considered when investigating alternatives.

NEMA defines development alternatives in relation to a proposed activity as different means of meeting the general purposes and requirements of the activity, which may include alternatives to the–

- property on which, or location where it is proposed to undertake the activity.
- type of activity to be undertaken.
- design or layout of the activity.
- technology to be used in the activity.
- operational aspects of the activity; and
- option of not implementing the activity.

For this project, rigorous feasibility studies and a scoping level assessment were undertaken by the Professional Team, and following on from the above, the alternatives identified as applicable to assess in this S&EIR Process are as follows:

1. Property/Location Alternatives
2. Design/Layout Alternatives
3. “No-Go” Alternative (this is a mandatory option)

In considering project alternatives, must be highlighted that the proposed projects are located within an area classified as a “Brownfields Site” and there are various limiting factors pertaining to the availability of suitable land and restrictions experienced due to biodiversity sensitivity in the area.

Based on the contextual information, and described in detail below, there is no evidence to suggest that other alternatives should be investigated for the proposed projects.

5.1 Property/Location Alternatives

Due to the nature and location of the current activities the proposed project is to be positioned in the locations and on the properties on which current surface mine activities are undertaken; and in accordance with current operational requirements and restrictions,

including topography and surface hydrology and wetland systems.

5.1.1 WWTP

The purpose of the WWTP is to *treat contaminated water* resulting from MQE Operations generally. All contaminated water, albeit from the processes on the site, activities from other interrelated sites, or the identified decant point (refer to **Figure** 2-3), ends up in the existing PCD complex as indicated in **Figure 5-1**.

Figure 5-1: Existing PCD Complex at MQE

The main consideration for the location of the WWTP was current surface structures and infrastructure, the layout thereof and available land; the proximity to the contaminated water to be treated while avoiding environmentally sensitive areas as far as practically possible. The most feasible and practical location is therefore right next to the PCD complex on previously disturbed land, indicated above by the yellow circle.

Similarly, the most feasible locations for the associated infrastructure were determined, using as far as possible existing routes and disturbed areas for access to the WWTP; the proposed Brine Treatment Plant, and pipelines.

No additional feeder pipelines to transport contaminated water to the PCD complex are required, existing pipelines are sufficient. The WWTP (indicated in turquoise blue) will

however require new intake and outlet pipelines (indicated in blue); a treated effluent discharge pipeline (indicated in magenta) to the discharge point at the Heyshope Dam; and a brine pipeline (indicated in yellow) to the Brine PCD (indicated in orange); as depicted in in **Figure 5-2**.

Figure 5-2: WWTP Pipelines

5.1.2 CDF

The existing MQE DD is located to the north-west of the coal washing plant (indicated in yellow) with the proposed new MQE CDF located further west of the existing MQE DD (indicated in orange) as can be seen in **Figure 5-3**.

Figure 5-3: Existing Discard Dump and Proposed CDF at MQE

As indicated earlier, the new MQE CDF is proposed to be located within the exact footprint of the previously approved MQE New DD. As such, no further location alternatives were identified nor investigated in this assessment process, however, a summary of the assessment undertaken by Hatch in their 2011 Concept Study to determine the preferred location alternative is provided below.

The following six (6) alternatives were proposed for the MQE New DD and were assessed by Hatch in their 2011 Concept Study (refer to **Figure 5-4**):

- Site A: situated to the east of the coal washing plant;
- Site B: situated to the north of the coal washing plant;
- Site C: situated to the northwest of the coal washing plant and includes the existing MQE DD site;
- Site D: situated to the west of the current wash plant position and is located on the coal reserves in the area known as Maquasa West;
- Site E: is an open cast excavation situated approximately 2.4km to the west of the current wash plant position in the Maquasa West Open Cast section; and
- Site F: The site is situated approximately 3.2km to the west of the current wash plant position.

Figure 5-4: Discard Dump Site Alternatives

Disposal at Site E would involve disposal into an open cast excavation. The difficulty in controlling the AMD generated in the open cast excavation was considered a fatal flaw and was therefore eliminated as an option. The assessment of the remaining sites is summarised in **Table 5-1**. Based on the assessment, Site F was selected as the preferred site.

Table 5-1: MQE DD Location Alternatives assessed by Hatch in 2011.

SITE ID	ADVANTAGES	DISADVANTAGES	COMMENTS
Site A	• The relatively flat topography. • The proximity (±0.2km) to the proposed plant position. • The dump cannot sterilise any coal reserves.	• The proximity (± 0.6km) to the Heyshope Dam. • The collected seepage must be handled by a pumping system that must operate after mine closure. • The visible impact of the dump. • The polluted surface water and stormwater runoff must be handled by a pumping system during operation.	No comment
Site B	• The proximity (± 0.5km) to the proposed plant. • The dump can blend in with the natural topography to reduce the visible impact. • The polluted surface water and stormwater runoff can be handled by a gravity system (passive). • The seepage can be handled by a	• The major seep zone that will require significant engineering design to overcome and will have a low confidence level of success. • The Site is located partially above the old mined out area and the correct as mined out survey should be sourced to establish how many pillars have been left after mining activities stopped.	Steep zone

SITE ID	ADVANTAGES	DISADVANTAGES	COMMENTS
	gravity system (passive).	• The depth to underground workings is approximately 30 m.	
Site C	• The dump can blend in with the natural topography to reduce the visible impact. • The polluted surface water and stormwater runoff be handled by a gravity system (passive). • The seepage can be handled by a gravity system (passive).	• That it is (± 1.2km) from the existing washing area. • The Site is located directly above the old mined out area and the correct as mined out survey should be sourced to establish how many pillars have been left after mining activities stopped.	Above old mine out area including existing Discard Dump
Site D	• The dump can blend in with the natural topography to reduce the visible impact. • The polluted surface water and stormwater runoff can be handled by a gravity system (passive). • The seepage can be handled by a gravity system (passive).	• The difficulty in containing seepage. • The distance (± 1.9km) from the proposed plant position. • The Site is located partially above the old mined out area and the correct as mined out survey should be sourced to establish how many pillars have been left after mining activities stopped.	AMD (Acid Mine Drainage) could exclude this site.
Site F	• The dump is on a slope that faces away from the Heyshope Dam and Driefontein and therefore the visual impact is reduced. • The two naturally occurring clay layers within the soil profile and the elevation of the groundwater is below the second layer. • The dump cannot sterilise any coal reserves.	• The distance from the current washing plant position. • The introduction of a pumping system to return the seepage to the plant during its operational life.	No comment

5.2 Design/Layout Alternatives

A summary of the aspects considered for the potential design and/or layout alternatives for the proposed projects is outlined below.

5.2.1 WWTP

The potential management/remedial measures for contaminated water present at MQE were first identified in 2018 by GCS as part of the Numerical Groundwater and Transport Model Update for the Maquasa Operations and then further investigated by GFK Consulting Engineers as part of their investigations to determine the most appropriate way forward in this regard.

Potential decant management/remedial actions were identified in 2018 by GCS as part of the Numerical Groundwater and Transport Model Update for the Maquasa Operations. Various management/remedial actions were investigated and are summarised below:

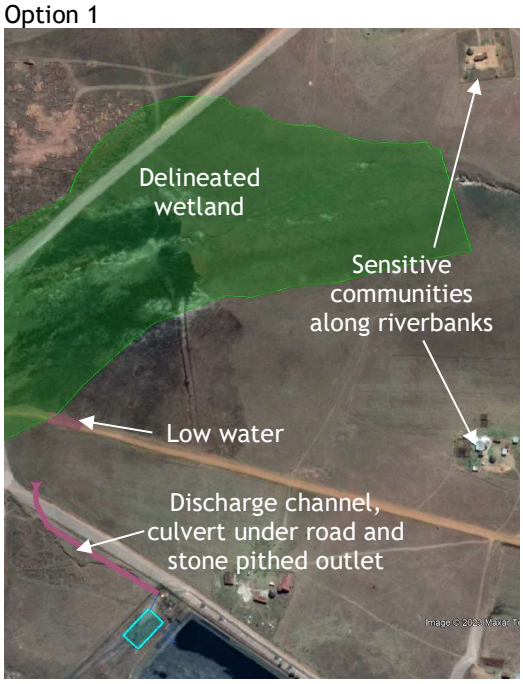
- Evaporation of decant over the PCDs;
- Passive treatment via an artificially constructed wetland system; and
- Active treatment via a wastewater treatment plant.

It was found that active treatment is the most feasible solution due to the decant point location, high contaminated water flow rates, and required discharge water quality. Additionally, with evaporation, the weather would determine the efficiency of the water management system, and the operation has time (can operate a maximum of 12 hours per day) and spatial (can only be undertaken over the existing PCDs due to salt load) constraints.

Active treatment will be able to accommodate high contaminated water flow rates (4500m^3/day) to be treated and the required discharge quality. Passive treatment systems are typically limited to 50l/s inflow rates, making such a system unfeasible and nearly impossible to implement.

Active treatment is further favoured over mechanically forced evaporation of the surplus water, as the efficiency of such an evaporation system is dependent on the weather, the limited pumping hours (maximum 12 hours per day), as well as special constraints (must be pumped/evaporated over the PCD's due to salt load).

Option 1



The WWTP outlet will discharge into a channel which will route the water through a culvert at the first road opening into a stone-pitched outlet to the open field. Provision has been made for a low water bridge at the next road with final discharge into the wetland.

Option 2

The WWTP outlet will discharge into an underground pipeline following the fence line and existing roadways, towards a protected discharge point into the Heyshope Dam.

From the above, it is clear that Option 2 is the preferred alternative with the least potential impact associated with it. Due to the high erosion potential, risk to the communities, and disturbance to the ecological and water resources associated with Option 1, it was deemed to be unfeasible, and thus Option 2 was identified as the preferred alternative for further investigation.

5.2.2 Co-Disposal Facility

Similarly, to the discussion around property/location alternatives for the MQE CDF, the design alternatives have previously been investigated and are still applicable. The determining factor for the preferred alternative is however again associated with the nature and location of the current activities; the location, extent, and design of the previously approved MQE DD; the current operational requirements and restrictions, whereby specifically a CDF is required. The preferred alternative is integrated discard "Dry". The alternatives assessment provided in the 2016 EIR is provided below.

Integrated Discard "Dry" (Preferred Alternative)

Integrated discard "dry" process involves dumping coarse discard material the conventional way in layers and mixing the low moisture "filter cake" fine discard material in layers with the coarse discard.

The integrated discard "dry" technique will reduce the permeability of the coarse discard and therefore have a reduction in AMD. Although the expected AMD is significantly less than that for co-disposal AMD is expected to continue after closure.

Co-disposal "Wet and Dry"

Co-disposal involves the impoundment of slurry within the body of the coarse discard, which will lead to AMD during the operating life and a considerable period after closure.

Integrated Discard "Wet"

Integrated discard involves the mixing of slurry and the coarse discard which will be deposited like conventional tailings. The tailings will beach, with the coarse product being deposited first followed by the fine product which will accumulate at the pool centre.

The integrated discard technique will reduce the permeability of the coarse discard and therefore a reduction in AMD is expected. Although the expected AMD is significantly less than that for co-disposal, AMD is expected to continue after closure. However, this disposal technique is a relatively new and unproven technology.

Separate Disposal "Wet – Site 1 and Dry Site 2"

Separate disposal involves the deposition of the slurry into the underground workings or a

separate above-ground fines slurry pond, and the impoundment of the coarse discard above the ground surface. This reduces the AMD potential of the coarse discard, and the control and containment of AMD from the slurry if it is placed below ground.

In the case of Maquasa, the fines could be transported and deposited in the form of a slurry back into the underground workings. These areas of disposal would be prepared using the appropriate preplanning and mining methods.

The slurry would then be deposited at an elevation below the expected working level and remain flooded thereby excluding or limiting the supply of oxygen. However, a decision has been made to stop this operation and to dry the slurry, and dispose of the "filter cake" on the coarse DD.

Coarse Discard disposal involves impounding the coarse discard on a selected site above natural ground. The coarse discard is then compacted to minimise the risk of spontaneous combustion by limiting the ingress of air and water into the waste dump. The AMD that could be generated from the coarse discard during operations would then be captured and contained within the mine property and once the dump has been encapsulated, the amount of seepage is likely to cease after a short period of time.

5.3 No-Go Alternative

The EIA Regulations, 2014 (as amended) requires that all development alternatives be included in the investigation process. The no-go option would be comparatively assessed against the above mentioned alternatives during the EIA phase and will act as a baseline against which all the other development alternatives are measured.

The "no-go" option would result in the MQE projects not being implemented, i.e. not constructing the WWTP to treat contaminated water at the site, and not constructing the CDF to accommodate the required discard and slurry produced at the site.

Should the new CDF not be realised, disposal capacity for the wastes produced at MQE will run out and operations at MQE may need to cease. The no-go option would thus result in a significant economic loss for Kangra (Maquasa Operations); the surrounding community; the municipality; and at local, provincial, and national macro-economic levels. The loss of employment would be immense, as workers often support entire families in an area with high unemployment rates. Furthermore, the benefits that flow from the MQE in terms of local economic development projects and skills development training to employees would be lost.

Additionally, the potential for inappropriate disposal of wastes produced at MQE without having established the new CDF increases the environmental risk to the surrounding sensitive landscapes exponentially. The risk for resource water pollution of the Heyshope Dam as a

result of the continued decant of untreated contaminated water will also increase with no establishment of the new WWTP.

Consequently, the “no-go” alternative is not the preferred alternative.

5.4 Concluding Statement of Preferred Alternatives

Based on the preliminary results of scientific studies done and socio-economic consideration, the following concluding remarks are made regarding the preferred alternatives:

- MQE WWTP & Associated Infrastructure: A few wetlands of low sensitivity are in the area. Towards the south medium sensitivity wetlands are found. The preferred alternative as described in Section 2.1 is deemed to be the only viable option for further investigation.
- MQE CDF & Associated Infrastructure: A few wetlands with low sensitivity are in the CDF footprint’s location. This is due to previously mined areas. This alternative is however still deemed to be the preferred alternative as explained in earlier sections.

6 ENVIRONMENTAL BASELINE

The baseline environment is described in this chapter. The baseline environment provides a status against which to assess the proposed project activities and potential impacts.

6.1 Geology

6.1.1 Regional Geology

The geology of the region comprises Vryheid Arenites, a sedimentary rock composed of sand-sized fragments irrespective of composition, thick beds of yellowish to white cross-bedded sandstone and grit, which alternate with beds of soft, dark-grey, sandy shale, and a few seams of coal. It would appear as if the underlying geological patterns do not have a significant effect on the vegetation development.

6.1.2 Local Geology

The geology of the study area is shown in **Figure 6-1**. The Quaternary Period deposits, representing the youngest period in geological history, consist of alluvial sands that occur along the major rivers as well as surface ferricrete. The area is generally underlain by sedimentary rocks of the Ecca Group, a subgroup of the Karoo Supergroup. These sediments form part of a segment of the northeastern margin of the depositional Karoo Basin. The sedimentary rocks have been deposited discordantly on the basement.

In this area of the Karoo Basin, the Ecca Group consists of the Pietermaritzburg Shale Formation at the base, followed by the Vryheid Formation, which is composed predominantly of sandstone, and the Volksrust Shale Formation at the top. The Vryheid Formation comprises a lower fluvial-dominated deltaic interval, a middle fluvial interval, and an upper fluvial-dominated deltaic interval.

The fluvial deltaic intervals are the fluvial sequences of sediments deposition as a delta. This process explains the lithological units of Vryheid which are lower sandstones, coal zone, and upper sandstones. The Volksrust Formation consists of silty shale, mudstone, and siltstone or sandstone lenses towards its upper and lower boundaries (Johnson, M.R *et al.*, 2006).

Sedimentary rocks of the Vryheid Formation of the Ecca Group underlie the study area. The Formation is characterised by thick beds of yellowish to white, cross-bedded sandstone and grit, which alternate with beds of soft, dark-grey, sandy shale and a few seams of coal in the middle of the formation. All the coal seams occur within the Vryheid Formation of the Ecca Group (Karoo Supergroup). The basal rocks comprise of lava, tuff, schists, and chert of the Undifferentiated Onverwacht Group, which forms part of the Barberton Sequence. **Figure 6-1** shows the lithostratigraphy of the area.

Table 6-1*:* Lithostratigraphic Sequence

SUPERGROUP	AGE (Ma)	GROUP	FORMATION	DESCRIPTION
	65		Surface deposits	Alluvium, scree & ferricrete
Karoo	570	Ecca	Volksrust	Shale
			Vryheid	Grit, sandstone, shale, coal
			Pietermaritzburg	Micaceous shale
Barberton	2061	Undifferentiated Onverwacht		Schist, volcanic rock, tuff, chert, agglomerate

The Maquasa West and East Coal Field deposit is part of a very large basin extending far to the West and North and cutting off against a basement headland towards the East in the Amsterdam and Piet Retief directions.

The most important coal seams in the Maquasa West and East Coal Field are as follows:

- GUS SEAM (Top) Moderately to well developed 1.0 - 2.0m thick; and
- DUNDAS SEAM (Bottom) Varies in thickness and remains well developed.

The coal seam lithology is mixed with subordinate dull to dull lustrous bands within an essentially mixed, mainly bright laminated coal sequence. A coarsely pyrite/siderite spotted horizon occurs throughout the upper half o*f* the seam. The roof consists of a thick 15 – 20m competent, coarse-grained sandstone unit up to 100 m. However, in certain areas, the roof is associated with a combination of mudstone, siltstone, and shale.

The floor of the coal seams is generally competent and consists of siltstone/sandstone rock types. During the deposits of sediments in the still sagging Karoo Basin, tension in the crust due to continuing sagging leads to failure and subsequently intrusion of Post-Karoo dolerite sills and dykes along weak zones such as fractures, fissures, and faults. Consequently, dykes and sills varying between a few centimetres to a couple of metres in thickness intruded the study area.

The highest topographic features comprise resistant remnants of the B4 and B6 dolerite sills. The B4 sill lies concordant to sedimentation at the base of the Volksrust Formation. Contrasting to the B4 sill, the B6 sill is highly transgressively active and creates complex ring dyke structures that transgress the coal, causing vertical displacement and areas of burnt or devolatilised coal.

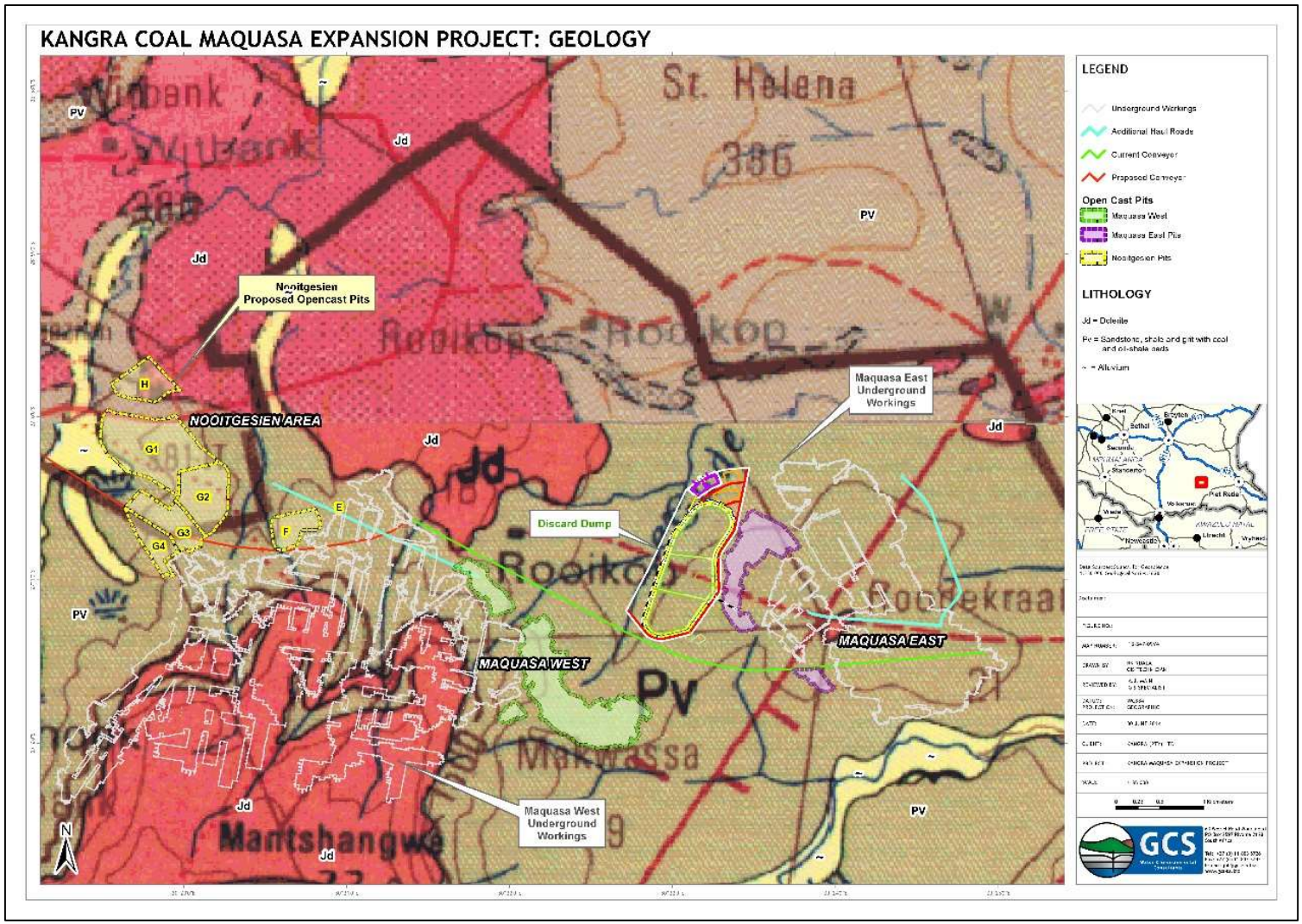


Figure 6-1: Geology of the project area

6.2 Topography

The regional topography can be described as undulating with elevations ranging from 1750 (metres above mean sea level) mamsl in the highest regions to the south-east of the mining operations in the south-eastern corner of the remainder portion of the farm Kransbank, to 1300 mamsl at the lowest point of the Heyshope Dam to the south-east of the MQE Operations.

The regional topography is characterised primarily by the two (2) catchments of the Mpundu (south-southeast of the mining operations) and Hlelo (west / north-west of the mining operations) rivers. The ridge separating the Maquasa and Nooitgesien operations acts as the boundary between these two (2) catchments. Several smaller non-perennial rivers form part of these river systems including small marsh and swamp areas as a result of inundation during the wet season.

The Maquasa East and West mining operations are located on the eastern facing slopes of the Heyshope Dam valley with elevations ranging from 1545 to 1305 mamsl with an average gradient of 1:19 in an easterly direction. The topography of the project area is presented in **Figure 6-2.**

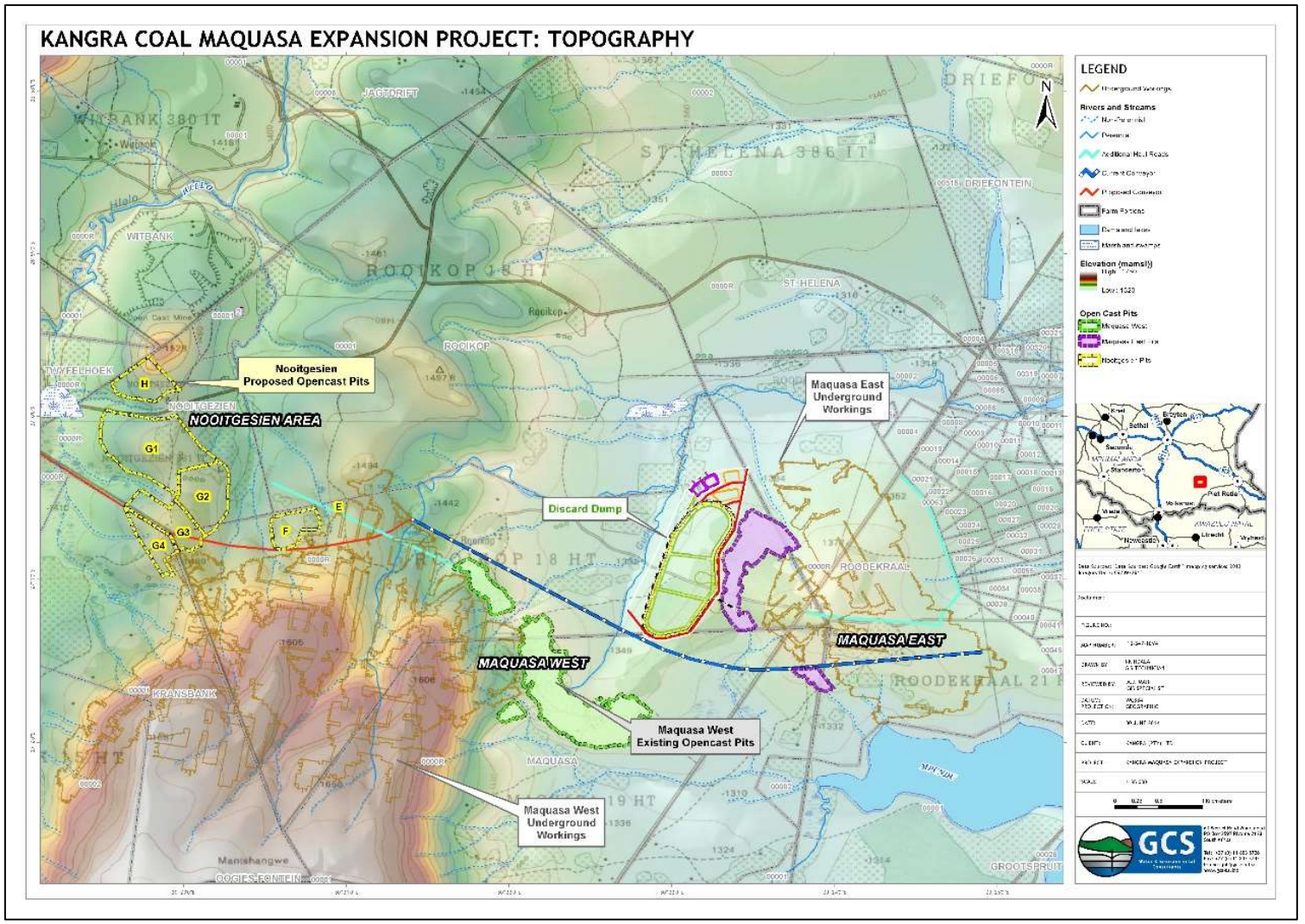


Figure 6-2: Topography of the project area

6.3 Climate

The study area is in Water Management Area 12: Usutu to Mhlatuze and falls over 2 quaternary catchment areas namely W51B and W52A.

6.3.1 Temperature

The average yearly temperature (refer to **Figure 6-3**) for the project area ranges from 25 to 33°C (high) and -4 to -2°C (Low). The study area is situated in a subtropical highland climate or temperate oceanic climate with dry winters (Cwb) area, as per the Köppen Climate Classification (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006). The project area receives summer rainfall.

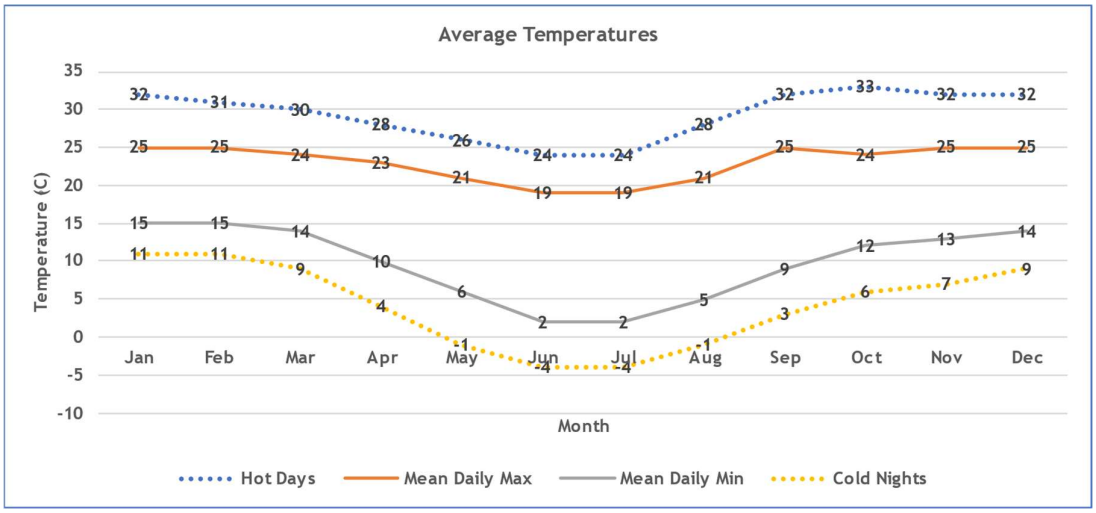


Figure 6-3: Average yearly temperatures (Meteoblue, 2022)

6.3.2 Rainfall and Evaporation

The project area is situated in rainfall zone W5A. The mean annual precipitation (MAP) measured at several rainfall stations that fall close to the site is summarised in **Table 6-2**, below.

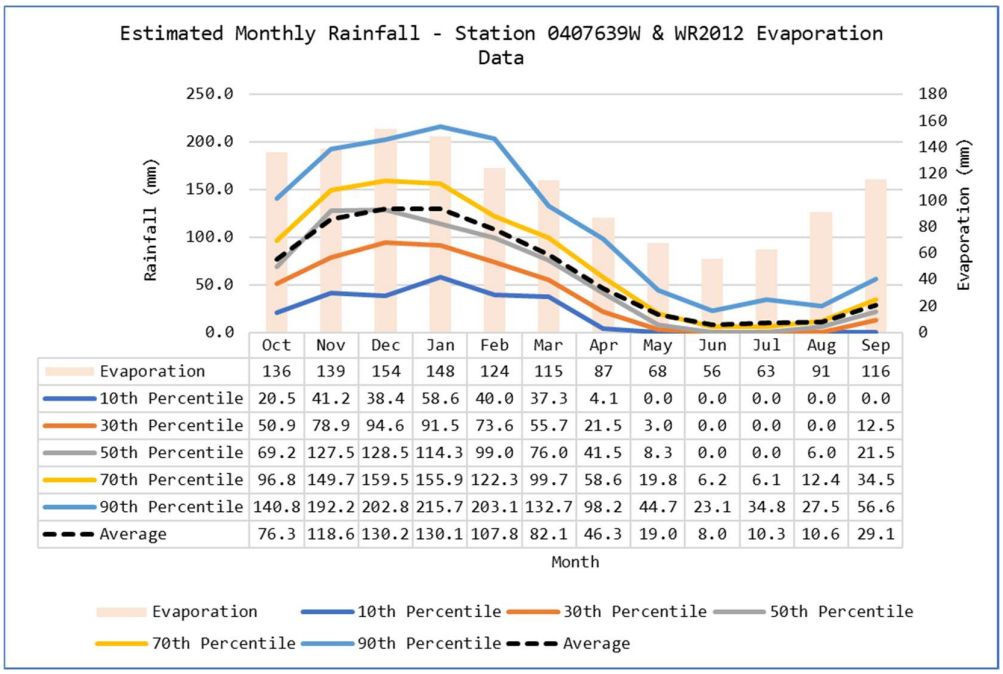
Table 6-2: MAP of nearest rainfall stations

STATION NAME	ID	MAP (mm/yr)
GROOT RIETVLEI	0407639_W	770
DIRKIESDORP (POL)	0407730_W	681
SPITSKOP	0407397_W	800
BRERETON PARK	0443807_W	900
Average		**787.75**

The monthly rainfall data used to calculate MAP was obtained from rainfall station 0407639W

(Grootvlei). The rainfall record is for the period 1929 to 2003 (74 years). Monthly rainfall for the site is likely to be distributed as shown in **Figure 6-4**, below.

Available rainfall data suggest a MAP ranging from 482 (30th percentile) to 1372 (90th percentile) mm/yr. The average rainfall is in the order of 768 mm/yr. The project area falls within evaporation zone 13A, of which Mean Annual Evaporation (MAE) ranges from 1 200 to 1 300 mm/yr. The MAE far exceeds the MAP for the site, which implies greater evaporative losses when compared to incident rainfall. Monthly evapotranspiration for the site is likely to be distributed as shown in **Figure 6-4**, below.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation	136	139	154	148	124	115	87	68	56	63	91	116
10th Percentile	20.5	41.2	38.4	58.6	40.0	37.3	4.1	0.0	0.0	0.0	0.0	0.0
30th Percentile	50.9	78.9	94.6	91.5	73.6	55.7	21.5	3.0	0.0	0.0	0.0	12.5
50th Percentile	69.2	127.5	128.5	114.3	99.0	76.0	41.5	8.3	0.0	0.0	6.0	21.5
70th Percentile	96.8	149.7	159.5	155.9	122.3	99.7	58.6	19.8	6.2	6.1	12.4	34.5
90th Percentile	140.8	192.2	202.8	215.7	203.1	132.7	98.2	44.7	23.1	34.8	27.5	56.6
Average	76.3	118.6	130.2	130.1	107.8	82.1	46.3	19.0	8.0	10.3	10.6	29.1

Figure 6-4: Average rainfall for Station 0407639W & WR2012 evaporation

6.3.3 Wind

Figure 6-5 shows the wind rose for the project area (Vryheid used as reference) and presents the number of hours per year the wind blows from the indicated direction. The wind blows from WW, ENE, and E more often, at velocities ranging from 1 km/hr to 28 km/hr; and from other directions but less frequently and at lower velocities (< 19 km/hr).

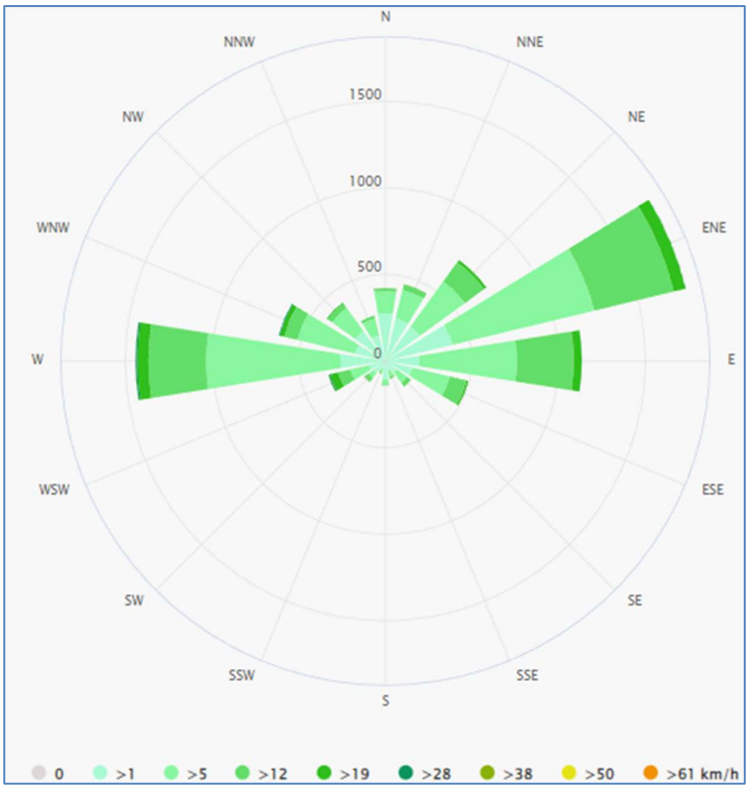


Figure 6-5: Wind rose (Meteoblue, 2022)

6.4 Land Cover

The dominant land types associated with the sub-catchment are shown in **Figure 6-6**, and is observed to be natural grasslands. The slope % rise for the general area is shown in **Figure 6-7**. Slope rise % was used to characterise the sub-catchment slope, hydropedology flow fields, and general drainage.

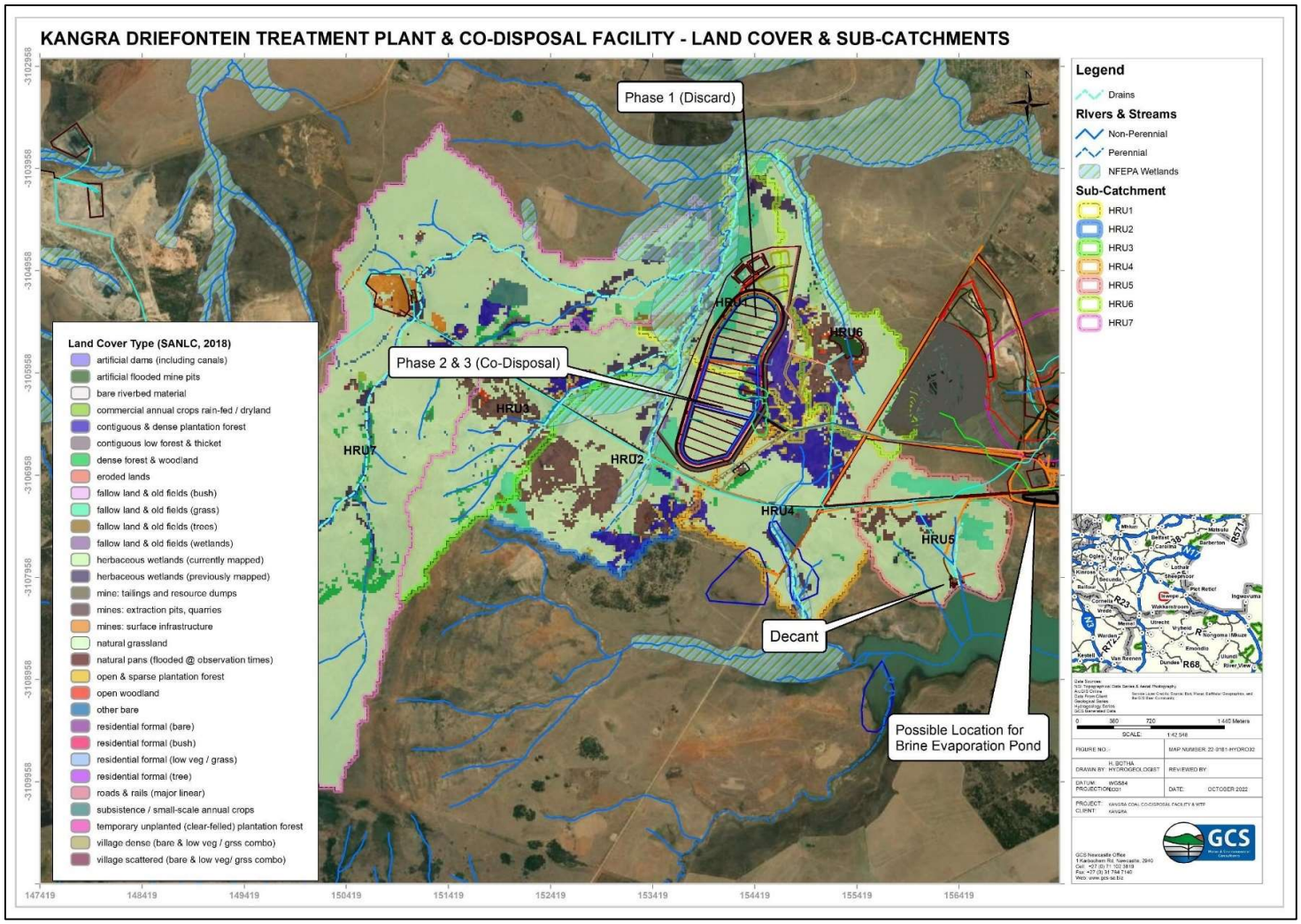


Figure 6-6: Landcover of the Study Area

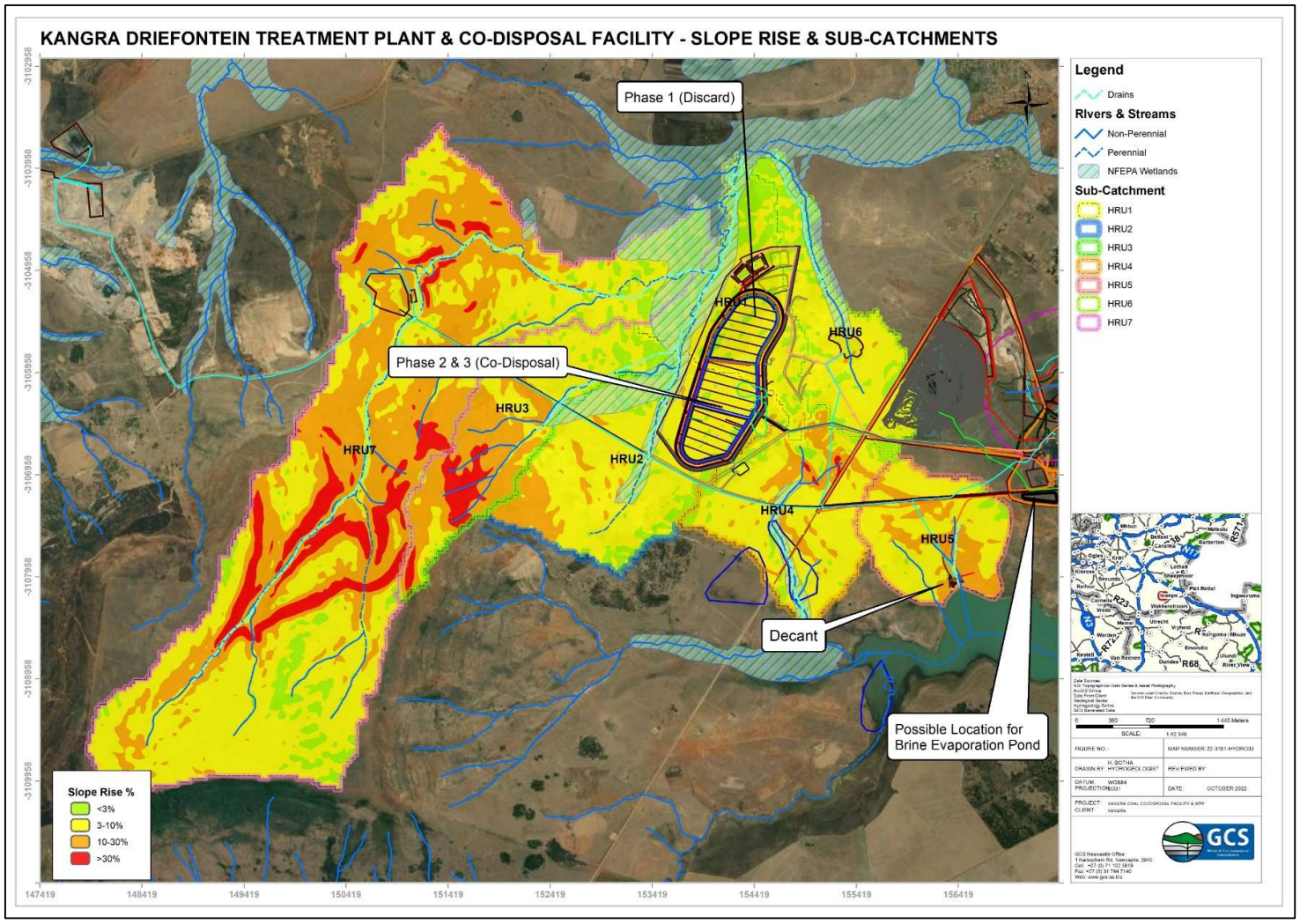


Figure 6-7: Sub-catchments and surface slope rise %

6.5 Land Morphology and Soils

6.5.1 Soil Types

Different soil types are encountered within shoulder, midslope, and valley positions of the project area (referred to as soil hillslope) and are mainly due to subsurface geology, products of weathering, degree of saturation, soil texture, and slope position (refer to **Figure 6-8**). The terrain in the project area is slightly sloping to flat (due to undulating hills), with soil depths ranging from 600 mm to 1200 mm generally with clay content ranging from 15 to 60%.

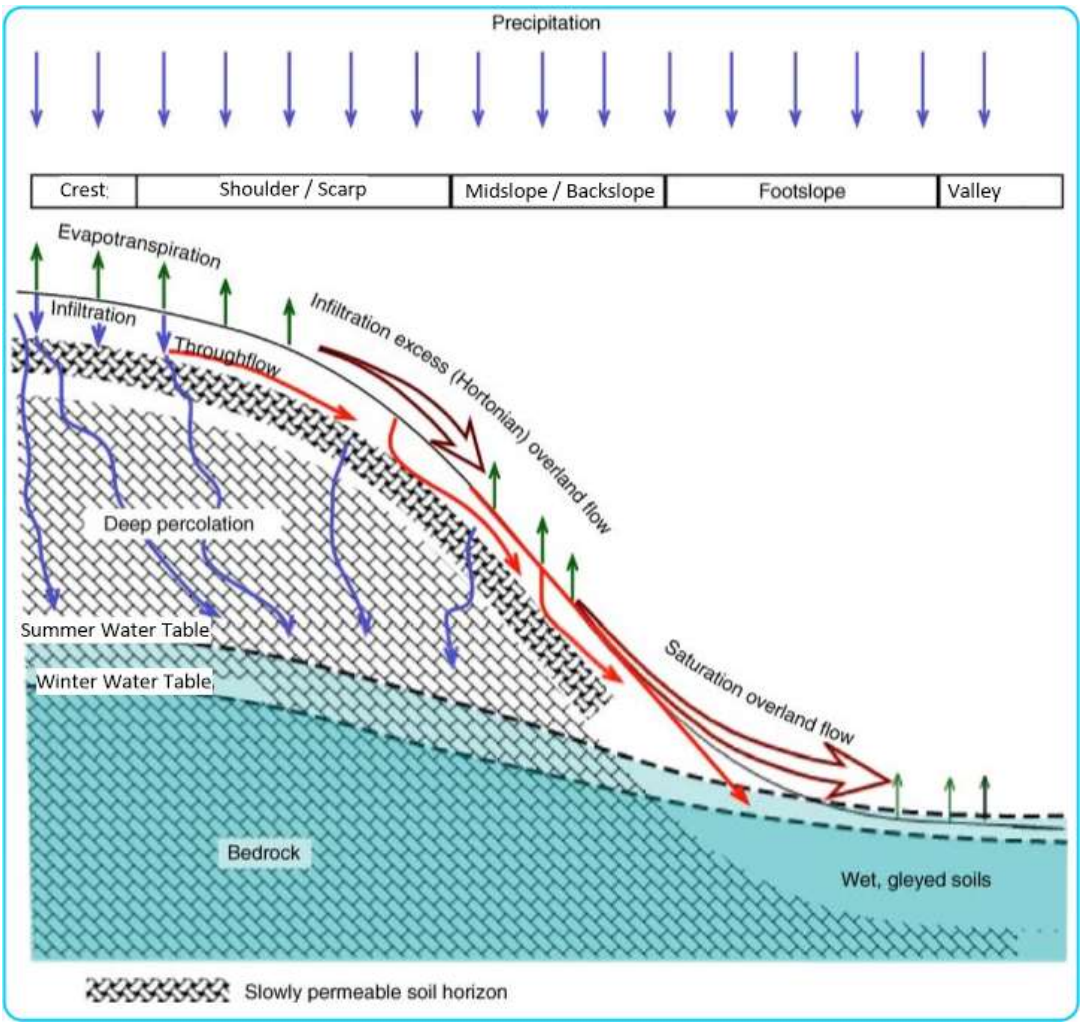


Figure 6-8: Land morphology concept (Almond, 2016)

According to the Land Types of South Africa databases (Land Type Survey Staff, 1972 – 2006c), the soils in the area typically conform to land types of the Bb62 group, which entail duplex soils typically red and yellow, dystrophic/mesotrophic, apedal soils with plinthic subsoils (plinthic soils comprise > 10% of land type, red soils comprise < 33% of land type). According to WR2012 soil data for the area, the erodibility of the soils for the area can be considered

medium (WRC, 2015). Typical soil types on hillslopes associated with this landform are shown in **Figure 6-9** and **Figure 6-10** shows the soil land types associated with the greater project area.

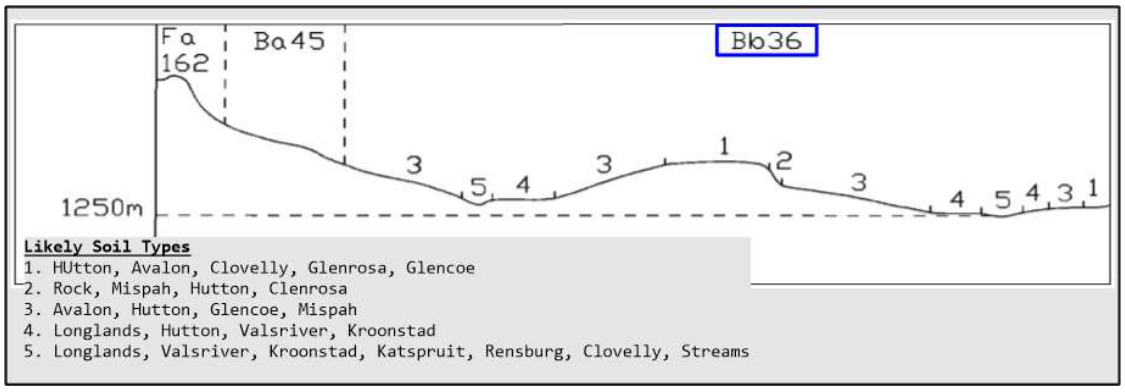


Figure 6-9: Bb62

Duplex soils are characterised by a distinct difference in saturated and unsaturated hydraulic conductivity between the coarser overlying and higher clay content structured underlying horizons. In this regard, the coarser materials can accommodate more distinct lateral flows of water with its associated redox morphology in the form of bleaching and removal of sesquioxides. The structured subsoil horizon may exhibit a certain degree of redox morphology expression (redox depletions and redox accumulations) that can, in its maximal expression< lead to the classification of a G horizon in the lower parts of the landscape. Wetlands are often identified in areas with E horizons and shallow lateral seepage due to the perching of the water on the structured subsoil.

Distinct water accumulation and lateral flows may also occur beneath the structured horizons in unconsolidated materials or fractured and weathering rock. In these cases, the redox morphology is consistent with the criteria used for wetland identification except for the depth criteria that preclude it from formal wetland identification.

GCS undertook a soil survey to evaluate the soil types, and to derive the hydropedological soil types (refer to soil auger positions and estimated soil types in **Figure 6-11**). Four (4) dominant hillslopes define the site and soil hydrological processes (from the position of the proposed CDF). From the soil survey undertaken, the following is noted:

- The majority of the CDF footprint area is characterised by shallow soils classified as the Glencoe soil type. The soil type was observed to have relatively shallow orthic A (topsoil) horizons, followed by a yellow-brown apedal B horizon with evidence of Fe and Mn concretions, clay matter (more than in the A horizon) that gradually transitions into very hard plinthic rock (horizon). The presence of clay matter and

weathered plinth will likely cause temporary perched water tables, during prolonged rainfall events/storm events. Stagnant flow along the hard plinthic / soil interface is expected in a lateral direction. The Glencoe soil form was observed in 42% of the test auger holes.

- Towards the southeast side of the site (crest/hilltop) very shallow soils were encountered off the Mispah soil type. Augering in these areas hit refusal at depths <0.1m. The Mispah soil form was encountered in 28% of the test auger holes. It was noted that the area southeast of the proposed CDF gradually extends into backfilled material used to rehabilitate the old opencast pit associated with the area. The Mispah soil form occurred in areas that appear to be associated with the high wall of the old pit.
- Towards the northeastern side of the site, soils of the Hutton soil type were observed. These soils are signified by deeply weathered soils, having a distinct A horizon, followed by thick yellow-brown apedal B horizons. Deeper in the profile, weathered zone material was observed, with signs of wetness. The soils lacked pedological features which would classify this layer as soft plinthic B. The Hutton soil form was encountered in 14% of the auger test holes.
- Towards the northeast and northwest of the site, near the drainage line areas in depression areas or areas where stagnant water was observed, soils of the Katspruit and Rensburg soil forms were encountered. The presence of a saturated G horizon, with mottling and gleying, suggests long-term saturated conditions. These soil types were inferred to the greater project area, based on their position of the hillslopes. The Katspruit and Rensburg soil forms were encountered in 16% of the auger test holes.

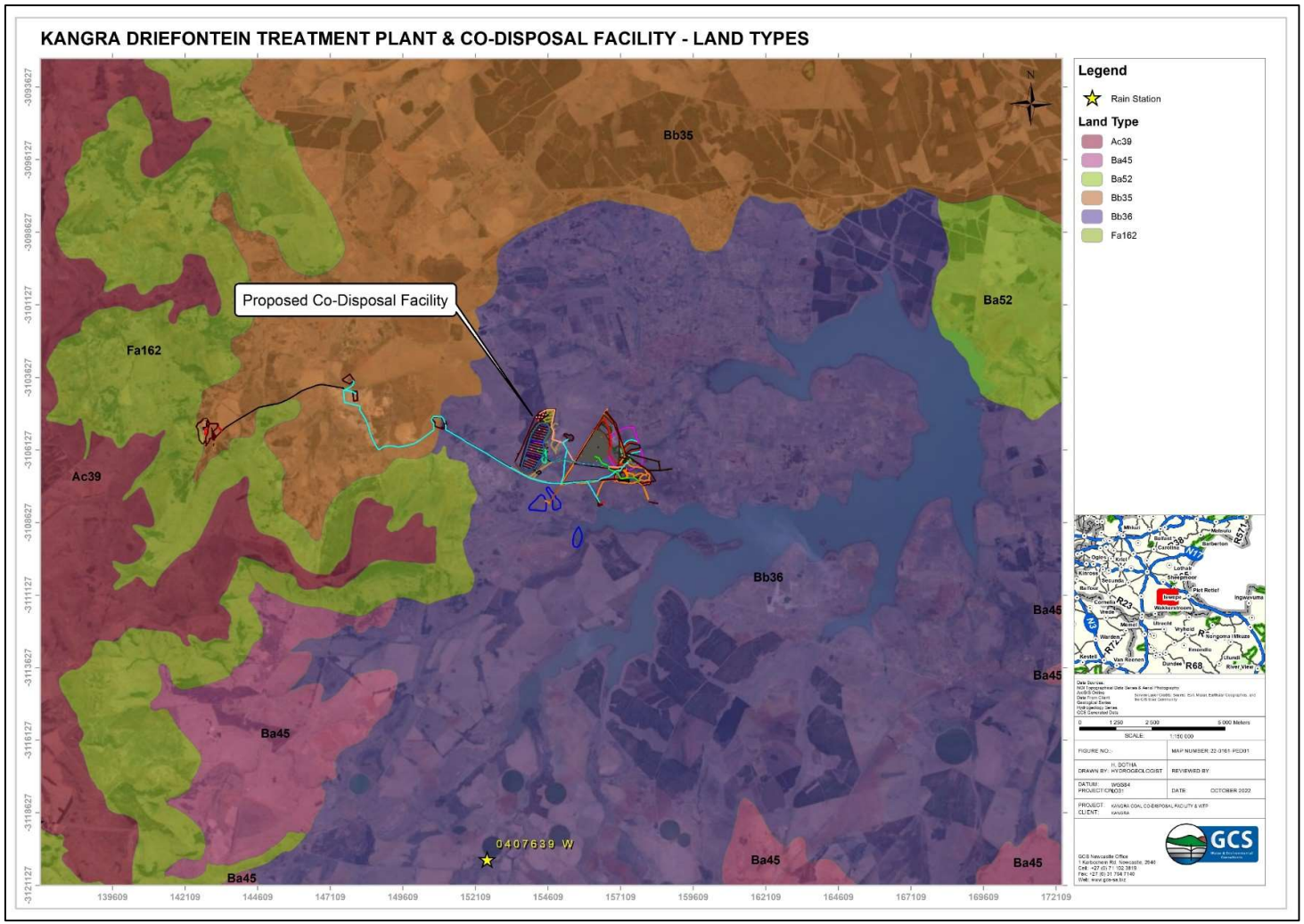


Figure 6-10: Land types associated with the project area

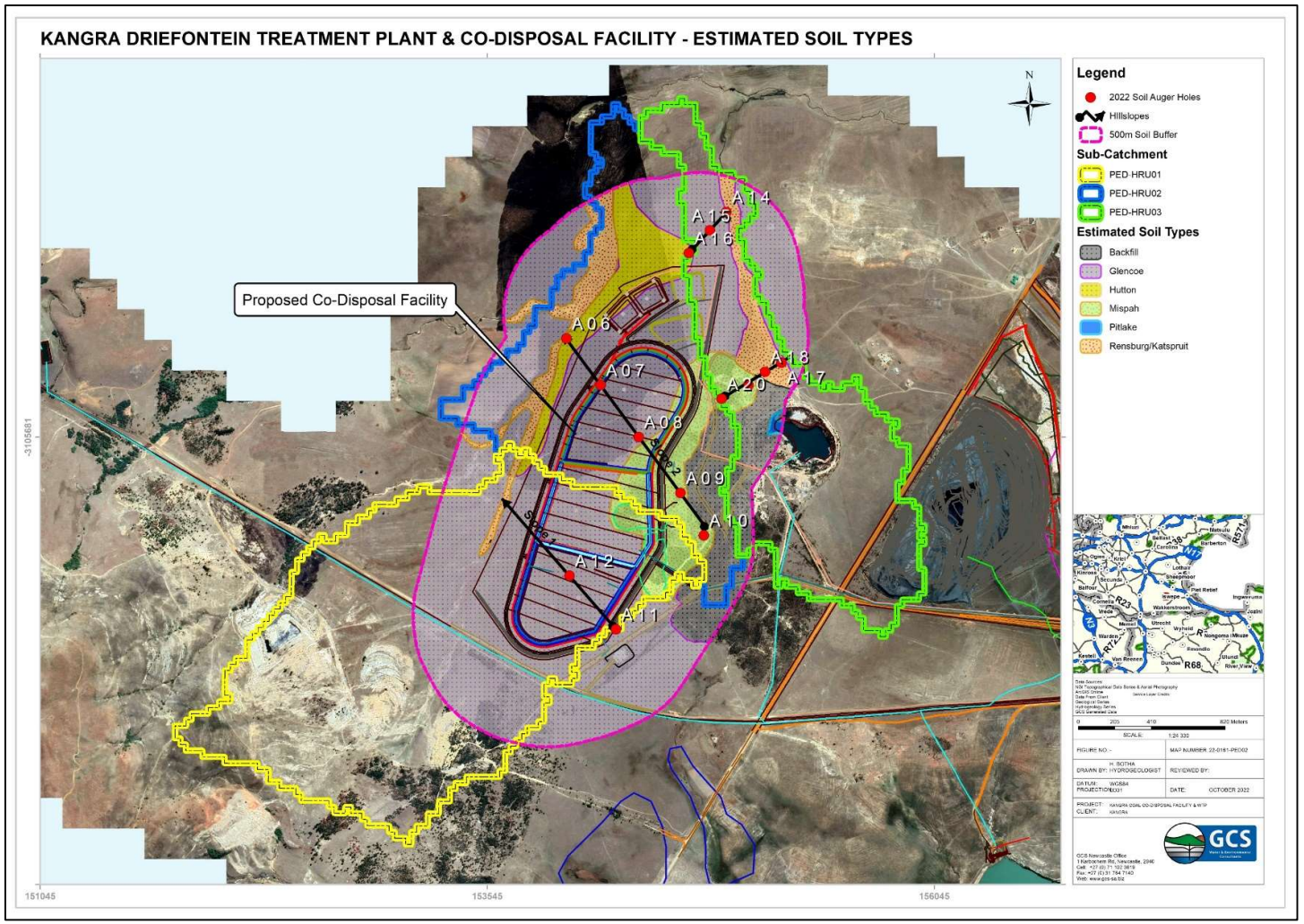


Figure 6-11: Estimated soil distribution for sub-catchments associated with the project

6.5.2 Soil Permeability

Several soil samples were taken from both A and B horizons and subjected to particle size distribution tests. The laboratory test results are available in Appendix B of the Hydropedology Report (refer to Appendix E-5 of this report). Based on available soil data for the project area, it is anticipated that the area is characterised by sandy loam to sandy clay loam soil types. As such, the anticipated permeability of the soils is estimated at 1.3 cm/hr to 4.1 x 10^{-3} cm/hr (refer to **Table 6-3**).

Table 6-3: Soil permeability classes for agriculture and conservation (Food and Agriculture Organisation (FAO, 1980))

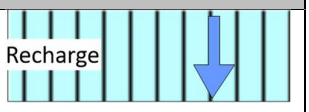
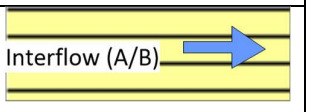
SOIL TEXTURE	PERMEABILITY (cm/hour)
Sand	5
Sandy Loam	2.5
Loam	1.3
Clay Loam	0.8
Silty Clay	0.25
Clay	0.05

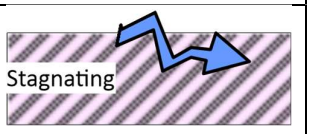
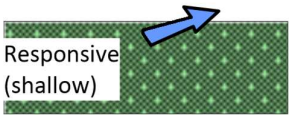
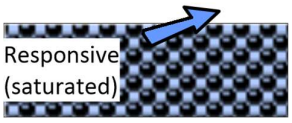
6.5.3 Hydrological Soil Types (HST)

Soil genesis is influenced by physical and chemical water-related processes and soils are, therefore, the first-order control of hydrological processes. The water transfer function of soils varies on several factors including soil properties, topography, and climate.

Characteristic soil properties make it possible to conceptualise hillslope hydrological responses within catchments. In the determination of Hydrological Soil Types (HST), soils were divided into classes based on their expected hydrological responses (Von Tol, *et al.*, 2013). Hydrological processes were perceived from traceable signatures in the soil matrix resulting from the soil's ability to transmit, store, and react with water (Le Roux *et al.*, 2011). The HST descriptions and representative symbols are presented in **Table 6-4**.

Table 6-4: Hydrological soil types

HYDROLOGICAL SOIL TYPE	DESCRIPTION	SYMBOL
Recharge	The soils do not have any morphological indication of saturation. Vertical flow through and out of the profile into the underlying bedrock is the dominant flow path. These soils are deep and freely drained and are experiencing the leaching of nutrients to underlying soil horizons.	
Interflow (A/B)	The soils have a textural discontinuity which facilitates the build-up of water in the topsoil, the water that sits on the upper layer then flows laterally into the stream on the A/B horizon interface. The flow path is predominantly	

HYDROLOGICAL SOIL TYPE	DESCRIPTION	SYMBOL
	downslope in a lateral direction.	
Interflow (Soil/Bedrock) Or Interflow (A/ Bedrock)	Soils overlying relatively impermeable bedrock. Hydromorphic properties signify the temporal build of water on the soil/bedrock interface and slow discharge in a predominantly lateral direction.	
Stagnating	Stagnating soils tend to act like interflow (soil/bedrock) soil types, however, due to the presence of abundant clays lateral discharge is slow. A build-up of water content in the soil, profile leads to temporary perched groundwater after high rainfall events.	
Responsive (Shallow)	The soils are shallow, and they are over a relatively less permeable weathered rock or bedrock. They have limited storage capacity which results in the generation of overland flow after rainfall events.	
Responsive (Saturated)	Soils with morphological evidence of long periods of saturation. These soils are close to saturation during rainy seasons and promote the generation of overland flow due to saturation.	

*Adapted from (Van Tol, Le Roux, & Lorentz, 2013)

Hillslopes and preferential soil flow can be seen in **Figure 6-16**. The hillslopes generally feed into responsive soil types or streams/rivers.

The hydrological processes associated with the land types and soil types in the project area are discussed concerning the numbered arrows in **Figure 6-12** to **Figure 6-15**, and the hillslope positions are indicated in **Figure 6-17**. The following provides a summary of the likely soil flow paths and the HSTs.

6.5.3.1 Hillslope 1

Crest to midslope/backslope:

On the crest to midslope position of the hillslope, stagnating soils of the Glencoe soil types were encountered.

2. a. Stagnating soils tend to act like interflow (soil/bedrock) soil types, however, due to the presence of abundant clays lateral discharge is slow. Slow discharge in a predominantly lateral direction is expected for water that can make it to the plinthic interface. A build-up of water content in the soil, profile leads to temporary perched groundwater after high

rainfall events.

2. b. Deep percolation into the subsoils/hard rock and subsequent aquifers towards the lower topography areas is expected.

Footslope:

On the footslope position of the hillslope, deep/shallow recharge soils of the Hutton soil types were encountered.

1.a. Shallow and deep vertical recharge to subsoils are expected, as well as some lateral movement where subsoils turn to hard rock/plinthic material (as per greater site context).

1. b. Deep percolation into the subsoils/hard rock and subsequent aquifers towards the lower topography areas is expected. This deep percolation water contributes to surface water streams as groundwater baseflow.

Valley Bottom:

On the valley positions of the hillslope, responsive (saturated) soils occur.

4.a. b. In responsive soils, the build-up of water is expected in the B and upper A horizons after rain, and overland discharge and minor lateral seepage are expected (due to saturation excess). Secondary vertical seepage to deeper soil zones from the saturated B horizon is expected. At the transition from one soil type to the other (upstream to downstream) overland flow may take place during wet seasons.

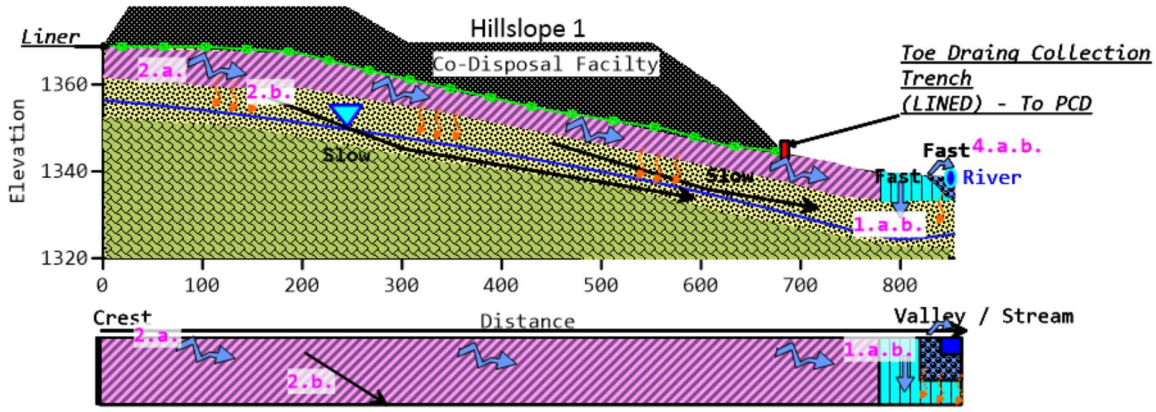


Figure 6-12: Hillslope 1 – conceptual hydropedology flow regimes

6.5.3.2 Hillslope 2

Crest:

On the crest position of the hillslope, the rehabilitated opencast associated with the area will act as anthropogenic recharge soils.

1.a. Shallow and deep vertical recharge to subsoils are expected, as well as some lateral movement where subsoils turn to hard rock/plinthic material (as per greater site context).

1. b. Deep percolation into the subsoils/hard rock and subsequent aquifers towards the lower topography areas is expected. This deep percolation water contributes to surface water streams as groundwater baseflow.

Shoulder to midslope:

On the shoulder to midslope position of the hillslope, interflow (soil/bedrock) soils of the Mispah type were encountered.

3.a. Shallow hard rock or soft plinthic B horizons will signify a temporal build of water on the soil/bedrock interface and slow discharge in a predominantly lateral direction will occur.

3. b. In areas where bedrock has been subjected to fracturing secondary flow paths towards the groundwater table could exist. Water in the fractured zone will likely seep vertically down into the groundwater table.

Footslope:

On the footslope position of the hillslope, deep/shallow recharge soils of the Hutton soil types were encountered.

1.a. Shallow and deep vertical recharge to subsoils are expected, as well as some lateral movement where subsoils turn to hard rock/plinthic material (as per greater site context).

1. b. Deep percolation into the subsoils/hard rock and subsequent aquifers towards the lower topography areas is expected. This deep percolation water contributes to surface water streams as groundwater baseflow.

Valley Bottom:

On the valley positions of the hillslope, responsive (saturated) soils occur.

4.a. b. In responsive soils, the build-up of water is expected in the B and upper A horizons after rain, and overland discharge and minor lateral seepage are expected (due to saturation excess). Secondary vertical seepage to deeper soil zones from the saturated B horizon is expected. At the transition from one soil type to the other (upstream to downstream) overland flow may take place during wet seasons.

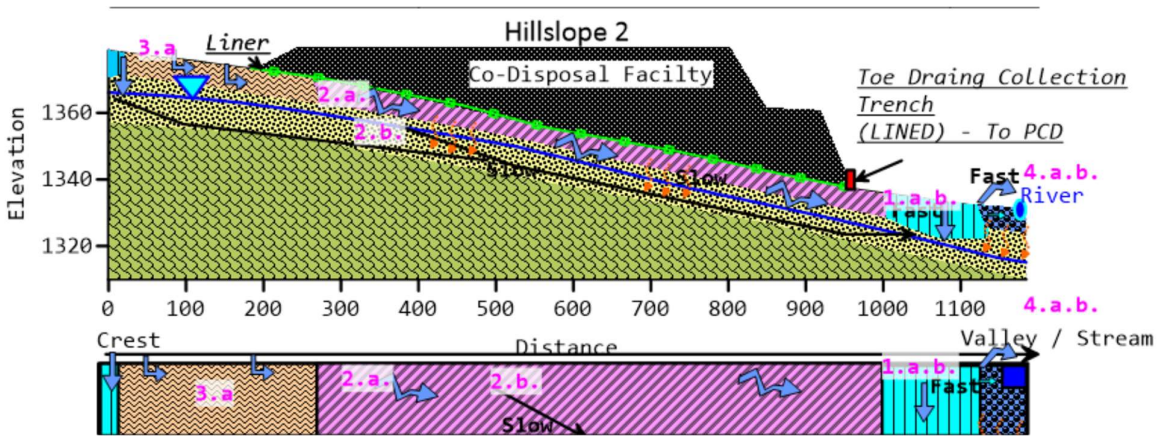


Figure 6-13: Hillslope 2 – conceptual hydropedology flow regimes

6.5.3.3 Hillslope 3

Crest to Midslope

On the crest to midslope position of the hillslope, interflow (soil/bedrock) soils of the Mispah type were encountered.

3.a. Shallow hard rock or soft plinthic B horizons will signify a temporal build of water on the soil/bedrock interface and slow discharge in a predominantly lateral direction will occur.

3. b. In areas where bedrock has been subjected to fracturing secondary flow paths towards the groundwater table could exist. Water in the fractured zone will likely seep vertically down into the groundwater table.

Footslope to the Valley Bottom

On the valley positions of the hillslope, responsive (saturated) soils occur.

4.a. b. In responsive soils, the build-up of water is expected in the B and upper A horizons after rain, and overland discharge and minor lateral seepage are expected (due to saturation excess). Secondary vertical seepage to deeper soil zones from the saturated B horizon is expected. At the transition from one soil type to the other (upstream to downstream) overland flow may take place during wet seasons.

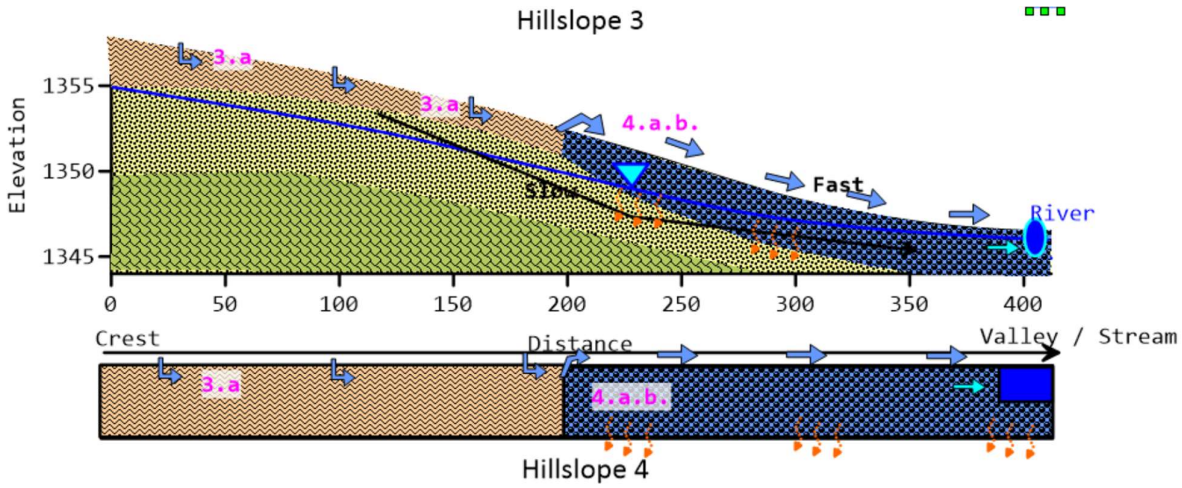


Figure 6-14: Hillslope 3 – conceptual hydropedology flow regimes

6.5.3.4 Hillslope 4

Crest

On the crest position of the hillslope, deep/shallow recharge soils of the Hutton soil types were encountered.

1.a. Shallow and deep vertical recharge to subsoils are expected, as well as some lateral movement where subsoils turn to hard rock/plinthic material (as per greater site context).

1. b. Deep percolation into the subsoils/hard rock and subsequent aquifers towards the lower topography areas is expected. This deep percolation water contributes to surface water streams as groundwater baseflow.

Scarp to Footslope

On the scarp to footslope position of the hillslope, stagnating soils of the Glencoe soil types were encountered.

2. a. Stagnating soils tend to act like interflow (soil/bedrock) soil types, however, due to the presence of abundant clays lateral discharge is slow. Slow discharge in a predominantly lateral direction is expected for water that can make it to the plinthic interface. A build-up of water content in the soil, profile leads to temporary perched groundwater after high rainfall events.

2. b. Deep percolation into the subsoils/hard rock and subsequent aquifers towards the lower topography areas is expected.

Valley Bottom

On the valley positions of the hillslope, responsive (saturated) soils occur.

4.a. b. In responsive soils, the build-up of water is expected in the B and upper A horizons after rain, and overland discharge and minor lateral seepage are expected (due to saturation excess). Secondary vertical seepage to deeper soil zones from the saturated B horizon is expected. At the transition from one soil type to the other (upstream to downstream) overland flow may take place during wet seasons.

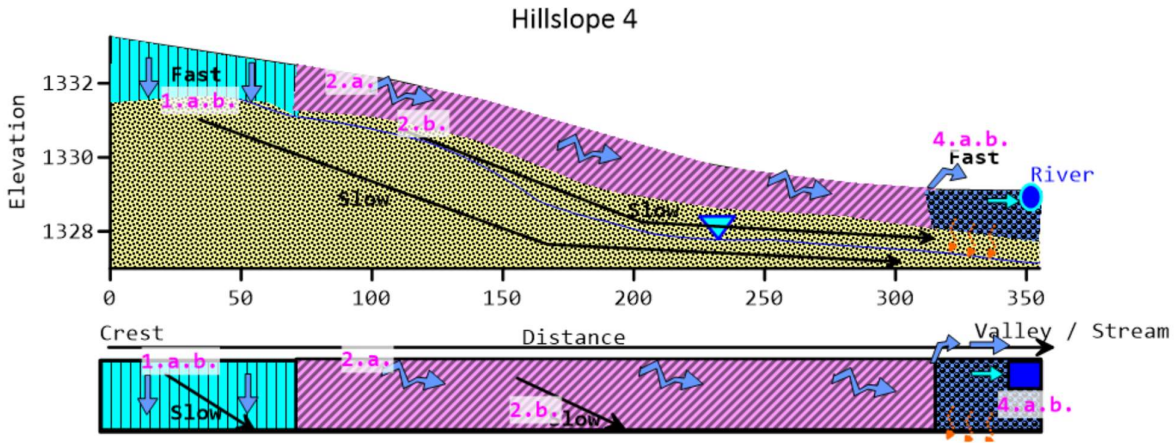


Figure 6-15: Hillslope 4 – conceptual hydropedology flow regimes

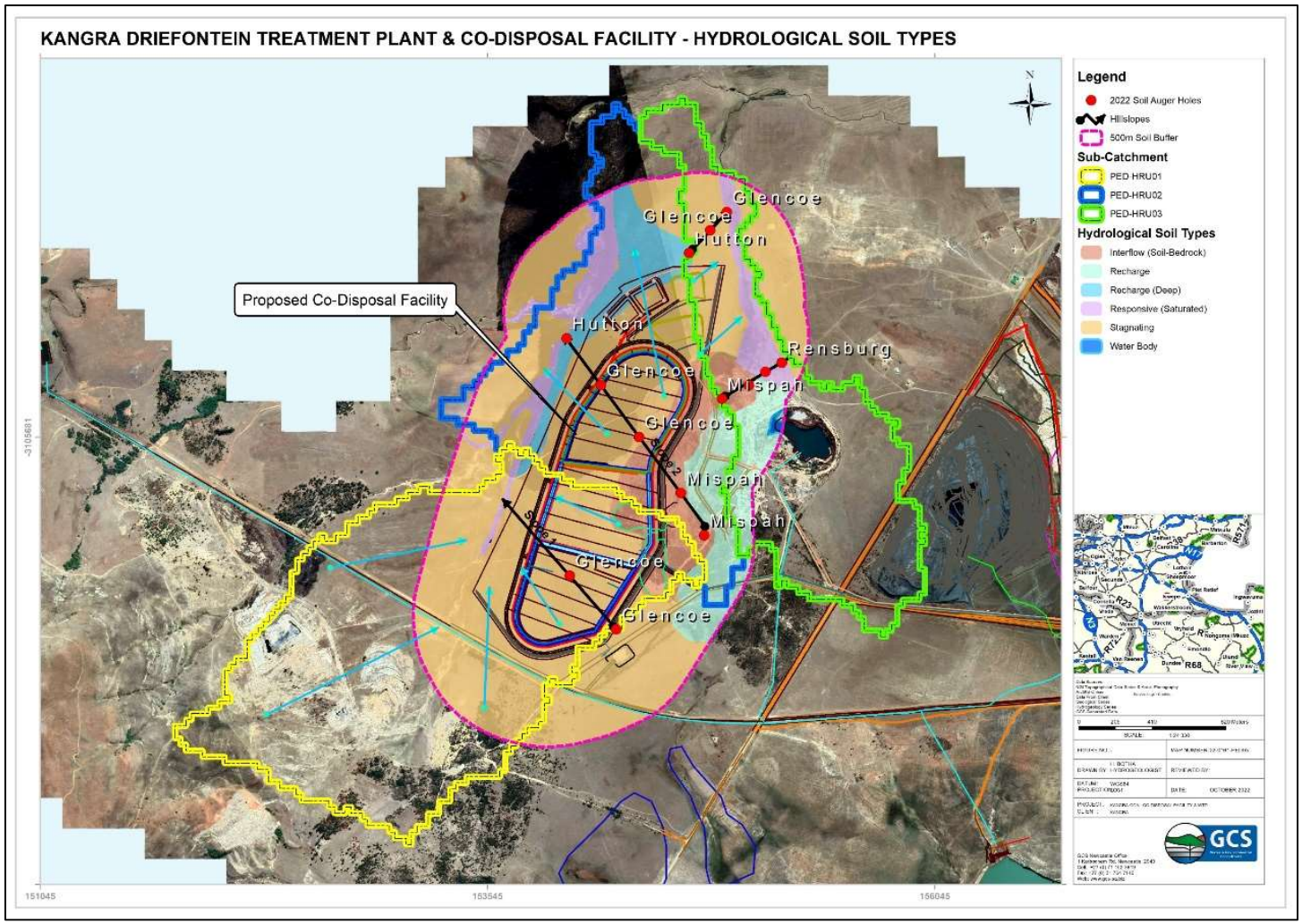


Figure 6-16: Hydrological soil types in the study area and soil flow paths

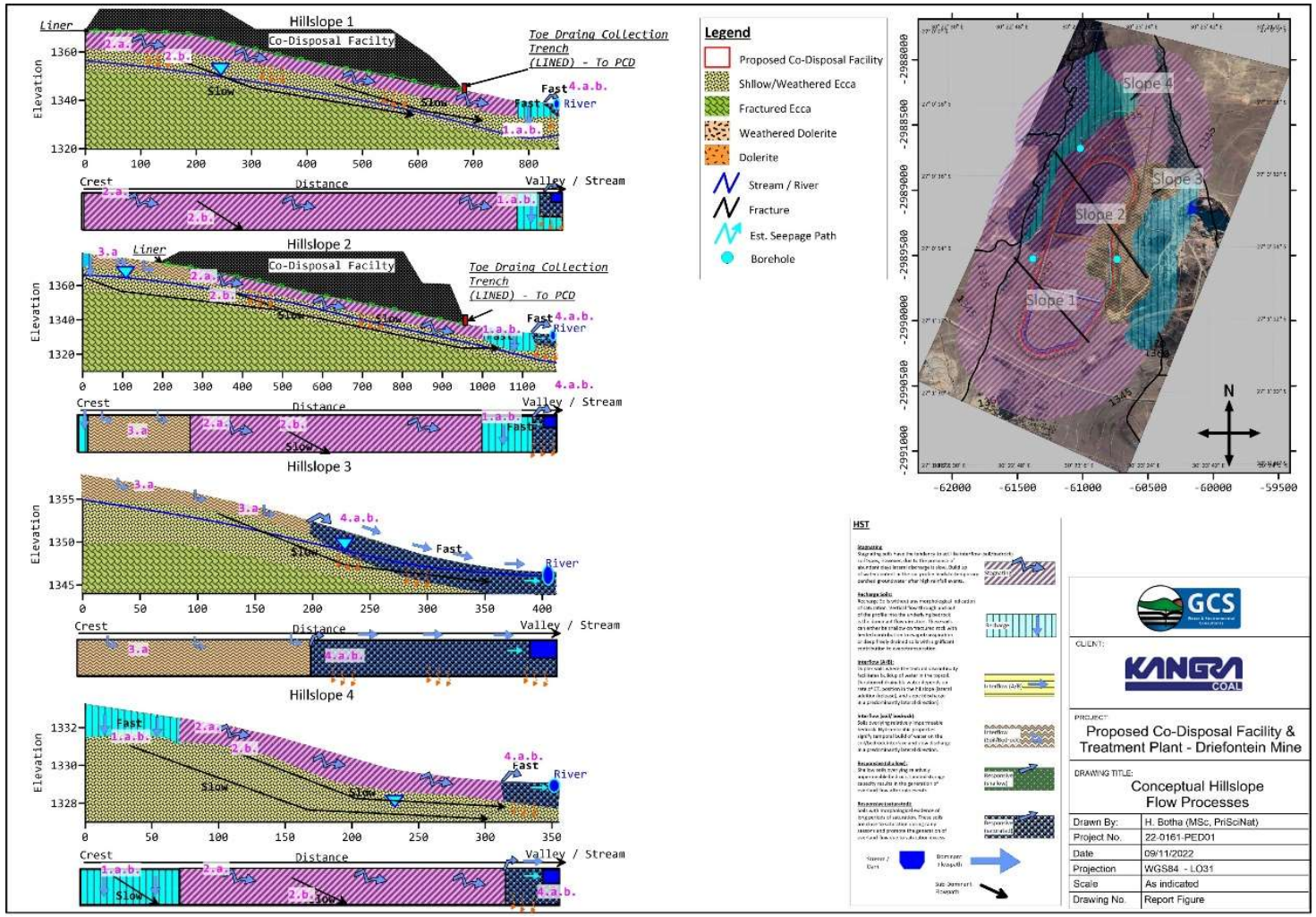


Figure 6-17: Conceptualisation of hydrological soil flow paths

6.5.4 Flow Drivers

The general hydropedological flow drivers, and coupled geohydrological processes, for a natural setting are presented in **Figure 6-18**. It can be seen that the main hydrological processes in a non-mining setting are:

- Atmospheric zone:
    - Precipitation;
    - Runoff; and
    - Evaporation.
- Unsaturated zone:
    - Infiltration;
    - Interflow (soil capillary rise, percolation, vertical soil water flow); and
    - Groundwater baseflow (lateral soil water possibly saturated lateral groundwater flow – in areas where shallow groundwater levels occur).
- Saturated zone:
    - Deep lateral seepage; and
    - Groundwater flow (baseflow and aquifer flow).

For the proposed development (built-up areas, that make the land surface impervious) the hydrological process will be altered and is presented in **Figure 6-19**. The following components will highly likely be impacted and will depend on the geomorphology and HSTs of a specific sub-catchment and associated hillslopes, namely:

- Natural runoff towards the valley areas will be disturbed. All runoff from the CDF will be collected in the toe drain systems and report to the PCDs.
- Infiltration over the surface area that is disturbed will be suppressed/removed completely, and no longer be available to add to soil interflow and deep percolation soil functions.
- Interflow (vertical or lateral or both) will be intercepted by the upstream cut off trench, acting as a clean water diversion system.
- Runoff from the upper reaches of the sub-catchment will be intercepted and removed (if not diverted).

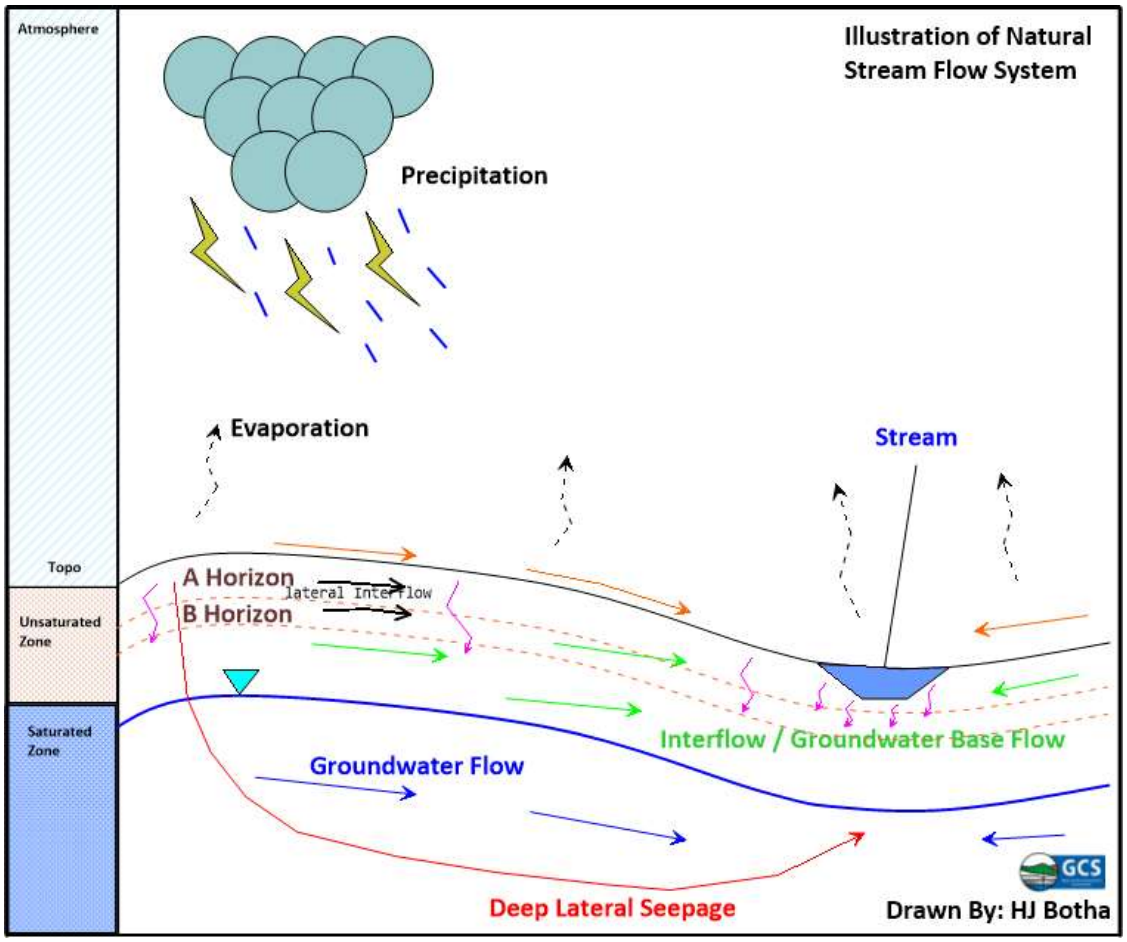


Figure 6-18: Natural flow drivers

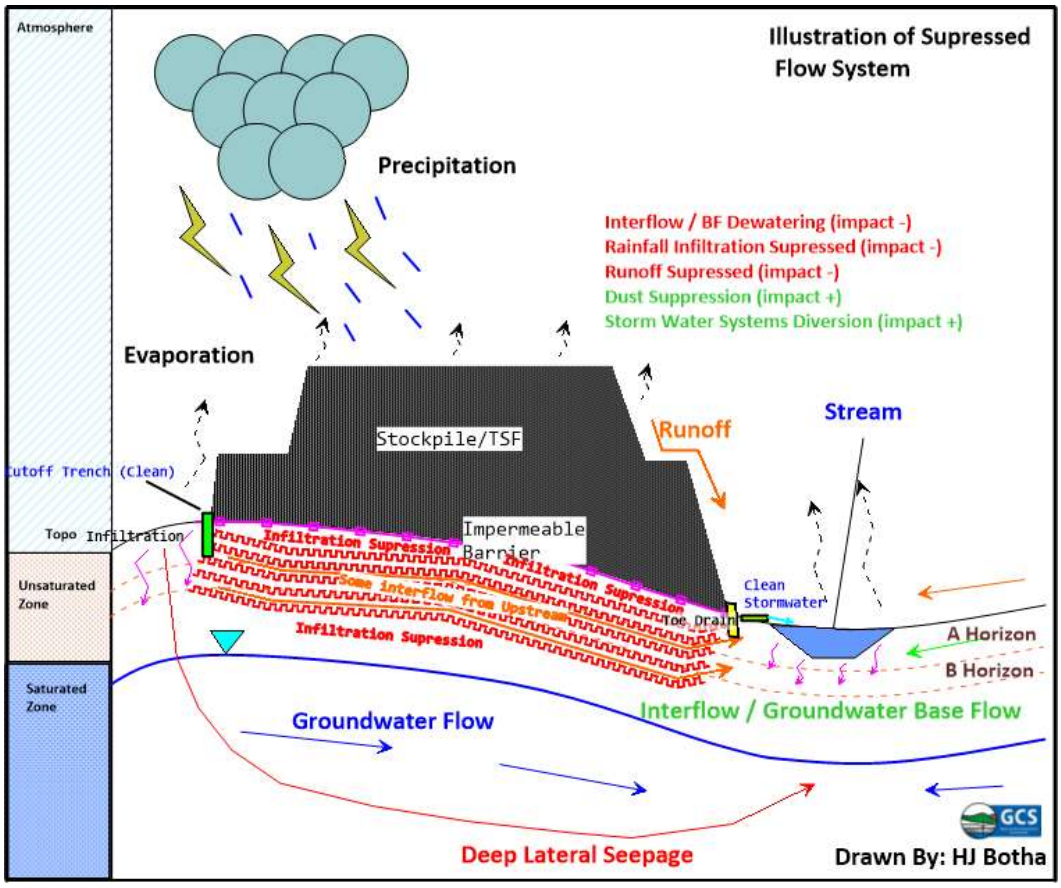


Figure 6-19: Altered flow drivers – built-up area for a lines Tailings Storage Facility (TSF)/Landfill

6.6 Land Capability

Land Capability generally refers to the ability of given soil and contextual conditions to sustain productive agricultural cultivation. The Land Use Capability Assessment undertaken for the previous DD project (GCS, 2014) established the following land capability categories within the CDF study area:

- Intensive Agriculture (84.22ha): Most of the study area is covered by Clovelly and Pinedene soil forms, classified as Class II - arable land (refer to **Table 6-5**). These soils can be used for intensive agriculture. These soils are major agricultural soil forms in South Africa, owing to their deep, well-drained nature.
- Moderate Agriculture (17.06ha): The study area also comprises soils of the Glencoe form, which are poorly drained owing to their moderately slow permeability in the upper parts of the soil (Horizon A). This influences their high-water holding capacity (James, 1986). These soils are suitable for moderate agriculture owing to their high management requirements, as they exhibit a seasonal water table or ponding. These

were thus classified as Class III. These soils tend to compact and form clods when worked while they are still wet (James, 1986).

- Undefined Use (4.62ha): The study area also comprises an area under rehabilitation, comprising Anthrosols. These soils do not have a defined capability owing to the mixed and unknown composition of these soil types. In this case, this area will initially be grassed once rehabilitation is completed.

Table 6-5: Land Capability Classes- Description and Suitability

CLASS	DEFINITION	CONSERVATION NEEDS	USE SUITABILITY
I	• No or few limitations. • Very high arable potential. • Very low erosion hazard.	Good agronomic practice.	Annual cropping.
II	• Slight limitations. • High arable potential. • Low erosion hazard.	Adequate runoff control..	Annual cropping with special tillage or ley (25 %).
III	• Moderate limitations. • Some erosion hazards.	Special conservation practice and tillage methods.	Rotation of crops and ley (50 %).
IV	• Severe limitations. • Low arable potential. • High erosion hazard.	Intensive conservation practice.	Long-term leys (75 %).
V	• Watercourse and land with wetness limitations.	Protection and control of water table.	Improved pastures or Wildlife.
VI	• Limitations preclude cultivation. • Suitable for perennial vegetation.	Protection measures for establishment e.g. Sod-seeding.	Veld and/or afforestation.
VII	• Very severe limitations. • Suitable only for natural vegetation.	Adequate management of natural vegetation.	Natural veld grazing and afforestation.
VIII	• Extremely severe limitations. • Not suitable for grazing or afforestation.	Total protection from agriculture.	Wildlife.

6.7 Terrestrial Biodiversity

The baseline information related to the terrestrial biodiversity of the site is extracted from the Ecological Assessment Report attached under Appendix E-1.

6.7.1 Flora

6.7.1.1 Vegetation Unit

The study area corresponds to the Grassland Biome as defined by Mucina & Rutherford (VegMap, 2006). This unit is found in the eastern, precipitation-rich regions of the Highveld. Grasslands of these parts are regarded as 'sour grasslands'. The proposed development is located within the Eastern Highveld Grassland (GM12) vegetation unit (refer to **Figure 6-20)**,

which is distributed along slightly, to moderately undulating plains, including some low hills and pan depressions, in Mpumalanga and Gauteng Provinces. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida, Digitaria, Erigrostis, Themeda, Tristachya,* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra, Celtis Africana, Diospyros lyciodes* subsp *lycioides, Parinari capensis, Protea caffra, P. welwitschii,* and *Rhus magalismontanum*).

The diversity of plants within the study area represents 56 plant families, typically dominated by Poaceae (graminoids, 28 species,15.3%) and Asteraceae (Daisy family, 28 species, 14.7%). The important taxa associated with this vegetation unit are:

Graminoids: *Aristida aequiglumis (d), A. congesta (d), A. junciformis* subsp. *galpinii (d), D. tricholaenoides (d), Elionurus muticus (d), Eragrostis chloromelas (d), E. curvula (d), E. plana (d), E. racemosa (d), E. sclerantha (d), Heteropogon contortus (d), Loudetia simplex (d), Setaria sphacelata (d), Sporobolus africanus (d), S. pectinatus (d), Themeda triandra (d), Trachypogon spicatus (d), Tristachya leucothrix (d), T. rehmannii (d), Alloteropsis semialata* subsp. e*cklonian*a, *Andropogon, appendiculatus, A. schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides.*

Herbs: *Berkheya setifera (d), Haplocarpha scaposa (d), Justicia anagalloides (d), Pelargonium luridum (d), Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens, H. caespititum, H. callicomum, H. oreophilum, H. rugulosum, Ipomoea crassipes, Pentanisia prunelloides* subsp. *latifolia, Selago densiflora, Sencio coronatus, Vernonia oligocephala, and Wahlenbergia undulate.*

Geophytic Herbs: *Gladiolus crassifolius, Haemanthus humilis* subsp. *hirsutus, Hypoxis rigidula* var.*pilosissima, Ledebouria ovatfolia.*

Succulent Herb: *Aloe ecklonis.*

Low Shrubs: *Anthospermum rigidum* subsp. *pumilum, Stoebe plumose.*

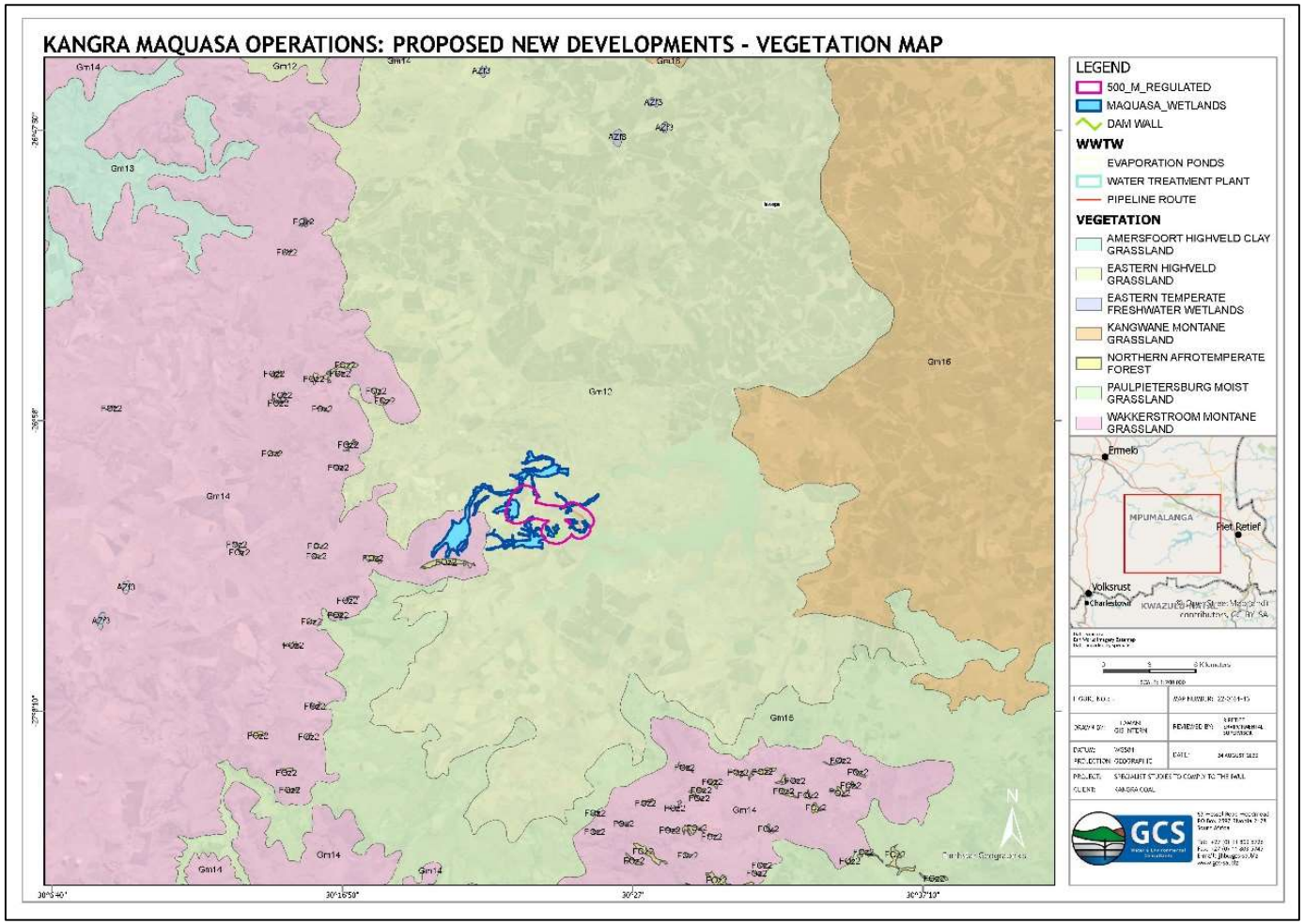


Figure 6-20: Vegetation Units of the Study Area

6.7.1.2 Conservation Status and Sensitivity

The conservation status of the Eastern Highveld Grassland vegetation is listed as Endangered. This vegetation type has a conservation target of 24%. Currently, only a small fraction is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and private reserves (Holkranse, Kransbank, Morgenstood). Some 44% is transformed primarily by cultivation, plantations, mines, urbanisation, and by building dams. Cultivation may have had a more extensive impact than indicated by land cover data. The vegetation sensitivity map for the study area is shown in **Figure 6-21**.

6.7.1.3 Protected Areas

The mining area has three protected areas within its vicinity, namely Paardeplaats Nature Reserve (approximately 6 km to the southeast); Pongola Bush Nature Reserve (approximately 8 km to the south); and Wakkerstroom Wetland Nature Reserve (approximately 13 km to the southwest).

Moist Escarpment Grasslands (adjacent to the mining area running from northwest through to southeast) comprise a National Protected Areas Expansion Strategy (NPAES) Focus Area.

6.7.1.4 Critical Biodiversity Areas (CBA)

From an ecological perspective, the development is situated within an area that has been disturbed. The Terrestrial CBA of the site is mixed between transformed areas and ecological support areas (ESA). The CBA map of the study area is provided in **Figure 6-22**.

6.7.1.5 Plant and Tree Species of Conservation Concern

The Real Yellowwood (Opregte-geelhout) [*Potocarpus latifolius*] was found in the Quarter Degree Square (QDS). This tree is a listed protected tree in terms of the NFA.

No individuals of the endemic or biogeographically important plants were observed during the survey, although they may have previously been found in the larger area due to the season of assessment. Six (6) red data species potentially occur in the QDS of the study area according to the SIBIS database. Potential habitat for species does exist, however, the verification for these species and habitat conditions must be reassessed during the summer period. None of these threatened species were identified during the site inspection in May 2023. The list of Red Listed Plant species within QDS 2730AB is presented in **Table 6-6**.

Table 6-6: List of Red Listed Plant Species under QDS 2730AB

FAMILY	TAXON	RED LIST CATEGORY
Asphodelaceae	*Aloe kniphofioides*	Vulnerable
Araceae	*Zantedeschia pentlandii*	Vulnerable
Fabaceae	*Indigofera hybrida*	Vulnerable
Proteaceae	*Protea parvula*	Near Threatened
Hyacinthaceae	*Merwilla plumbea*	Near Threatened

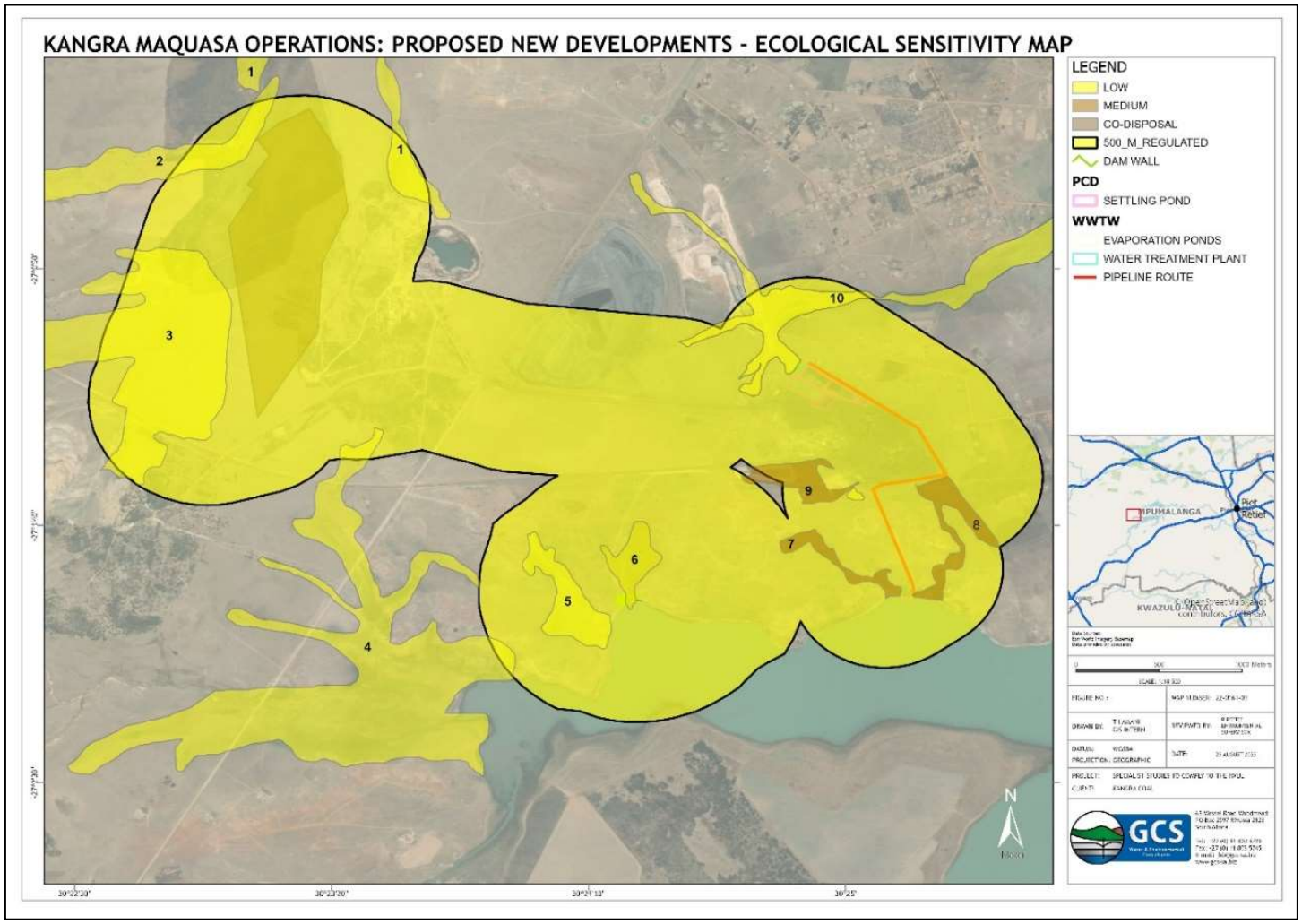


Figure 6-21: Sensitivity of the study area

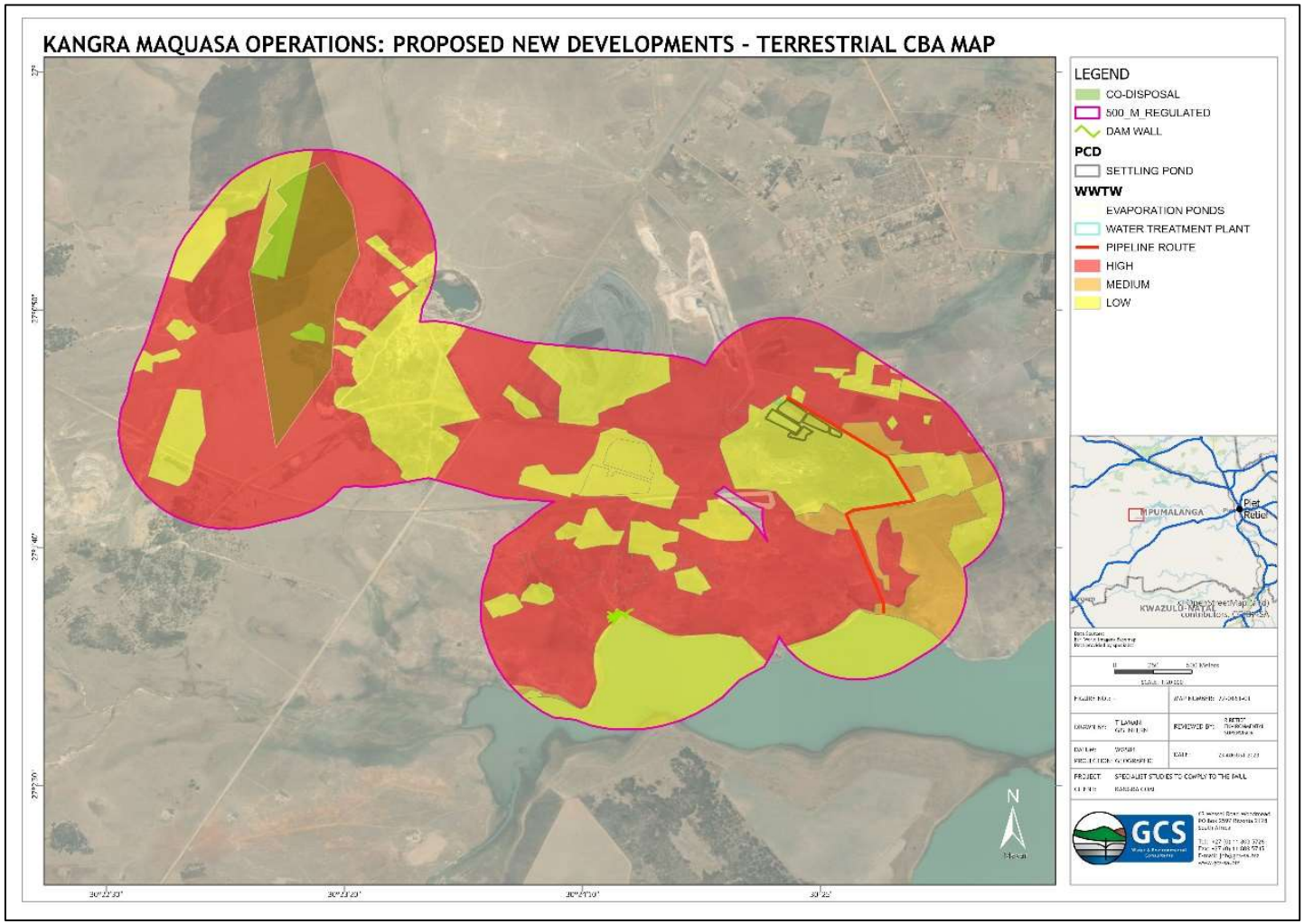


Figure 6-22: Terrestrial CBA and ESA surrounding the proposed development

6.7.2 Fauna

The area investigated (proposed areas of mine expansion) is situated within the proposed Grassland Biosphere Reserve which is undoubtedly one of the most important biodiversity areas in Africa and despite "proposed Biosphere Reserve" status, this area is severely threatened, and it faces some monumental conservation problems. It might be reasoned that the study area comprises only a small fraction of the entire proposed Grassland Biosphere Reserve, but cumulative anthropogenic impacts relevant to the faunal communities of the region need to be taken in consideration. Most of the study area is characterised by untransformed wetland and grassland faunal habitat.

The proposed project is located within one of South Africa's registered Important Bird and Biodiversity Areas (IBAs). Even though IBAs do not have formal protection status it is important to indicate in EIA reports when a development falls within an IBA.

6.7.2.1 Mammals

The site has two (2) listed threatened species identified to occur within the site QDS (Refer to **Table 6-7**). The results show there are eight (8) identified mammal species occurring within the QDS. These species have all been listed as South African endemics (Virtual Museum). Of the identified species there are 5 listed species, these being 3 **Near Threatened** and 2 **Endangered** species. The Endangered species identified are:

- **Oribi**: this species is listed as Least Concern globally, however within South Africa this species is listed as **Endangered**. This species is mainly threatened by habitat destruction (Loss and Fragmentation) due to commercial forestry, commercial farming, grassland degradation, and mining. Illegal hunting is the biggest threat to the survival of this species.
- **Swinny's Horseshoe Bat**: this species is listed as Least Concern globally, however within South Africa this species is listed as **Endangered**. This species is threatened by deforestation and general habitat conversion.

None of these species were observed during the site visit, however, habitat for the Swamp Must Shrew, the Swinny Horseshoe Bat, and the black-footed cat exist around the site.

Table 6-7: Mammal species identified to occur in QDS 2730AB

FAMILY	SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY
Bovidae	*Ourebia ourebi*	Oribi	Endangered
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable (2016)
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern

FAMILY	SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY
Muridae	*Aethomys ineptus*	Tete Veld Aethomys	Least Concern (2016)
Muridae	*Gerbilliscus leucogaster*	Bushveld Gerbil	Least Concern (2016)
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	Least Concern (2016)
Rhinolophidae	*Rhinolophus swinnyi*	Swinny's Horseshoe Bat	Vulnerable (2016)
Soricidae	*Crocidura cyanea*	Reddish-grey Musk Shrew	Least Concern (2016)
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)
Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	Least Concern (2016)
Vespertilionidae	*Myotis tricolour*	Temminck's Myotis	Least Concern (2016)

6.7.2.2 Avifauna

In terms of the migrating and nesting birds in the QDS, a total of 107 different species occur in the area. Of these five (5) species of birds were recorded on the Red List for birds in the QDS. Blue Cranes were physically observed within the wetland area of HGM 9; however, this area will not be impacted by the proposed development as illustrated in **Figure 6-32**. Nesting sites and vulnerable areas should be minimally disturbed.

Table 6-8: Avifauna species identified to occur in QDS 2730AB

REF	COMMON SPECIES	COMMON GROUP	GENUS	SPECIES	RD (REGIONAL, GLOBAL)
72	Hamerkop		*Scopus*	*umbretta*	
637	Neddicky		*Cisticola*	*fulvicapilla*	
844	Quailfinch		*Ortygospiza*	*atricollis*	
105	Secretarybird		*Sagittarius*	*serpentarius*	VU, EN
431	Black-collared	Barbet	*Lybius*	*torquatus*	
439	Crested	Barbet	*Trachyphonus*	*vaillantii*	
808	Southern Red	Bishop	*Euplectes*	*orix*	
810	Yellow	Bishop	*Euplectes*	*capensis*	
709	Southern	Boubou	*Laniarius*	*ferrugineus*	
545	Dark-capped	Bulbul	*Pycnonotus*	*tricolour*	
874	Golden-breasted	Bunting	*Emberiza*	*flaviventris*	
219	Denham's	Bustard	*Neotis*	*denhami*	NT, NT
222	White-bellied	Bustard	*Eupodotis*	*senegalensis*	
154	Common	Buzzard	*Buteo*	*buteo*	
155	Forest	Buzzard	*Buteo*	*trizonatus*	
152	Jackal	Buzzard	*Buteo*	*rufofuscus*	
860	Black-throated	Canary	*Crithagra*	*atrogularis*	
857	Cape	Canary	*Serinus*	*canicollis*	
859	Yellow-fronted	Canary	*Crithagra*	*mozambica*	
575	Ant-eating	Chat	*Myrmecocichla*	*formicivora*	
631	Cloud	Cisticola	*Cisticola*	*textrix*	

REF	COMMON SPECIES	COMMON GROUP	GENUS	SPECIES	RD (REGIONAL, GLOBAL)
646	Levaillant's	Cisticola	*Cisticola*	*tinniens*	
634	Wing-snapping	Cisticola	*Cisticola*	*ayresii*	
629	Zitting	Cisticola	*Cisticola*	*juncidis*	
50	Reed	Cormorant	*Microcarbo*	*africanus*	
216	Blue	Crane	*Grus*	*paradisea*	NT, VU
214	Grey Crowned	Crane	*Balearica*	*regulorum*	EN, EN
523	Cape	Crow	*Corvus*	*capensis*	
352	Diederik	Cuckoo	*Chrysococcyx*	*caprius*	
316	Cape Turtle	Dove	*Streptopelia*	*capicola*	
317	Laughing	Dove	*Spilopelia*	*senegalensis*	
318	Namaqua	Dove	*Oena*	*capensis*	
314	Red-eyed	Dove	*Streptopelia*	*semitorquata*	
96	Yellow-billed	Duck	*Anas*	*undulata*	
60	Intermediate	Egret	*Ardea*	*intermedia*	
61	Western Cattle	Egret	*Bubulcus*	*ibis*	
119	Amur	Falcon	*Falco*	*amurensis*	
707	Southern	Fiscal	*Lanius*	*collaris*	
655	African Dusky	Flycatcher	*Muscicapa*	*adusta*	
682	African Paradise	Flycatcher	*Terpsiphone*	*viridis*	
173	Coqui	Francolin	*Peliperdix*	*coqui*	
89	Egyptian	Goose	*Alopochen*	*aegyptiaca*	
88	Spur-winged	Goose	*Plectropterus*	*gambensis*	
618	Cape	Grassbird	*Sphenoeacus*	*afer*	
171	African	Harrier-Hawk	*Polyboroides*	*typus*	
55	Black-headed	Heron	*Ardea*	*melanocephala*	
54	Grey	Heron	*Ardea*	*cinerea*	
81	African Sacred	Ibis	*Threskiornis*	*aethiopicus*	
83	Glossy	Ibis	*Plegadis*	*falcinellus*	
84	Hadada	Ibis	*Bostrychia*	*hagedash*	
82	Southern Bald	Ibis	*Geronticus*	*calvus*	VU, VU
397	Malachite	Kingfisher	*Corythornis*	*cristatus*	
130	Black-winged	Kite	*Elanus*	*caeruleus*	
129	Yellow-billed	Kite	*Milvus*	*aegyptius*	
247	African Wattled	Lapwing	*Vanellus*	*senegallus*	
243	Black-winged	Lapwing	*Vanellus*	*melanopterus*	
245	Blacksmith	Lapwing	*Vanellus*	*armatus*	
242	Crowned	Lapwing	*Vanellus*	*coronatus*	
458	Rufous-naped	Lark	*Mirafra*	*africana*	
474	Spike-heeled	Lark	*Chersomanes*	*albofasciata*	
703	Cape	Longclaw	*Macronyx*	*capensis*	
510	Banded	Martin	*Riparia*	*cincta*	
509	Brown-throated	Martin	*Riparia*	*paludicola*	

REF	COMMON SPECIES	COMMON GROUP	GENUS	SPECIES	RD (REGIONAL, GLOBAL)
390	Speckled	Mousebird	*Colius*	*striatus*	
521	Black-headed	Oriole	*Oriolus*	*larvatus*	
311	Speckled	Pigeon	*Columba*	*guinea*	
692	African	Pipit	*Anthus*	*cinnamomeus*	
238	Three-banded	Plover	*Charadrius*	*tricollaris*	
649	Tawny-flanked	Prinia	*Prinia*	*subflava*	
189	Common	Quail	*Coturnix*	*coturnix*	
581	Cape	Robin-Chat	*Cossypha*	*caffra*	
511	Black (Southern Africa)	Saw-wing	*Psalidoprocne*	*pristoptera holomelas*	
250	African	Snipe	*Gallinago*	*nigripennis*	
786	Cape	Sparrow	*Passer*	*melanurus*	
784	House	Sparrow	*Passer*	*domesticus*	
4142	Southern Grey-headed	Sparrow	*Passer*	*diffusus*	
85	African	Spoonbill	*Platalea*	*alba*	
185	Swainson's	Spurfowl	*Pternistis*	*swainsonii*	
746	Pied	Starling	*Lamprotornis*	*bicolor*	
745	Red-winged	Starling	*Onychognathus*	*morio*	
736	Violet-backed	Starling	*Cinnyricinclus*	*leucogaster*	
576	African	Stonechat	*Saxicola*	*torquatus*	
751	Malachite	Sunbird	*Nectarinia*	*famosa*	
493	Barn	Swallow	*Hirundo*	*rustica*	
502	Greater Striped	Swallow	*Cecropis*	*cucullata*	
503	Lesser Striped	Swallow	*Cecropis*	*abyssinica*	
504	South African Cliff	Swallow	*Petrochelidon*	*spilodera*	
495	White-throated	Swallow	*Hirundo*	*albigularis*	
385	Little	Swift	*Apus*	*affinis*	
383	White-rumped	Swift	*Apus*	*caffer*	
305	Whiskered	Tern	*Chlidonias*	*hybrida*	
275	Spotted	Thick-knee	*Burhinus*	*capensis*	
1105	Olive	Thrush	*Turdus*	*olivaceus*	
686	Cape	Wagtail	*Motacilla*	*capensis*	
666	African Yellow	Warbler	*Iduna*	*natalensis*	
843	Common	Waxbill	*Estrilda*	*astrild*	
838	Orange-breasted	Waxbill	*Amandava*	*subflava*	
799	Cape	Weaver	*Ploceus*	*capensis*	
803	Southern Masked	Weaver	*Ploceus*	*velatus*	
564	Mountain	Wheatear	*Myrmecocichla*	*monticola*	
1172	Cape	White-eye	*Zosterops*	*virens*	
846	Pin-tailed	Whydah	*Vidua*	*macroura*	
816	Fan-tailed	Widowbird	*Euplectes*	*axillaris*	
818	Long tailed	Widowbird	*Euplectes*	*progne*	
814	White-winged	Widowbird	*Euplectes*	*albonotatus*	

REF	COMMON SPECIES	COMMON GROUP	GENUS	SPECIES	RD (REGIONAL, GLOBAL)
445	Ground	Woodpecker	*Geocolaptes*	*olivaceus*	
452	Olive	Woodpecker	*Dendropicos*	*griseocephalus*	

6.7.2.3 Reptiles

In terms of the reptile species of concern in the area, a total of 20 species of reptiles were recorded. None of these were, however, on the International Union for Conservation of Nature (IUCN) Red List. Suitable habitat for the least concerned reptile species is located around the mining operations for the species to occur. The list of reptiles expected to occur in the QDS is presented in **Table 6-9**.

Table 6-9: Reptile species identified to occur in QDS 2730AB

#	FAMILY	SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY
1	Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern (SARCA 2014)
2	Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern (SARCA 2014)
3	Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern (SARCA 2014)
4	Cordylidae	*Chamaesaura anguina anguina*	Cape Grass Lizard	Least Concern (SARCA 2014)
5	Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern (SARCA 2014)
6	Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	Least Concern (SARCA 2014)
7	Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)
8	Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	Least Concern (SARCA 2014)
9	Gekkonidae	*Pachydactylus vansoni*	Van Son's Gecko	Least Concern (SARCA 2014)
10	Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)
11	Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern (SARCA 2014)
12	Lamprophiidae	*Duberria lutrix lutrix*	South African Slug-eater	Least Concern (IUCN 2021, sp. level)
13	Lamprophiidae	*Lamprophis guttatus*	Spotted House Snake	Least Concern (SARCA 2014)
14	Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern (SARCA 2014)
15	Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern (SARCA 2014)
16	Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)
17	Scincidae	*Acontias wakkerstroomensis*	Wakkerstroom Legless Skink	
18	Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern (SARCA 2014)
19	Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)
20	Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern (SARCA 2014)

6.7.2.4 Amphibians

In terms of frog species of concern in the area, a total of 12 species of amphibians occur in the area (Refer to **Table 6-10**), and none are on the IUCN Red List.

Table 6-10: Amphibian species identified to occur in QDS 2730AB

#	SPECIES CODE	FAMILY	SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY
1	370	Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern
2	330	Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern (IUCN, 2016)
3	590	Hyperoliidae	*Hyperolius marmoratus*	Painted Reed Frog	Least Concern (IUCN ver 3.1, 2013)
4	660	Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
5	1050	Pipidae	*Xenopus laevis*	Common Platanna	Least Concern (IUCN 2020)
6	820	Ptychadenidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern
7	880	Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
8	890	Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern (2017)
9	400	Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern (2013)
10	940	Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern
11	950	Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern
12	1030	Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern

6.7.2.5 Invertebrate Species of Conservation Concern

In terms of butterfly species of concern in the area, a total of 22 species of butterfly occur in the area (Refer to **Table 6-11**), and one, the Wakkerstroom Widow is listed on the IUCN Red List as Near Threatened. Suitable vegetation and habitat for the species were observed and the possibility of the species occurring on-site, cannot be excluded.

Beetles, Scorpions, and Spiders

- No beetles of conservation priority were recorded within the QDS 2730AB. The likelihood of these species occurring within the QDS cannot be excluded.
- None of the baboon spiders were recorded within the QSD 2730AB, however suitable habitat for spiders exists in the wetland and grassland areas.
- None of the red listed scorpions were recorded within the QSD 2730AB. The chance-finding scorpions in the rocky and grassland areas cannot be excluded.

Table 6-11: Butterfly species identified to occur in QDS 2730AB

#	FAMILY	SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY
1	HESPERIIDAE	*Afrogegenes sp.*		
2	LYCAENIDAE	*Actizera lucida*	Rayed blue	Least Concern (SABCA 2013)
3	LYCAENIDAE	*Aloeides henningi*	Hillside russet	Least Concern (SABCA

#	FAMILY	SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY
				2013)
4	LYCAENIDAE	*Aloeides merces*	Wakkerstroom russet	Least Concern (SABCA 2013)
5	LYCAENIDAE	*Aloeides oreas*	Small mountain russet	Least Concern (SABCA 2013)
6	LYCAENIDAE	*Aloeides titei*	Mountain russet	Least Concern (SABCA 2013)
7	LYCAENIDAE	*Capys alpheus extentus*	Orange banded protea	Least Concern (SABCA 2013)
8	LYCAENIDAE	*Chrysoritis aethon*	Lydenburg opal	Least Concern (SABCA 2013)
9	LYCAENIDAE	*Durbania amakosa ayresi*	Amakoza rocksitter	Least Concern (SABCA 2013)
10	LYCAENIDAE	*Orachrysops lacrimosa*	Restless cupid	Least Concern (SABCA 2013)
11	NYMPHALIDAE	*Acraea violarum*	Speckled red acraea	Least Concern (SABCA 2013)
12	NYMPHALIDAE	*Aeropetes tulbaghia*	Table Mountain beauty	Least Concern (SABCA 2013)
13	NYMPHALIDAE	*Danaus chrysippus orientis*	African plain tiger	Least Concern (SABCA 2013)
14	NYMPHALIDAE	*Dingana alaedeus*	Wakkerstroom widow	Near Threatened (SABCA 2013)
15	NYMPHALIDAE	*Junonia hierta cebrene*	Yellow pansy	Least Concern (SABCA 2013)
16	NYMPHALIDAE	*Pseudonympha magoides*	False silver-bottom brown	Least Concern (SABCA 2013)
17	NYMPHALIDAE	*Pseudonympha paludis*	Marsh brown	Least Concern (SABCA 2013)
18	NYMPHALIDAE	*Pseudonympha varii*	Mountain marsh brown	Least Concern (SABCA 2013)
19	NYMPHALIDAE	*Stygionympha curlei*	Marsh hillside brown	Least Concern (SABCA 2013)
20	NYMPHALIDAE	*Stygionympha wichgrafi williami*	Wichgraf's hillside brown	Least Concern (SABCA 2013)
21	PIERIDAE	*Eurema brigitta brigitta*	Broad-bordered grass yellow	Least Concern (SABCA 2013)
22	PIERIDAE	*Teracolus agoye bowkeri*	Speckled sulphur tip	Least Concern (SABCA 2013)

6.8 Surface Water

6.8.1 Water Management Area

The project area is located in the W51B and W52A quaternary catchments, which form part of the Inkomati-Usuthu Water Management Area (**Figure 6-23**).

The project boundary area covers 42.40km^2. The majority of the project area is situated within quaternary catchment W51B which drains towards the Heyshope Dam. Only a small portion of the project area (Nooitgesien opencast area on the western side of the mining right area) is situated in W52A which drains towards the Hlelo River.

6.8.2 Surface Water Hydrology

Seven (7) hydrological response units describe the natural drainage for the study area (using a 1:1 000 stream count and 30 m DTM fill) (refer to **Figure 6-24**). The sub-catchment relates

well to desktop-delineated drainage lines for the project area, as well as verified streams associated with the project area.

Primary drainage from the position of the proposed co-disposal site, and much of the MQE area is towards the northeast, to the perennial Egude River, which makes up the bottom inflow of the Heyshope Dam. Drainage from the southern portions of the MQE area, and MQW is towards the south, via several perennial and non-perennial drainage lines, towards the southern inflow of the Heyshope Dam. The Heyshope Dam is therefore the end received of any surface water-related pollution that may take place at the MQE Operations. The sub-catchments that are associated with the proposed CDF are HRU1 to 3, and HRU6. The sub-catchment associated with the proposed treatment area is HRU5.

Table 6-12: Summary of sub-catchment characteristics

Sub-Catchment		HRU1	HRU2	HRU3	HRU4	HRU5	HRU6	HRU7
Area (km²)		1.549	2.609	1.890	1.84	1.24	1.36	9.92
Longest Drainage Line (km)		1.99	1.08	1.148	1.18	0.57	1.33	7.26
Average Slope (%)		0.56%	1.23%	3.08%	2.01%	9.14%	1.70%	4.30%
Slope (%)	<3	35.66%	15.25%	8.46%	12.24%	4.19%	26.40%	20.00%
	3-10	63.80%	73.48%	42.12%	72.04%	66.11%	73.10%	10.00%
	10-30	0.53%	11.27%	39.28%	14.94%	29.70%	0.50%	20.00%
	>30	0.00%	0.00%	10.14%	0.78%	0.00%	0.00%	50.00%
Land Cover	Thick bush & plantation	18%	11%	8%	17%	2%	12%	5.91%
	Light bush & farmlands	29%	11%	4%	4%	16%	2%	2.60%
	Grasslands	51.5%	61.3%	77.4%	75.6%	75.0%	63.1%	89.4%
	No Vegetation	1%	17%	10%	3%	7%	23%	2.08%

The site area was divided into five (5) natural sub-catchment areas based on natural topography and contour data. The sub-catchments were delineated, and runoff was estimated. Two (2) sub-catchments drain in a northerly direction and fall within quaternary catchment W52A (the western side of the project area) while the remaining three (3) sub-catchments (eastern side of the project area) fall within quaternary catchment area W51B.

Sub-catchments 3 and 4 drain in a northeastern direction while sub-catchment 5 drains to the southeast. Sub-catchment 5 comprises several smaller catchments that all drain into the Heyshope Dam but were lumped together to represent 1 cumulative sub-catchment for this study. The largely rural catchments are dominated by grasslands, but mining activities and small peri-urban settlements to the east will influence runoff patterns.

Surrounding areas are dominated by plantations and natural forests. The catchment is hilly, with steep slopes and (normally) well-defined, narrow streams (channels).

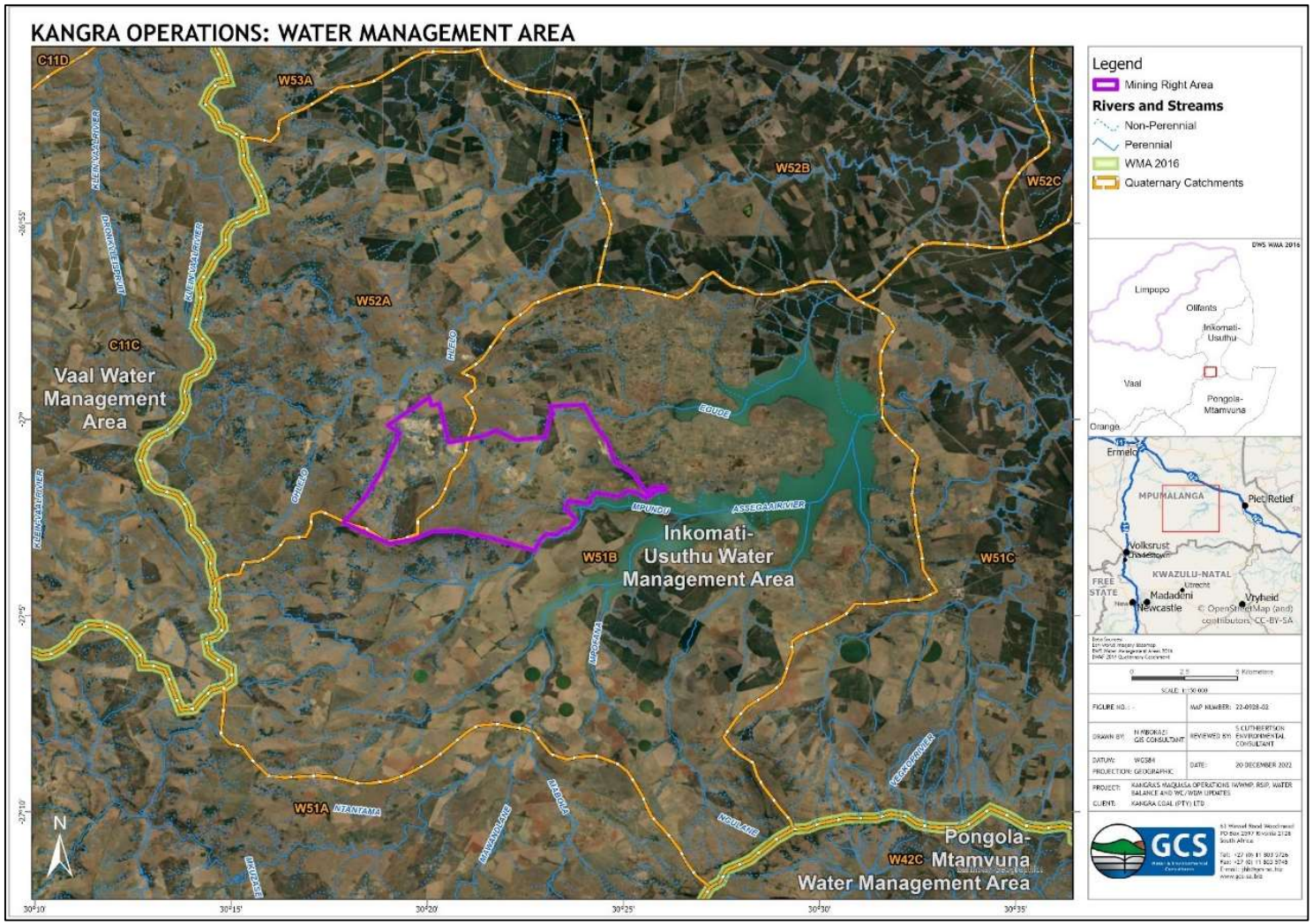


Figure 6-23: Water Management Area and Quaternary Catchments for Kangra Maquasa Operations

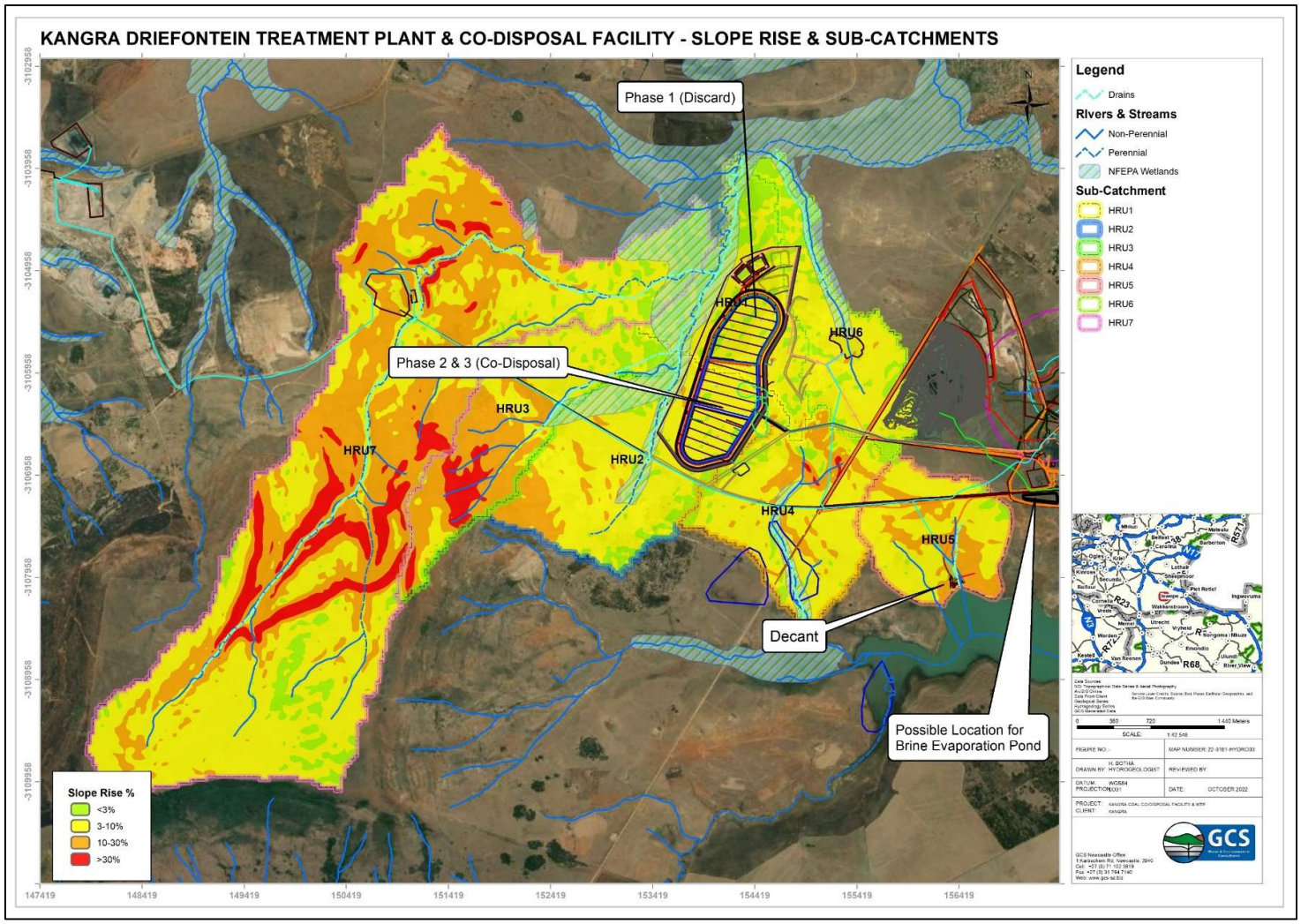


Figure 6-24: Maquasa Hydrology Sub-Catchments

6.8.3 Surface Water Quality

The MQE area consists of mine infrastructure, open cast areas, an overburden dump, a DD, pollution control dams, settling ponds and underground mine workings. A total of (19) nineteen groundwater sites and twenty-three (23) surface water sites exist in the MQE area and are monitored quarterly or monthly (depending on the sampling site type).

The surface water sampling points at MQE are summarised in **Table 6-13** and shown in **Figure 6-25** and the water quality is discussed thereafter.

Table 6-13: MQE surface water sampling sites

SITE ID	LATITUDE (WGS84)	LONGITUDE (WGS84)
Below Highwall Seepage	-27.0300	30.39053
Canal Along Main Road	-27.00575	30.4068
Discard Dump Dam 1	-27.01555	30.40247
Discard Dump Seepage 1	-27.01161	30.4032
Discard Plant	-27.02391	30.41937
Discharge into Heyshope Dam	-27.02665	30.40522
DS of Natural Seepage	-27.03175	30.42167
East Heyshope	-27.03188	30.40492
Enprotec Filter Discharge	-27.02567	30.41827
Export Plant	-27.02275	30.41793
Heyshope Dam Water / Abstraction	-27.0317	30.42058
Highwall Seepage	-27.02541	30.38938
Improtect Clarified	-27.02516	30.4177
Inland Plant	-27.02232	30.41798
Pit D East	-27.01373	30.39485
Plant Set Pond / Dam 2	-27.01917	30.41457
Plant Water Dam 3	-27.02003	30.41356
Water Treatment Maquasa Plant East	-27.02252	30.41292
West Heyshope	-27.03175	30.4054
924	-27.02259	30.43474
932	-27.00536	30.43202
933	-27.01793	30.41272
CSW04	-27.016445	30.412429
Monitoring Localities		
Internal Process Water		

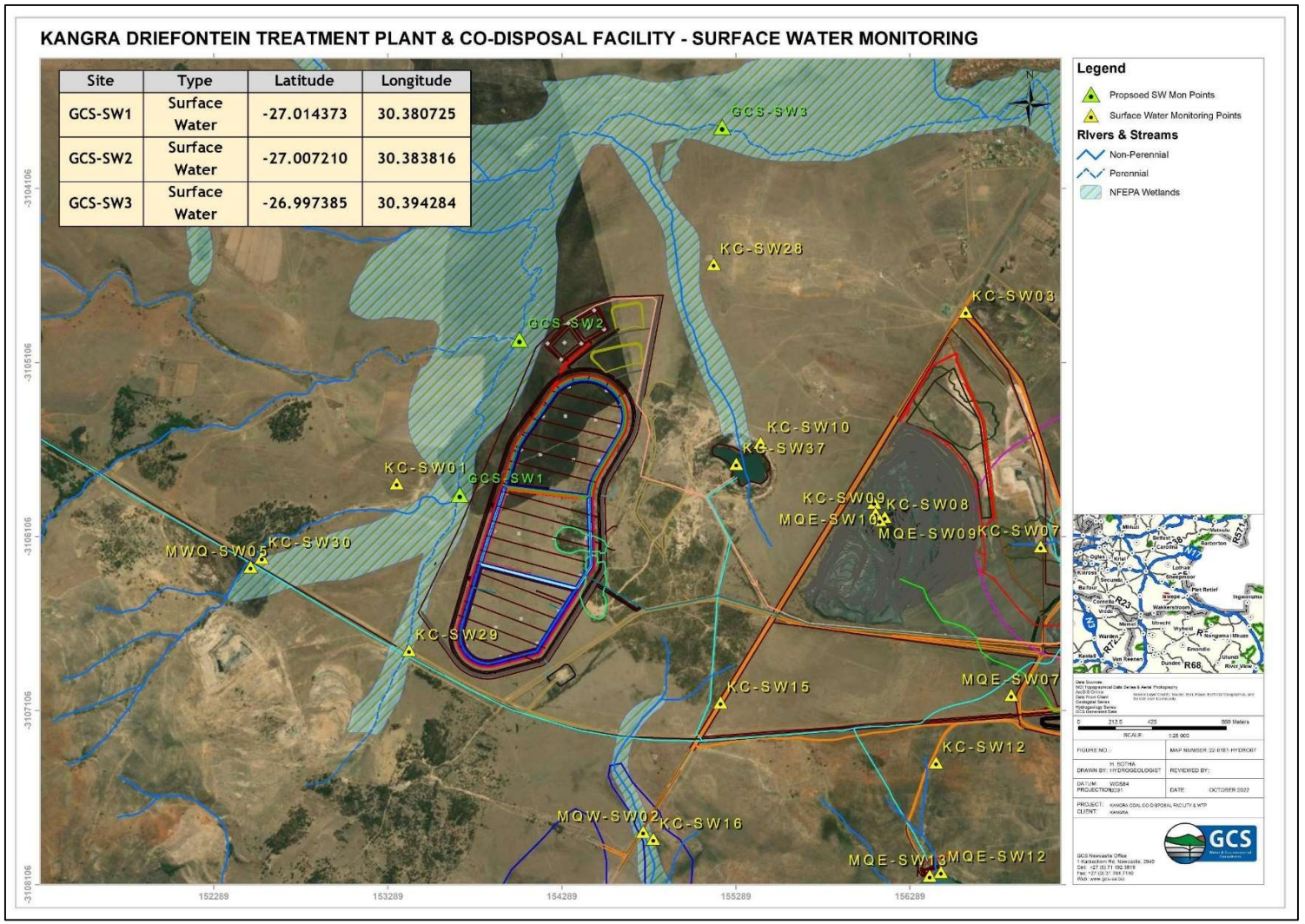


Figure 6-25: Surface Water Monitoring Points in the vicinity of CDF and WWTP

One new surface water point (CSW04) was added to the surface water monitoring network in July 2021. Canal Along Main Road was dry throughout the second quarter while CSW04 was dry during the July 2022 sampling event.

The following observations were made during the 2022 second quarter:

- All surface water monitoring points exhibited neutral to slightly alkaline pH conditions throughout the second quarter, ranging between 6.8 and 8.3.
- Surface water points Below Highwall Seepage, Highwall Seepage, D/S of Natural Seepage, East Heyshope, Heyshope Dam Abstraction, West Heyshope and SW 932 displayed low to no significant impact from the site.
    - In terms of metal concentrations, manganese (< 0.65 mg/l) was elevated at Below Highwall Seepage, Highwall Seepage and SW 932 during the second quarter of 2022. Iron (< 0.15 mg/l) was elevated at East Heyshope, Heyshope Dam Abstraction and West Heyshope during the second quarter of 2022.
    - Aluminium concentrations were elevated at Heyshope Dam Abstraction and West Heyshope during the second quarter of 2022. The source is most likely the upstream DD. Aluminium is commonly associated with burnt clinker material generated by discard dumps.
    - Ammonia concentrations were elevated at Below Highwall Seepage, Highwall Seepage, D/S of Natural Seepage, East Heyshope, Heyshope Dam Abstraction, West Heyshope and SW 932 during the June 2022 sampling event, ranging between 7.3 and 7.9 mg/l.
- CSW04 and SW 933 indicated an impact from the site during the 2022 second quarter period. CSW04 was compliant with the Usuthu River Catchment Target Water Quality Guidelines (TWQG) during the May 2022 sampling event and could not be sampled during the July 2022 sampling event due to low water levels.
    - EC, TDS, calcium and sodium concentrations exceeded the Usuthu River Catchment TWQGs at SW 933 throughout the second quarter. TDS ranged between 2 00 mg/l and 3 300 mg/l as shown in **Figure 6-26**.
    - During the June 2022 sampling event, CSW04 indicated elevated EC, TDS, calcium and sodium concentrations exceeding the Usuthu River Catchment TWQGs. Elevated salt concentrations at CSW04 are likely due to evaporation at this locality causing the water to become more concentrated.

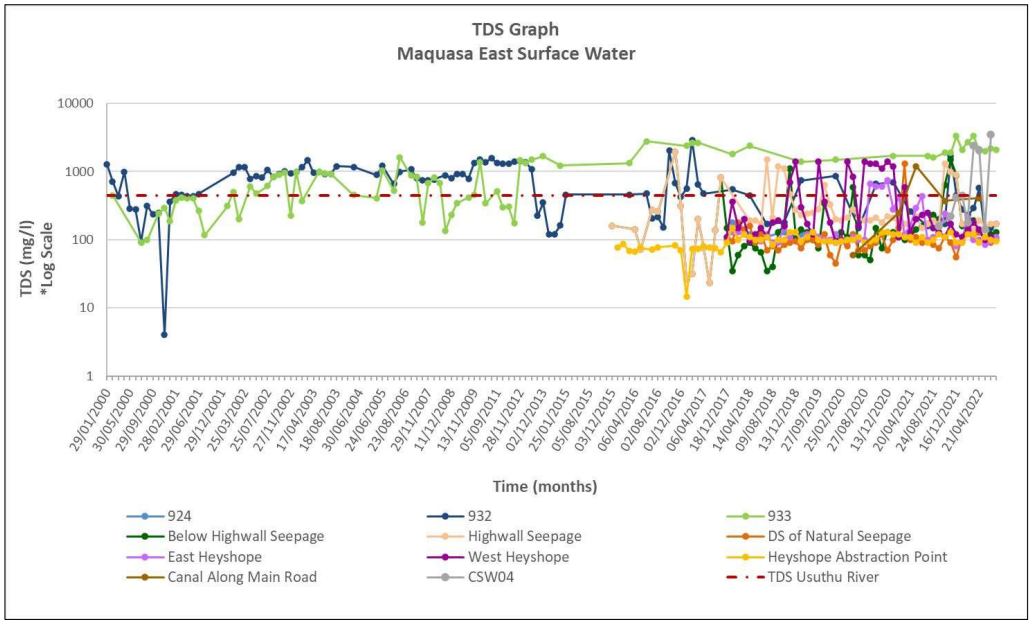


Figure 6-26: Maquasa East logarithmic surface water TDS graph

- Sulphate concentrations predominantly exceeded the Usuthu River Catchment TWQG at CSW04 and SW 933 as shown in **Figure 6-27**.
  - Sulphate at SW 933, located downstream of the underground workings, has historically fluctuated however, a relatively stable trend has been observed since 2013. Sulphate ranged between 1 840 and 2 260 mg/l in the second quarter.
  - Sulphate at most localities indicated slight decreases in concentrations during the second quarter.
  - Sulphate exceeded the Usuthu River Catchment TWQG at CSW04 (3 230 mg/l) during the June 2022 sampling event.
- Additionally, ammonia (8 mg/l) and nitrate (30 mg/l) were elevated at CSW04 during the June 2022 sampling event. SW 933 indicated elevated ammonia (7.8 mg/l) concentrations during the June 2022 sampling event.
- In terms of metal concentrations, manganese was in exceedance at SW 933 and CSW04, ranging between 3 and 10.0 mg/l.

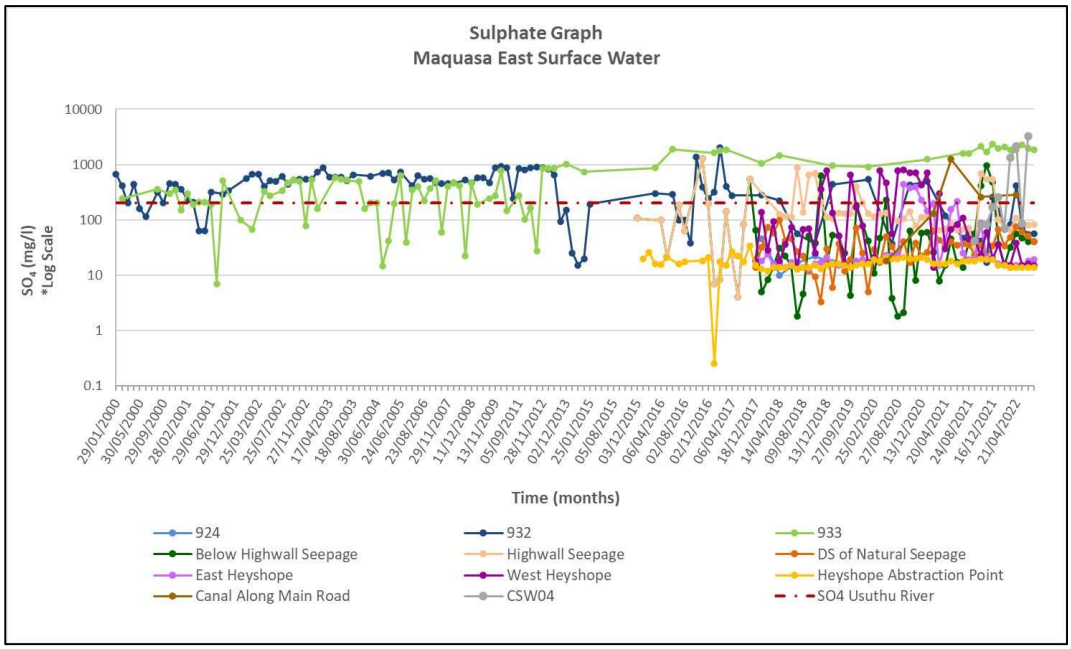


Figure 6-27: Maquasa East logarithmic surface water sulphate graph

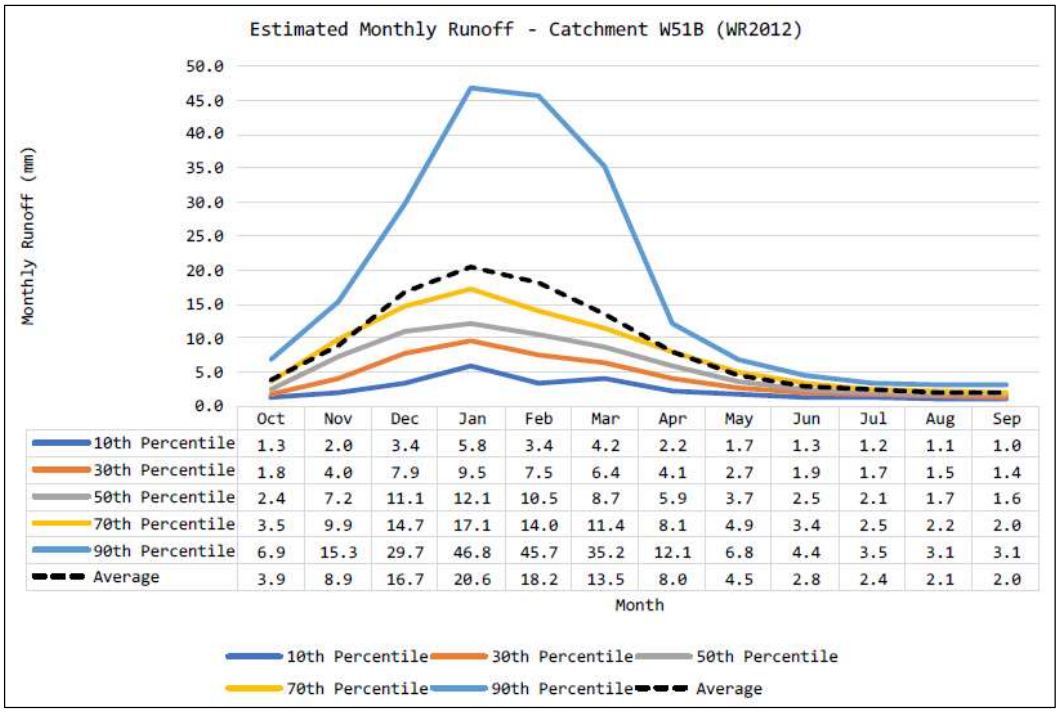
The groundwater quality results for boreholes Well Yende, KGA1, KGA2, BCBH02, GCS16 and GCS17 indicate an impact from the site. KGA1 and GCS16 indicate the most significant impact, which is most likely a result of combined seepage from the discard facility and underground workings. These boreholes have displayed consistently non-compliant water quality, representative of high sulphate mine drainage as a result of decanting mine water from the underground workings.

Surface water points Canal Along Main Road, CSW04, SW 932 and SW 933 indicated an impact from the site; the remaining points displayed low to no significant impact.

The predominant trend at this site indicates intermittently impacted surface water quality. This may suggest periodic decant or dilution following rainfall events, at certain sample positions.

6.8.4 Mean Annual Runoff

Runoff from natural (unmodified) catchments for quaternary catchment W51B is simulated in WR2012 (WRC, 2015) as being equivalent to 103.5 mm/yr (or 13% of the MAP). This is approximately 51.369 Mm^3/yr Natural Mean Annual Runoff for the surface area of W51B. The simulated natural (unmodified) runoff for W51B is presented in **Figure 6-28**.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
10th Percentile	1.3	2.0	3.4	5.8	3.4	4.2	2.2	1.7	1.3	1.2	1.1	1.0
30th Percentile	1.8	4.0	7.9	9.5	7.5	6.4	4.1	2.7	1.9	1.7	1.5	1.4
50th Percentile	2.4	7.2	11.1	12.1	10.5	8.7	5.9	3.7	2.5	2.1	1.7	1.6
70th Percentile	3.5	9.9	14.7	17.1	14.0	11.4	8.1	4.9	3.4	2.5	2.2	2.0
90th Percentile	6.9	15.3	29.7	46.8	45.7	35.2	12.1	6.8	4.4	3.5	3.1	3.1
Average	3.9	8.9	16.7	20.6	18.2	13.5	8.0	4.5	2.8	2.4	2.1	2.0

Figure 6-28: Simulated natural (unmodified) runoff for W51B

6.8.5 Floodlines

Flood peak flow for the perennial stream portion associated with the sub-catchment was estimated with the Rational Method (3), Standard Design Flood and Midgley & Pitman Method (refer to Appendix A of the Hydrological Assessment Report). The full methodology for the calculation of floodlines is provided under section 5 of the Hydrological Assessment Report (Appendix E-3). The floodlines are presented in **Figure 6-29**.

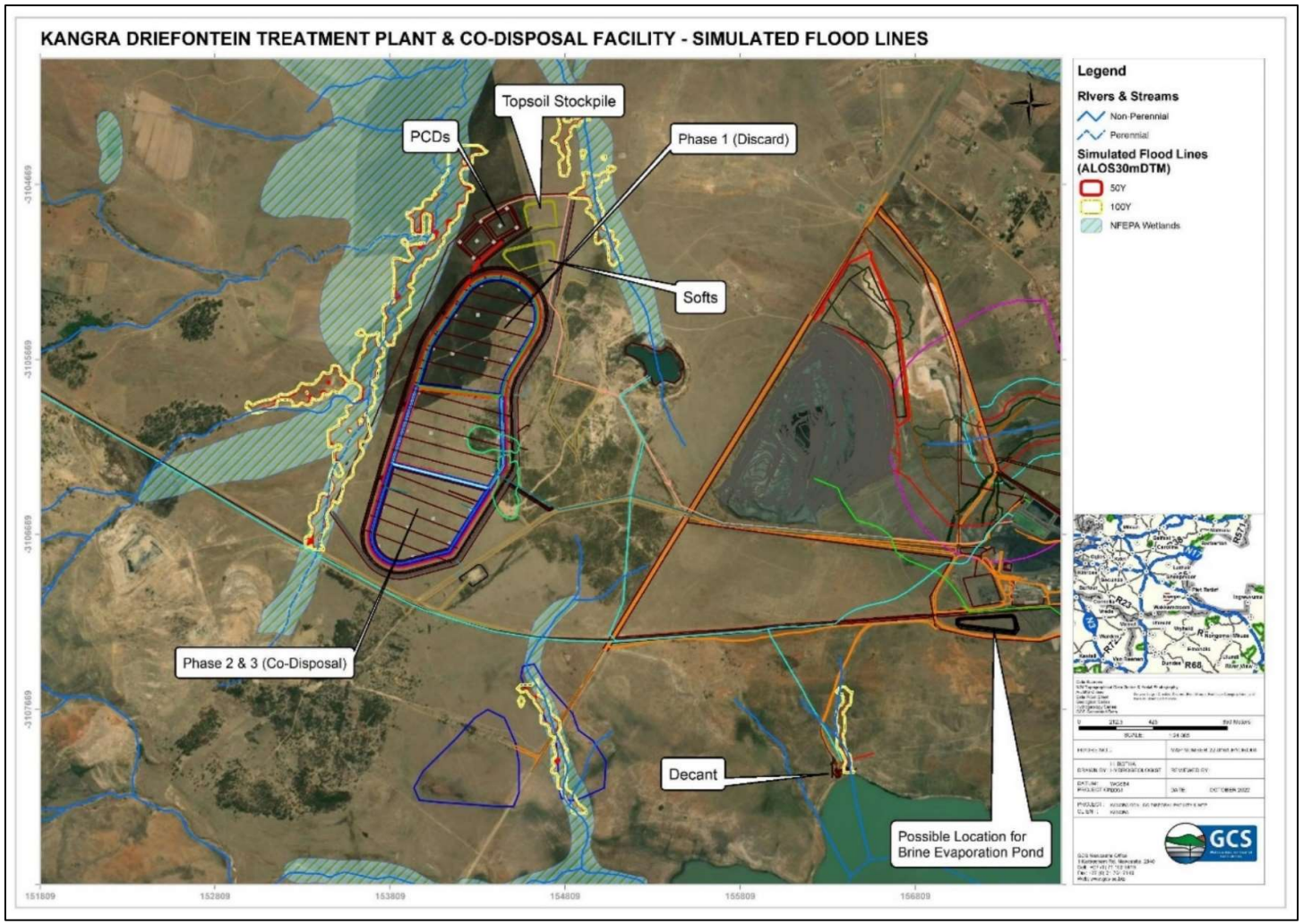


Figure 6-29: Floodline Map of the Project Area

6.8.6 Resource Class and River Health

In South Africa, a river health classification scheme is used to standardise the output of different river systems. The document titled "Resource Directed Measures for Protection of Water Resources: River Ecosystems Version 1.0.24", dated September 1999, compiled by the DWS, provides the indexes of Attainable Ecological Management Classes as shown in **Table 6-14**. Each index is calibrated so that its results can be expressed in terms of ecological and management perspectives.

Table 6-14: Resource Classes at set out by the DWS

RIVER HEALTH CLASS	ECOLOGICAL PERSPECTIVE	MANAGEMENT PERSPECTIVE
Natural / Excellent (Class A)	No or negligible modification of in-stream and riparian habitats and biota.	Protected rivers; relatively untouched by human hands; no discharge or impoundments allowed.
Good (Class B)	Ecosystems essentially in a good state; biodiversity is largely intact.	Some human-related disturbance but mostly of low impact potential.
Fair (Class C)	A few sensitive species may be lost; a lower abundance of biological populations is likely to occur, or sometimes, higher abundances of tolerant or opportunistic species occur.	Multiple disturbances associated with need for socio-economic development, e.g., impoundment habitat modification and water quality degradation.
Poor Class D)	Habitat diversity and availability have declined; mostly only tolerant species present; species present are often diseased; population dynamics have been disrupted (e.g., biota can no longer reproduce, or alien species have invaded the ecosystem).	Often characterised by high human densities or extensive resource exploitation. Management intervention is needed to improve river health – e.g., to restore flow patterns, river habitats or water quality.

6.8.6.1 Determining Current Management Class for the Water Resource

With reference to 'A guideline for water use authorisation in the mining sector, Edition 1 (2005),' DWS has identified the Drainage Region as being: W51B and W52A. Drainage region W5 is classified as:

- **High** in its Ecological Importance and Sensitivity (EIS);
- **Moderately Modified**, Class C (W51B) in its Present Ecological State (PES); and
- **Largely Natural**, Class B (W52A) in its PES.

6.8.6.2 Determining Sensitivity of the Water Resource in the Vicinity of the Mine

In the short term, with the future Management classes not defined, the precautionary principle will apply, and the vision for the catchment will be based on ecological criteria, as tabulated in **Table 6-15**. Management measures in the short term for W51B have been evaluated as improving the PES of the River to a Class B/C. Management measures in the short term for W52A have been evaluated as improving the PES of the River to a Class A/B (**Table 6-16**).

Table 6-15: Short Term PES and EIS for W51B

			Ecological Importance and Sensitivity (EIS)			
			VH	H	M	L
Present Ecological State (PES)	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	B Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D Improve	D/E/F Improve	E/F Maintain	E/F Maintain

Table 6-16: Short Term PES and EIS for W52A

			Ecological Importance and Sensitivity (EIS)			
			VH	H	M	L
Present Ecological State (PES)	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	B Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D Improve	D/E/F Improve	E/F Maintain	E/F Maintain

In the long-term, the catchment vision will be based on the current assessment and the future Management Class, as tabulated in **Table 6-17**and **Table 6-18**.

Management measures in the long-term have been evaluated as maintained with a vision of a future Management Class III for drainage regions W51B and W52A.

Table 6-17: Long-Term PES and EIS for W51B

			Ecological Importance and Sensitivity (EIS)			
			I Special Protected	II Protected	III Good Quality	IV Acceptable Quality
Present Ecological State (PES)	A	Pristine	Maintain	Maintain	N/A	N/A
	B	Natural	Maintain	Maintain	Maintain	Sustainable use
	C	Good	Improve	Improve	Maintain	Sustainable use
	D	Fair	Improve	Improve	Improve	Maintain
	E/F	Poor	Improve	Improve	Improve	Improve

Table 6-18: Long-Term PES and EIS for W51A

			Ecological Importance and Sensitivity (EIS)			
			I Special Protected	II Protected	III Good Quality	IV Acceptable Quality
Present Ecological State (PES)	A	Pristine	Maintain	Maintain	N/A	N/A
	B	Natural	Maintain	Maintain	Maintain	Sustainable use
	C	Good	Improve	Improve	Maintain	Sustainable use
	D	Fair	Improve	Improve	Improve	Maintain
	E/F	Poor	Improve	Improve	Improve	Improve

The sensitivity of the water resource is based on the management measures that will be employed to affect the catchment vision. This has been tabulated in **Table 6-19**.

Table 6-19: Sensitivity of the Water Resource

STRATEGY NO.	STRATEGY FOR THE WATER RESOURCE	SENSITIVITY OF THE WATER RESOURCE
1	Employ management measures with a view to improving the resource class.	High
2	Employ management measures with a view to maintain the resource class as is.	Medium
3	Employ management measures with a view to allow controlled degradation of the water resource.	Low

6.8.7 Receiving Water Quality Objectives

There are currently no receiving water quality objectives published for the project's catchment area by the DWS. The last known RQO relating to Kangra Operations (i.e., Lower

Vaal Catchment) to be published was done so in April 2016 (GN 470) It should, however, be noted that no water is discharged to any receiving water resources by the Maquasa mining area. The mine is operating on a closed water circuit.

6.8.8 Surface Water User Survey

The mining area is situated north of the western portion of the Heyshope Dam. This dam was established in 1986 and it is used to supply water to surrounding municipalities and industries. Water from the dam is also used to supply Eskom with water for electricity generation.

6.8.9 National Freshwater Ecosystem Priority Area (FEPA)

The Atlas of Freshwater Ecosystem Priority Areas (FEPA) in South Africa (Nel *et al*, 2011a) (The Atlas) provides a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. FEPA's were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, current condition of habitat, presence of threatened vegetation, fish, frogs and birds, and importance in terms of maintaining downstream habitat. The Atlas incorporates the National Wetland Inventory (SANBI, 2011) to provide information on the distribution and extent of wetland areas.

River FEPA's achieve biodiversity targets for river ecosystems and threatened/near threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). The FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. Kangra CDF is located in the W51B Quaternary Catchment. The dominant rivers in this Quaternary Catchment are the Assegaai and Ngulane Rivers that drain the catchment in an easterly direction (see **Figure 6-30**). Both these rivers are classified as NFEPA Rivers and has been classified as Class C features which means that they are Moderately Modified.

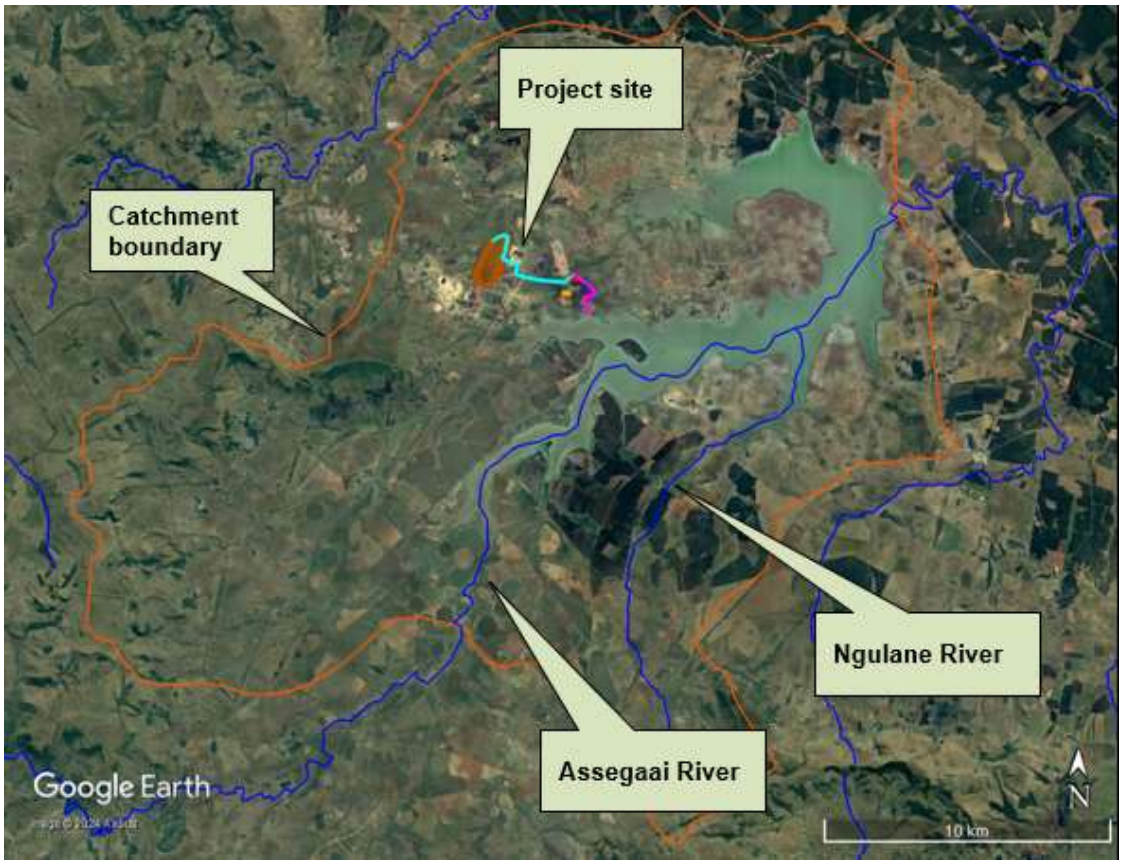
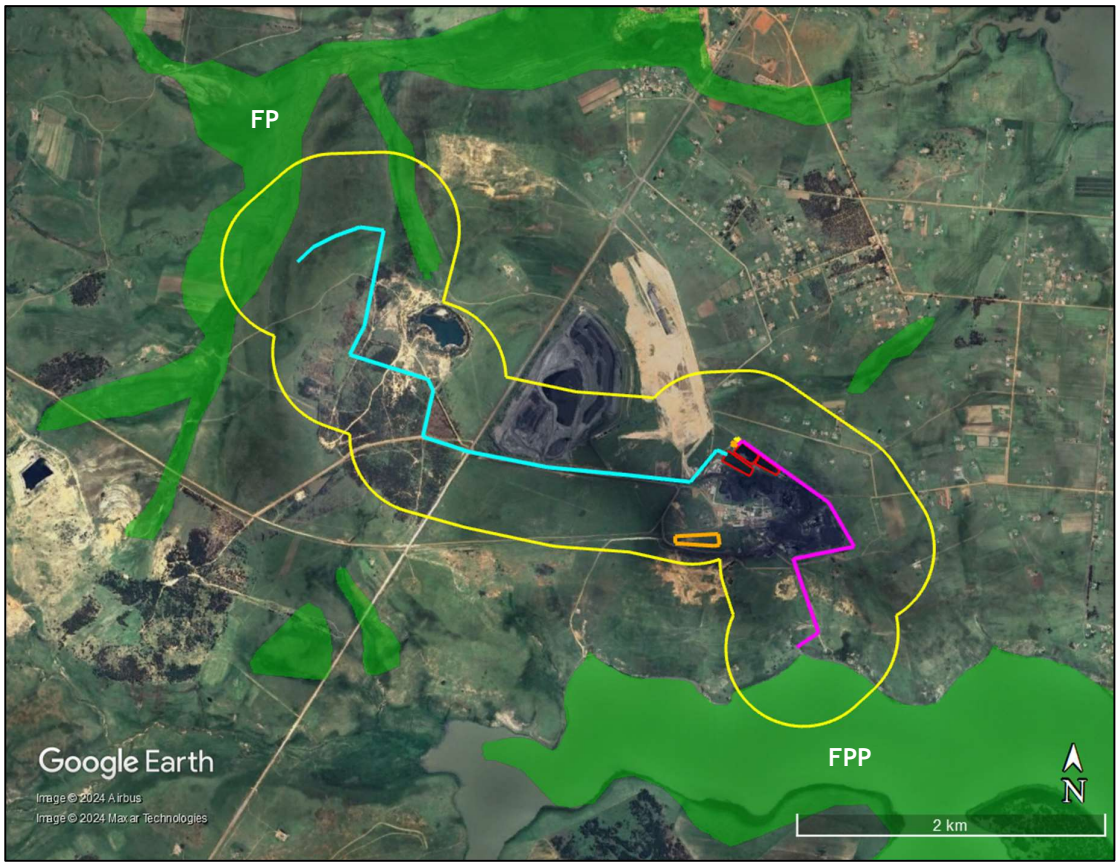


Figure 6-30: Location of the NFEPA Rivers identified in the NFEPA Database for Quaternary Catchment W51B

The database has also identified two wetland features within a 500m radius of the project site. The location of these wetland features is project site is provided in **Figure 6-32**. The database identifies both the wetland features as floodplain wetlands. The floodplain wetland located to the south of the study site is artificial in nature and consists of the Heyshope Dam.



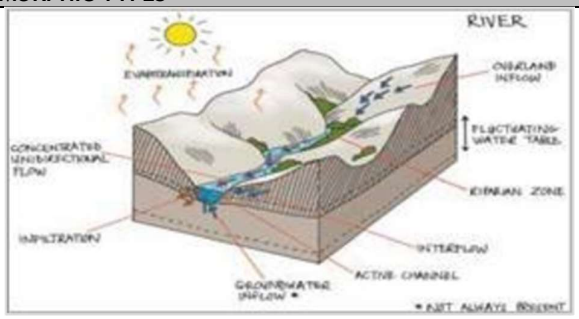
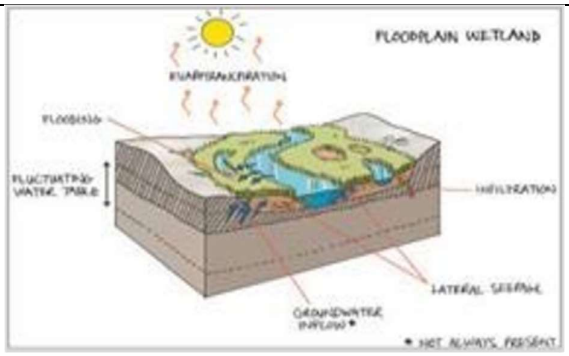
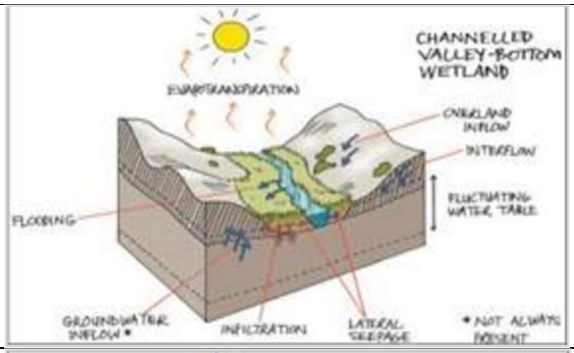
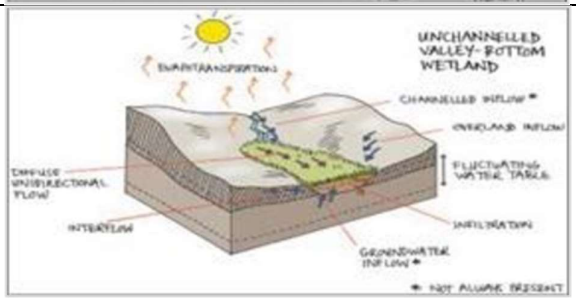
FPP = Floodplain

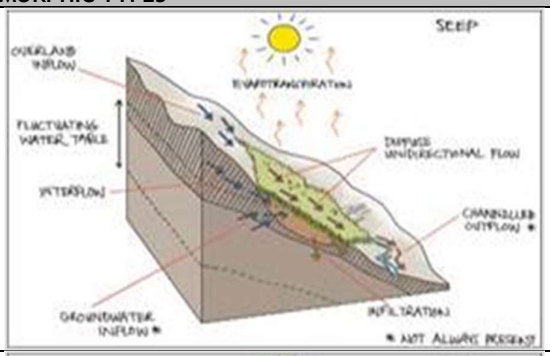
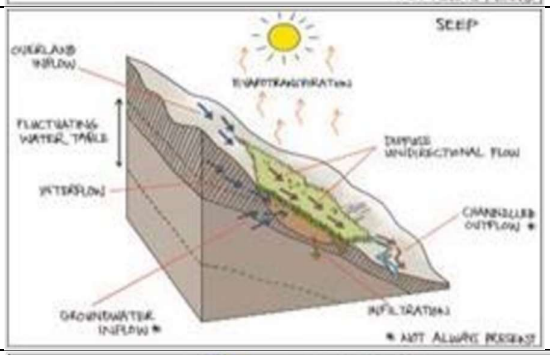
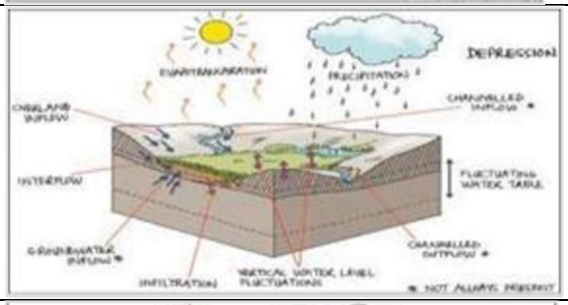
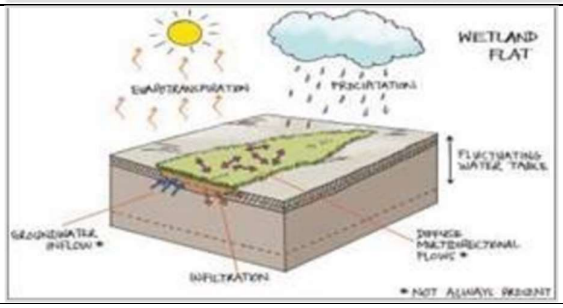
Figure 6-31: Location of the wetland features identified in the NFEPA Dataset (shown in green) in relation to a 500m radius (shown in yellow) of the project site

6.8.10 Sensitive Areas (Wetlands)

Following the identification of the aquatic features on the study site, these are then classified into specific hydrogeomorphic (HGM) units according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa (inland systems) (Ollis *et al.*, 2013). The summary of these HGM types in presented in **Table 6-20**.

Table 6-20: Wetland hydrogeomorphic (HGM) types typically supporting inland wetlands in South Africa (Ollis *et al.*, 2013)

HYDROGEOMORPHIC TYPES		DESCRIPTION
River		Rivers are linear landforms with clearly discernible banks and a channel, which permanently or periodically, carries a contained and defined flow of water. A river is taken to include both the active channel and the riparian zone.
Floodplain		Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.
Valley bottom with channel		Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterised by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.

HYDROGEOMORPHIC TYPES		DESCRIPTION
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs are mainly subsurface flow and outflow is usually via a well- defined stream channel connecting the area directly to a stream channel.
Isolated Hillslope seepage		Similar to other hillslope seeps but with no direct surface water connection to a stream channel. Slopes on hillsides, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs mainly from subsurface flow and outflow primarily by diffuse subsurface and/or limited surface flow.
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive subsurface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.
Wetland Flat		A flat wetland with no apparent inlet or outlet points. Water is obtained from surface or near surface flows and is lost either by downward percolation or evapotranspiration. May be only seasonal in terms of its wetness and hydromorphic soils may be only weakly developed or else be absent. Vegetation may be the strongest indicator.

6.8.10.1 Wetland Delineation and Description

The site assessment confirmed the absence of any natural wetland features within the boundaries of the project site. Furthermore, it identified three wetland features, one a floodplain wetland associated with the Kwaggalaagte River, one a Channelled Valley Bottom wetland associated with the Heilvleispruit and a seep wetland (SP) within a 500m radius of the project site. The location of these features is indicated in **Figure 6-32** and the identification of the wetland features is provided in **Table 6-21**.

Table 6-21: Wetland classification as per SANBI guideline (Ollis *et al*. 2013)

WETLAND SYSTEM	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
	System	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)
HGM 1	Inland	Mesic Highveld Grassland Group 4	Slope	Channelled Valley Bottom wetland
HGM 2	Inland	Mesic Highveld Grassland Group 4	Slope	Channelled Valley Bottom wetland
HGM 3	Inland	Mesic Highveld Grassland Group 4	Slope	Channelled Valley Bottom wetland
HMG 4	Inland	Mesic Highveld Grassland Group 4	Gentle slope	Seep wetland
HGM 5	Inland	Mesic Highveld Grassland Group 4	Valley floor	Unchannelled valley bottom wetland
HMG 6	Inland	Mesic Highveld Grassland Group 4	Valley floor	Unchannelled valley bottom wetland
HMG 7	Inland	Mesic Highveld Grassland Group 4	Valley floor	Channelled Valley bottom

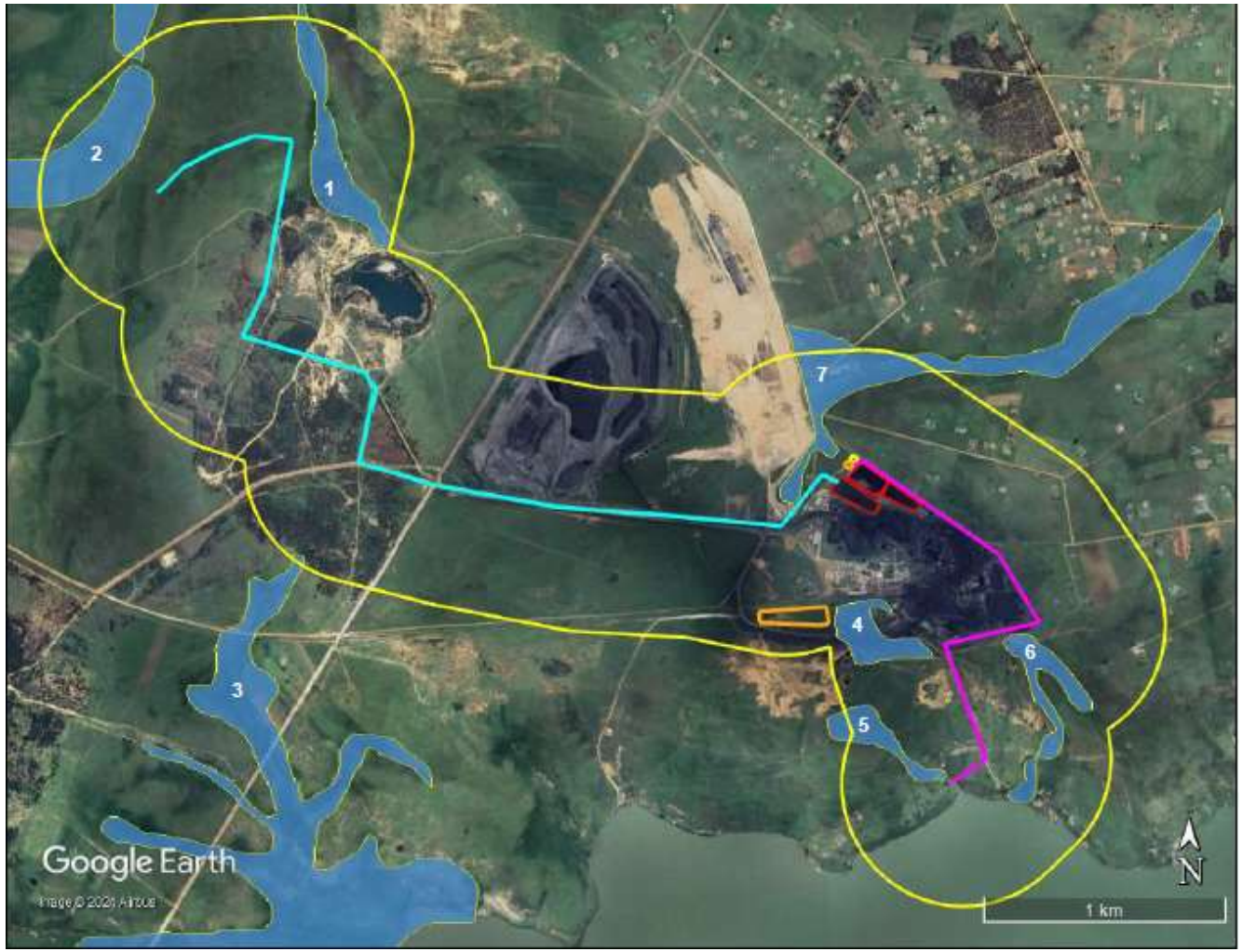


Figure 6-32: Location of the wetland features identified during the field assessment (in blue) within a 500m radius (in yellow) of the project site

6.8.10.2 Aquatic Features Functional Assessment

The functional assessment of the wetland features all relates to the HGM Unit classification of the wetlands.

Seep wetlands (**Figure 6-33**) are typically located on gentle slopes and contain no water inflow channels. Water will typically collect in these seep areas and due to the dense vegetation within the footprint will have a relatively high roughness coefficient that slows the movement of water to a point that infiltration into the soils is a prominent feature of these wetlands. The key water inputs into these seeps are the interflow from the near surface groundwater that moves down the slopes as well as overland surface flow down the slopes. Evaporation and channelled outflow are key water releases from the features.

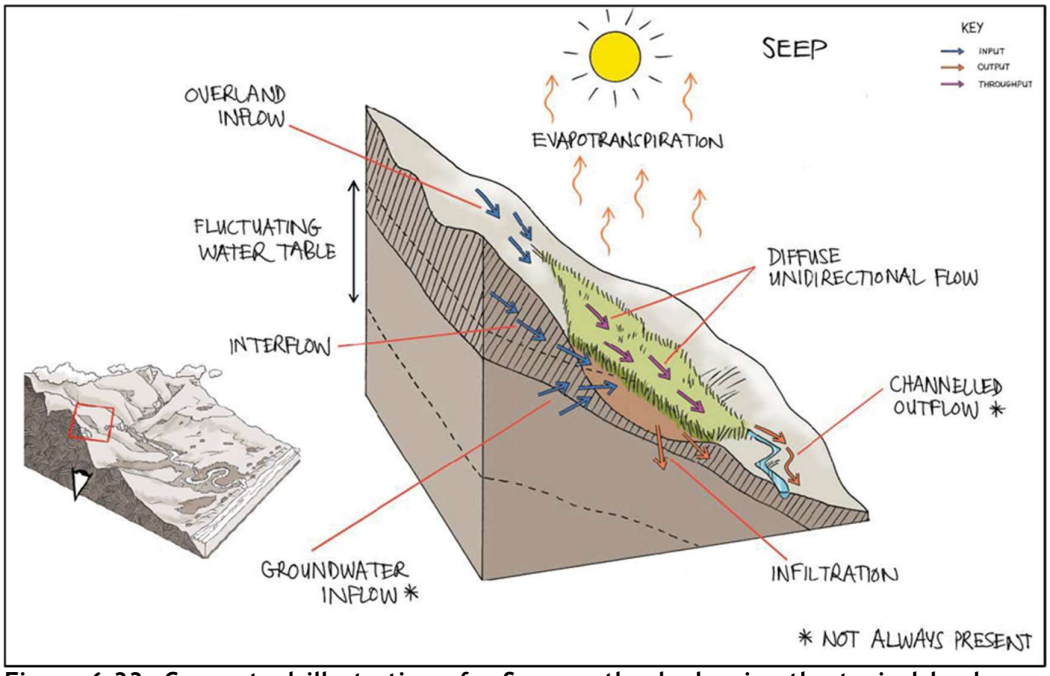


Figure 6-33*:* Conceptual illustration of a Seep wetland, showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis *et al*. 2013)

Unchannelled Valley Bottom wetlands (Figure 6-34) are characterised by their location on valley floors, an absence of a distinct channel and the presence of the diffuse flow of water through the feature. Water inputs are typically from an upstream channel that becomes dominated by diffuse (surface and subsurface) flow as it enters the wetland and seepage from adjacent slopes. There may also be groundwater input into the wetland. Water characteristically moves through the wetland in the form of diffuse surface or subsurface flow, but the outflow may be in the form of either diffuse or concentrated surface flow. As such, these wetland types provide services associated with the erosion control, storage of

toxicants, phosphates and nitrates and certain level of flood retention.

Infiltration and evapotranspiration from unchannelled valley bottom wetlands can be significant, but horizontal, unidirectional, diffuse surface flow tends to dominate these wetland systems.

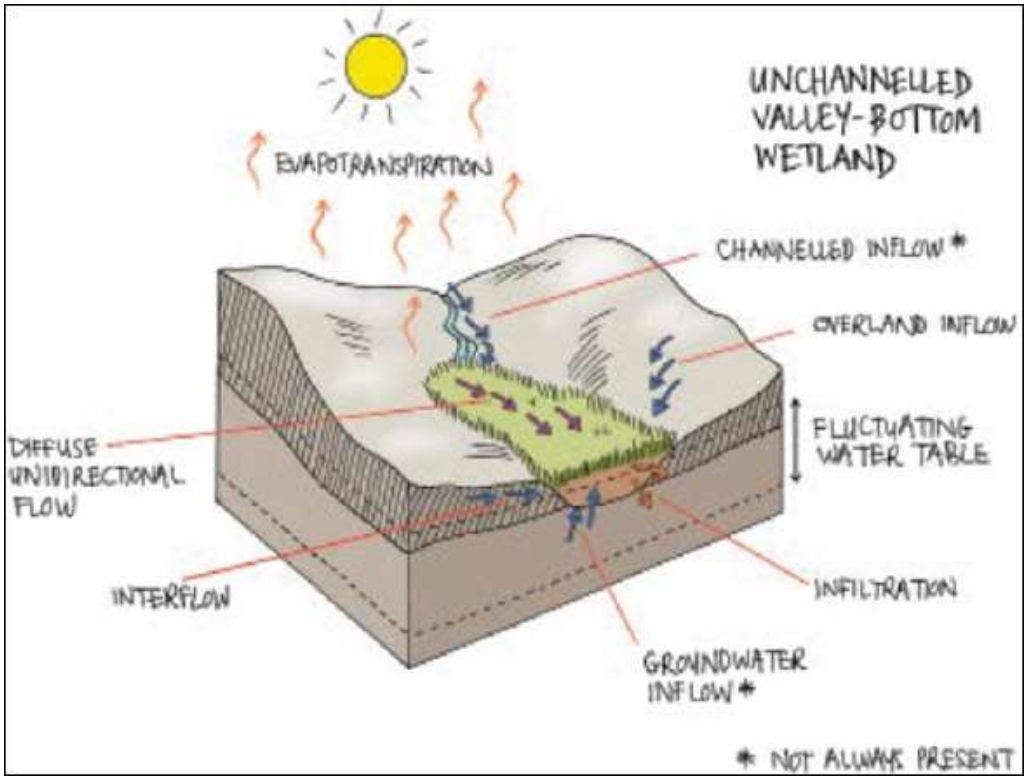


Figure 6-34: Conceptual illustration of a Unchannelled Valley Bottom wetland showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis *et al*. 2013)

Channelled Valley Bottom wetlands must be considered as wetland ecosystems that are distinct from, but sometimes associated with, the adjacent river channel itself, which must be classified as a 'river'. These wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland.

Figure 6-35 is a conceptual diagram of a Channelled Valley Bottom wetland, showing the dominant inputs and outputs of water. Dominant water inputs to these wetlands are from the river channel flowing through the wetland, either as surface flow resulting from flooding or as sub- surface flow, and/or from adjacent valley-side slopes (as overland flow or interflow). Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events

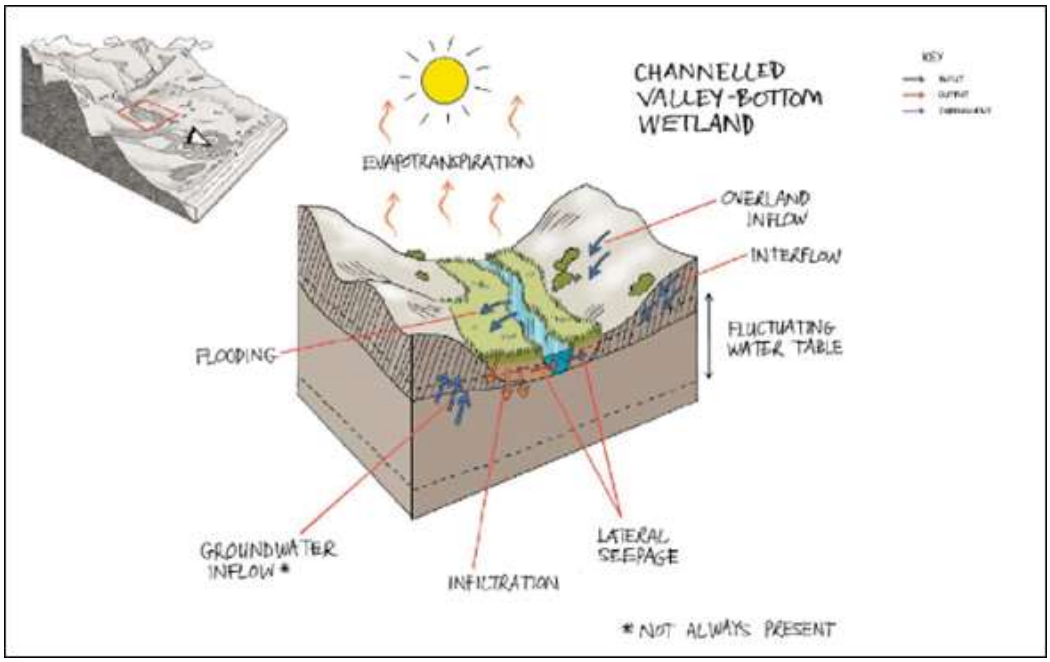


Figure 6-35*:* Conceptual illustration of a Channelled Valley Bottom wetland showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis *et al*. 2013)

Water generally exits a Channelled Valley Bottom wetland in the form of diffuse surface or subsurface flow into the adjacent river, with infiltration into the ground and evapotranspiration of water from these wetlands also being potentially significant. Based on the hydrological characteristics of these wetlands they provide sediment, toxicant and nutrient storage functions as well as water supply particularly during the dry seasons.

6.8.10.3 Wetland Ecological Function

The ecosystem services provided by the wetlands identified on-site were assessed and rated using the WET-EcoServices method (Kotze *et al*. 2008). The summarised results for HGM 1 to HGM 7 are provided in **Table 6-22**. The average ecosystem services score has been determined to be "Moderately high".

Table 6-22: Ecosystem service provision by the Channelled Valley Bottom Wetlands associated with the project site

WETLAND UNIT					HGM						
					1	2	3	4	5	6	7
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		2.1	2.0	2.0	2.2	2.3	2.3	2.3
			Streamflow regulation		2.0	2.0	2.3	2.2	2.3	2.3	2.3
			Water enhancement benefits: Quality	Sediment trapping	2.8	2.8	2.8	2.9	2.8	2.8	2.8
				Phosphate assimilation	2.4	2.2	1.9	2.2	2.4	2.2	1.9
				Nitrate assimilation	1.9	1.9	1.5	2.4	2.2	2.2	2.2
				Toxicant assimilation	2.4	2.4	1.9	2.6	2.4	2.4	2.4
				Erosion control	2.3	2.0	1.7	1.8	1.8	1.8	1.7
			Carbon storage		1.7	1.7	1.3	1.3	2.0	2.0	1.7
	Direct Benefits	**Biodiversity maintenance**			1.4	1.4	1.8	1.6	1.8	1.6	1.6
		Provisioning benefits	Provisioning of water for human use		2.2	1.7	1.7	1.7	1.7	1.7	1.7
			Provisioning of harvestable resources		2.8	2.2	2.2	2.2	2.2	2.2	2.2
			Provisioning of cultivated foods		1.8	1.8	1.8	1.8	1.8	1.8	1.8
		Cultural benefits	Cultural heritage		1.3	1.3	1.3	1.3	1.3	1.3	1.3
			Tourism and recreation		1.7	1.7	1.7	1.7	1.9	1.7	1.7
			Education and research		1.0	1.0	1.0	0.8	1.8	0.8	1.0
Average Eco Services Score					2.0	3.0	2.0	2.0	2.0	2.0	2.0

The key ecosystem services provided by the wetland features relate directly their ability to assimilate various substances that move through the catchment. These include nitrates, phosphates and toxicants while the wetlands trap sediment from the catchment which allows for the establishment of dense wetland vegetation that in turn limits the erosion in the features.

6.8.10.4 Present Ecological State (PES) of the Delineated Wetlands

The Present Ecological State (PES) of an aquatic feature is a function of the impacts that are present within the footprint of the feature as well as the catchments associated with each of these features and how these impacts affect the drivers of the wetland and watercourse.

The impacts identified in the table above were used in the Level 1 Wethealth assessment to determine the PES of the wetland system. The results of the Level 1 assessment are provided

in **Table 6-23** below.

Table 6-23: Present Ecological Status of the System

HGM Unit	DRIVER			COMBINED SCORE
	HYDROLOGY	GEOMORPHOLOGY	VEGETATION	
1	4.1	6.2	4.6	**4.8 = Class D Largely modified**
2	4.5	6.8	4.8	**5.2 = Class D Largely modified**
3	4.7	7.3	5.3	**5.6 = Class D Largely modified**
4	2.3	1.2	2.6	**2.0 = Class C Moderately modified**
5	2.2	1.1	1.7	**1.7 = Class B Small modification**
6	2.6	1.4	2.6	**2.3 = Class C Moderately modified**
7	4.4	4.6	5.2	**4.7 = Class D Largely modified**

The wetland classification provided above makes provision for the following:

- The Class B wetland is considered to be largely natural with limited impacts on the wetland drivers resulting in very little impact on the wetland biodiversity and function.
- The Class C wetlands are considered to have moderate modifications of its wetland drivers resulting in limited impact to the wetland biodiversity and function.
- The Class D wetlands are considered to have undergone large modifications due to severe impacts resulting in large changes to the wetland drivers which consequently results in significant impacts on the wetland biodiversity and function.

6.8.10.5 Ecological Importance and Sensitivity (EIS) of the Delineated Wetlands

The Ecological Importance of any aquatic feature is an expression of its importance to the maintenance of the ecological diversity and functioning within itself, as well as hydrologically downstream. The Ecological Sensitivity is a function of the system's ability to resist disturbances on its drivers and its capability to recover from these disturbances once they have occurred.

The wetland EIS assessment was applied to the HGM units described in the previous section to assess the levels of sensitivity and Ecological Importance of the wetlands. The result of the assessment is shown in **Table 6-24**.

Table 6-24: Ecological Importance and Sensitivity of the aquatic system

HGM UNIT	CRITERIA	IMPORTANCE	EIS CLASS	OVERALL IMPORTANCE AND SENSITIVITY
1	Ecological importance and sensitivity	2.7	M	Medium
	Hydrological/functional importance	2.8	M	
	Direct human benefits	1.3	L	
2	Ecological importance and sensitivity	2.7	M	Medium
	Hydrological/functional importance	2.8	M	
	Direct human benefit	1.3	L	
3	Ecological importance and sensitivity	2.4	M	Medium
	Hydrological/functional importance	2.7	M	
	Direct human benefits	1.9	L	
4	Ecological importance and sensitivity	3.7	H	Medium
	Hydrological/functional importance	2.8	M	
	Direct human benefits	1.0	L	
5	Ecological importance and sensitivity	3.3	H	High
	Hydrological/functional importance	3.0	H	
	Direct human benefits	1.7	L	
6	Ecological importance and sensitivity	2.2	M	Medium
	Hydrological/functional importance	2.2	M	
	Direct human benefits	1.7	L	
7	Ecological importance and sensitivity	2.2	M	Medium
	Hydrological/functional importance	2.2	M	
	Direct human benefits	1.7	L	

6.8.10.6 Buffer Determination

The modelled wetland characteristics was used to determine the appropriate buffer for these wetlands by using the wetland buffer determination model developed by the Water Research Commission.

Based on the findings of the assessment, the location and extent of the aquatic features, the PES of the aquatic features, the ecosystem services provided by the system and the EIS of the aquatic features, the following buffers have been determined:

Construction Phase (*Figure 6-36*):

- No plant and equipment must be allowed to be parked within a 40m distance of the delineated edge of any delineated wetland;
- No portable ablution facilities must be allowed to be placed within a 40m distance of the delineated edge of any wetland; and

- No petrochemical storage facilities must be allowed to be placed within a 40m distance of the delineated edge of any wetland.

Operational Phase (*Figure 6-37*):

- No part of the infrastructure associated with the project must be allowed to be within a 20m distance from the delineated edge of any wetland.

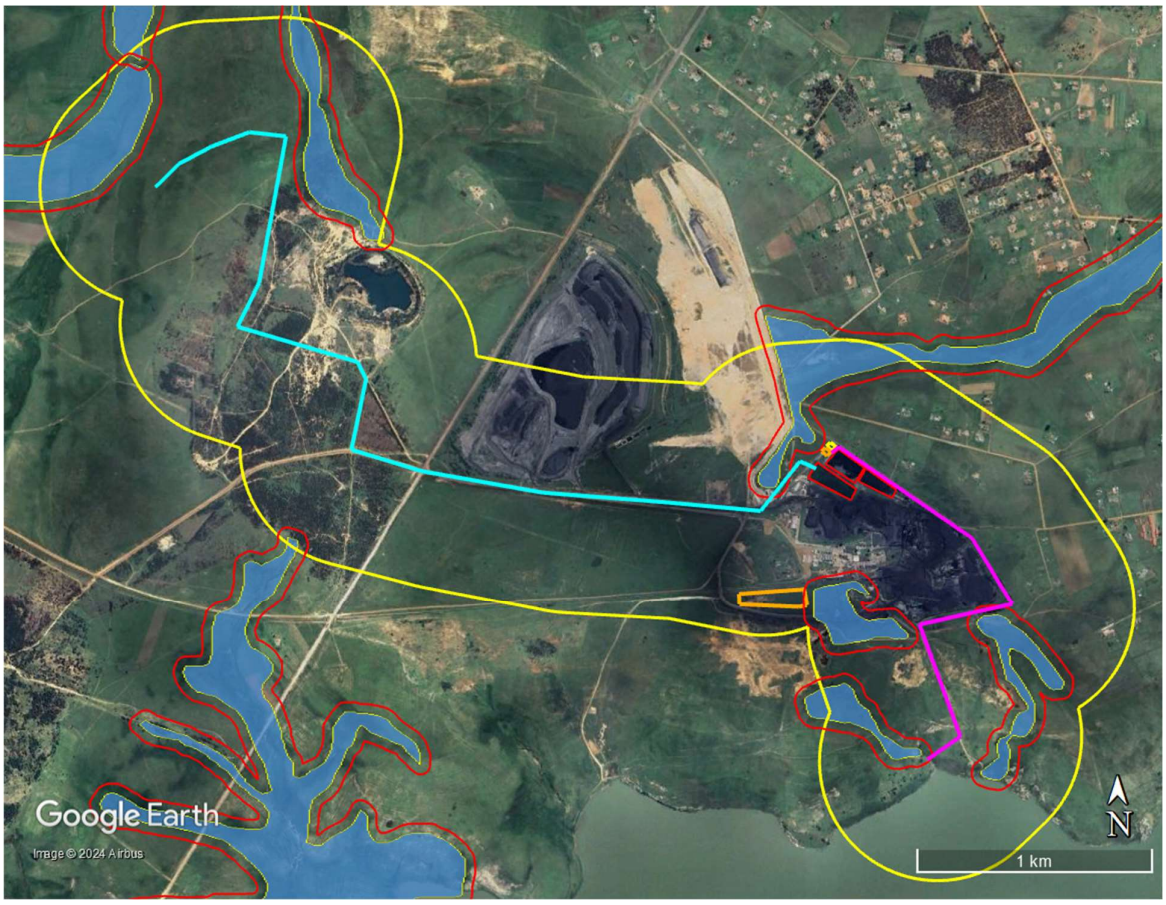


Figure 6-36 ***Location and extent of the applicable 40m construction buffer (in red) around the wetland within the study site***

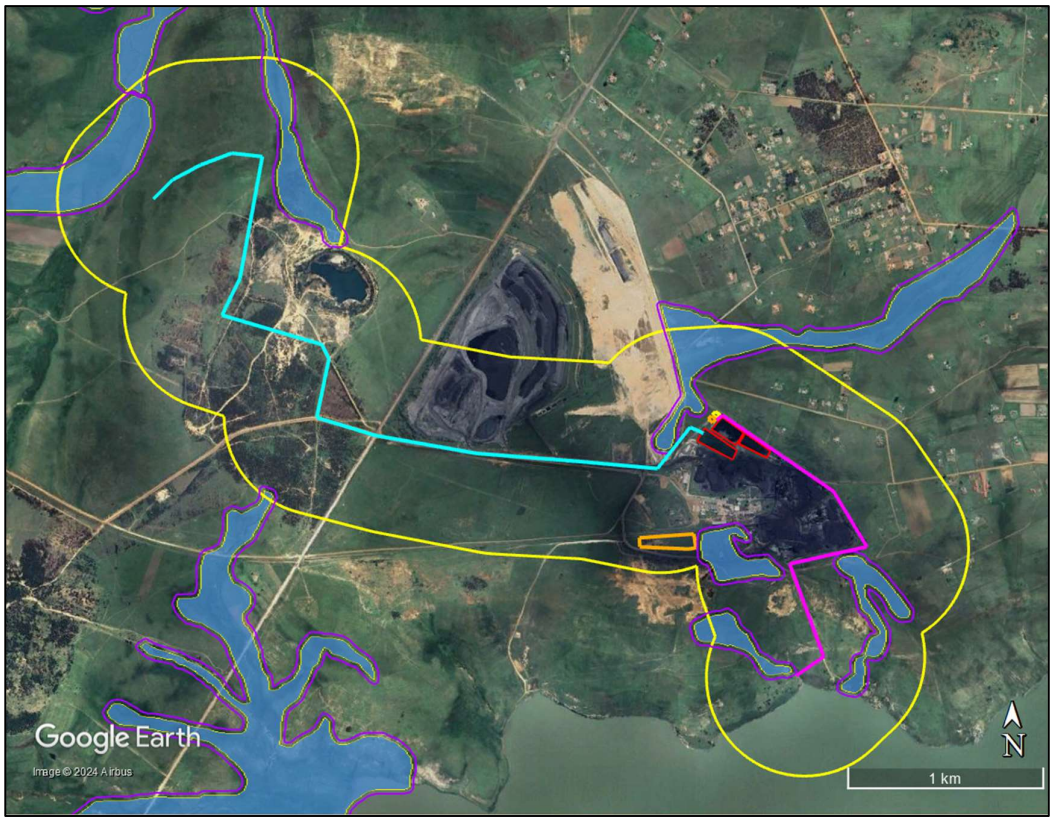


Figure 6-37 ***Location and extent of the applicable 20m operational buffer (in purple) around the wetland features within the study site***

6.9 Groundwater

6.9.1 Aquifer Characterisation

The following section supplies a brief overview of the aquifer characteristics encountered at the Maquasa (East and West) and Nooitgesien operations, with a specific focus on the aquifer type, aquifer zones, preferential flow paths and groundwater occurrence.

6.9.1.1 Aquifer Type and Aquifer Zones

Based on available data, the aquifer occurring in the area can be divided into three (3) distinct zones:

1. **Alluvium zone:**
    - Alluvial horizons occur along streams and rivers that traverse the area. These water-bearing horizons are generally connected to the streams and rivers and can be connected to deeper lying weathered and fractured water-bearing horizons depending on the nature of the alluvial sediments (ERM, 2013).

2. **Weathered to semi-confined aquifer zone:**
    - The sedimentary rocks of the Ecca Group form the main water-bearing strata. In the Ecca Group, multi-layered aquifers are common, especially within the coalfields. It is, however, conceptualised as a single unit with interconnectivity between layers, as a worst-case scenario; and
    - On average the saturated thickness of the weathered to semi-confined aquifer zone, determined by boreholes drilled at the site, varies from 5 to 27m. However, on a catchment scale, the average weathered thickness is estimated to be in the order of 16 to 23m (King *et al.*, 1998a; King *et al.*, 1998b; ERM, 2013; GCS, 2013).
3. **Confined fractured aquifer zone:**
    - The Dwyka Formation, which underlies the Ecca Group, normally has a very low permeability due to its secondary aquifer characteristics. The aquifer can be referred to as being primarily fractured and acts as an aquitard.
    - The fractured aquifer thickness for the general area is estimated to extend from a depth of 23 to 124 mbgl; and is estimated to be in the order of 100 - 130m thick (King *et al.*, 1998; and Lourens, 2013).

From the above mentioned, the aquifer in the area can be referred to as being predominantly intergranular and fractured. These aquifer types generally have very low to medium primary hydraulic conductivity/porosity due to the secondary nature of the aquifer (King *et al.*, 1998). A conceptual drawing of the typical aquifer zones in the study area is presented in **Figure 6-38.**

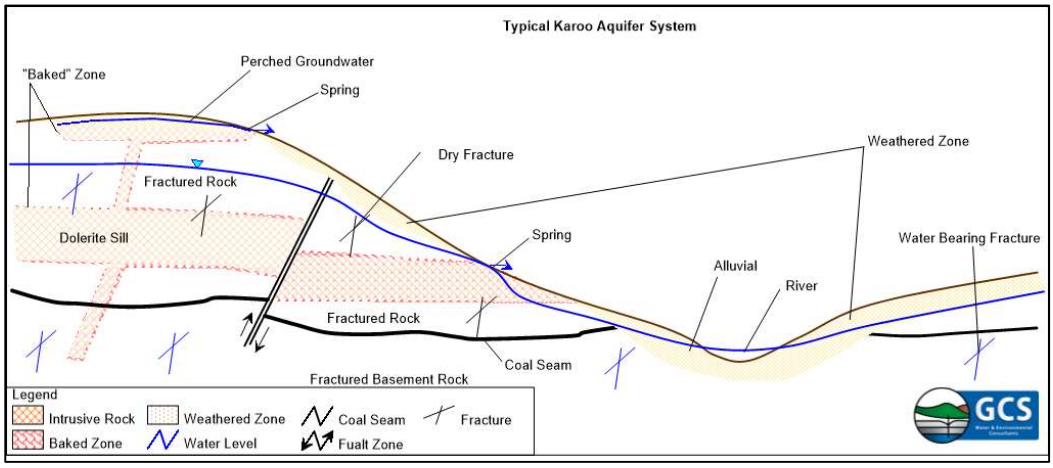


Figure 6-38*:* Conceptualisation of the study area aquifer zone

6.9.1.2 Preferential Flow Paths

Dolerite intrusions in the form of dykes and sills are common in the Karoo Supergroup and are often encountered in the study area. These intrusions can serve as both aquifers and aquifuges[30].

Thick un-weathered dykes will inhibit the flow of water, while the baked and cracked contact zones can be highly conductive. These conductive zones effectively interconnect the strata of the Ecca sediments both vertically and horizontally into a single, but highly heterogeneous and anisotropic zone on the scale of typical mining activity.

Various dolerite dykes and contact zones have been mapped during the course of the underground mining activities in the area. The strike of the dykes in this area are both parallel and perpendicular to the direction of groundwater flow and therefore act as no flow and preferential flow boundaries. It is therefore currently assumed that the different groundwater bearing horizons are interconnected on a regional scale. On a more local scale, the sills can present horizontal barriers to groundwater flow which results in the local development of wetlands and springs.

Furthermore, significant vertical displacement of the coal seams has been observed adjacent to some geological structures in the project area, which suggests that faulting has occurred. Significant differences in water levels were observed across some of these faults, which suggest that in places faults act as barriers to groundwater flow, creating separate groundwater compartments (ERM, 2013).

6.9.1.3 Primary Groundwater Occurrence

According to literature for the region (King *et al.,* 1998), groundwater is typically encountered in/along:

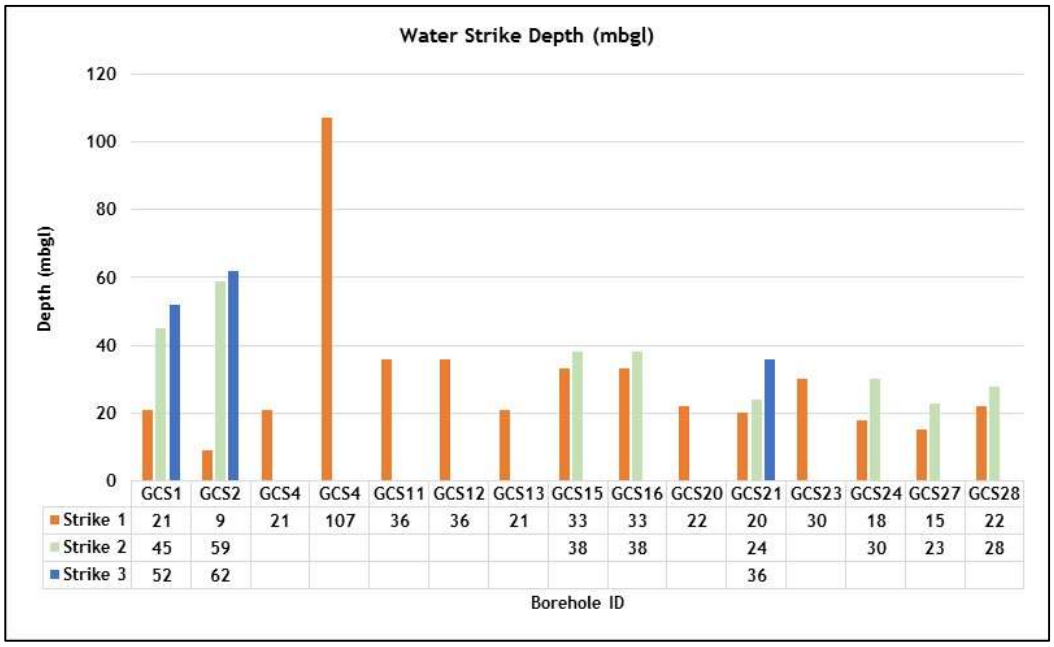
- Dolerite dyke and sill contacts with host rock;
- Contact zones between lithologies or unconformities; and
- Faults and associated fracture zones.

Based on borehole logs drilled in 2013 by GCS (GCS, 2013), it is clear that groundwater in the local area is typically encountered within contact zones between lithologies or unconformities.

Figure 6-39 plots available water strike data for boreholes previously drilled by GCS with hydrogeological data recorded. The first water strike generally occurs at a depth in the order of 29mbgl, with the exception of borehole GCS4. The 2nd water strike generally occurs at a

[30] **Aquifuge:** An impermeable body of rock which contains no interconnected openings or interstices and therefore neither absorbs nor transmits water.

depth in the order of 35mbgl and the third water strike at depths > 50mbgl. Irrespective of the borehole depth, water strikes generally occurred along sandstone/siltstone (shale) contacts as well as dolerite contacts with the host rocks.



	GCS1	GCS2	GCS4	GCS4	GCS11	GCS12	GCS13	GCS15	GCS16	GCS20	GCS21	GCS23	GCS24	GCS27	GCS28
Strike 1	21	9	21	107	36	36	21	33	33	22	20	30	18	15	22
Strike 2	45	59						38	38		24		30	23	28
Strike 3	52	62									36				

Figure 6-39*:* Borehole water strike depths

6.9.2 Groundwater Levels and Direction

As groundwater flow behaviour is aligned to surface water flow conditions, it was assumed that the aquifer extent for the work conducted by GCS coincides with the surface water catchment boundaries.

There are several monitoring boreholes situated at the Maquasa and Nooitgesien Operation Areas. Furthermore, several groundwater levels have previously been recorded at hydrocensus boreholes identified in the area.

Based on the available groundwater data (1998 - 2022) the groundwater levels range from 1.8 to > 50 mbgl. In some areas, piezometric pressure heads cause artesian conditions, where groundwater emerges to the surface via boreholes drilled into these confined aquifers. **Figure 6-40** plots the groundwater elevation vs topographic elevation for groundwater boreholes in the project area. There is a good linear relationship between topographic and groundwater elevations. The data suggest that the groundwater table mimics the topography and that groundwater levels have not fluctuated significantly between the hydrocensus periods.

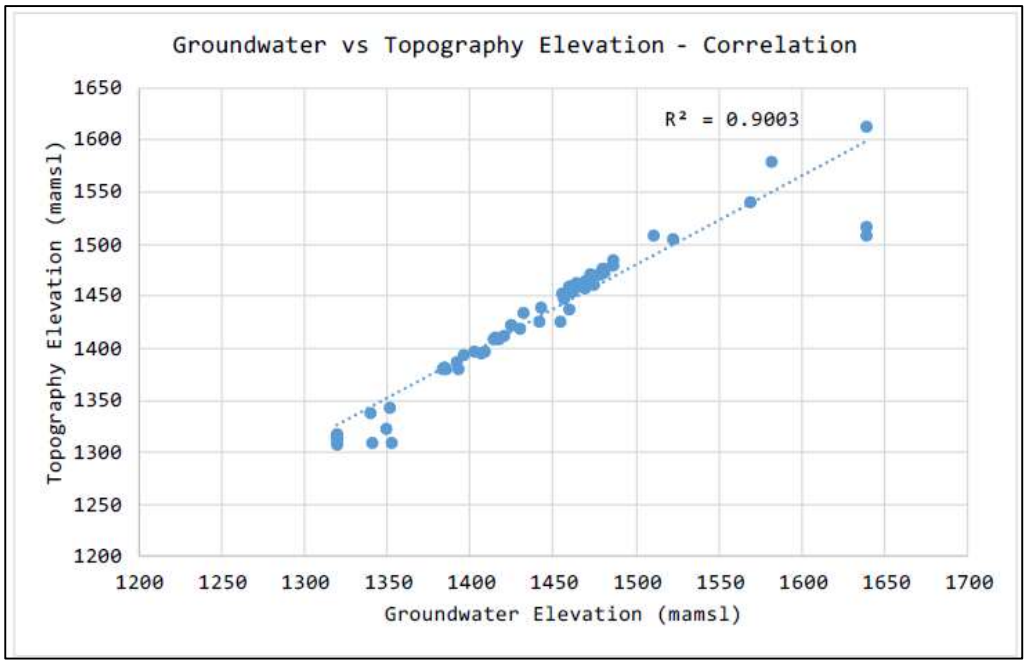


Figure 6-40: Groundwater elevation vs topographic elevation

6.9.3 Groundwater Recharge

The effective groundwater recharge from rainfall is the portion of rainfall that reaches the groundwater rest level and excludes surface water runoff, evapotranspiration and soil moisture. The effective rainfall recharge is dependent on catchment geology, soils and surface runoff and stream morphology.

Recharge in the order of 5 to 7% (King *et al.*, 1998; DWAF, 2006) of the MAP was calculated and will vary depending on the annual rainfall. Groundwater recharge, calculated using the chloride (Cl) method, gives rainfall recharge figures varying between as high as 25% and as low as 10% (ERM, 2013).

Observed discharges from the weathered aquifer in other areas of Mpumalanga suggest isolated occurrences of recharge as high as 15% of the annual rainfall. The average natural recharge to the deeper fractured aquifer is estimated to be in the order of 3 - 5% of the annual rainfall (GCS, 2008).

It is highly likely that recharged of mined out and backfilled opencast areas can be as high as 15%. Moreover, conveying any surface water (i.e. stormwater or seepage wastewater) underground will greatly increase artificial recharge to the groundwater aquifer.

6.9.4 Aquifer Yield

The aquifer can be considered a low to moderate-yielding aquifer and has a reported average yield in the order of 0.5 l/s to 2 l/s (King *et al.*, 1998a and King *et al.*, 1998b).

Boreholes drilled in the Maquasa and Nooitgesien areas have low yields in the range of 0.01 to 4.5 l/s (refer to **Figure 6-41**). Higher blow yields are often encountered at boreholes drilled into contact zones associated with dolerite intrusions, or fault zones.

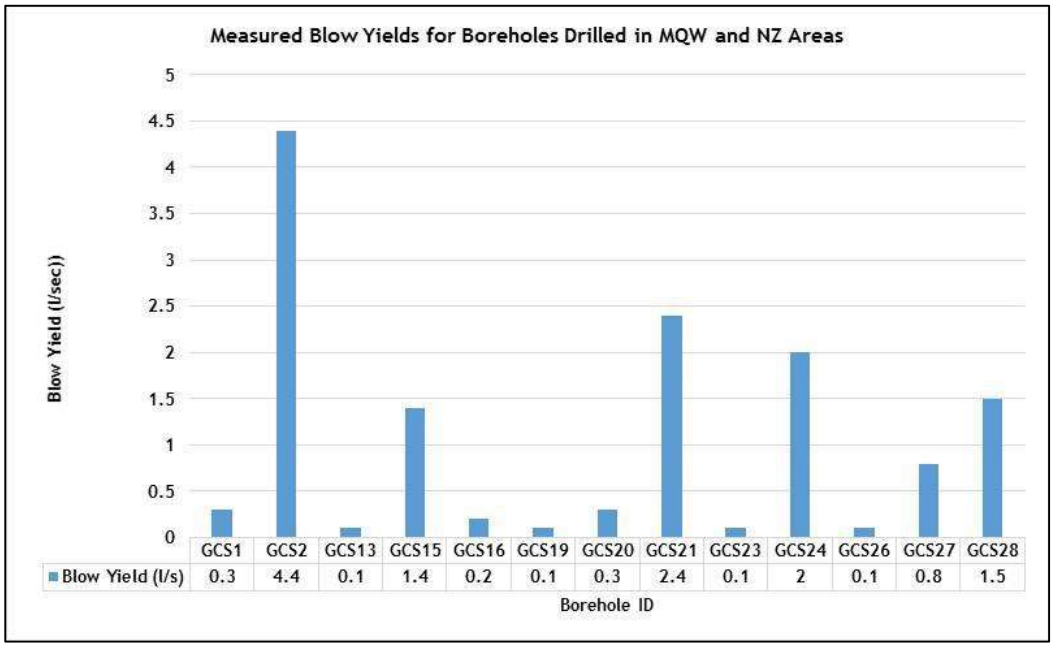


Figure 6-41*:* Measured blow yields for boreholes drilled in the Maquasa and Kusipongo areas

6.9.5 Groundwater Quality

The groundwater quality results were obtained from the *Water Quality Monitoring Report for the Kangra Coal Maquasa East, Maquasa West & Nooitgesien Operations: Third Quarter, 2022 Monitoring Period'* (Annexure A).

6.9.5.1 Maquasa West and Nooitgesien

The following observations were made during the 2022 third quarter monitoring event:

- Borehole GCS20 indicated slightly acidic pH levels (5.8) while the remaining boreholes indicated neutral to slightly alkaline pH levels (6.5 to 8.2); refer to **Figure 6-42**.
    - The pH levels at borehole GC19 (8.2) and GCS20 (5.8) were non-compliant with the WUL limits; the remaining boreholes were compliant.
- Boreholes GCS18, GCS19, GCS20 and GCS21 showed low to no significant impact from the site, based on typical mine indicator parameters.

- Elevated EC, TDS, total alkalinity, sodium and fluoride concentrations exceeded the WUL limits at GCS21.
- Nitrate concentrations (<0.8 mg/l) slightly exceeded the WUL limit at GCS18, GCS 19 and GCS20.

- The water quality at boreholes GCS22, GCS23 and GCS24 located downgradient of the NS mine workings, was non-compliant when compared to the WUL limits.
  - EC, TDS, total hardness, calcium, magnesium and potassium concentrations were elevated above the WUL limits at all three (3) boreholes. Additionally, sodium was in exceedance at GCS22 and GCS24. TDS ranged between 840 mg/l (GCS23) and 2 000 mg/l (GCS24); refer to **Figure 6-43**.
  - All three (3) boreholes are characterised by fluctuating sulphate concentrations, which exceed the WUL limit, ranging between 548 mg/l (GCS23) and 1 960 mg/l (GCS24) in October 2022 **(Figure 6-44**). The water quality at GCS22 and GCS24 has deteriorated since 2020. Borehole GCS23 indicated an initial improvement in water quality between 2019 and 2021, however subsequent data indicates deteriorating water quality.
  - Additionally, nitrate concentrations exceeded the WUL limit at all three (3) boreholes ranging between 0.6 mg/l (GCS24) and 1.9 mg/l (GCS22), in October 2022.
  - In terms of metal concentrations, manganese was elevated at all three (3) boreholes, ranging between 1.0 mg/l (GCS23) and 15.0 mg/l (GCS24) in October 2022.
- Borehole GCS24 is located adjacent to the NS opencast workings. Water level data for this borehole shows rebounding water levels following a period of drawdown at the opencast workings. As such, the groundwater flow path is now moving away from the opencast workings and the data shows that the Zone of Impact (ZOI) has been intersected by GCS22, GCS23 and GCS24.

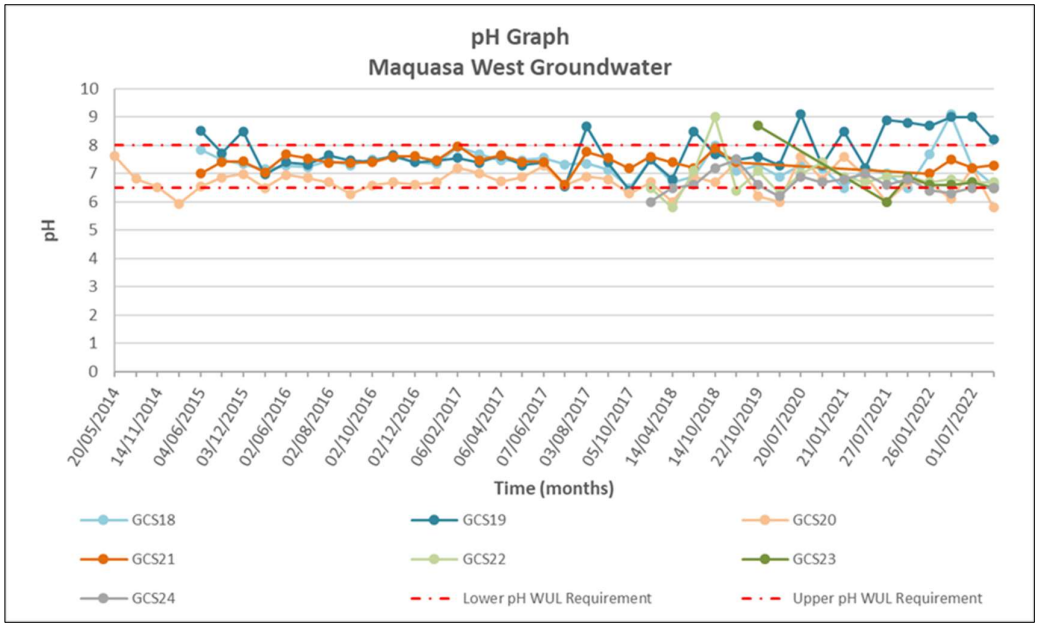


Figure 6-42: Maquasa West groundwater pH graph

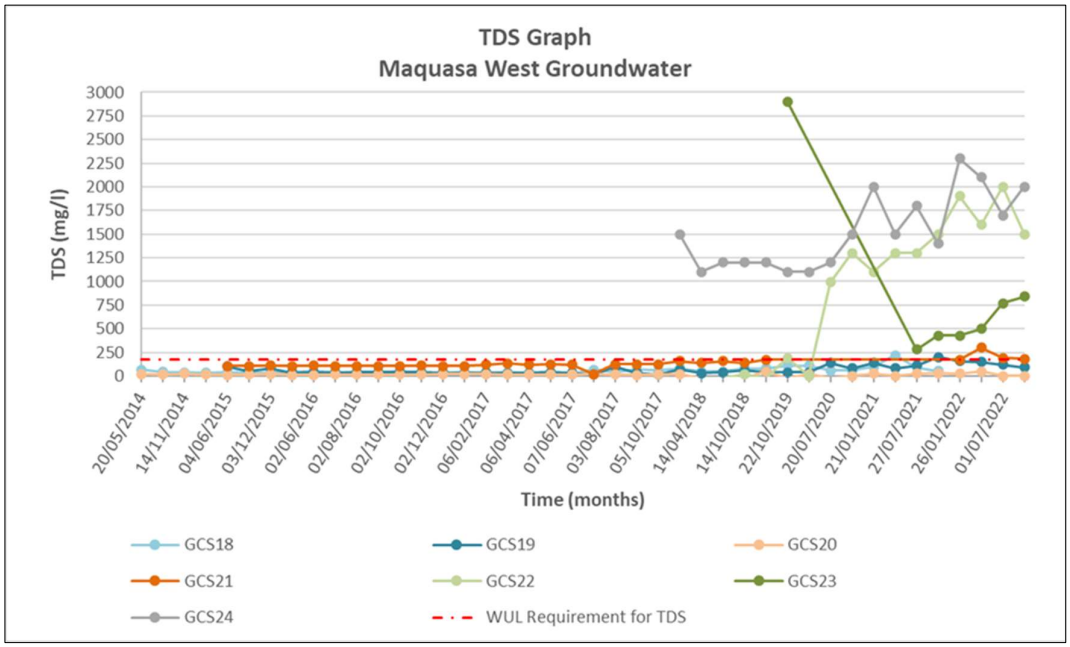


Figure 6-43: Maquasa West groundwater TDS graph

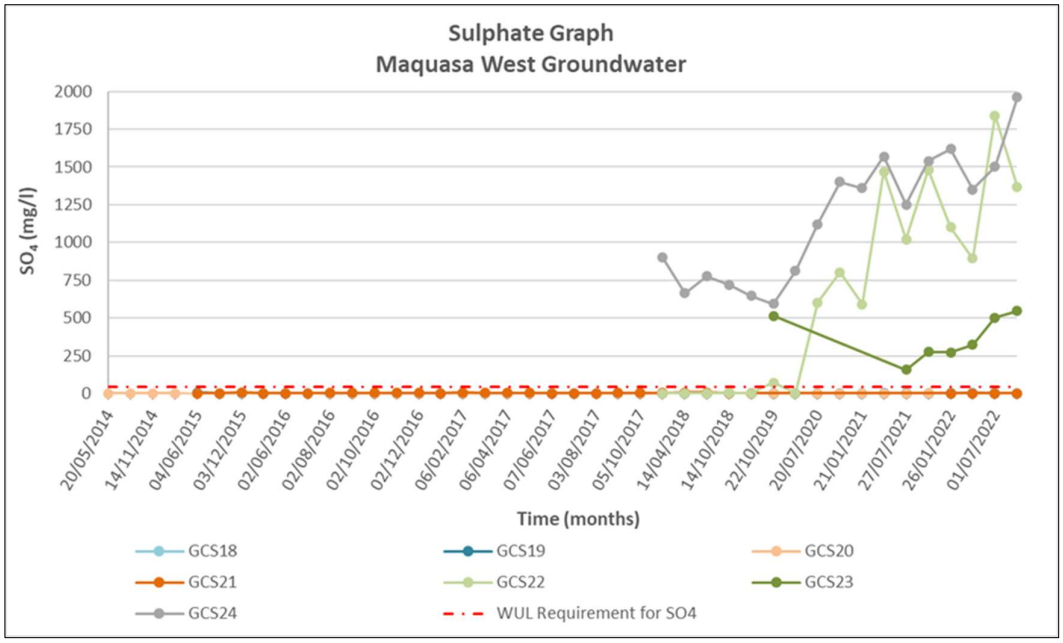


Figure 6-44: Maquasa West groundwater sulphate graph

6.9.5.2 Maquasa East

Borehole BCBH02 is buried. Four (4) new boreholes (GCS28, MON BH03, MON BH04 and MON BH05) were added and one borehole (Well Yende Family) was removed from the groundwater monitoring network in September 2022.

The following observations were made during the 2022 third quarter monitoring event:

- All groundwater monitoring points exhibited neutral pH conditions, ranging between 6.5 and 7.9; refer to **Figure 6-45**.
- Boreholes Well Yende, BH 923, BCBH01, GCS11, GCS12, GCS13, GCS14, GCS15, MON BH04 and MON BH05 showed low to no significant impact from the site in the third quarter of 2022.
    - Slight exceedances of the WUL Limits were observed, including chloride at Well Yende, fluoride at BCBH01, potassium, chloride and fluoride at MON BH04 and sodium at MON BH05.
    - Additionally, nitrate was elevated at most points, ranging between 0.3 and 6.9 mg/l.
- The water quality at KGA1, KGA2, GCS16, GCS17, GCS28 and MON BH03 was non-compliant when compared to the WUL limits.
    - Several parameter concentrations exceeded the WUL Limits in October 2022:

- EC, TDS, calcium, magnesium, sodium, potassium, total alkalinity, chloride and total hardness were elevated at GCS16. GCS16 indicated the most impacted water quality, with TDS recorded as 1 400 mg/l.
- EC, TDS, magnesium, sodium, potassium and chloride were elevated at KGA1.
- Potassium and nitrate were elevated at KGA2.
- EC, TDS, sodium, total alkalinity, chloride and fluoride were elevated at GCS17.
- EC, TDS, calcium, magnesium, potassium and total hardness were elevated at GCS28.
- EC, TDS, calcium, magnesium, sodium, potassium, total alkalinity, fluoride and total hardness were elevated at MON BH03.

o Sulphate concentrations varied at the site; refer to **Figure 6-46.**

- Sulphate at GCS16 has displayed a stable trend over time, consistently exceeding the WUL limit, recorded as 764 mg/l in October 2022. GCS16 is decanting directly from the underground workings at MQE into a PCD, situated in close proximity to the Heyshope Dam.
- Sulphate at KGA1 and KGA2 have displayed an increasing trend over time, currently exceeding the WUL limit, recorded as 300 and 73 mg/l respectively in October 2022. KGA1 is situated downgradient of the Discard Plant and KGA2 is situated downgradient of both the DD and the underground workings at MQE.
- Sulphate was also elevated at GCS28 (240 mg/l) and MON BH03 (93 mg/l) in October 2022. Future monitoring will confirm the trends.

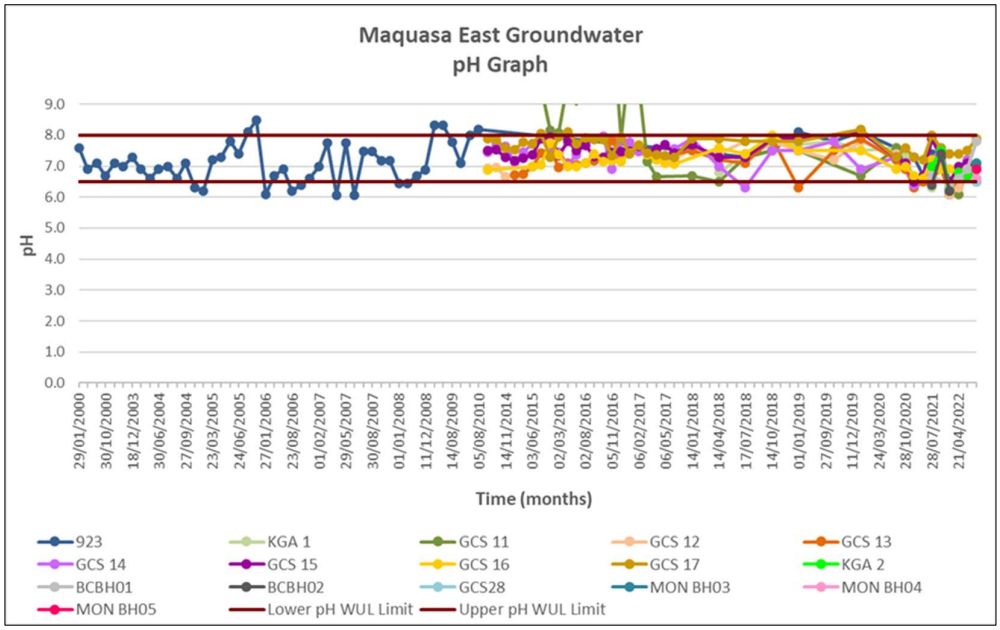


Figure 6-45: Maquasa East groundwater pH graph

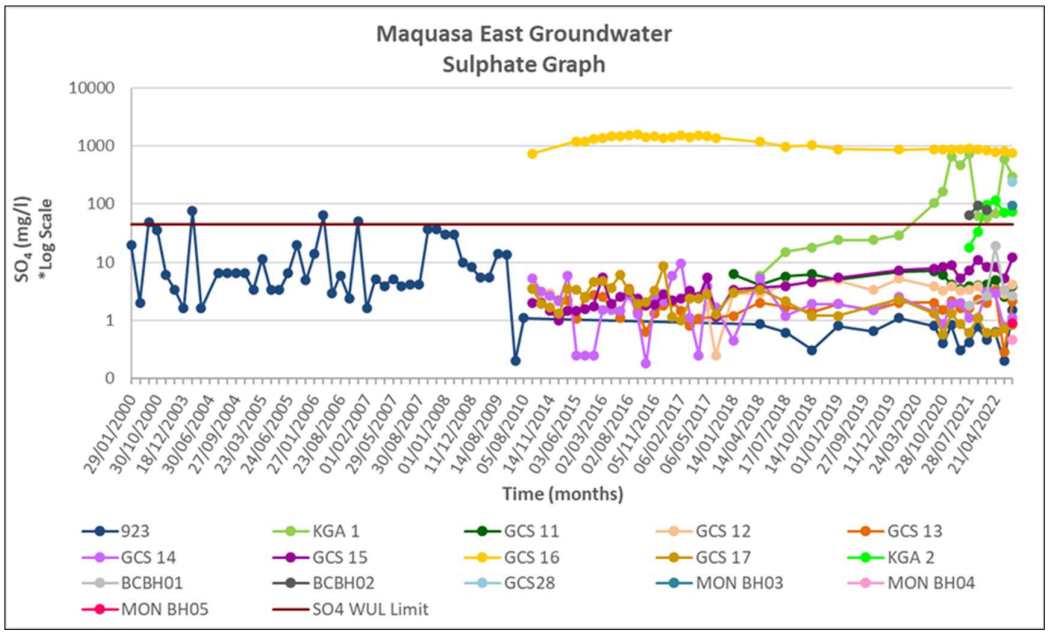


Figure 6-46: Maquasa East logarithmic groundwater sulphate graph

6.9.6 Hydrocensus

Given that groundwater flow direction generally follows the surface topography of the area; the hydrocensus survey focused more on eight (8) opencast pits. To identify the groundwater users, a census of all groundwater abstraction points was conducted within and surrounding

the mining area.

The survey of boreholes and springs was undertaken during site investigation before the rainy season. The survey was aimed at identifying existing users, depth to water levels, depth of boreholes, and the ambient groundwater quality. This included all the springs and boreholes in a search area of 1 500ha. No boreholes which are used for water supply were found during the survey. Only one spring, which was used by the local community, was identified (Spring 4). Water levels were also measured in the newly drilled hydro-exploration boreholes (GCS 11 - GCS 30), open uncased exploration boreholes (A – AAZ, BHM 1&3), and existing monitoring boreholes (GCS 1 & 2). The hydrocensus results are presented in the map under **Figure 6-47.**

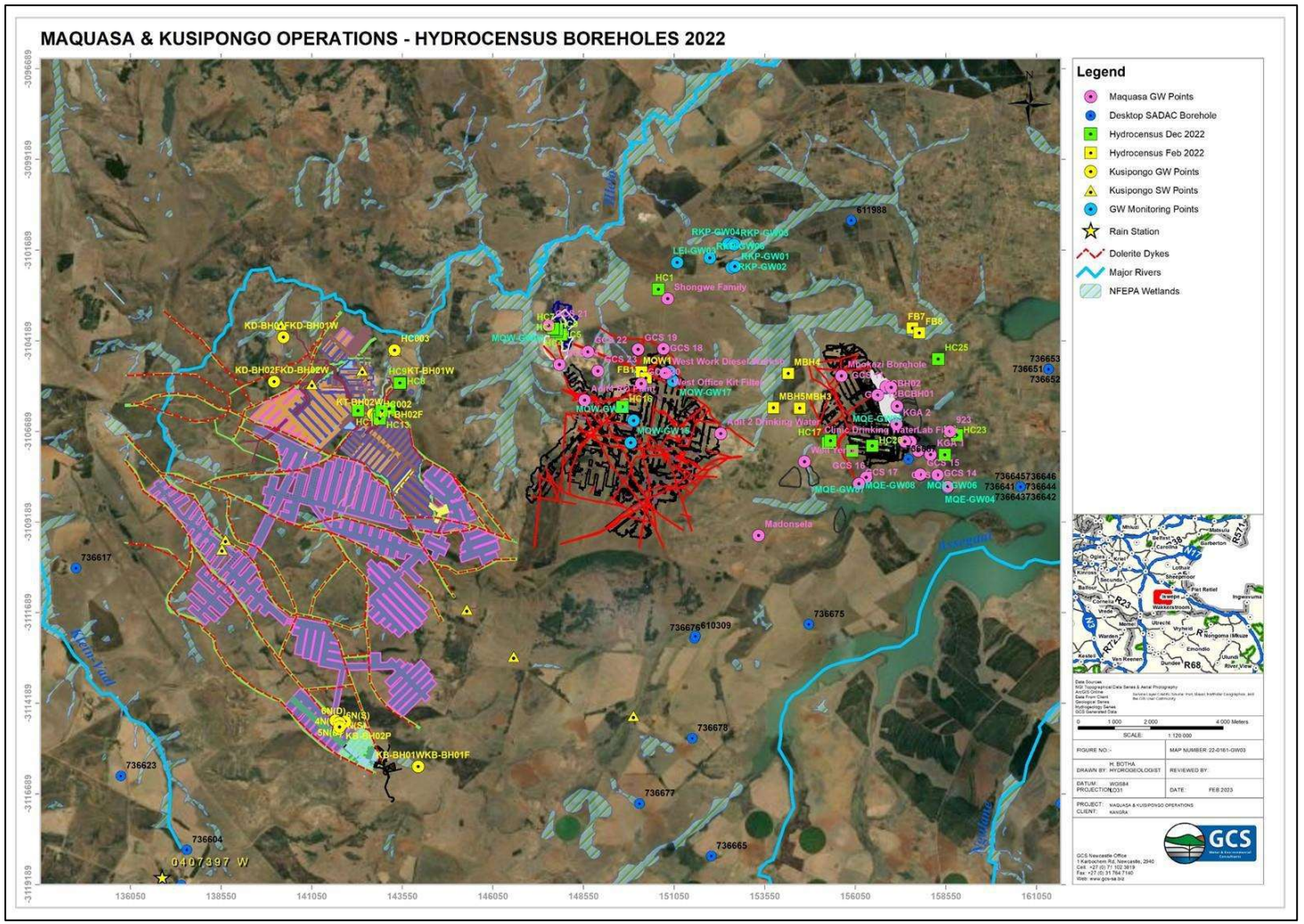


Figure 6-47: Hydrocensus boreholes in the vicinity of the Study Area

6.9.7 Conceptual Groundwater Model

6.9.7.1 Pollution Sources

The following sources have been identified:

- Underground workings at MQE and decant therefrom into the Heyshope Dam- an existing source of pollution.
- Mined out MQW workings – partially flooded.
- Several historic open cast sections around NZ, MQE and MQW (rehabilitated).
- Processing plant, PCDs (lined), ROM stockpiles and product stockpiles.
- A CDF (coal discard and coal slurry) was constructed on top of the old MQE workings.
- Overburden dumps around the access ports of MQW and Nooitgesien.
- Offices, ablution, stores, hard park, existing dams, channels, berms, culverts, silt traps, oil traps, fuel depot, workshop, wash bay, substation, parking and sewage management.

Material present in the underground working cavities consists of the roof and floor sandstones, shales and dolerite (likely some carbonaceous rock in contact with the coal seam) and coal pillars, which are required to be barred down from above the mined horizon making the working environment safe and will not be waste generated from the mined seam.

ROM is generally kept on-site long enough to ensure haulage for processing. ROM will be a combination of floor and roof sandstone (traces), shale (traces) and coal. The footprint of the ROM pads is maintained as small as possible.

Based on the available mine plan, coal (ROM), soft material, hard rock material, topsoil, coal discard and slurry wastes will be kept on-site. Acid drainage is associated with the DD and slurry wastes as well as the hanging wall, footwall, and mine pillars within the mining void during and after mining. Neutral mine drainage may be associated with the softs and hard dumps which may contain sulphide-rich minerals, and SD can be expected for flooded mine workings which do daylight (i.e. diffuse decant to surface as is currently observed at MQE).

GCS has previously (2013 and 2022) conducted various Acid-Base Accounting (ABA), Net-Acid Generation (NAG), X-Ray Diffraction (XRD), X-Ray Fluorescence and static leach tests on coal and overburden (shale, sandstone, and siltstone) material samples retrieved from the Maquasa mining areas. These studies established that the coal discard and coal slurry samples from the MQE DD are potentially long-term acid generating.

Coal and coal wastes have a significant potential to generate AMD, while overburden samples showed a low AMD potential. The overburden/roof samples are also likely to generate low to medium salt loads.

SO_4 is the dominant anion that leached out in the peroxide extraction. Al, As, Fe, Mn, Ni and Sb are present at elevated concentrations in the peroxide extraction from either the coal or the overburden samples. None of these metals and trace elements leached at high concentrations in the peroxide extraction of the floor sample as the solution is near neutral.

6.9.7.2 Pathway

Based on the aquifer characteristics (e.g. weathering depth, groundwater strike and static water levels), the hydrogeological system at the project site can be categorised into two aquifers: shallow weathered rock/material aquifer and deeper fractured rock aquifer hosted within the Vryheid Formation sediments.

Shallow weathered rock/material aquifer – Vryheid Formation sediments comprise highly weathered material and have an average thickness of between ~5 and ~27 m. Due to the limited depth extent and average depth to groundwater (between ~2.5 and ~35 m), it is unlikely that this system will comprise a significant groundwater potential. However, in terms of seepage emanating contaminant transport, this aquifer is considered important.

Deeper fractured rock aquifer – Vryheid Formation sediments comprise a thick sequence of interlayered sediments with limited primary porosity. Secondary structures are likely to result in the development of discrete zones of high hydraulic conductivity. Although specific differences in the lithological units of this formation are observed (e.g. degree of weathering and alteration etc.), the lithology of this formation can be considered similar across the project site.

Various dolerite dykes and contact zones have been mapped during the underground mining activities and exploration drilling in the area. The strike of the dykes in this area are both parallel and perpendicular to the direction of groundwater flow and therefore act as no flow and preferential flow boundaries. It is therefore currently assumed that the different groundwater bearing horizons are interconnected on a regional scale. On a more local scale, the sills can present horizontal barriers to groundwater flow which results in the local development of wetlands and springs.

The groundwater table mimics the topography and groundwater flows from high-lying areas (water divides) to low-lying areas, with groundwater levels varying from the surface (seepage) to >50 mbgl. The variation in groundwater levels is due to the topography changes associated with the steep escarpments as well as the result of localised structural features (i.e. barrier) traversing the project area.

6.9.7.3 Receptors

No groundwater-dependent receptors within the project area have been identified. However, the many non-perennial (ephemeral) and perennial streams in the study area are considered the end-receptors of any poor quality seepage or loss of base flow (i.e. mine dewatering impacts). Due to the mining depth at Kusipongo and Maquasa both the weathered and fractured aquifer zones are considered receptors of potential pollution.

6.9.8 Numerical Groundwater Model

The update of the numerical flow and transport model for the Maquasa Operations is presented in this section. The parameters, structure of the model is provided under Chapter 7 of the Geohydrological Report (Appendix E-4).

The purpose of the modelling exercise is to understand the operational groundwater flow system; simulate the existing Zone of Impact (ZOIp) associated with the mining operations (SO_4 was used to illustrate plume movement); and to simulate the zone of influence (ZOIf) for active mine workings.

The groundwater regime of the study area is highly heterogeneous due to complex faulting and intrusions, which ultimately influence the groundwater flow patterns. Constructing a groundwater flow model with all the detail is close to impossible; however, assumptions are made based on data gathered and used to simulate different scenarios to conclude with management protocol.

6.9.8.1 Calibrated Flow Model

Groundwater flow models are simplified mathematical representations of complex aquifer systems. The simplification limits the accuracy with which groundwater systems can be simulated. There are numerous sources of error and uncertainty in these models, stemming from practical limitations of grid spacing, time discretisation, parameter structure, insufficient calibration data, and the effects of processes not simulated by the model. These factors, alongside unavoidable error in field observations and measurements, result in uncertainty in the model predictions.

The calibrated flow model with simulated groundwater elevations is shown in **Figure 6-48**. The following is noted when evaluating the flow model:

- The groundwater table mimics the topography.
- The flow model indicates groundwater flow velocities ranging from 0.01 (min) to 1.75 (max) m/day (or 638 m/yr). Groundwater movement in the weathered zone is greater than that of the deeper aquifer zones, as well as several orders greater in the

alluvium zones when compared to the host rock.

6.9.8.2 Calibrated 2022 Sulphate Plumes (ZOIp)

Calibrated sulphate plume for MQE is shown in **Figure 6-49**. In general, it is observed that pollution plume gradients are higher closer to known mine waste residue sites, and gradually decrease further away towards lower laying areas (prevailing groundwater flow directions).

6.9.8.3 Simulated Aquifer Drawdown

The simulated aquifer drawdown as a result of the opencast mining operation at MQE is shown in **Figure 6-50**.

Due to the general stable trend of groundwater levels, as well as the observation that several boreholes situated along pit areas or actively dewatered adits down reflect dewatering patterns, the dewatering model could not be calibrated. Hence, the maximum potential aquifer drawdown ZOIf is presented for active workings. The dewatering zones were defined based on the provided mining plan up to the year December 2022.

Although the mines in the project area very seldom have groundwater ingress, dewatering activities may induce aquifer drawdown.

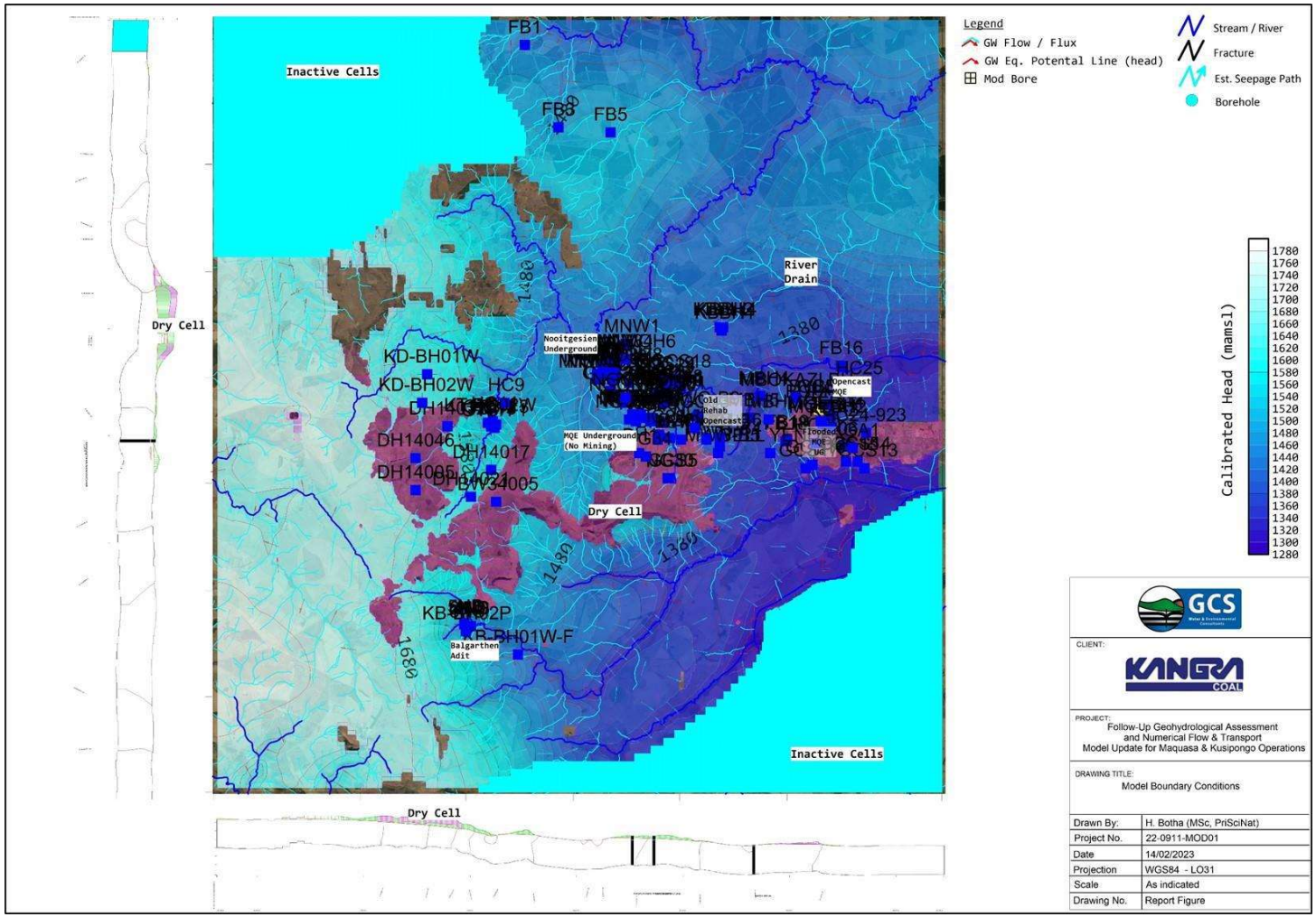


Figure 6-48: Calibrated flow model for the Kusipongo and Maquasa Operations

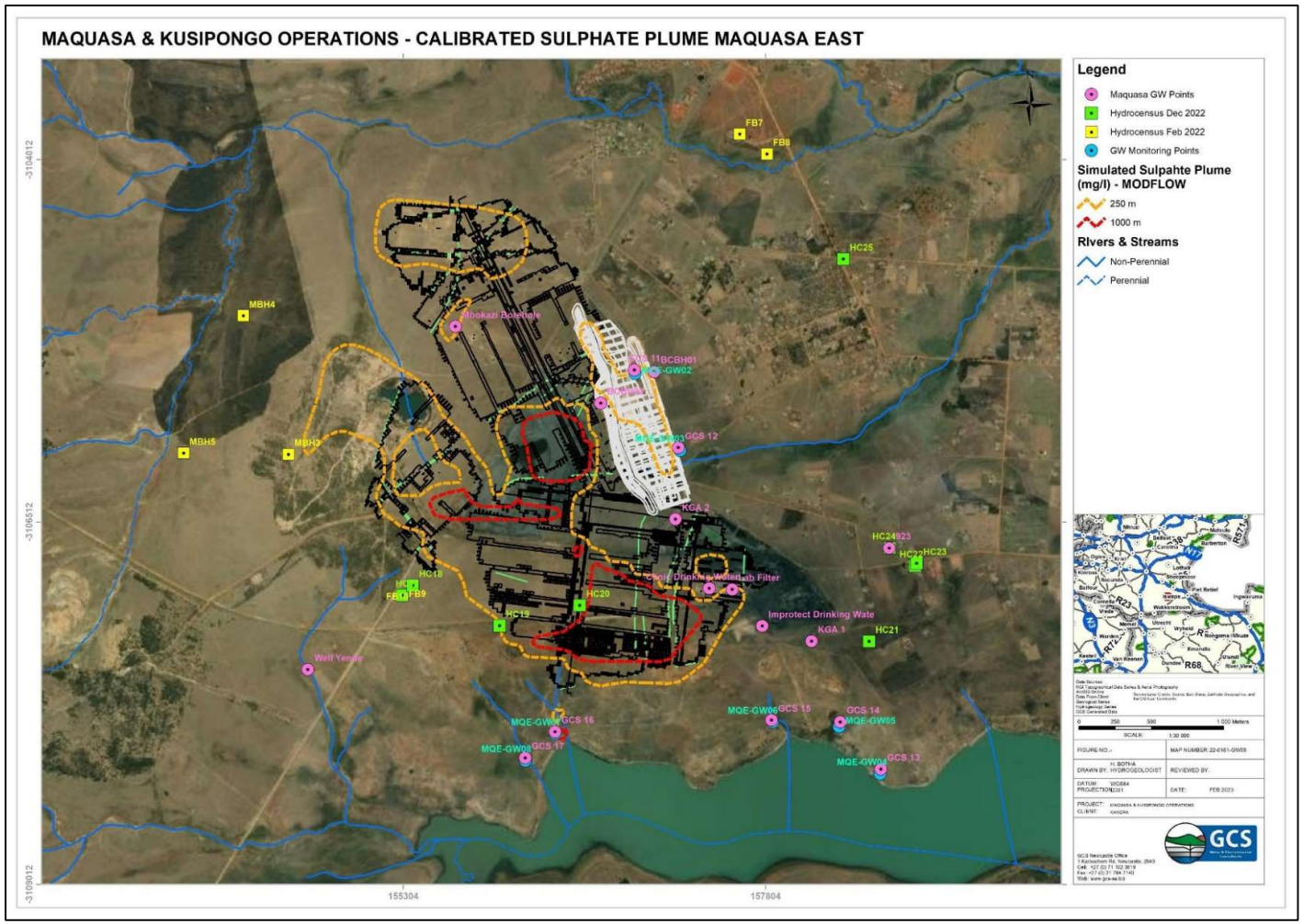


Figure 6-49: Calibrated sulphate plume for the year 2022 – MQE

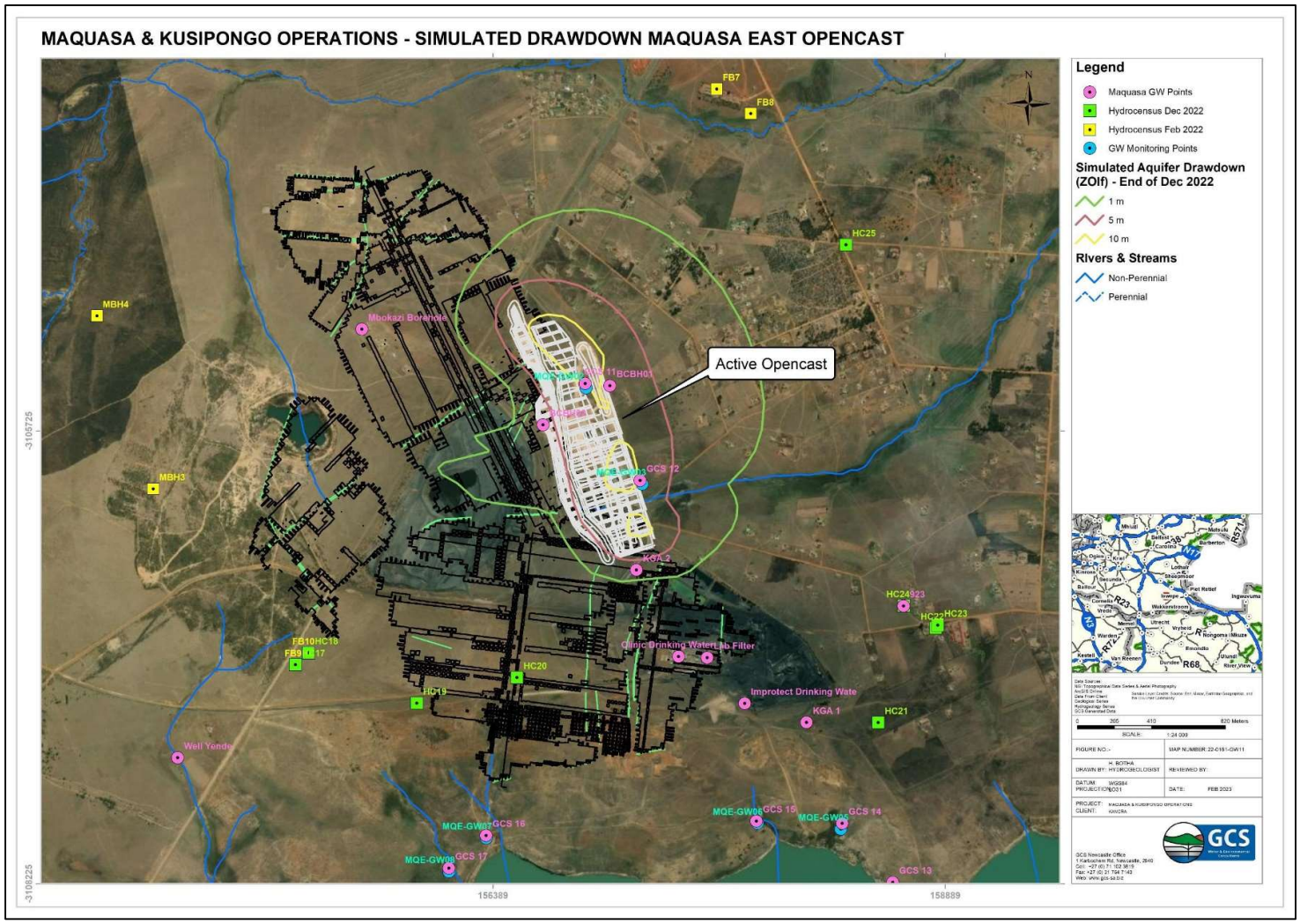


Figure 6-50: Predicted aquifer drawdown (ZOIf)- MQE opencast operations

6.10 Air Quality

The proposed project is located within the northeastern portion of the Highveld Priority Area (HPA) declared in 2007 terms of the NEMAQA.

Approximately half of the total annual emissions (279 630 tonnes/a) of fine particulate matter (PM10) within the HPA, is attributed to particulate entrainment on mine haul roads. Primary metallurgical industry and power generation account for 17% and 12% respectively. Other substances of concern are Nitrogen Oxides (NOx) (73% from power generation) and Sulphur Dioxide (SO_2) (82% from power generation).

Other sources of emissions within the HPA include the petrochemical industry, motor vehicles, clay brick manufacturing, household fuel burning, etc.

According to the HPA Air Quality Management Plan (AQMP), most of the HPA experiences relatively good air quality, but there are nine (9) extensive areas where ambient air quality standards for SO_2, NO_2, PM10 and Ozone (O_3) are exceeded. These nine(9) areas are referred to as hotspots.

The PSLM is highlighted as a hotspot, however, ambient air quality complies with the standards because the frequency of the exceedances recorded is within the tolerance limits. The exceedances of S~ limit values occur at the Majuba monitoring site (close to the Majuba Power Station).

The “Deadly Air” Case in 2019, brought to the Pretoria High Court by the Centre for Environmental Rights on behalf of two environmental justice groups, Groundwork and the Vukani Environmental Justice Movement, sought recourse on the high air pollution levels in the HPA (Wernecke, et.al., 2022). The "Deadly Air" Case is an indication of the aims set out in the AQMP since it was published.

The proposed project is located within a landscape comprising of natural vegetation and small patches of cultivated fields. The main sources of air pollutants include:

- Emissions from vehicles, i.e., mine trucks and vehicles travelling along nearby main roads; and
- Dust created from conveyors, RoM stockpiles, opencast pits, and the coal washing plant.

6.11 Noise

In 2008, a Noise Impact Assessment was undertaken by DBAccoustics (Van der Merwe, 2008) in respect of the Power Station and Ash Dump. The noise survey found that the mining and mining related activities are the sources of noise in the general area, i.e. mine vehicles; conveyors; and ventilation fan noise from the MQW Mining operations (clearly audible in the study area when there is a westerly wind) and the crushing and screening plant at MQE.

The prevailing noise level recorded at the gravel road (to the south of the proposed CDF location and adjacent to a conveyor) at the time of the survey was 66.7 dBA during the daytime and 70.0 dBA during the nighttime.

The noise assessment established that the district cannot be classified as a rural district according to the definition set out in the SANS 10103 of 2008. There are existing mining activities with the result that there is more traffic (heavy-duty vehicles), which is one of the biggest contributors to the higher prevailing ambient noise levels.

The Driefontein residential area and the residents are already exposed to a certain extent of higher noise levels than expected in a residential area.

6.12 Heritage and Archaeology

A Phase 1 Heritage Impact Assessment was undertaken by Dr Julius C.C. Pistorius in 2013 in respect of the MQE opencast mining expansion project.

During the survey, two square dwellings dating from the recent past (less than 60 years) were identified. These dwellings are of low significance.

No sites of high significance (e.g. graveyards) were identified within the areas surveyed. No further cultural, heritage, or archaeological studies are considered necessary for the project area.

It is always a possibility that the assessments may have overlooked heritage resources in the areas surveyed. This is because heritage sites may occur in tall grass or in Blue Gum lots, while others may lie below the surface of the earth and may only be exposed once development commences. To address this a Chance Finds Procedure will be developed prior to construction, as stipulated in the EMPr.

6.13 Socio-Economic Environment

6.13.1 Regional Context

Kangra is located within the Mpumalanga Province, GSDM, MLM, and PSLM. Mpumalanga means "the place where the sun rises".

Mpumalanga lies in eastern South Africa, north of KwaZulu-Natal, and borders Swaziland and Mozambique. In the north, it borders on the Limpopo Province, while to the west it borders on the Gauteng Province, to the southwest it borders on the Free State Province, and to the south the KwaZulu-Natal Province. The capital of the province is Mbombela (previously known as Nelspruit).

Mpumalanga Province is divided into three (3) District Municipalities (DM), which are further subdivided into 17 Local Municipalities (LM). The DMs for the Mpumalanga Province are

provided below:

- GSDM.
- Nkangala DM.
- Ehlanzeni DM.

The GSDM is divided into the following LM:

- Chief Albert Luthuli Local Municipality.
- Msukaligwa Local Municipality.
- MLM.
- PSLM.
- Lekwa Local Municipality.
- Dipaleseng Local Municipality.
- Govan Mbeki Local Municipality.

6.13.2 Local Context

The following information has been sourced from the GSDM Amended Integrated Development Plan 2021-2022 and the Statistics South Africa 2016 Census Data.

6.13.2.1 Demographic Profile

Population and Household Profile:

The population size (persons) for the Mkhondo LM increased by 2.1% over the 2011 to 2016 time period, whereas the Dr Pixley Ka Isaka Seme LM had a growth of 0.6% over the same period. The GSDM only saw a slight increase (1.9%) in population size between 2011 and 2016. Households have grown over the 2011 to 2016 time period, with the GSDM experiencing an increase of 18.07%.

Population Group:

The Mkhondo LM population is composed of mostly Black African persons (98%) followed by 1% White persons. The Dr Pixley Ka Isaka Seme LM population has a similar composition with 92.1% Black African persons followed by 6.7% White persons The GSDM shows a 91.6% Black African population with a larger percentage of White persons (6.8%) (Statistics SA, 2016).

6.13.2.2 Economic Profile

This section provides a delineation of the study area and a brief economic status quo pertaining to employment and labour profile.

Employment and Labour Profile:

The employment status of the population has a variety of important implications. Economically active and employed persons can contribute to the overall welfare of a specific community by paying their taxes, looking after the youth and aged, and by stimulating the economy. However, should a community have a large number of economically inactive and/or unemployed persons, the burden on the economically active population of that community is amplified.

Gert Sibande's unemployment rate was the lowest among all the districts in Mpumalanga (28.7%). In 2019 the youth unemployment rate was at 58.0% with a very high youth unemployment rate of females (68.5%). The job loss estimates in 2020, due to the COVID-19 lockdown, were between 30 000 and 39 000 with & the unemployment rate (strict definition) increasing to between 35.3% and 37.4%. In 2019, the Mkhondo LM had an unemployment rate of 32.3% (20 075 people) and the PSLM had a 37.5% unemployment rate (10 215 people).

In 2019, Trade (23.2%), Community Service (18.3%) and Finance (12.9%) were the top three (3) leading industries in terms of providing employment in the GSDM. However, the largest industries in the GSDM are Mining, Manufacturing, Community Services and Trade.

Mkhondo LM's top three (3) industry sectors are Agriculture (25.2%), Trade (15.8%) and Transport (14.5%). Dr Pixley Isaka Ka Seme LM's top 3 industry sectors are Utilities (12.2%), Construction (11.5%), and Agriculture (7.5%)

Water and Sanitation

In the GSDM, 81.3% of people have access to safe drinking water with 87.2% of Dr Pixley Ka Isaka Seme LM and 85.4% of Mkhondo LM residents having access to safe drinking water. The top three (3) main sources of water for drinking in both GSDM and Mkhondo LM were piped tap water (inside yard), followed by piped tap water (inside dwelling) and finally flowing water/stream. Whereas Dr Pixley Ka Isaka Seme LM's top three (3) main sources for drinking water were piped tap water (inside yard), followed by piped tap water (inside dwelling) and finally boreholes.

The majority of residents in the GSDM (97.38%) have access to some type of toilet facility. The main toilet facility access is via flush toilets connected to public sewage systems (67.14%), followed by pit toilets with a ventilation pipe (11.8%) and pit toilets without a ventilation pipe (11.08%). However, 2.62% do not have access to any type of toilet facility. In the Mkhondo LM, 95.69% of residents have access to toilet facilities. The main toilet facility

access is via flush toilets connected to public sewage systems (42.78%), followed by pit toilets without ventilation (32.27%) and ecological toilets (9.8%). In the Dr Pixley Ka Isaka Seme LM, 95.75% of residents have access to toilet facilities. The main toilet facility access is via flush toilets connected to public sewage systems (64.8%), followed by pit toilets with a ventilation pipe (16.01%) and pit toilets without a ventilation pipe (8.64%).

6.13.3 Neighbouring Community/Sensitive Receptors

The Driefontein community, which is located to the east of the proposed CDF, borders the MQE property.

This community consists of a densely populated settlement of mostly Reconstruction and Development Property style housing, or low-cost housing. According to the Kangra Social and Labour Plan (SLP) (2022-2026) MP30/5/1/2/3/2/1/10099 MR), 194 people from the Driefontein community are employed by Kangra.

The Driefontein local area still has many dwellings without clean running water and sanitation facilities, and several roads are in poor condition and pose a risk to the safety of pedestrians and the health of the larger community by dust creation.

6.14 Visual Aspects

The visual character of an area plays a significant role in determining an area's sense of place, specifically the area's land use, topography, cultural features, landscape quality, etc.

The area surrounding the study area comprises of existing Kangra Coal mine and related infrastructure, land that has been rehabilitated and grassland.

6.15 Traffic

The proposed project site is situated approximately 45km west of Piet Retief and is accessed by the D1091 provincial road. The D1091 connects to the N2 national road via the D2548 provincial road. The N2, which is approximately 23 km east of the site, is surface single carriageway road.

The D1091 is a provincial gravel road with a road reserve of 25 to 26 metres. The section of road from the D1091 to MQE is a gravel haul road of the mine. The road is close to natural ground level and it is expected that drainage could be problematic during wet periods. The type of material and dust suppressant used may be slippery under these conditions (JG Afrika, 2019).

7 SUMMARY OF SPECIALIST INVESTIGATIONS

This section provides an overview of the specialist studies undertaken for the project, including the following information regarding each study:

- The details of the specialist who prepared the report;
- An overview of the scope of each study; and
- An overview of each specialist's findings and the implications of those on the project.

The results of the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool (01 November 2022) (Appendix A) for the MQE proposed projects and the studies undertaken as required are presented in **Table 7-1.** A Geohydrological Impact Assessment was also undertaken.

Table 7-1: Site Sensitivities (based on the property description) from the DFFE Screening Tool.

THEME	VERY HIGH	HIGH	MEDIUM	LOW	SPECIALIST STUDY
Agriculture	X				Hydropedological Impact Assessment
Animal Species		X			Ecological Assessment
Aquatic Biodiversity	X				Aquatic & Wetland Impact Assessment Hydrological Impact Assessment
Archaeological and Cultural Heritage				X	Heritage Investigation
Civil Aviation				X	None required
Defence				X	None required
Palaeontology	X				Site walkthrough prior to construction
Plant Species			X		Ecological Assessment
Terrestrial Biodiversity	X				Ecological Assessment

7.1 Ecological Assessment

7.1.1 Specialist Details

An Ecological Assessment was undertaken by GCS (Pty) Ltd (C/O Nico-Ronaldo Greeff-Retief, June 2023) for the proposed project in accordance with the requirements for specialist assessments as outlined within the NEMA EIA Regulations (as amended). This report is included in Appendix E-1.

7.1.2 Scope of Work

The Ecological Assessment comprised of the following components:

- Fauna: Mammals (including bats), birds, reptiles, amphibians and invertebrates.
- Plants and vegetation (including alien vegetation).
- Habitat features – Caves and/or ridges.

Specifically, the Terms of Reference included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site-specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity) that occur in the study area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical, and faunal features within the proposed development areas;
- Site visit to verify desktop information;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application; and
- Provide a map to identify sensitive receptors in the study area, based on available maps, database information & site visit verification.

7.1.3 Findings

The following findings were made during the Ecological Assessment:

- Anthropogenic impacts identified within the study site include alien vegetation encroachment, gravel roads, natural vegetation removal, hardening of surfaces to establish the mining infrastructure, fencing, grazing of animals, and disturbances to the wetland systems around the site.
- From the site visit it was confirmed that the on-site sensitivity of the site is Medium (for certain wetlands within the regulated area), while the grasslands have been disturbed and some remnants of grasslands remain which might have a functional role to play for ecological connectivity. The grasslands have been given a low sensitivity; however, the data is based on a single site visit during autumn, outside of the biodiversity period.
- The study site still has a functional role to play in regional ecological functioning and biological functions at the site even though it has been influenced by human-related impacts.
- The Terrestrial Critical Biodiversity Area (CBA) of the site is mixed between transformed areas and ESA.
- Ecological connectivity between the grasslands and drainage located towards the Heyshope Dam cannot be excluded from the overall study area. The vegetation and drainage may still fulfil an ecological function by sustaining biodiversity and ecological maintenance of downstream users as well as maintenance of ecological biodiversity drivers.
- Applying the relevant mitigation measures to the system to ensure that the

functionality of the watercourse is not lost will directly ensure that the surrounding system's functionality is retained and that impacts on the water resources are limited.

7.1.4 Recommendations

From an ecological perspective, the development is situated within an area which has been disturbed. If all mitigatory actions are implemented with due care, satisfactory standards will be achieved. Alien eradication and rehabilitation must be encouraged through the development the implementation of an alien and invasive species plan, starting during the construction phase, and must continue for the life of the proposed development. Mitigation must include limiting activities to the designated, demarcated footprint, good waste management, concurrent rehabilitation of disturbed areas, relocation of animals, and the prohibition of harm to animals.

Based on the results and conclusions presented in the Ecological Assessment Report, and the outcomes of the field survey, it is the opinion of the specialists that a follow-up study must be accompanied by this study to verify all protected trees, medicinal plants, birds, and other fauna on-site, before a decision by the CA may be undertaken.

7.1.5 Conclusion

It was concluded that the construction activities would impact on the low sensitive terrestrial biota. Mitigation measures are provided may reduce the negative risks anticipated with the mining infrastructure construction.

The specialist has recommended that a follow-up specialist study be undertaken prior to the issuance of a decision by the CA. It is recommended that this follow-up survey is included as a condition in the EA and must be undertaken prior to site clearing.

7.2 Wetland Assessment

7.2.1 Specialist Details

A Wetland and Aquatic Assessment was undertaken by Ecolink Consulting (C/O Magnus van Rooyen, September 2024) for the proposed project in accordance with the requirements for specialist assessments as outlined within the NEMA EIA Regulations (as amended). This report is included in Appendix E-2.

7.2.2 Scope of Work

The scope of work comprised the following:

- The characterisation of the current state of the local river systems.

- The delineation and assessment of wetlands within 500m of the project area.
- A risk assessment for the proposed development; and
- The prescription of mitigation measures and recommendations for identified risks.

The scope of work was undertaken in the following manner:

- Phase 1: Wetland Baseline Assessment:
    - Delineate the extent of the wetland units occurring within and in the vicinity of the mining footprint and proposed expansions.
    - Describe the soil and vegetation of the delineated wetland units based on on-site observations.
    - Determine the PES of the delineated wetland areas using the WETHealth tool (Level 1) developed by Macfarlane *et al*. (2009).
- Phase 2: Wetland Impact Assessment:
    - Identify, describe, and assess the potential impacts to be imparted on the delineated wetland units resulting from the establishment and operation of the proposed sand mine; and
    - Provide mitigation measures to avoid, minimise, repair, and/or offset the severity/magnitude of the potential impacts on the delineated wetland units.

7.2.3 Findings

The wetland and aquatic assessment established the following:

- The site assessment confirmed the absence of any natural wetland features and any river FEPAs within the boundaries of the project site.
- A total of seven wetland systems were identified within the "regulated area of a watercourse" as defined by the NWA.
- The PES of these wetlands ranged from Class B (one wetland), Class C (two wetlands) and Class D (four wetlands) with the EIS of the features being classified as low to medium.
- The impacts that were identified and assessed can all be sufficiently managed and mitigated by the implementation of the measures detailed in this assessment.

7.2.4 Recommendations

The following recommendations have been made:

- A 40m buffer has been recommended around the wetlands for the construction phase and a 20m buffer for the operational phase. These fulfil ecological functions and serve as natural corridors for fauna species and breeding grounds. A 100m buffer was

requested by the Mpumalanga Tourism and Parks Agency during the public comment period. This required buffer has been included in the mitigation for the site and the EMPr.

- It is also suggested by the specialist that a rehabilitation plan must be implemented during the rehabilitation of the mine. The rehabilitation plan must focus on the following aspects:
    - Rehabilitation of head-cuts where they occur within the identified wetland features.
    - Rehabilitation of overgrazed riparian and surrounding areas.
- It is recommended that an ECO, who meets the requirements of the NEMA: EIA Regulations (2014) as amended, be appointed to conduct monthly audits of the construction phase of the project. An audit report must be completed for each monthly audit and be submitted to the relevant authority.
- In addition, it is suggested that provision be made for a biannual biomonitoring be conducted of the identified wetland features and that monthly water quality monitoring be done on the treated effluent discharge at the point of discharge into the Heyshope Dam. This will ensure early detection of any exceedances of the discharged limits.

7.2.5 Conclusion

Based on the findings of the Wetland Assessment, it is the opinion of the specialist that there are no fatal flaws that will prevent the development from being authorised subject to the implementation of the mitigation measures provided in this report and the specialist investigation report.

7.3 Hydrological Assessment

7.3.1 Specialist Details

A Hydrological Assessment was undertaken by GCS (Pty) Ltd (C/O Hendrik Botha, June 2023) for the proposed project in accordance with the requirements for specialist assessments as outlined within the NEMA EIA Regulations (as amended). This report is included in Appendix E-3.

7.3.2 Scope of Work

The scope of work completed, was as follows:

- Baseline Hydrology Review:
    - Hydro-meteorological data collection and analysis.

  - Catchment delineation and drainage characteristics.
  - Determination of catchment hydraulic and geometric parameters.
- Peak Flows & Flood Line Modelling:
  - Peak flood volume calculation for the 1:10, 1:20, 1:50, and 1:100-year recurring events.
  - Flood line modelling using HEC-RAS hydraulic software – 1:50 and 1:100-year flood lines were presented; and
  - Analysis of the modelling results.
- Conceptual Storm Water Management Plan and Stormwater Monitoring:
  - Identification of stormwater sub-catchments (i.e., clean and dirty areas).
  - Determination of stormwater flows and volumes (1:10, 1:20, 1:50 and 1:100-year return periods) were undertaken.
  - Indications and explanations of the placement of stormwater attenuation infrastructure were offered.
  - A stormwater monitoring system plan was drafted, to ensure that the stormwater discharge impact on the environment is managed and controlled.
- Risk assessment:
  - A hydrological risk assessment was undertaken, to contextualise the potential surface water risk of the project.
- Surface Water Monitoring Plan:
  - A surface water monitoring plan was developed.
- Reporting:
  - This report was compiled, composing the components above.

7.3.3 Findings

The delineated drainage lines associated with the project area can be considered moderate flood hazard areas, based on the peak flows estimated and the flooding depth observed from the HEC-RAS model output. From the flood lines produced, it is noted that all the proposed infrastructure (CDF, PCDs, WWTP and Brine PCD) will be situated outside probable zones of inundation. Hence, there is no likely flooding risk. Limited sedimentation and erosion for the drainage lines and streams associated with the site are anticipated.

The non-perennial and perennial streams downstream of the proposed CDF, NFEPA wetland units and vadose zone soils are the main receptors of potential surface-related pollution at the site.

7.3.4 Recommendations

- Several additional monitoring points are proposed, to be incorporated into the

existing surface water monitoring programme for the mine.

- Avoidance areas: The flood lines also suggest no flooding risk associated with the proposed development. The 1:100-year flood line should be considered an avoidance area (buffer area) (CSIR, 2005).
- Care should be taken if development is to take place within the exclusion zone. If development does take place in the exclusion zone, proper flooding protocols and erosion prevention measures should be implemented. This could include gabion mattresses and cut off walls, gutters and drains, roadside curbs, reed beds or stilling basins at discharged areas, integrated into the engineering designs for the development. Subsurface infrastructure (i.e. sewer lines, water pipes, etc.) will be less susceptible to surface flood damage, and can highly likely be constructed in the demarked flood line areas. It should, however, be noted that soils on steeply sloped areas (> 1:4) should be compacted to prevent slope failure which could cause mass wasting and subsurface infrastructure damage. These systems would need to be sized by a civil engineer, considering runoff patterns and stormwater flow velocities from the final engineering designs for the development.
- If linear infrastructure is zoned to occur in the demarcated flood line areas, the structures are to be designed to such a degree by a professional engineer to prevent environmental damage if a flood does occur; prevent slope failure on the water course banks; prevent increased flooding potential; withstand the flood peak flow forces and buoyancy forces; effectively convey flood water/stormwater for safe discharge to the environment; and have erosion control measures in place at any point of discharge into the environment (stilling basins, reed beds, energy damping blocks or mats, gabion mattresses etc).

7.3.5 Conclusion

Based on the risks identified, and assuming the mitigation measures proposed will be implemented, it is proposed that the construction of the CDF and the WWTP and the authorisation of these activities be considered. This is grounded on the assumption that the proposed mitigation measures, EMPr and EIA recommendations are implemented during the construction, operational and closure phases of the project.

7.4 Geohydrological Assessment

7.4.1 Specialist Details

A Geohydrological Assessment was undertaken by GCS (Pty) Ltd (C/O Hendrik Botha, February 2023) for the proposed project in accordance with the requirements for specialist assessments as outlined within the NEMA EIA Regulations (as amended). This report is included in Appendix E-4.

This study provides an update of the numerical groundwater model. A Geohydrological Investigation was undertaken with respect to the previously proposed DD (GCS, 2015), located in the same position as the proposed CDF.

7.4.2 Scope of Work

The scope of work completed, was as follows:

- Desktop Data Review:
  - All available reports relating to the site were assessed, including a review of all geohydrology, hydrology, hydrochemistry, and geology literature data.
  - GCS water monitoring data for the site were assessed and integrated into this investigation.
  - A desktop level hydrocensus was conducted. The National Groundwater Archive (NGA, 2019), Groundwater Resource Information Project (GRIP, 2016) and the Southern African Development Community Groundwater Information Portal (SADAC GIP) databases were assessed to identify existing groundwater users in the area.
- Baseline Hydrology Review:
  - Hydro-meteorological data collection and analysis.
  - Catchment delineation and drainage characteristics.
  - Determination of catchment hydraulic and geometric parameters.
- Field investigation:
  - A site walk-over assessment was undertaken to map sensitive groundwater-surface water interaction zones identified on a desktop level.
  - Slug testing was conducted on suitable boreholes at the site.
  - A groundwater hydrocensus was conducted within a 5km radius of the Maquasa and Kusipongo.
- Hydrogeological, geochemical, and geological conceptual model update:
  - The existing hydrogeological and geological site conceptual model was updated with data obtained for the study area – focusing on the Maquasa and Kusipongo operations areas.
- Groundwater numerical flow and transport update:
  - The steady-state model was updated and calibrated with data available for the study area (2022 monitoring data). The steady-state model was converted to a

transient-state model to enable scenario modelling. The following were evaluated:

- Groundwater flow velocities and directions.
- The mining operation's impact on groundwater levels and cone of depression is presented as the zone of influence (ZOIf). This includes:
  - MQE- opencast mining in progress.
  - NZ -underground mining in progress.
  - Twyfelhoek (Udumo) adit; and
  - Balgarthern Adit.
- Source term impacts presented as the ZOIp for the Maquasa and Kusipongo operations.

- Hydrogeological risk assessment:
  - A risk assessment was conducted based on the source-pathway-receptor principle.
  - The existing impacts associated with the Maquasa and Kusipongo operations on the groundwater and subsequent surface water environments were evaluated.
- Monitoring, Audit, and Groundwater remediation plan:
  - A groundwater and surface water monitoring plan, with mitigation measures, was developed for the site based on the baseline assessment of the site conditions.
  - A groundwater remediation plan for the Kusipongo resource Twyfelhoek (Udumo) adit and Balgarthern Adit.
- Reporting:
  - A geohydrological report encompassing all work done as well as a groundwater risk assessment and monitoring plan will be compiled.

7.4.3 Findings

Based on the aquifer characteristics (e.g. weathering depth, groundwater strike, and static water levels), the hydrogeological system at the project site can be categorised into two aquifers: shallow weathered rock/material aquifer and deeper fractured rock aquifer hosted within the Vryheid Formation sediments.

Shallow weathered rock/material aquifer – Vryheid Formation sediments comprise highly

weathered material and have an average thickness of between ~5 and ~27 m. Due to the limited depth extent and average depth to groundwater (between ~2.5 and ~35 m), it is unlikely that this system will comprise a significant groundwater potential. However, in terms of seepage emanating contaminant transport, this aquifer is considered important.

The previous assessment (GCS, 2015) found that the potential groundwater quality and quantity impact/s associated with the discard storage facility can countered by the appropriate design of the discard facility (i.e. liner system, concurrent rehabilitation methodology).

7.4.4 Recommendations

- Rock samples should be collected during mining, to maintain a clear understanding of the AMD potential of the rock being mined. It is important to use ABA and NAG as pre-emptive tools to determine if any AMD may occur. An annual geochemical screening assessment of mine residue waste sites is recommended.
- The numerical groundwater model and transport model should be updated annually to:
    - Recalibrate the flow system based on the dedicated monitoring boreholes drilled and routine water level monitoring data gathered for the site.
    - Confirm preferential flow paths and groundwater migration velocities as new geological data is attained via mining.
    - Evaluate the spatial impact (i.e., SO_4 plume) calibrated with the proposed monitoring borehole data.
    - Confirm long-term liabilities associated with the workings (i.e. predict likely changes in flow fields etc.); and
    - Ensure no monitoring network gaps exist (i.e. check if the monitoring network is representative of the site).
- The following can be done to improve the assumptions and understanding of the groundwater aquifer and hence improve the numerical groundwater model confidence:
    - All new exploration boreholes drilled in the area should note groundwater occurrences as well as strike depths. The data can be used to update the conceptual hydrogeological model which is incorporated into the numerical flow model.
    - Water levels of dedicated monitoring boreholes that will be drilled, as well as any new boreholes that are discovered in the area during routine hydrocensus updates, should be monitored (quarterly dedicated holes, biannual hydrocensus).
    - Dewatering volumes (during mining) should be recorded daily and reported

bi-monthly.

7.4.5 Conclusion

The 2015 Geohydrological Assessment (GCS, 2015) did not identify any fatal flaws which would preclude the authorisation of the proposed CDF.

7.5 Hydropedological Assessment

7.5.1 Specialist Details

A Hydropedological Assessment was undertaken by GCS (Pty) Ltd (C/O Hendrik Botha, February 2023) for the proposed project in accordance with the requirements for specialist assessments as outlined within the NEMA EIA Regulations (as amended). This report is included in Appendix E-5.

7.5.2 Scope of Work

The scope of work completed was as follows:

- Desktop study:
    - All available reports (which were provided by the client) relating to the site were assessed.
    - Evaluation of soil occurrences in the study area, based on available South African databases.
- Field investigation:
    - Several auger holes were drilled in the project area, in pre-determined hillslope areas.
    - The soils identified in the study area were screened per the Soil Classification guidelines for South Africa (Department of Agricultural Development, 1991) and (SCWG, 2018) To derive hydropedological flow regimes.
- Hydropedological assessment:
    - Meteorological evaluation.
    - Catchment delineation.
    - Estimation of soil permeability and soil flow processes based on field observation and desktop data.
    - HOSASH (Hydrology of South African Soils and Hillslopes) index.
- Water balance and flow modelling:

  - A simple spreadsheet-based water balance model was used to illustrate unsaturated zone fluxes/water balances.
  - The total water loss during a development phase concerning the natural water processes in a sub-catchment was estimated. This was used in conjunction with the water balance flow model to determine the natural stream loss % for a sub-catchment and associated hillslopes.

- Risk assessment:
  - The risk and impact criteria were applied to the study area, to evaluate hydropedological risks.
  - Natural flow losses were estimated, using a spreadsheet water balance developed for the site.

- Mapping and report:
  - Several hydrological hillslope profiles, soil distribution, and hydrological soil type maps were produced; and
  - The report was compiled.

7.5.3 Findings

Soil data were evaluated for the project area to produce a soil distribution map. The soil map was used to categorise the HST, into six (6) categories: Recharge; Responsive (shallow); Responsive (saturated); Stagnating; Interflow (A/B); and Interflow (soil/bedrock).

Three (3) sub-catchments and four (4) prominent hillslopes were defined for the proposed development area. Generally, recharge soils were observed on the crest and footslope positions of two (2) of the hillslopes, with the remainder of the hillslopes (and the majority of the site) being dominated by stagnating HST. It was noted that the area southeast of the proposed CDF gradually extends into backfilled material used to rehabilitate the old opencast pit associated with the area.

These soils were classified as interflow (soil/bedrock) type and occurred in areas that appear to be associated with the high wall of the old rehabilitated pit. The valley positions associated with the site, nearing perennial and non-perennial drainage lines, are dominated by responses (saturated) soil types. In responsive soils, the build-up of water is expected in the B and upper A horizons after rain, and overland discharge and minor lateral seepage are expected (due to saturation excess). Secondary vertical seepage to deeper soil zones from the saturated B horizon is expected. At the transition from one soil type to the other (upstream to downstream) overland flow may take place during wet seasons.

As the areas are mainly undeveloped, natural soil water processes are expected. The

predicted impact on the wetlands and watercourses fed by the hydropedological processes ranges from 2.95% (expected no impact) to 25.39% (expected high impact) for the hydropedological sub-catchments.

It is assumed that wetlands that do exist in the area need to maintain the current PES and EIS post-development, as per the resource management objectives. The calculation suggests that the PES will likely change if the wetland units are only fed by the sub-catchments. However, considering the greater sub-catchment and drainage area, the severity decreases to low and moderate for HRU1 and HRU2. The severity of a flow driver suppression on a sub-catchment scale can further be improved by incorporating stormwater attenuation back into the environment.

7.5.4 Recommendations

No defined hydropedological buffer areas are recommended; however, it is proposed that stormwater attenuation from the development area back to the natural environment be considered. Wetland buffers should be at least 15 m to 25 m, or as per the dedicated wetland assessment report for the site (refer to GCS, 2022 – wetland assessment report). Efforts should be made to maintain the current PES and EIS of the wetland units identified during the operational phase of the project, as well as during the closure phase.

7.5.5 Conclusion

This assessment cannot find any grounds or identify high hydropedological risks that do not proceed with the development. This is grounded on the assumption that the proposed mitigation measures and EMPr recommendations are implemented during the construction, operational, and closure phases of the development.

8 PUBLIC PARTICIPATION PROCESS

The PPP is a legislated requirement under NEMA for EA and WML applications. This section of the report documents the process, which was and will be followed with respect to the consultation of Interested and Affected Parties (I&APs)/stakeholders and government authorities.

8.1 Purpose of Public Participation

The most important objective of PPP is to provide sufficient and accessible information to potential I&APs in an objective manner and a platform for constructive participation in the EA Application, thereby assisting I&APs to:

- Gain an understanding of the Proposed Project, the various components, and the potential impacts (positive and negative);
- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their issues have been recorded in the Comments and Responses Report (CRR) and considered in investigations; and
- Contribute relevant local information and traditional knowledge to the process.

8.2 Competent Authority Consultation

The CA (Mpumalanga DMRE) has been/will be consulted at the following key stages:

- The FSR was submitted to the CA on 23 November 2023. The acceptance of the report was issued on 13 August 2024.
- A possible site meeting and site visit with the CA will be held during the EIR phase.
- A consultation meeting will be held with the CA approximately two (2) weeks after the distribution of the Draft Environmental Impact Report (DEIR), to discuss any additional comments from I&APs and the outcome of the specialist studies, should it be required. An indication of the CA's satisfaction with the process undertaken to that stage should also be clear after the meeting.
- The Final Environmental Impact Report (FEIR) will be submitted to the CA once all outstanding issues have been resolved.
- The CA may convene a meeting post-submission of the FEIR should it be deemed necessary.

8.3 Public Consultation Process

This section provides a summary of the various activities of the public consultation process

to be undertaken in support of the application process.

8.3.1 Stakeholder Database

A stakeholder database or list of I&APs was compiled and will be updated during the PPP and as more I&APs are registered. The database was compiled by:

a) using lists of contact details of I&APs from previous environmental applications for MQE;
b) using information provided by the Applicant's community liaison officers; and
c) including responses from I&APs.

The I&AP database will be used to convey information to stakeholders as part of the announcement of the S&EIR Application; the opportunity for I&AP consultation and the availability of the draft and final S&EIR Reports as these became available for public review. For the Proposed Project, I&APs included the following:

- Owners of the land where the Proposed projects is to be undertaken (project area) other than Maquasa Mine (Kangra (Pty) Ltd);
- Owners and occupiers of land adjacent to the project area;
- Provincial (Mpumalanga) and local government;
- Organs of state, other than the Competent Authority (CA) having jurisdiction over any aspect of the proposed activities, including the DWS, Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), etc.
- Relevant residents' associations, agricultural unions, community-based organisations, water user associations, and any catchment management authority and Non-Governmental Organisation (NGOs);
- Environmental organisations, forums, groups, and associations; and
- Private sector organisations (businesses, industries) in the vicinity.

8.3.2 Preapplication and Announcement of the Application Process

A preapplication consultation process was undertaken, whereby the I&APs were provided to opportunity to register for the proposed project. The integrated application process was announced to I&APs by means of the following:

- An advertisement was placed in the Excelsior News on the 27th of January 2023; and
- Site Notices were placed all around the project area.

All I&APs were given 14 days to register their interest in the project. This task was undertaken to ensure that the current participants who are interested in or affected by the proposed project are registered as I&APs.

8.3.3 Application Process Notifications

The continuation of the integrated application process, the commencement of the Scoping Phase, and the availability of the Draft Scoping Report (DSR) was announced to I&APs by means of the following:

- An advertisement was placed in the Excelsior News on the 24th of November 2023;
- A Background Information Document (BID) was compiled and distributed to all I&APs on the stakeholder database and copies were available on request;
- Site Notices were placed all around the project area;
- Placement of copies of the notification documentation and the BIDs on the GCS website (https://www.gcs-sa.biz/public-documents/). The GCS Website is used to make documents electronically available to stakeholders. The website address was published in the advertisement, BIDs, site notices, and all other communication;
- A Registration and Comment Sheet was distributed with every BID, inviting stakeholders to register as I&APs and to provide their comments on the proposed application; and
- The I&APs had 30 days to register, however, according to NEMA the process only ends after the submission of the final EIA Report to the CA, therefore, registration and comment remains open.

8.3.4 Public Review of Draft Scoping Report

The DSR was available for public comment from 24 November 2023 until 16 January 2024 (30 days).

- Piet Retief Library, 10B Retief Street;
- MQE Security Office, MQE Mine; and
- Thusong Service Centre, Driefontein Community.

The Report was also available electronically via the GCS Website (link provided above) or a CD/USB was available upon request.

The report was updated at the end of the 30 days to include all comments received during the public review period. The Final Scoping Report was then submitted to the Mpumalanga DMRE.

8.3.5 Impact Assessment Phase Public Participation

The Draft DEIR was available from 18 September 2024 to 18 October 2024. The availability of these reports was announced as follows:

- An English and isiZulu advertisement were published in the Excelsior News on 13 September 2024.

- A Non-Technical Summary of the DEIR was made available in English and isiZulu. These documents were distributed via email to the I&APs on the database.
- Notification via email of the availability of the reports for public review and the direct link to the GCS Website were sent to all I&APs.
- Site Notices (8) were placed in English and isiZulu around the proposed developments as well as at the municipal offices and at the public places where the reports were made available from 18 September 2024.
- Hard copies of the reports were available at the following locations.
    - Piet Retief Library, 10B Retief Street, Piet Retief.
    - MQE Security Office, MQE Mine, Driefontein.
    - Thusong Service Centre, Driefontein Community.
    - MLM in Driefontein.

The reports were made available electronically on the GCS Website. The direct link to the report was emailed to all I&APs on the stakeholder database.

- A pamphlet was distributed via the municipality to make stakeholders aware of the open day which was held on 1 October 2024.
- An announcement of the availability of the draft documents and the open day was made available to Mkhondo FM Radio Station for broadcasting.

An open day was held at the Kangra Training Centre in Driefontein on 1 October 2024 to assist I&APs with the content of the reports available on public review and to obtain their comments and concerns. A presentation of a summary of the reports was compiled and available as well as a series of posters and copies of the Non-technical Summaries.

8.3.6 Availability of the FEIR and EMPr

All stakeholders on the database will receive a letter informing them that the FEIR and EMPr have been submitted to the CA for consideration. Electronic copies of the FEIR will be available should the I&APs wish to review the documents submitted to the CA. The I&APs will be informed that should they wish to submit comments on the FEIR; these must be submitted directly to the CA and copied to the EAP.

8.3.7 Public Participation Following the Competent Authority Decision

Once the CA issues their decision in respect of the integrated application in writing, their decision and the details thereof will be communicated to I&APs according to the conditions stipulated. I&APs will be made aware of their rights to appeal the decision and the proposed

process to follow in such regard. The legislative and required public participation activities will end once the appeal periods have lapsed.

8.3.8 Comments and Response Report

All comments received during the EIA Process were captured in the Comments and Responses (CRR) chapter of the Public Participation Report (Refer to Appendix C).

9 EIA PROCESS AND APPROACH

A S&EIR Process has two distinct phases: The Scoping Phase and the Environmental Impact Reporting Phase. The Scoping Phase has been concluded with the acceptance of the Scoping Report by the on the 13 August 2024.

This DEIR illustrates the risk assessment undertaken of potential biophysical and socio-economic aspects and impacts of the proposed project on the receiving environment. This DEIR summarises the risks and findings of various specialist studies undertaken and outlines avoidance, mitigation, and management actions that will assist in minimising the impact of the project as far as possible.

The Environmental Impact Phase concludes with the submission of a Final EIR (FEIR) to the CA for consideration, thereafter the application will be granted or rejected.

9.1 Impact Assessment Methodology

Possible impacts are identified through comments from I&APs, specialist reports, and from the EAP's experience.

The assessment of potential impacts was addressed in a standard manner, to ensure that a wide range of impacts were comparable. The ranking criteria and rating scales were applied to all specialist studies for the project. To enable a scientific approach to the determination of the environmental significance (importance), a numerical value is linked to each rating scale.

Clearly defined rating and rankings scales (**Table 9-1** to**-Table 9-7**) will be used to assess the impacts associated with the projects. The impacts identified by each specialist study and through PPP will be combined into a single impact rating table for ease of assessment.

Table 9-1: Severity or magnitude of impact

Not applicable/none/negligible	0
Minor/insignificant/non-harmful (no loss of species/habitat)	2
Low/small/potentially harmful (replaceable loss with minimal effort)	4
Moderate/significant/slightly harmful (replaceable loss of species/habitat with great effort and investment)	6
High/highly Significant/harmful (impact on human health or welfare/loss of species/habitat)	8
Very High/extremely significant/extremely harmful/within a regulated sensitive area (loss of human life/irreplaceable loss of Red Data species/conservation habitat)	10

Table 9-2: Spatial Scale of activity

Not applicable/none/negligible	0
Site only	1
Local (within 5km)	2
Regional/neighbouring areas (5 km to 50 km)	3
National	4
International	5

Table 9-3: Duration of activity

Not applicable/none/negligible	0
Immediate (immediately reversible with minimal effort)	1
Short term (0-5 years - reversible)	2
Medium-term (5 to 15 years – difficult to reverse with effort)	3
Long-term/life of the activity (very difficult to reverse with extensive effort)	4
Permanent/beyond the life of the activity (not reversible)	5

Table 9-4: Frequency of activity (how often the activity is undertaken)

Not applicable/none/negligible	0
Improbable /almost never/annually or less	1
Low probability/very seldom/6 monthly	2
Medium probability/infrequent/temporary/monthly	3
Highly probable/often/semi-permanent/weekly	4
Definite/always/permanent/daily	5

Table 9-5: Frequency of incident/impact (how often activity impacts environment)

Almost never/almost impossible/>20%	1
Very seldom/highly unlikely/>40%	2
Infrequent/unlikely/seldom/>60%	3
Often/regularly/likely/possible/>80%	4
Daily/highly likely/definitely/>100%	5

Table 9-6: Legal Issues - governance of activity by legislation.

No legislation	1
Fully covered by legislation	5

Table 9-7: Detection (how quickly/easily impacts/risks of activity on environment, people, and property are detected)

Immediately (easier to mitigate)	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered (more difficult to mitigate)	5

Each impact identified must be assessed in terms of probability (likelihood of occurring); the consequence of the impact (spatial scale, severity, and duration); and the associated risk (impact significance).

Consequence was then determined as follows:

CONSEQUENCE = Severity + Spatial Scale + Duration

The probability or likelihood of occurrence of the activity was then calculated based on frequencies of the activity and impact, whether the activity is governed by legislation, and how easily it can be detected:

LIKELIHOOD = Frequency of Activity + Frequency of Impact + Legal issues + Detection

The significance or risk of each identified impact was then based on the product of consequence and likelihood:

Environmental Significance/Risk = Consequence x Likelihood

Impacts will be rated as either of high, medium, or low significance on the basis provided in **Table 9-8**. Each impact will also be assessed in terms of the level to which there is an irreplaceable loss of resources (**Table 9-9**) and its degree of reversibility (

Table 9-10).

Table 9-8: Impact significance ratings.

SIGNIFICANCE	ENVIRONMENTAL RISK RATING	COLOUR CODE
High (positive)	>240	H
Medium (positive)	120 to 240	M
Low (positive)	<120	L
Neutral	0	N
Low (negative)	>-120	L
Medium (negative)	-120 to -240	M
High (negative)	<-240 (max = 400)	H

Sub-categories:

Significance	Extreme	Very High	High	Moderate
High	260-400	320-359	280-319	241-279
Significance	High	Moderate	Medium	
Medium	200-240	160-199	120-159	
Significance	Moderate	Moderate	Low	
Low	80-119	40-79	1-39	

Significance	Extreme	Very High	High	Moderate
High	260-400	320-359	280-319	241-279
Significance	High	Moderate	Low	
Medium	200-240	160-199	120-159	
Significance	High	Moderate	Negligible	
Low	80-119	40-79	1-39	

Table 9-9: Irreplaceability of resource caused by impacts

No irreplaceable resources will be impacted (the affected resource is easy to replace/rehabilitate)	Low
Resources that will be impacted can be replaced, with effort	Medium
Project will destroy unique resources that cannot be replaced	High

Table 9-10: Reversibility of impacts

Low reversibility to non-reversible	Low
Moderate reversibility of impacts	Medium
High reversibility of impacts	High

The significance of an impact gives one indication of the level of mitigation measures required to minimise negative impacts and reduce environmental damage during the construction, operational and decommissioning phases. Suitable and appropriate mitigation measures, to ensure avoidance, management and mitigation of impacts, will be identified for each of the potential impacts based on specialist recommendations and GCS expertise.

9.2 Impact Management

Each specialist has identified means of avoiding, mitigating and/or managing the negative impacts in their particular aspect of investigation. The recommended management strategies were synthesised by GCS to formulate the EMPr for the proposed project.

10 ENVIRONMENTAL IMPACT ASSESSMENT

The potential impact identified for the life of the proposed project are discussed in this chapter. The significance rating for each impact is presented in the Impact Assessment Matrix under Appendix D. The matrix includes the proposed mitigation measures, which are expanded upon in the EMPr, attached under Appendix F.

10.1 Assessment of Construction Phase Impacts

The potential construction phase impacts identified due to the following anticipated construction activities are discussed in this section:

- Clearing of vegetation.
- Stripping, handling and stockpiling of topsoil.
- Excavation of material/earthworks.
- Transportation of construction materials.
- Travel along unsurfaced roads.
- Construction of structures including development of berms and channels, pouring of concrete, installation of pipelines.
- Storage of construction materials and hydrocarbons.
- Storage and handling of general, hazardous and construction waste.

10.1.1 Potential Impacts on Air Quality and Climate

Localised impacts on ambient air quality are anticipated through the generation of wind-borne dust due to construction activities. Dust has the potential to impact human health and cause ecosystem damage. Sources of dust include travelling on gravel roads, wind-borne dust from exposed areas and stockpiles, soil stripping and handling and earthworks/excavating.

Due to the temporary nature of the construction phase and the limited footprint areas associated with the proposed project, the potential impacts were considered to have a relatively high, **Low** significance. With the implementation of the dust suppression control measures listed in the EMPr, the impacts can be reduced to **Low** significance.

Greenhouse Gases (GHGs), which contribute to global climate change, will be generated throughout the construction and decommissioning phases of the proposed project. Direct GHG emissions include exhaust fumes from equipment, vehicles and backup generators (when required). Allowing fires for cooking or burning of waste or debris may also contribute to this impact. The anticipated impact of the project activities on GHG emissions and climate is expected to be moderate **Low** and can be reduced to **Negligible** with the implementation of

the recommended mitigation measures.

10.1.2 Potential Impacts on Terrestrial Ecology

The construction phase is considered to have the largest direct impact on biodiversity. The proposed clearing and excavation of the footprint areas will result in the physical destruction and/or modification of terrestrial habitat and includes habitat loss impacts and habitat and vegetation degradation impacts.

The loss of vegetation within the development footprint has been rated as extremely **High** significance, which can be reduced to **Medium** through the implementation of the recommended mitigation measures such as demarcation of the footprint, limiting all activities to the demarcated footprint and existing roads, implementing a fire management plan and progressive/concurrent rehabilitation. The irreplaceability of the loss of resources is considered **High** and the degree to which it can be reversed is **Low** as all vegetation will be removed from the areas where the structures will be constructed.

The introduction of alien species, especially plants, will lead to the degradation and loss of surrounding natural vegetation. This is probably one of the most significant potential impacts from a terrestrial invertebrate perspective and may have very significant knock-on effects that could impact virtually every aspect of the surrounding ecosystem. Vehicles often transport many seeds, and some may be of invader species, which may become established along the road, especially where the area is disturbed. Continued movement of personnel and vehicles on and off the site, as well as occasional delivery of materials required for maintenance, will result in a risk of importation of alien species throughout the life of the project. This impact has been ranked as **Medium** and can be reduced to **Low** with the implementation of an Alien Plant Management Plan and appropriate waste management to prevent attracting pests.

The faunal community faces displacement due to habitat loss, direct mortalities and disturbance Construction activities will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution. Disturbance due to dust and noise pollution and vibration may disrupt behaviour. The impact has been ranked as **Medium** but can be reduced to **Low** with the implementation of the recommended mitigation measures such as footprint demarcation, placement of warning and speed limit signs and environmental awareness training to manage the behaviour of personnel in order to prevent harm to animals; warding off animals and removing slow moving animals prior to vegetation clearing and planning of activities to clear vegetation during the dry season.

10.1.3 Potential Impacts on Freshwater Ecology

The construction phase impacts on the HGM units, Heyshope Dam and drainage lines were ranked as **Medium** significance. The significance of these impacts can be reduced to Low through the implementation of the recommended mitigation measures. The following impacts were identified:

- Potential loss of riparian vegetation as a result of the vegetation clearing and earthworks associated with the construction activities.
- Uncontrolled stormwater management of the cleared construction areas could result in increased sedimentation of the wetlands.
- The presence of plant and equipment on the construction site that make use of petrochemical substances for operation pose a risk of contamination of the water quality in the wetlands.
- Spillage or leakage from ablution facilities could impact on the water quality that moves through the aquatic features, which could decrease the PES of the features.

10.1.4 Potential Impacts on Soils, Land Capability and Land Use

The construction phase will require the stripping, handling and stockpiling of topsoil and will result in soil compaction, erosion and loss of land capability.

The loss of land capability is rated as **Medium** largely due to the location of the proposed CDF and WWTP within an existing active mining area. This impact can be reduced to **Low** through the implementation of mitigation measures aimed primarily at minimising the extent of the affected area.

There is potential to impact the *soil interflow processes*, namely:

- Alteration to natural hydropedological flow paths by infilling or cut-and-fill activities.
- Suppression of rainfall infiltration as a result of the installation of an impermeable barrier and initial deposition of coal wastes onto the impermeable barrier.
- Impacts on the macro-soil structure.
- Impacts on the hydropedological processes supporting the watercourses.

This will result in subsequent impacts on *soil structure and land capability* and could compromise soil quality. These impacts are expected from the preparation to the closure phase of the project. There is the potential for *soil contamination and suppression of natural hydropedological flow drivers* in areas associated with the proposed CDF and PCDs. Potential contaminants from the project are expected to include construction-related consumables, fuels, hydrocarbons, residues and hazardous wastes. The final design of the facility is based

on the waste classification which informs the liner requirements. In the absence of mitigation, the intensity of unmitigated impacts would be high, particularly for the suppression of the natural hydropedological flow drivers and that relating to soil quality. In time, reduced soil water quality could be reversed, however, at this stage, the related period is not known. The related unmitigated significance is, therefore, **Medium**.

With respect to the impact on water quality and quantity of watercourses/wetlands sustained by the hydropedological flow; as well as the contamination of soils and subsequent compromised water quality, the following is anticipated:

- Soil and surface water contamination, degradation and sedimentation from the following activities:
    - Leakages from vehicles and mine machines, and seepage from mine materials (i.e. construction material for permanent facilities, cement, paint, etc.).
    - Erosion and sedimentation of watercourses as a result of mine preparation activities, stockpiling and initial mining phase due to unforeseen circumstances (i.e. bad weather).
    - Alteration of natural drainage lines may lead to ponding or increased runoff patterns (i.e. may cause stagnant water levels or increase erosion).
- Vegetation loss will likely decrease soil infiltration and increase runoff, which will likely increase erosion.
- Soil quality could be compromised if oil and fuel spills from vehicles occur during the operational phase at the site. Prolonged pollution may migrate to the nearby watercourse and/or percolate into the groundwater table.

The following construction phase activities may contribute to these impacts:

- Site preparation, including placement of contractor laydown areas and storage (i.e. temporary stockpiles, bunded areas etc.) facilities.
- Disturbing vadose zone during soil excavations/infilling activities.
- In-situ placement of new soils, altering existing soil flow processes (i.e. cut-and-fill areas).
- Linear developments (pipelines, electrical pylons & transmission lines and roads associated with the project) will likely not have a major impact on hydropedology as these structures entail disturbing a very shallow or small surface area. However, soil compaction due to road and pipeline installations, and the movement of heavy vehicles and mining machinery is highly likely to occur.

- Vegetation loss will likely decrease soil infiltration and increase runoff, which will likely increase erosion.

10.1.5 Potential Impact on Geohydrology

The clearing and excavation during the construction phase will disturb the vadose zone. This could contribute to sediment runoff and surface water contamination. Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or baseflow component to shallow streams.

Spills of sewage water, as well as spills and leaks of hydrocarbons from the hydrocarbon storage areas, plant and machinery used for clearing and excavation and parked vehicles, can infiltrate and contaminate the groundwater system.

Temporary dewatering of perched groundwater is also expected during intense storm events and shortly thereafter. This can be managed by discharging clean dewatered / rainwater collected into the nearby stream with appropriate erosion protection measures in place. If water is contaminated, discharge to the closest greywater system (depending on the extent of contamination).

The impacts on groundwater identified during the construction phase have been rated as **Medium** and can be reduced to **Low** with the implementation of the recommended mitigation measures. Water monitoring from the outset of the development is crucial to provide input into the active water management system and act as an early warning system for the application of mitigation measures.

10.1.6 Potential Impact on Hydrology

The identified risks for the construction/development phase include:

- The destruction of the localised geological units during excavations. This impact is permanent and is therefore not included in the impact table as no mitigation measures can be recommended.
- Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or base flow component to shallow streams. This disturbance of the vadose zone has been rated as **High** significance.
- Surface water contamination and sedimentation from various construction activities such as clearing and excavation, hydrocarbon laden runoff from unattended leaks or spills; and the alteration of natural drainage lines which may lead to ponding or increased runoff patterns (i.e. may cause stagnant water levels or increase erosion). This impact has been rated as having **Medium** significance.

- The temporary dewatering of perched groundwater (only expected during intense storm events and shortly thereafter). Has the potential to impact the surface water resource. This impact has been rated as having **Medium** significance.

The continuation of the existing monitoring plan during construction is critical. The collected information should be used as part of an active water management system and act as an early warning system for the application of mitigation measures. Except for the destruction of the geology, the other identified impacts during the construction phase are rated low after mitigation and management measures are applied. The identified impacts are therefore not likely to negatively affect the commencement of the proposed project.

10.1.7 Potential Visual Impacts

The construction phase will transform the landscape through the removal of vegetation, excavating the area and constructing infrastructure. The severity of the impact is lessened by the location of the activities within a current mining area. This impact is rated as **Medium**.

Dust creation has the potential to create poor visibility conditions. This is likely to largely be confined to the site. This impact has been rated as having **Medium** significance if unmitigated.

The significance of both of the abovementioned impacts can be reduced to **Low** with the implementation of the recommended mitigation measures.

During the construction phase, night lighting at the laydown area and for security purposes may be required. The significance of this impact is rated as **Low** but can be further reduced by carefully considering the type and positioning of this lighting in order to contain the light to the areas that need illumination and prevent glare from the activities.

10.1.8 Potential Noise Impacts

Although noise is likely to be created during the construction phase, these are not likely to be above the ambient noise levels of the nearby mining operations, therefore the impact on sensitive receptors (neighbouring community) is considered **Low**. Mitigation and management measures such as maintaining standard working hours, servicing vehicles and equipment in accordance with a service schedule, noise monitoring and recording and investigating complaints, can further reduce the significance of this impact.

10.1.9 Potential Cultural Heritage and Palaeontological Impacts

Considering that no heritage resources were recorded during the site surveys, impact significance has been determined to be **Low**. The possibility of unearthing resources of

significance remains, however. A site walkthrough must be conducted by a qualified palaeontologist during the pre-construction phase.

A Chance Finds Procedure must be compiled and implemented should any sites of significance be unearthed/identified during construction. This would involve stopping all work in the area until a qualified specialist has visited the site. Work may only continue on the advice of the heritage specialist. Work may only continue after clearance is received from the heritage specialist.

10.1.10 Potential Traffic Impacts

The presence of construction vehicles and more personnel at the site during the construction phase is anticipated to increase the traffic volumes and potentially the number of traffic incidents. This is considered to be of **Medium** significance and can be reduced to **Low** by managing working hours, creating awareness and implementing penalties for non-compliance with the rules of the road.

10.1.11 Potential Socio-Economic Impacts

The creation of employment opportunities during the construction phase is considered a positive impact, however, due to the scale and duration of the construction, the number of jobs created will be low and these jobs will be short term/temporary. This impact has been rated as Low. It is imperative that Kangra enforces the application of its employment and procurement policies by the contractors appointed to maximise the benefit to the local community and contribute to Kangra's Social and Labour commitments.

The nuisance created by dust and noise is considered to be of **Medium** significance due to the current ambient conditions created by the existing mining operation. This can be reduced to Low through the implementation of the recommended mitigation measures, monitoring, as well as the recording and investigating of complaints.

10.2 Assessment of Operational Phase Impacts

The potential construction phase impacts identified due to the following anticipated operational activities are discussed in this section:

- Transportation of discard material and brine filter cake via truck using a haul road and the dumping onto the CDF using an access ramp;
- Compaction of waste material on the CDF with earth-moving equipment;
- Deposition of coal slurry. There is a possibility of the addition of brine to the CDF;
- Handling and disposal of waste;

- Management of runoff and supernatant water;
- Maintenance of haul roads;
- Concurrent rehabilitation of lower CDF layers with fertile soil and vegetation;
- Pumping of contaminated water from the dam to WWTP;
- Pumping of brine from WWTP to brine evaporation dam;
- Dewatering of brine at the Brine Treatment Plant to produce filter cake; and
- Discharging treated water from WWTP to Heyshope Dam.

10.2.1 Potential Impacts on Air Quality and Climate

The impacts on air quality are expected as a result of the operation of the CDF and the use of haul/gravel roads. The impact on air quality is considered moderate **Medium**. The implementation of the recommended concurrent rehabilitation of the CDF, the rehabilitation of any exposed areas and the wet suppression of gravel roads will likely reduce the severity and spatial extent of the impact, thereby reducing the impacts on potential sensitive receptors. This will reduce the significance of the impact to **Low**.

10.2.2 Potential Impacts on Terrestrial Ecology

The operational phase impacts have all been rated as **Medium** and can be reduced to **Low** significance with the implementation of the recommended mitigation measures.

Continued fragmentation and degradation of habitats and ecosystems is likely to occur as the disturbance created during the construction phase will leave the project area vulnerable to erosion and Invasive plant encroachment. An alien invasive management must be implemented, activities must be limited to the demarcated areas and no alien plants should be allowed to be brought to the site to reduce the significance of this impact.

Proximity of infrastructure and human activity to the wetlands may lead to local disturbance of fauna and flora, through noise, light, trampling, etc. Fauna may move away from the site. This impact can be mitigated by limiting activities close to wetlands and facing lighting away from wetland areas.

The spread of faunal alien species will lead to the ongoing displacement and direct mortalities of the faunal community. This can be mitigated by management of lighting, directing towards the operational areas and keeping it to a minimum, avoiding the use of roads at night and including holes (30x30cm) at the bottom of the fence at 250m intervals to allow for free movement of fauna.

10.2.3 Potential Impacts on Freshwater Ecology

The operational phase impacts on the freshwater ecology were rated as **Medium.** These impacts can be reduced through the implementation of the recommended mitigation measures. The other potential impacts identified are:

- Any leakages of untreated effluent from the WWTP will result in the contamination of the water in the wetland features which will impact on the PES of the features.
- Any leakages of untreated effluent from the pipe networks supplying untreated effluent to the WWTP will result in the contamination of the water in the wetland features which will impact on the PES of the features.
- Any leakages of treated effluent from the discharge pipeline may result in additional water entering the wetland features associated with the project. This additional water moving into the wetlands may impact the PES of the features.
- The discharge of treated effluent is directly into the Heyshope Dam. Any changes in the quality of the treated effluent may impact on the water quality in the dam.

10.2.4 Potential Impacts on, Soils, Land Capability and Land Use

There is potential to impact the water quality and quantity of watercourses/wetlands sustained by the hydropedological flow, using suppression or alteration of the natural flow as a result of the proposed activities. Moreover, contamination of soils during the project may compromise water quality.

Disturbing the inner-soil architecture of the original soil profile will disturb natural flow processes (i.e. a result of infilling or cut-and-fill activities). Excavated soil will be placed in other areas (i.e. on top of other soils) and will have an impact on the flow dynamics of the soil it is dumped on top of. This may reduce rainfall infiltration and induce runoff. Impermeable areas will decrease rainfall infiltration into soils, and hence reduce interflow (A/B and A/bedrock) or lateral flow to downstream wetland areas. The following impacts are anticipated:

- Alteration to natural hydropedological flow paths.
- Impacts on the macro-soil structure.
- Impacts on the hydropedological processes supporting the watercourses.

This impact has been rated as a **negative Medium** significance impact, which can be rerated as a **positive Medium** impact by revegetating areas where heavy machinery movement takes place to prevent erosion and the attenuated release of clean stormwater back into the

environment. The release of stormwater will offset the rainfall infiltration reduction impacts on soil interflow and may benefit downstream watercourses and wetland units.

Seepage/leakages/overland flow from the CDF, as well as unattended leaks and spillages from vehicles and machinery, may impact soil quality. This is rated as a **Low** significance impact, which can be managed and reduced through the implementation of the recommended mitigation measures.

10.2.5 Potential Impact on Geohydrology

The operational phase impacts will largely be mitigated through the construction of the facilities in accordance with the designs approved by the DWS. These requirements, which have been provided for in the design, are discussed in Chapter 2 of this Report. The following impacts have been identified:

- Groundwater quality: If not managed correctly, the CDF and PCD liner systems may deteriorate/be damaged, which will cause contaminated seepage to migrate from the site (both vertically and laterally). Also, uncontrolled or emergency release – uncontrolled and/or emergency release of effluent from the PCD will cause contaminated seepage to migrate from the site (both vertically and laterally). Seepage may also occur due to repeated overflows from the PCDs and the subsequent saturation of the surrounding soil. The potential impacts on the groundwater quality are rated as **High** significance impacts. Following appropriate management and maintenance measures will greatly reduce the risk of failure of the liner and drainage systems, reducing the impact **Low** significance.
- Groundwater quantity: Groundwater recharge is likely to be reduced due to the use of the liner system below the DD and PCD. This is considered a **Low** significance impact, due to the localised nature. This cannot be mitigated as liner systems are required to protect the groundwater quality.

10.2.6 Potential Impact on Hydrology

Potential seepage from the proposed CDF and runoff from parked vehicles will likely contaminate vadose zone soils.

Surface water contamination may occur due to the following:

- Stormwater runoff from WWTP and CDF.
- Poor stormwater drainage on-site.
- Increased erosion due to vegetation loss.

- Contaminated runoff water into nearby streams from parked vehicles or overflow from PCDs.
- Sedimentation of watercourses due to altered runoff patterns.
- Seepage from the CDF.

As the CDF is designed to contain potential seepage from the coal waste and to capture runoff from the site, the significance of this impact after mitigation is rated as **Low**.

The treatment of decanting from the Heyshope decant containment dam is considered a very positive intervention in terms of limiting the impact on the Heyshope Dam.

10.2.7 Potential Visual Impacts

Visual impacts are posed by the increased size of the CDF through the life of the operation, which has been ranked as a **Medium** significance impact. The CDF is located within an existing mining operation; therefore, the visual character landscape will not be greatly transformed.

The impacts created by the nighttime lighting and potentially poor visibility conditions created by dust generation have been rated **Low** significance impacts. These must be mitigated and managed as recommended in the Impact Assessment Matrix and EMPr.

10.2.8 Potential Noise Impacts

Similar to the construction phase, the noise created is not likely to be above the ambient noise levels of the mining operations, therefore the impact on sensitive receptors (neighbouring community) is considered **Medium**. Mitigation and management measures such as maintaining standard working hours, servicing vehicles and equipment in accordance with a service schedule, noise monitoring and recording and investigating complaints, can reduce the significance of this to **Low** impact.

10.2.9 Potential Cultural Heritage and Palaeontological Impacts

There are no additional anticipated risks to heritage and palaeontological resources for the proposed projects upon completion of construction.

10.2.10 Potential Traffic Impacts

Traffic volumes are expected to return to what they are currently during the operational phase, therefore no additional impacts are anticipated.

10.2.11 Potential Socio-Economic Impacts

As discussed in Chapter 4 of this Report, the proposed development is crucial to the continuation of mining at MQE. The development CDF will provide the required disposal capacity, thereby allowing for the full LoM to be achieved. This will have a positive socio-economic impact through the maintenance of long-term employment. This has been rated as a positive **Medium** significance impact.

The continuation of operational activities will also continue the generation of nuisance impacts such as dust and noise creation and the maintenance of current traffic volumes. This impact is rated as **Medium** significance and can be reduced to **Low** by the implementation of the proposed mitigation measures.

10.3 Assessment of Decommissioning Phase Impacts

The potential decommissioning phase impacts identified due to the following anticipated operational activities are discussed in this section:

- Termination of co-disposal activities. The capping and rehabilitation of the remainder of the CDF will be undertaken, as well as the rehabilitation of the haul roads and any disturbed areas around the CDF, which may not have been properly rehabilitated. This will involve the placement of topsoil and vegetation and the removal of alien invasive plants where necessary.
- Removal of the equipment such as pipelines, electrical and mechanical equipment (including the pump station); the de-silting of the PCD, removal of concrete foundations and removal of all rubble and waste.
- Installation of long-term stormwater systems or upgrades to the operational stormwater system.
- Termination of treatment activities and brine generation (only if no decant from the old MQE workings takes place) The Geohydrological Assessment (refer to Appendix E-4) indicates that the potential for decant during this phase. This will be confirmed through regular updates of the numerical groundwater model over the LoM.
- Ripping of compacted areas including haul roads.
- Monitoring and maintenance: This will involve monitoring the environment, i.e. vegetation, surface water and groundwater monitoring to determine if the rehabilitation, as well as any management measures, have been effective. During this phase planning will be undertaken based on all the data collected during monitoring and detailed studies, to implement any additional measures required to apply for closure of the facility.

10.3.1 Potential Impacts on Air Quality and Climate

Localised impacts on ambient air quality are anticipated through the generation of wind-borne dust due to decommissioning and rehabilitation activities. Dust has the potential to impact human health and cause ecosystem damage. Sources of dust include travelling on gravel roads, wind-borne dust from exposed areas and removal of structures and foundations, ripping of compacted surfaces.

Due to the temporary nature of the decommissioning phase and the limited footprint areas associated with the proposed project, the potential impacts were considered to have a relatively high, **Low** significance. With the implementation of the recommended mitigation measures, the impacts can be reduced to moderately **Low**.

Greenhouse Gases (GHGs), which contribute to global climate change, will be generated throughout the construction and decommissioning phases of the proposed project. Direct GHG emissions include exhaust fumes from equipment, vehicles and backup generators (when required). Allowing fires for cooking or burning of waste or debris may also contribute to this impact. The anticipated impact of the project activities on GHG emissions and climate is expected to be moderate **Low** and can be reduced to **Negligible** with the implementation of the recommended mitigation measures.

10.3.2 Potential Impacts on Terrestrial Ecology

The proposed decommissioning activities have the potential to impact negatively on the terrestrial ecology due to the movement of vehicles machinery and personnel and incorrect handling and disposal of waste. The impacts identified are considered to be **Medium** to **Low** significance and can be successfully mitigated.

The potential impacts include the potential loss of indigenous vegetation units, the potential increase in alien vegetation; contamination of the area by demolition and domestic waste; the direct mortality of fauna; and the disruption of faunal behaviour due to dust and noise pollution and vibration.

10.3.3 Potential Impacts on Freshwater Ecology

Potential impacts on freshwater resources during decommissioning activities result from inadequate waste management, inadequate stormwater management, leakages from the portable chemical toilets, hydrocarbon spillages from plant and equipment, and leaking or spills from storage facilities.

The cessation of activities and rehabilitation efforts are expected to have a positive impact of **Medium** significance, the remaining impacts are rated as a negative, **Medium** significance.

Seepage, leakages and/or overland flow from the CDF and PCDs will cause soil degradation and compromise soil quality. Prolonged pollution may migrate to the nearby watercourse and/or percolate into the groundwater table.

Erosion and sedimentation caused by decommissioning activities, poor waste management and inadequate stormwater management will deteriorate water quality resulting in a negative effect on aquatic resources due to water quality deterioration as a result of erosion and sedimentation.

10.3.4 Potential Impacts on Soils, Land Capability and Land Use

The activities will generally entail rehabilitation and site clean-ups, with the aim of restoring natural flow processes. Similar impacts to those associated with the construction phase are anticipated but will be limited to areas that are further disturbed/rehabilitated.

It is anticipated that once the CDF is rehabilitated and the area stabilised, new hydropedology flow regimes will form as a result of the rehabilitated CDF and PCDs, with liners that still prevent infiltration. Impacts are expected on the soil interflow processes and the soil structure and land capability. These are expected to be positive overall and have been rated as positive **Medium**, provided the recommended mitigation measures are implemented.

The presence of the CDF will have long-term implications in terms of altering the natural hydropedological flow drivers of the subsoils, on which the facility is situated This applies to the proposed PCDs as well. This will likely impact on the soil interflow processes (alteration to natural hydropedological flow paths; impacts on the macro-soil structure; and impacts on the hydropedological processes supporting the watercourses). This has been rated as a negative Medium but will be considered a positive impact if clean stormwater is attenuated back to the natural environment, directly downstream of the development. The release of stormwater will offset the rainfall infiltration reduction impacts on soil interflow and may benefit downstream watercourses and wetland units.

Hydrocarbon leaks and soil erosion are likely to impact the soil if not properly avoided or mitigated. Operation and maintenance of vehicles and machinery resulting in spills or leaks.

10.3.5 Potential Impact on Geohydrology

During the decommissioning phase, hydrocarbon leaks or spillages may impact on the groundwater if not properly managed oil, grease and fuel leaks could lead to hydrocarbon contamination of the vadose zone which could percolate into the shallow aquifer. This has been rated as **Medium** significance but can reduced to **Low** with the implementation of measures to avoid these occurrences, or properly manage them.

The volume of water infiltrating the CDF will reduce once the final capping and rehabilitation of the CDF is undertaken. This will reduce volumes reporting to PCD and reduce the risk of overflows.

10.3.6 Potential Impact on Hydrology

The identified risks for this phase have been rated as **Medium** to **Low**:

- Poor quality seepage and runoff from the CDF (due to poorly maintained liner and drainage system) may impact soil quality and eventually lead to poor quality seepage into the surroundings.
- Poor quality seepage from vehicles accessing the site to do rehabilitation work; and
- Potential surface water sedimentation and contamination as a result of altered runoff patterns and poor stormwater drainage on-site.

Rehabilitation of the CDF is expected to have positive impacts. The reshaping and rehabilitation of the CDF will be beneficial to the environment. Capping and reducing infiltration into the dump will help mitigate any poor quality seepage. This positive impact has been rated as **Medium** significance.

10.3.7 Potential Visual Impacts

The removal of surface infrastructure and associated rehabilitation activities is anticipated to have a positive impact on the aesthetics of the project area.

During the decommissioning phase, night lighting at the laydown area and for security purposes will be required. The type and positioning of this lighting should be carefully considered in order to contain the light to the areas that need illumination and prevent glare from the activities. This impact has been rated **Low** significance and this can be reduced to **Negligible** with the implementation of mitigation measures.

10.3.8 Potential Noise Impacts

Similar to the construction phase, the noise created is not likely to be above the ambient noise levels of the mining operations. This, with the shorter duration of the decommissioning activities, means that the impact on sensitive receptors (neighbouring community) is considered **Low**. Mitigation and management measures such as maintaining standard working hours, servicing vehicles and equipment in accordance with a service schedule, noise monitoring and recording and investigating complaints, can further reduce the significance.

10.3.9 Potential Cultural Heritage and Palaeontological Impacts

Considering that limited additional areas will be impacted during decommissioning, this impact is considered to be **Low**. A Chance Finds Protocol must be implemented should any sites of significance be unearthed/identified during decommissioning. This would involve stopping all work in the area until a qualified specialist has visited the site. Work may only continue after clearance is received from the heritage specialist.

10.3.10 Potential Socio-Economic Impacts

Nuisance factors such as dust, noise and traffic are expected for the duration of the decommissioning activities. This has been rated as **Medium**, however, the significance can be reduced to **Low** if the recommended mitigation measures are implemented.

The decommissioning phase is expected to create temporary jobs, which will have a positive impact on the area, however, this may also prompt an influx of jobs seekers. Both the positive and negative impacts of job creation are rated as **Low** significance, however clear communication and the application of the existing labour and procurement policies is required to manage community expectations.

10.4 Potential Cumulative and Residual Impacts

As defined in the EIA Regulations, "cumulative impact", in relation to an activity, means 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.

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation, this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system.

10.4.1 Air Quality Assessment

The main sources likely to contribute to cumulative particulate impact are surrounding mining operations; materials handling and crushing operations; conveyors, RoM stockpiles, opencast pits, the coal washing plant, agricultural activities; vehicle entrainment on unpaved road surfaces; and household and biomass burning. Furthermore, the project area is located

in the eastern portion of the HPA declared in terms of the NEMAQA. The potential cumulative impacts were therefore considered to have a **Medium** significance overall.

10.4.2 Terrestrial Ecological Impacts

The development of the proposed infrastructure will contribute to cumulative habitat loss and thereby impact the ecological processes in the region. A rehabilitation plan and Alien Plant Management Plan must be compiled for each development and must be effectively implemented. The significance rating is **Medium** and can be reduced slightly with the implementation of appropriate mitigation measures.

10.4.3 Freshwater Ecological Impacts

There is there is the potential to increase the input of contamination into the Heyshope Dam and the wetland unit at the site due to leakages from pipeline and the WWTW and BTP, as well as the potential failure of the WWTW to meet the proposed discharge qualities.

These have been rated as a **Medium** significance impacts, which can be reduced to **Low** through the implementation of the recommended mitigation measures.

10.4.4 Potential Impacts on Soils, Land Capability and Land Use

The CDF will result in a permanent change to the land capability. The disturbances required for the proposed developments will increase the extent of the land impacted. These impacts include further degradation the soil quality, impact on soil interflow processes (alteration to natural hydropedological flow paths; impacts on the macro-soil structure; and impacts on the hydropedological processes supporting the watercourses), soil compaction, soil erosion, natural nutrient content decreases and loss of natural bio-organisms essential to soil processes. These impacts have been rated as **Medium**.

10.4.5 Geohydrological Impacts

The groundwater monitoring results for MQE show that the water quality has been compromised over the course of the mining activities and the numerical model indicates an existing pollution plume (refer to section 6.9.8) with pollution plume gradients higher closer to known mine waste residue sites, and gradually decrease further away towards lower laying areas. The construction of the proposed new facilities in accordance with the NEM: WA requirements and the conditions set out in the WUL (once issued), will prevent the contamination of groundwater provided that the liner and drainage systems are properly maintained. The possibility of seepage from these facilities is therefore expected to be low if regular maintenance is undertaken and the potential for these facilities to contribute to the current pollution plume is expected to be low.

Groundwater contamination from the construction and operational activities such as unmitigated spills and overflows from the PCD, may add to the impact on the quality of groundwater.

The reduction of recharge due to the compaction of soil and the use of liners below the CDF and PCD in conjunction with mining activities is likely to reduce the amount of groundwater within the resource. The lack of groundwater users in the area and the fact that the removal of water from the mining areas is likely to end once mining ends makes this impact of **Low** significance.

10.4.6 Hydrology Impacts

As all activities will take place on the same property, there will be cumulative impacts. The proposed WWTP and brine storage pond are zoned in an area where existing mine impacts are noted. The proposed construction, operational and decommissioning activities pose additional risks to vadose zone soils and nearby water resources. If not properly mitigated, these activities are likely to increase the extent of the areas contaminated, contribute to the degradation of the surface water quality, as well as increase the sediment load within the watercourses.

10.4.7 Visual Impacts

The area surrounding the proposed CDF is utilised for mining and mining related activities. In this context, the visual impact of the CDF will not be large because the development will not contrast against the surrounding land use. Also, the proposed CDF will not be visible from a residential or high-volume tourist attraction or major road. The cumulative effect of the CDF to the visual impact of the mine is therefore considered to be **Low**.

The impact created by the additional nighttime lighting has been rated **Low** significance. These must be mitigated and managed as recommended in the Impact Assessment Matrix and EMPr.

10.4.8 Cultural Heritage and Palaeontological Impact Assessment

The site is located within an existing MRA, surrounded by disturbed areas, therefore no cumulative impacts on this aspect are anticipated.

10.4.9 Noise Impacts

The noise created is not likely to be above the ambient noise levels of the mining operations. With the exception of the additional activities during the construction and decommissioning activities, the noise impacts associated with the proposed project are not likely to have a

cumulative effect on noise levels.

10.4.10 Socio-Economic Impact Assessment

The creation of additional jobs related to the project will be limited in number and duration, which will create a Low significance positive impact.

The additional noise and dust created during the construction, operation and decommissioning phases of the mine may potentially affect nearby residents. There is existing tolerance to these impacts due to the current mining activities. Furthermore, the CDF will be located further away from the community than the MQE plant, which means that these impacts are likely to be of **Low** significance.

11 KNOWLEDGE, GAPS AND LIMITATIONS

The EIA Regulations require that an account of any assumptions, uncertainties and gaps in knowledge applicable to the preparation of this Report is provided.

An impact assessment is a predictive tool to identify aspects of a development that need to be prevented, altered or controlled in a manner to reduce the impact on the receiving environment or determine where remediation activities will need to be incorporated into the overall development/activity plan. This does not mean that the impact will occur at the predicted significance but provides guidance on the formulation of the management and monitoring requirements which need to be incorporated to prevent/reduce/manage the impact.

Specialist investigations were undertaken to define the baseline environment and predict the impacts of the proposed project. The assumptions and limitations applicable to the individual specialist studies are outlined within each of the respective specialist reports attached under Appendix E of this EIR and will not be repeated herein.

Findings, recommendations and conclusions provided in this EIR, and all specialist reports, are based on the authors' best scientific and professional knowledge and information available at the time of compilation. Information in this EIR has been obtained from various sources. The following assumptions have been identified:

- It is assumed that all information received from the proponent is correct, with nothing withheld.
- It is assumed that the proponent will be developing the proposed projects as described within this Report and that no deviation will be required.
- The impact descriptions and assessment are based on the author's understanding of the proposed project based on the information provided.

Due to the limitations inherent in the field assessments, it is understood that surveys of the site may miss potential sites of archaeological, heritage and palaeontological value. To address this, a site walkthrough by a qualified palaeontologist recommended prior to the start of clearing activities, preferably during the pre-construction phase.

12 ENVIRONMENTAL IMPACT STATEMENT

12.1 Key Findings of the Impact Assessment

The results of the impact assessment indicated that the most significant impacts on the receiving environment would be those listed below in **Table 12-1, Table 12-2** and **Table 12-3.** The overall environmental sensitivity of the receiving environment and composite sensitive receptor impact is illustrated in **Figure 12-1** below. The correct implementation of the mitigation measures outlined in the EMPr will ensure that all impacts are managed, mitigated or avoided as far as practicably possible.

Table 12-1: Key Impacts: Construction Phase

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
Air Quality	Generation of inhalable particle emissions and fugitive dust and dust fallout.	L	L
	GHG emissions during construction activities.	L	L
Terrestrial Ecology	Loss of vegetation within the development footprint.	H	M
	Degradation and loss of surrounding natural vegetation.	M	L
	• Direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills, and persecution. • Disturbance due to dust and noise pollution and vibration may disrupt behaviour.	M	L
Freshwater Ecology	Loss of riparian vegetation due to vegetation clearing and earthworks.	M	L
	Potential increase in sedimentation of the wetland features.	M	L
	Contamination of the water in the wetlands petrochemical spillages.	M	L
	Contamination of the aquatic features due to spillages or leakages from on-site ablution facilities.	M	L
Soils, Land Capability and Land Use	Loss of land capability due to construction of permanent infrastructure (CDF).	M	M
	Soil interflow processes: • Infilling of wetlands and watercourses inducing alternative flow paths (if infilling occurs). • Alteration to natural hydropedological flow paths. • Impacts on the macro-soil structure. • Impacts on the hydropedological processes supporting the watercourses.	M	M
	Soil structure & land capability: • Exposure of soils, leading to increased runoff from cleared areas and erosion of the watercourses, thus increasing the potential for	M	M

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
	sedimentation of the watercourses. • Vegetation loss. • Soil compaction and erosion.		
	Soil quality: • Natural nutrient content decreases due to soil exposure. • Loss of natural bio-organisms essential to soil processes.	M	M
	Soil degradation. Compromised soil quality. Prolonged pollution may migrate to the nearby watercourse and/or percolate into the groundwater table.	M	L
	Perched water table dewatering.	M	L
Geohydrological Aspects	Disturbing vadose zone during soil excavations/construction activities.	M	L
	Poor quality seepage from machinery used to excavate soils. Oil, grease and fuel leaks could lead to hydrocarbon contamination of the vadose zone which could percolate into the shallow aquifer.	M	L
	Groundwater recharge may increase in some areas and decrease in others.	L	L
	Perched water table dewatering.	M	L
Hydrological Aspects	Disturbing vadose zone during soil excavations/activities.	H	M
	Surface water contamination and sedimentation from the following activities: • Washing of equipment and vehicles, unattended leaks and spills; • Erosion and sedimentation of watercourses due to unforeseen circumstances (i.e. bad weather); and • Alteration of natural drainage lines which may lead to ponding or increased runoff patterns (i.e. may cause stagnant water levels or increase erosion).	M	L
Hydrological Aspects	Perched water table dewatering.	L	L
Visual Impacts	Negative visual impact on aesthetics.	M	L
	Poor visibility due to dust creation.	M	L
	Visual intrusion due to glare, light trespass and skyglow.	L	L
Noise Impacts	Noise disturbance to sensitive receptors.	L	L
Heritage & Palaeontological Impacts	Loss of / damage to heritage/archaeological/palaeontological resources if unearthed during construction.	L	L
Traffic Impacts	Increase in traffic volumes and road incidents due to construction vehicles and construction personnel travelling to the site.	M	L

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
Socio-Economic Impacts	Temporary job creation and skills development.	L	L
	• Dust & noise could increase as a result of an increase in traffic. • General construction activities resulting in an increase in fugitive dust emissions.	M	L

Table 12-2: Key Impacts: Operational Phase

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
Air Quality	Generation of inhalable particle emissions and fugitive dust	M	L
Terrestrial Ecology	Disturbance created during the construction phase will leave the project area vulnerable to erosion and Invasive plant encroachment.	M	L
	This may lead to local disturbance of fauna and flora, through noise, light, trampling, etc. Fauna may move away from the site.	M	L
	Ongoing displacement and direct mortalities of faunal community due to disturbance	M	L
Freshwater Ecology	Contamination of the water in the wetland features, which will impact on the PES of the features, due to leakage of untreated effluent from WWTW	M	L
	Contamination of the water in the wetland features, which will impact on the PES of the features, due to leakage of untreated effluent from pipelines	M	L
	Changes to the hydrological regime of the wetlands due to leakages from the treated discharge pipeline.	M	L
	Pollution of the Heyshope Dam due to treated effluent discharge limits not being met by the WWTW.	M	L
Soils, Land Capability and Land Use	Soil interflow processes: • Alteration to natural hydropedological flow paths. • Impacts on the macro-soil structure. • Impacts on the hydropedological processes supporting the watercourses.	M	M
	Soil contamination	L	L
Geohydrological Aspects	Deterioration of groundwater quality due to seepage from PCDs	H	L
	Deterioration of groundwater quality due to failure of liner or drainage system.	H	L
	Reduction to groundwater recharge over project area	L	L
Hydrological Aspects	Contamination of vadose zone soils	M	L

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
	Contamination of surface water due to contaminated runoff and sedimentation	H	L
	Poor quality seepage into the subsoils from landfills may impact soil quality and eventually lead to poor quality seepage into the surroundings.	H	M
	Reduction of contamination surface water resource	H	H
Visual Impacts	Visual impact of the CDF due to the increasing size of CDF over the life of the facility	M	L
	Poor visibility conditions	L	L
	Visual intrusion due to glare, light trespass and skyglow	L	L
Noise Impacts	Noise disturbance to sensitive receptors	M	L
Heritage & Palaeontological Impacts	None	N/A	N/A
Socio-Economic Impacts	Continued mining is facilitated by the provision of a CDF for the disposal of mine wastes.	M	M
	• Traffic volumes are anticipated to remain the same. • Dust and noise as a result of general operational activities.	M	L

Table 12-3: Key Impacts: Decommissioning Phase

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
Air Quality	Generation of inhalable particle emissions and fugitive dust and dust fallout.	L	L
	GHG emissions during the demolition activities.	L	L
Terrestrial Ecology	Potential loss of Indigenous vegetation units.	L	L
	Potential increase in alien vegetation.	M	L
	Contamination of the area by demolition and domestic waste.	L	L
	Direct mortality of fauna Disturbance due to dust and noise pollution and vibration may disrupt behaviour.	L	L
	Positive effect on aquatic resources due to removal of surface infrastructure and rehabilitation of the area.	M	M
	Soil degradation: Compromised soil quality. Prolonged pollution may migrate to the nearby watercourse and/or percolate into the groundwater table.	M	L
	Negative effect on aquatic resources due to water	M	L

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
	quality deterioration as a result of erosion and sedimentation, and/or inadequate stormwater management		
	Negative effect on aquatic resources due to water quality deterioration as a result of contamination of the area by hydrocarbon/chemical spillages and/or dumping of material outside of designated areas	M	L
Soils, Land Capability and Land Use	Soil interflow processes: • Infilling of wetlands and watercourses inducing alternative flow paths (if infilling occurs). • Alteration to natural hydropedological flow paths. • Impacts on the macro-soil structure. • Impacts on the hydropedological processes supporting the watercourses.	M	M
	Soil structure & land capability: • Exposure of soils, leading to increased runoff from cleared areas and erosion of the watercourses, thus increasing the potential for sedimentation of the watercourses. • Vegetation loss. • Soil compaction and erosion.	M	M
	Soil quality: • Natural nutrient content decreases due to soil exposure. • Loss of natural bio-organisms essential to soil processes.	M	M
	Long-term implications due to the presence of CDF Soil interflow processes: • Infilling of wetlands and watercourses inducing alternative flow paths (if infilling occurs). • Alteration to natural hydropedological flow paths. • Impacts on the macro-soil structure. Impacts on the hydropedological processes supporting the watercourses	M	M
	Contamination of the area by petrochemical spillages	L	L
	Soil loss / Soil erosion	M	L
Geohydrological Aspects	Poor quality seepage from machinery. Oil, grease and fuel leaks could lead to hydrocarbon contamination of the vadose zone which could percolate into the shallow aquifer.	M	L
	Reduced volumes infiltrating the CDF reporting to PCD	M	M
Hydrological Aspects	The reshaping and rehabilitation of the Co-Disposal Facility will be beneficial to the	M	H

ENVIRONMENTAL ASPECT	IMPACT	WITHOUT MITIGATION	WITH MITIGATION
	environment. Capping and reducing infiltration into the dump will help mitigate any poor quality seepage.		
	Poor quality seepage into the subsoils from landfills may impact soil quality and eventually lead to poor quality seepage into the surroundings.	L	L
	• Potential surface water contamination as a result of poor stormwater drainage on-site.\ Increased erosion due to vegetation loss. • Contaminated runoff water into nearby streams from parked vehicles or unattended leaks or spills. • Sedimentation of watercourses due to altered runoff patterns.	L	L
	Surface water contamination due to overflow from PCD and TSF during storm events	M	L
Visual Impacts	Positive visual impact on aesthetics	L	L
	Visual intrusion due to glare, light trespass and skyglow	L	L
Noise Impacts	Noise disturbance to sensitive receptors	L	L
Heritage & Palaeontological Impacts	Loss of / damage to heritage/archaeological/palaeontological resources if unearthed during construction	L	L
Socio-Economic Impacts	Nuisance factors (dust, noise and traffic)	M	L
	Temporary job creation	L	L
	Influx of workers post operations.	L	L

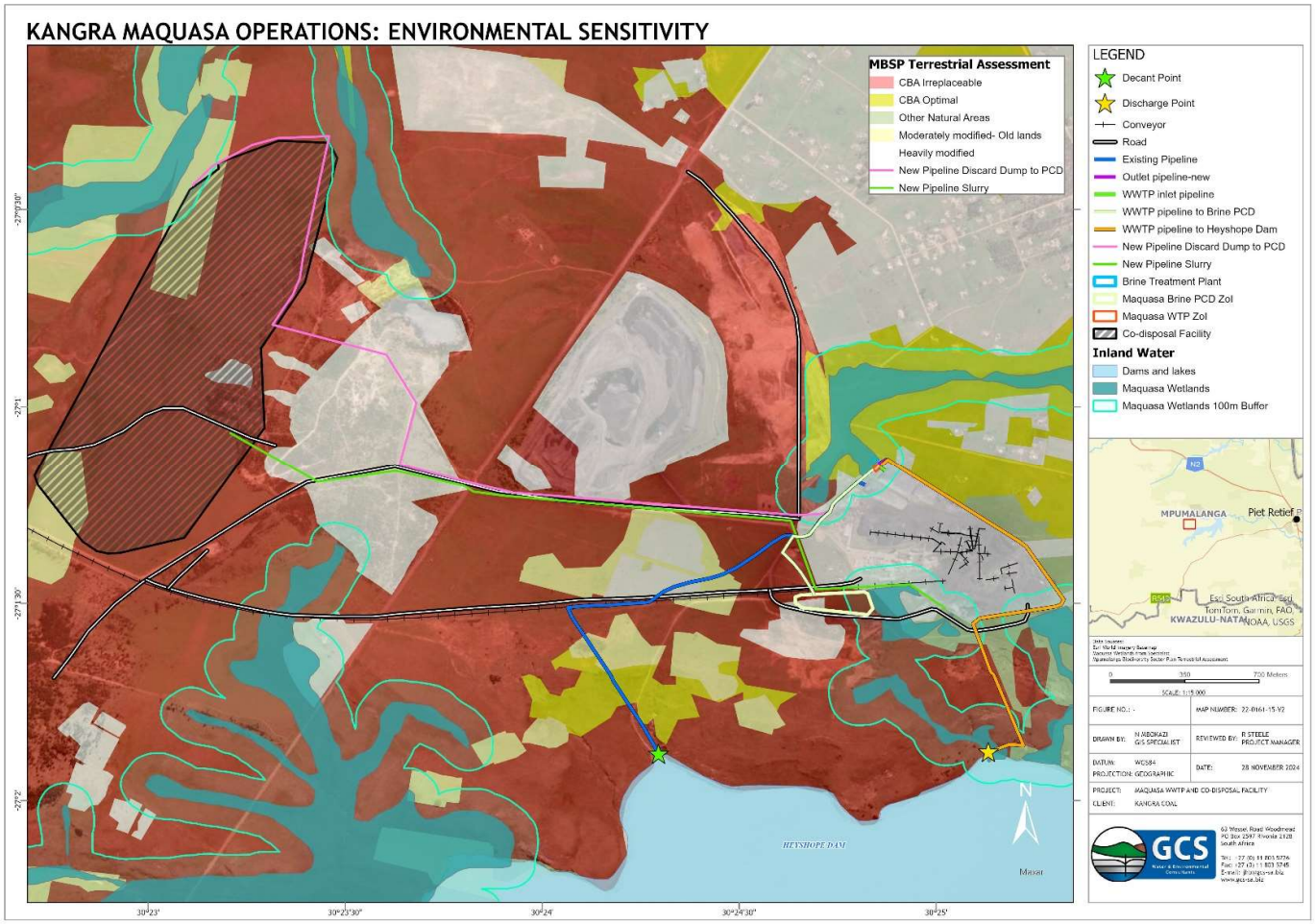


Figure 12-1: MQE CDF and WWTP Project Composite Environmental Sensitivity Map

12.2 Opinion Regarding Authorisation of Activity/ies

The assessments undertaken during the environmental impact assessment process have not identified any fatal flaws which would preclude the authorisation of the proposed project. The EAP is confident that all major negative impacts associated with the proposed development have been adequately described and can be mitigated to acceptable levels.

The goal of the proposed project is to mitigate the negative impacts of decant on the environment and continue contributing to the local economy by allowing the full LoM to be realised.

It is the opinion of the EAP that there is no reason not to grant the requested environmental authorisation in respect of the proposed WWTP and CDF and related infrastructure.

12.3 Environmental Management Programme Report (EMPr)

GCS has prepared an EMPr, which is required as part of the EIR submission. The purpose of the EMPr is to control the impacts of construction and operational activities. The effective implementation of an EMPr will ensure that the required works are conducted in an environmentally sound manner and that the potential negative impacts of construction and operational activities are minimised and/or prevented.

The EMPr details the responsibilities and authority of the various parties involved in the project and contains environmental specifications to which the contractor and operator are required to adhere throughout the construction and operational phases. The EMPr covers impacts that have been identified in the EIA Process and which could potentially arise during the construction, operation and decommissioning. The EMPr covers the following aspects:

- Project background information.
- Identification/listing of project and operational activities.
- Implementation and operational instructions.
- Roles and responsibilities of parties regarding environmental management.
- Environmental training and awareness material for construction staff.
- Environmental specifications e.g., protection of biodiversity and sensitive environments, rehabilitation, public safety and perceptions, traffic control, material and waste management, litter, containment and disposal of hazardous substances (e.g., paints, waste oils) etc.
- Decommissioning/Closure and Rehabilitation (as attached in Appendix E-8).
- Measurement of compliance with the EMPr.

12.4 Proposed Conditions of Authorisation

Following the findings of the EIA, it is suggested that the CA include the following conditions in the EA, should they decide to grant such:

- The Applicant, or anyone acting on the Applicant's behalf, must comply with the applicable legislation, regulatory and permit requirements from the Local Municipality, the District Municipality, the Mpumalanga Department of Agriculture, Rural Development, Land and Environment, DWS and all relevant authorities during the construction and operation phases.
- The recommendations and mitigation measures included in the specialist investigations must be adhered to as far as practicably possible.
- Obtain all licensing and permits from the relevant authorities to be compliant with national, and international laws, policies and acts.
- Correct implementation of all feasible mitigation measures included in the EMPr during the project lifecycle.
- Appoint a qualified palaeontologist to undertake a site walkthrough during the pre-construction phase.
- The final layout of the CDF must be designed taking into account the required 100m wetland buffers. The final layout must be overlaid onto a wetland buffer map for approval by the ECO prior to construction.
- A follow-up terrestrial biodiversity must be undertaken during the spring/summer season before the final decision by the CA. This must include a confirmation by an avifaunal specialist of the adequacy of 100m wetland buffer proposed.
- In terms of Environmental Monitoring and Auditing, the following:
    - Appointment of an independent ECO for the duration of the construction phase of the project, to monitor environmental compliance of the project to all environmental conditions and requirements during all construction phases (pre-construction, construction, post construction);
    - Appointment of an independent External Auditor on an annual basis to undertake annual environmental compliance audits for the project.

13 INFORMATION REQUESTED BY THE COMPETENT AUTHORITY

The Scoping Report acceptance letter from the DMRE dated 13 August 2024, included a list of requirements which are discussed in this chapter.

"c) Please ensure that comments from all relevant stakeholders are submitted to the Department with the Environmental Impact Assessment Report. This Includes but is not limited to the Provincial Heritage Resources Authority, Department of Agriculture, Forestry and Fisheries, Department of Water and Sanitation, Mpumalanga Department of Public Works, Roads and Transport and the local municipality. Proof of correspondence with the various stakeholders must be included in the EIAR. Should you be unable to obtain comments, proof of attempts that were made to obtain comments should be submitted to the Department.

EAP Response:

The proof of communication with the local, national and provincial authorities is included in the Public Participation Report attached under Appendix C.

"d) It should be noted that the Department requires the following to be provided/included and form part of the Final EIR and EMPr to be submitted.

- *The financial provision calculations must be provided for the proposed activities.*

EAP Response:

The Financial Provision was calculated by Elemental Sustainability in accordance with the "Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine. The report is attached as Appendix E-8. The summary of the closure cost for the proposed CDF, water treatment plant and related infrastructure is presented in Table 13-1 below.

Table 13-1: Closure Cost Summary: CDF and WTP Project

DESCRIPTION	COST
Subtotal 1 (Sum of items 1 to 15)	R12 331 915.72
Add 6% of Subtotal if Subtotal 2 ≥ R 100,000,000.00 Add 12% of Subtotal if Subtotal 2 ≤ R 100,000,000.00	R1 479 829.89
10.0% of Subtotal	R1 233 191.57
Subtotal 2 (Subtotal 1 plus Sum of management and contingency)	R15 044 937.18
VAT (15%)	R2 256 740.58

DESCRIPTION	COST
GRAND TOTAL (Subtotal 2 plus VAT)	R17 301 677.76

- *The plan to be submitted must include the location and aerial extent of the proposed mining activities.*

EAP Response:

The location and aerial extent of the proposed activities are provided in the maps in Section 1.5 of this Report.

- *A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. All maps must be visible in A3 with a clear legend.*

EAP Response:

The composite environmental sensitivities map is provided in Figure 12-1.

- *Public Participation Process must be transparent, and all comments received during the process must be incorporated into the comments and response report of the Environmental Impact Report.*

EAP Response:

The public participation process was undertaken in Chapter 6 of the EIA (as amended). The process followed, the evidence thereof, as well as all comments received are provided in the Public Participation Process Report, attached under Appendix C.

- *Traffic Impact Assessment study must be conducted, and recommendations must be incorporated in the EIA/EMPr submitted.*

EAP Response:

A Traffic Impact Assessment (TIA) was undertaken in 2019 (TTT Africa, 2019) for the Kusipongo Mine Expansion Project. The traffic counts undertaken at the intersection of the D1091 and the MQE access road indicate the road roads are “only used for mining activities and no external traffic traverses the area” (TTT Africa, 2019).

The Manual of Traffic Impact Studies published by the Department of Transport, 1995, provides that a full traffic impact analysis is required if more than 150 vehicle trips per hour will be generated by a development. The construction phase of the project is anticipated to create approximately 100 temporary jobs and no additional jobs will be created during the operational phase The Kusipongo TIA established that the construction traffic impacts were of low significance for this area. Furthermore, the haulage of material from Kusipongo to

MQE was accommodated in the Kusipongo TIA and all recommendations have been incorporated into the Kusipongo EIA.

Based on the low anticipated traffic volumes, the recently completed TIA for the MQE access road intersection for the Kusipongo expansion project, a TIA was not considered necessary. It must be noted however, that the potential traffic impacts have been assessed and mitigation measures have been recommended in the impact assessment and the EMPr

- *Proof of correspondence with the various stakeholders must be included in the EIAR. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department.*

EAP Response:

The proof of correspondence with stakeholders is provided in the Public Participation Process Report, attached under Appendix C. This report includes the stakeholder database, which lists all the stakeholders who were consulted regarding the project.

- *All comments from interested and affected parties must be adequately addressed in the final Environmental Impact Report.*

EAP Response:
All comments are addressed, as summarised in the CRR (Appendix C).

- *Any other matters required in terms of Appendix 3 (3) and Appendix 4(1) of the EIA Regulation 2014.*

EAP Response:

The requirements of Appendix 3(3) are listed in the Structure and Content Table before Section 1. This table indicates where each requirement has been addressed in this Report. The structure and content of the EMPr, required in Appendix 4 (1) of the EI regulations is similarly included in the EMPr, which is attached as F of this Report.

"f) Please ensure that the EIAR includes the A3 size locality map of the area and illustrates the exact location of the proposed development. The map must be of acceptable quality and as a minimum, have the following attributes, maps are related to one another, coordinates, legible legends, indicate alternative, scale and vegetation types of the study area.

EAP Response:

The location of the proposed activities is provided in the maps in Section 1.5 of this Report. The map indicating vegetation types is provided in Section 6.7.1 of this Report.

14 CONCLUSION

This EIR has been compiled where the potential impacts on the environment of listed activities associated with the proposed WWTP and CDF Project were considered, investigated and assessed in compliance with the NEMA and EIA Regulations 2014. This Report contains all information that is necessary for the CA to consider the application and to reach a decision regarding the application and includes an assessment of each identified potential impact, including biophysical, ecological, socio-economic and cumulative impacts of the project on the environment. The impact assessment is more detailed than the preliminary assessment undertaken in the Scoping Phase, by incorporating all the conditions required by the EIA Regulations 2014, to provide a thorough investigation into all potential impacts.

Based on the conclusion that no environmental fatal flaw was found and that any negative impacts can be mitigated to acceptable levels, GCS recommends that an EA is granted, provided the rehabilitation measures and all other proposed mitigation measures are implemented and the recommendations are considered.

15 EAP DECLARATION AND UNDERTAKING

I, Reneé Steele, on behalf of GCS Water & Environmental (Pty) Ltd, as the appointed Environmental Assessment Practitioner, declare that:

- I act as the independent Environmental Assessment Practitioner in this application;
- I have expertise in conducting environmental impact assessments, 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 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 will take into account, to the extent possible, the matters listed in Regulation 14 of the Regulations when preparing the application and any report relating to the application;
- I herewith undertake that the information provided in this Report is correct and that the comments and inputs from stakeholders and Interested and Affected Parties received since the project announcement have been correctly recorded in the report;
- I herewith undertake that the information provided in this report is correct and that the level of agreement with Interested and Affected Parties and stakeholders since the announcement of the project, has been correctly recorded in the report;
- 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, unless access to that information is protected by law, in which case it will be indicated that such information exists and will be provided to the Competent Authority;
- I will perform all obligations as expected from an Environmental Assessment Practitioner in terms of the Regulations;
- I am aware of what constitutes an offence in terms of Regulation 48 and that a person convicted of an offence in terms of Regulation 48(1) is liable to the penalties as contemplated in Section 49B of the Act; and
- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

Signature of the EAP: 

Name of Company: GCS Water and Environmental (Pty) Ltd

Date: 4 December 2024

16 REFERENCES

Department of Environmental Affairs. 2017. Guideline on Need and Desirability, Department of Environmental Affairs, (DEA), Pretoria, South Africa.

Department of Environmental Affairs. 2012. Highveld Priority Area Air Quality Management Plan. Government Notice 144, Government Gazette No. 35072.

GCS. April 2013. Kangra Coal Pty (Ltd): Proposed Expansion of Mining Operations: Environmental Impact Assessment and Environmental Management Programme Report.

GCS. June 2014. Soils, Land Use and Land Capability Assessment for the Proposed Kangra Discard Facility.

GCS. June 2015. Hydrogeological Investigation: Discard Storage Facility.

GCS Water & Environment (Pty) Ltd. 2018. Geohydrological Study Update for Maquasa East, Maquasa West and Nooitgezien Operations.

GCS. 15 February 2023. Follow-Up Geohydrological Assessment and Numerical Flow & Transport Model Update for Maquasa & Kusipongo Operations.

GCS. 2 June 2023. Ecological Assessment for the Kangra Coal (Pty) LTD Maquasa Mine Pipeline Disposal, WWTWs, Discard Dump near Piet Retief, Mpumalanga Province.

GCS. 2 June 2023. Wetland Assessment for the Kangra Coal (Pty) LTD Maquasa Mine Pipeline Disposal, WWTWs, Discard Dump near Piet Retief, Mpumalanga.

GCS. 18 October 2022. Hydrology Assessment for the Proposed Co-Disposal Facility & Water Treatment Plant at Kangra Maquasa East Operations.

GCS. 17 November 2022. Waste Classification Assessment Proposed Co-Disposal Facility at Kangra Maquasa East Operations.

GCS. 2023. Water Quality Monitoring Report for the Kangra Coal Maquasa East, Maquasa West & Nooitgesien Operations: Third Quarter, 2022 Monitoring Period.

Gert Sibande District Municipality Amended Integrated Development Plan 2021-2022

Hatch. 20 December 2011. Kusipongo Expansion Project - Concept Discard Dump Report - Issued for Client Review.

JG Afrika (Pty) Ltd. September 2019. Kusipongo Coal Mine Amendment – Investigation of Haulage Over Public Roads.

TTT Africa (Pty) Ltd. September 2019. Kangra Coal: Proposed Expansion of Mining Works to Include the Kusipongo Coal Resource.

TRAFFIC IMPACT STATEMENT

Van der Merwe, B. 2008. Environmental Noise Impact Assessment: Site Selection Process. DBAccoustics.

Wetland Consulting Services. 2013. Kangra Maquasa East and Maquasa West Proposed Opencast Expansion Projects: Wetland Delineation, Ecological and Impact Assessment Report.

Wernecke, Bianca; Langerman, Kristy E; Garland, Rebecca M and Feig, Gregor. Ambient air pollution on the Highveld: An airshed at a watershed moment? Clean Air J. [online]. 2022, vol.32, n.1 [cited 2024-03-07], pp.1-3. Available from: <http://www.scielo.org.za