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DRAFT ENVIRONMENTAL IMPACT REPORT ON

MEDUPI FLUE GAS DESULPHURISATION (FGD) RETROFIT PROJECT

DEA REF: 14/12/16/3/3/3/110

ZC Report No: 12949-46-Rep-003

Submitted to:

Eskom Holdings SOC Limited
P O Box 1091
Johannesburg
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19 February 2018 12949

YOUR COMMENT ON THE DRAFT ENVIRONMENTAL IMPACT REPORT (DEIR)

The DEIR was submitted for public review and comment for a period of 40 days. In accordance with Section 56(6) of the 2010 EIA Regulations, a registered Interested and Affected Party (I&AP) may submit comments on the DEIR, and these comments should be submitted to Zitholele Consulting on the details provided.

The Draft Environmental Impact Report (DEIR) is available for comment from **Monday, 19 February 2018**. This DEIR has been distributed to the Organs of State, and copies thereof are available at strategic public places in the project area (see below).

VENUE	CONTACT DETAILS
Printed Copies	
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Zitholele Consulting Website	http://www.zitholele.co.za/environmental/ under heading "EIA for Medupi FGD" and sub-heading "DEIR – February 2018"
Eskom Website	http://www.eskom.co.za/OurCompany/SustainableDevelopment/EnvironmentalImpactAssessments/Pages/Environment_Impact_Assessments.aspx under the heading "Medupi FGD"
Mathys Vosloo / Lebo Petlane	Available on CD on request via email Tel.: 011 207 2060 E-mail: fgd@zitholele.co.za

You may comment on the DEIR by:

- Completing the comment sheet;
- Writing a letter, or producing additional written submissions; and
- Emailing, faxing or calling the public participation office.

Due Date for comment on the DEIR is Thursday, 05 April 2018

SEND YOUR COMMENTS to:

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EXECUTIVE SUMMARY

Medupi Power Station is a greenfield coal-fired power station that forms part of the Eskom New Build Programme. Medupi Power Station has an installed generation capacity of 6 x 800 MW units and utilises a supercritical boiler and turbine technology designed to operate at higher temperatures and pressures, which allows for better efficiency of the power station. The result is an improvement of approximately 2 percentage points on the plant efficiency which equates to a reduced coal consumption of approximately 1 million tons per annum.

Electricity is generated in coal-fired power stations through combustion of coal. Coal is composed, primarily, of carbon along with variable quantities of other elements, chiefly hydrogen, sulphur, oxygen, and nitrogen. When coal is burned, the sulphur combines with oxygen to form, amongst other, sulphur dioxide (SO_2) and sulphur trioxide (SO_3). Due to the detrimental impact of high SO_2 concentrations associated with coal fired-power stations stringent air quality regulations have been implemented worldwide to combat the emissions sulphur oxides (SO_x).

Flue Gas Desulfurization (FGD) is a technology used to remove SO_2 from flue gases of fossil-fuel power plants, and from the emissions of other sulphur oxide emitting processes. Medupi Power Station is designed and constructed to be wet FGD ready, utilising limestone as a sorbent as per its Environmental Authorisation.

The Scoping Phase commenced in 2013 and was concluded in August 2015 with submission of a Scoping Report to the Department of Environmental Affairs (DEA), which was subsequently accepted with Plan of Study approved. During the execution of the Impact Assessment phase that followed, deviations on the development packaging were necessary to streamline the EIA application process for the Medupi FGD in order to fast track the application for authorisation and licensing of the FGD retrofit. Two bridging documents were prepared and submitted to I&APs to inform stakeholders of the proposed changes to EIA scope.

Subsequent to the aforementioned changes the EIA scope includes assessment of the construction and operation of a rail yard/siding to receive Limestone and transport gypsum via rail, the installation of diesel storage facilities within the FGD and rail yard footprint, the construction and operation of the wet FGD system as well as associated infrastructure required for operation of the FGD system, the handling, treatment and conveyance of gypsum and effluent, the construction and operation of a Waste Water Treatment Plant (WWTP), and the management, handling, transport and storage of salts and sludge generated through the waste water treatment process at a temporary waste storage facility.

Specialists were appointed to undertake the relevant assessments to identify and assess impacts, and propose appropriate mitigation and management measures for the identified impacts. The specialist studies commissioned include an Air Quality Impact Assessment, Noise Impact Assessment, Geology and Soils Assessment, Geotechnical Assessment, Geohydrology Impact Assessment, Surface Water Assessment, Traffic Impact Assessment, Terrestrial Ecological (Fauna, Flora, incl. Avifauna) and Wetland Impact Assessment, Social Impact Assessment, Heritage Impact Assessment, and Waste Assessment. A number of studies were previously undertaken for the Medupi Power Station footprint, and as a result some of the commissioned studies were tasked to assess these existing reports and data in order to provide a specialist opinion on the potential impact significance of identified impacts.

Possible feasible and reasonable alternatives associated with the FGD Retrofit project was considered, however, no feasible alternatives were identified for location of the FGD system and rail yard infrastructure. Furthermore, technology alternatives relating to the use of dry FGD, Wet FGD and Wet FGD with gas cooling technology installed to reduce water consumption by the FGD system were considered. It was concluded that due to high maintenance costs, specific characteristics of the ash, and availability of space within the existing power station footprint, the wet FGD system with gas cooler was not feasible at the Medupi Power Station.

The no-go option is to continue the operation of the Power Station without the FGD retrofit. However, this will result in the MPS operating in contravention of the conditions of its Air Emissions License. To remain compliant to legislation, the MPS would need to shut down operation. This would have a catastrophic impact on the South African economy and the stability of electricity supply to southern Africa. It can therefore be considered that the No-Go Option is fatally flawed for these reasons.

The FGD system, rail yard and associated infrastructure will be situated within the authorised development footprint of the Medupi Power Station as a whole. It was therefore noted that the FGD retrofit activities, besides the proposed area where the rail yard and associated structures will be constructed, will occur predominantly within an impacted footprint. This development area has already been rezoned for industrial and economic purposes in light of the development of the Medupi Power Station on this specific site.

AS a result of the development of the Medupi Power Station, existing pollution management measures such as clean and dirty water separation infrastructure, is already installed within the MPS footprint. This already provides some assurance that possible impacts originating from the FGD system and associated infrastructure will be managed within the existing pollution management system.

The specialist and impact assessments concluded that the potential impacts on geotechnical aspects, noise levels, heritage, archaeology and palaeontology, and traffic was expected to be minor and can successfully be mitigated to acceptable levels with proposed mitigation.

Assessment of the proposed air quality impacts has demonstrated what was anticipated, i.e. that implementation of the FGD system would significantly reduce the SO_2 emissions at the MPS to very low levels. However, within the MPS operations the FGD system will be a major consumer of water. This however is offset by a water allocation from MCWAP Phase 1 and 2.

The potential impact on local communities and social aspects is expected to have an overwhelmingly positive impact. Reduction of SO_2 levels once the FGD system is operational is the primary positive impact that will result in better quality of life in the regions. Additionally, indirect positive impacts resulting from growth in the local economy and greater employment opportunities will be significant.

Overall the impact of the installation of the FGD system, rail yard and associated infrastructure will have a Moderate to High impact on the local biodiversity, and to a lesser degree, wetlands in close proximity to the FGD. Although loss to intact vegetation types and habitat will be permanent for the life of the power station, impacts on fauna can be mitigated to more successfully to a greater extent.

The negative impacts associated with impacts on biodiversity and wetlands can be successfully mitigated to within acceptable levels, with the development contributing to the overwhelming positive impacts associated with the reduction in SO_2, significant benefits to the local economy and quality of life for local residents, Therefore, taking all of the findings, conclusions and considerations mentioned in this Draft Environmental Impact Report into account it is the reasoned opinion of the EAP that the proposed activities be authorised.

The EAP recommends the following general conditions to be included in the Environmental Authorisation (EA):

- The EA will be subject to the implementation of mitigation measures and conditions stipulated within the EMPr and this DEIR.
- Construction must commence within a period of 5 years
- EA will be valid for the life of the Medupi Power Station, subject to revisions and amendments through legislated procedures as the need arise.
- Eskom must continue to investigate water saving measures for its power generation fleet.
- Eskom must continue to investigate mechanisms for waste reduction or minimisation, especially relating to the re-use of ash and gypsum. This has the potential to unlock further economic benefits for local communities living near power stations.

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATIONS

ADF	Ash Disposal Facility
AEL	Atmospheric Emissions License
BMH	Bulk Material Handling
CaCl2	Calcium Chloride
CaF2	Calcium Fluoride
CO	carbon monoxide
CFB	Circulating Fluidized Bed
CCCW	Closed Cycle Cooling Water
CA	Competent Authority
CI	Conservation Important
CBA	Critical Biodiversity Area
dB	decibels
DMS	Degrees, Minutes and Seconds
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DM	District Municipality
DEIR	Draft Environmental Impact Report
DEMPr	Draft Environmental Management Programme
ESA	Early Stone Age
EI	Ecological Importance
ES	Ecological Sensitivity
ESA	Ecological Support Area
EAP	Environmental Assessment Practitioner
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMC	Environmental Monitoring Committee
EO	Environmental Officer
FFP	Fabric Filter Plant
FEIR	Final Impact Assessment Report
FGD	Flue Gas Desulfurization
FEPA	Freshwater Ecosystem Priority Area
FSL	Full Supply Level
Pty	Golder Associates Africa
GN	Government Notice
CaSO4•2H2O	gypsum crystals
HIA	Heritage Impact Assessment
HGM	Hydro-geomorphic
ID	Induced Draft
PM2.5	Inhalable particulate matter with an aerodynamic diameter equal to or less than 2.5 µm
IDP	Integrated Development Plan
IAIA	International Association for Impact Assessments
IEC	**International Electrotechnical Commission**
IFC	International Finance Corporation
LSA	Late Stone Age
LOS	Level of Service
CaCO3	Limestone
LM	Local Municipality
MgSO4	Magnesium Sulphate
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MPS	Medupi Power Station

MVA	Mega Volt Amp
MW	megawatt
MM5	Mesoscale Model version 5
mbgl	meters below ground level
MSA	Middle Stone Age
Mm3/a	million cubic metres per annum
mya	million years ago
MCWAP	Mokolo Crocodile Water Augmentation Project
NAAQ	National Ambient Air Quality
NAAQS	National Ambient Air Quality Standards
NDP	National Development Plan
NEMA	National Environmental Management Act
NEMA	National Environmental Management Act, No 107 of 1998
NEM:WA	National Environmental Management Waste Act, No. 59 of 2008
NEM:AQA	National Environmental Management: Air Quality Act, No 39 of 2004
NWMS	National Waste Management Strategy
NSS	Natural Scientific Services
NSRs	Noise Sensitive Receptors
SOx	oxides of sulphur
PoS	Plan of Study
PCD	Pollution Control Dam
PES	Present Ecological State
ROD	Record of Decision
SWP	Save Working Procedures
SEWs	**Semi-Ephemeral Washes**
SDBIPs	Service Delivery and Budget Implementation Plans
SIA	Social Impact Assessment
SLM	Sound Level Meter
SACNASP	South African Council for Natural Scientific Professionals
SANS	South African National Standards
SAWS	South African Weather Services
SDF	Spatial Development Framework
SWMS	Storm Water Management System
SIP	**Strategic Infrastructure Projects**
SO2	sulphur dioxide
SO3	sulphur trioxide
ToR	Terms of Reference
PM10	Thoracic particulate matter with an aerodynamic diameter of equal to or less than 10 µm
t/a	tons per annum
TOC	Total Organic Carbon
TIA	Traffic Impact Assessment
TFR	Transnet Freight Rail
VIA	Visual Impact Assessment
V	volt
WDF	Waste Disposal Facility
WML	Waste Management License
WWHC	Waste Water Hydrocyclone
WWTP	Waste Water Treatment Plant
WMA	Water Management Area
WRCS	Water Resource Classification System
WULA	Water Use License Application
WBPA	Waterberg-Bojanala Priority Area
WFGD	Wet Flue Gas Desulphurisation
WHO	World Health Organisation
ZLD	Zero Liquid Discharge

1 INTRODUCTION

1.1 Environmental Impact Assessment Content Roadmap

The purpose of this roadmap is to serve as a guide to indicate how the requirements of the Environmental Impact Assessment (EIA) process, as stipulated in the National Environmental Management Act, 107 of 1998 and the EIA Regulations of 2010 (GN543), have been complied with by linking the sections or chapters in this Environmental Impact Report (EIR). **Table 1-1** below provides a roadmap of where the requirements of GN543 are addressed in this DEIR.

Table 1-1: Environmental Impact Report Document Roadmap

GN 543 No.		Description	Relevant DEIR Part
31(2)(a)		Details of -	
	(i)	The EAP who compiled the report; and	Section 1.6
	(ii)	The expertise of the EAP to carry out an environmental impact assessment;	
31(2)(b)		A detailed description of the proposed activity;	Chapter 6: Project Description Table 5-1: Description of Listed Activities
31(2)(c)		A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is -	Section 6.2
	(i)	A linear activity, a description of the route of the activity; or	
	(ii)	An ocean-based activity, the coordinates where the activity is to be undertaken;	N/A
31(2)(d)		A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Chapter 8
31(2)(e)		Details of the public participation process conducted in terms of sub-regulation (1), including -	Chapter 3 and Section 4.5, Appendix F
	(i)	Steps undertaken in accordance with the plan of study;	Chapter 3, Section 4.1 and 4.2
	(ii)	A list of persons, organisations and organs of state that were registered as interested and affected parties;	Appendix F
	(iii)	A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and	Appendix F
	(iv)	Copies of any representations and comments received from registered Interested and Affected Parties (I&APs);	Appendix F, Comments from EIR phase will be included in FEIR
31(2)(f)		A description of the need and desirability of the proposed activity;	Chapter 2

GN 543 No.		Description	Relevant DEIR Part
31(2)(g)		A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;	Chapter 7
31(2)(h)		An indication of the methodology used in determining the significance of potential environmental impacts;	Section 11.1
31(2)(i)		A description and comparative assessment of all alternatives identified during the environmental impact assessment process;	Chapter 7
31(2)(j)		A summary of the findings and recommendations of any specialist report or report on a specialised process;	Chapter 10
31(2)(k)		A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;	Chapter 10 and Chapter 11
31(2)(l)		An assessment of each identified potentially significant impact, including -	Chapter 11
	(i)	Cumulative impacts;	
	(ii)	The nature of the impact;	
	(iii)	The extent and duration of the impact;	
	(iv)	The probability of the impact occurring;	
	(v)	The degree to which the impact can be reversed;	
	(vi)	The degree to which the impact may cause irreplaceable loss of resources; and	
	(vii)	The degree to which the impact can be mitigated.	
31(2)(m)		A description of any assumptions, uncertainties and gaps in knowledge;	Chapter 9
31(2)(n)		A reasoned opinion as to whether the 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;	Chapter 14
31(2)(o)		An environmental impact statement which contains -	Chapter 13
	(i)	A summary of the key findings of the environmental impact assessment; and	
	(ii)	A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	
31(2)(p)		A draft EMPr containing the aspects contemplated in Regulation 33;	Appendix H
31(2)(q)		Copies of any specialist reports and reports on specialised processes complying with Regulation 32;	Appendix G
31(2)(r)		Any specific information that may be required by the competent authority; and	Appendix C, D and E
31(2)(s)		Any other matters required in terms of sections 24(4)(a) and 24(4)(b) of the Act.	N/A

1.2 Project Background

This project focuses on the environmental authorisation process for the Medupi Power Station Flue Gas Desulphurisation (FGD) Retrofit project. In the sub-sections below, background is provided about the Medupi Power Station (MPS), which is currently in construction.

1.2.1 Medupi Power Station (MPS)

Medupi Power Station is a greenfield coal-fired power station that forms part of the Eskom New Build Programme. Medupi Power Station is the fourth dry-cooled based-load power station in South Africa, following Kendal, Majuba and Matimba Power Stations.

Medupi Power Station is located about 15km west of the town of Lephalale in the Limpopo Province. Refer to **Figure 1-1** for the locality map indicating the position of the Medupi Power Station within the Lephalale Municipal area. The Power Station is situated on 883 hectares that was historically operated as a game and livestock farm (Bohlweki Environmental, 2006).

Medupi Power Station has an installed generation capacity of 6 x 800 megawatt (MW) units and utilises a supercritical boiler and turbine technology designed to operate at higher temperatures and pressures, which allows for better efficiency of the power station. The result is an improvement of approximately 2 percentage points on the plant efficiency which equates to a reduced coal consumption of approximately 1 million tons per annum.

Due to the low availability of water in the area, the station is dry cooled and is anticipated that it will use approximately 0.16 litres of water per kWh of electricity produced. This is expected to increase by an additional 0.2 litres of water per kWh when the Flue Gas Desulphurisation (FGD) plant is retrofitted later on.

Each generation unit produces gases that is channelled via ducts called flues to one of 2 chimneys where these gases, also referred to as flue gases, are released into the atmosphere. Each chimney receives flue gasses from three (3) generating units simultaneously.

The power station is currently under both construction and operational phase, with units 4, 5 and 6 already commissioned and operational while construction of units 1, 2 and 3 is ongoing.

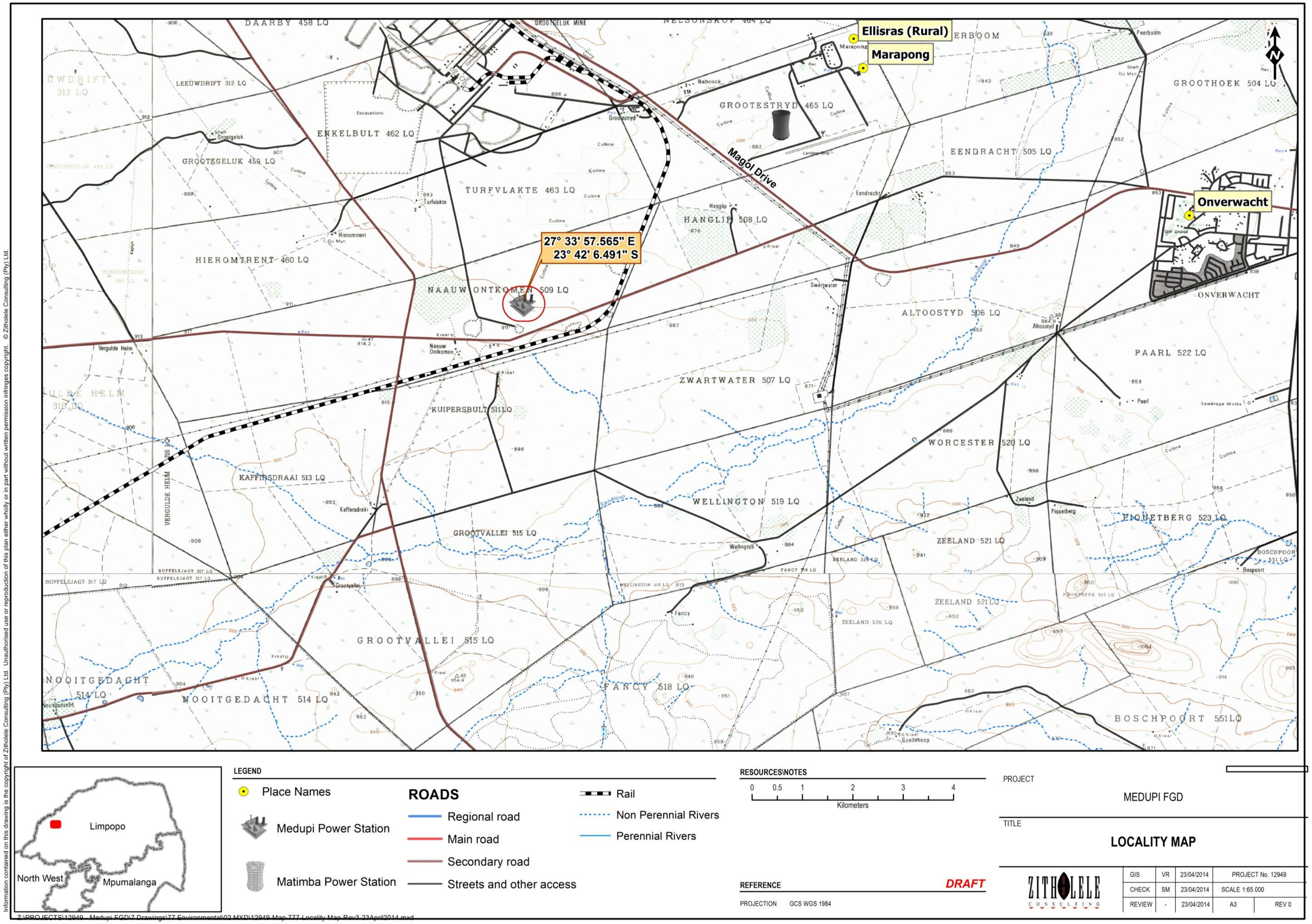


Figure 1-1: Project Locality Map

1.2.2 Generation of SO_2 at the coal-fired power station

Electricity is generated in coal-fired power stations through combustion of coal. Coal is composed, primarily, of carbon along with variable quantities of other elements, chiefly hydrogen, sulphur, oxygen, and nitrogen. When coal is burned, the sulphur combines with oxygen to form oxides of sulphur (SO_x), which include sulphur dioxide (SO_2) and sulphur trioxide (SO_3) (Eskom Holdings SOC Limited, 2017).

SO_2 contributes to the formation of acid rain, which damages forests, crops, buildings, fences and acidifies lakes, streams, and rivers, making them unsuitable for aquatic plant and animal life. In addition, inhalation of high concentrations of SO_2 irritates the nose, throat, and airways to cause coughing, wheezing, shortness of breath, or a tight feeling around the chest.

Stringent air quality regulations have been implemented worldwide to combat the emissions of SO_x. Since the major emission of SO_x is by coal-fired power stations, removing sulphur from the flue gas is a common technique for reducing these emissions (US EPA, 2016).

The six generation units at Medupi Power Station have been designed and constructed to accommodate the installation of wet limestone Flue Gas Desulphurisation technology which is a sulphur dioxide (SO_2) abatement technology. Each of the six generating units of the Power Station operates independently.

1.2.3 Flue Gas Desulphurisation

Flue Gas Desulfurization (FGD) is a technology used to remove SO_2 from exhaust flue gases of fossil-fuel (coal) power plants, and from the emissions of other sulphur oxide emitting processes. Medupi Power Station has been designed and constructed to be wet FGD / wet scrubbing ready, utilising limestone as a sorbent (as per its Environmental Authorisation).

In wet FGD systems, the flue gas normally passes first through a fly ash removal device, which may be either an electrostatic precipitator or a wet scrubber, and then into the SO_2-absorber that removes SO_2 from the flue gas through wet scrubbing. The sorbent that will be utilised for Medupi FGD Retrofit Project is Limestone ($CaCO_3$).

Wet scrubbing is a process where spray towers spray water in the form of water dropplets into the scrubbing chamber, thereby allowing a reaction between the water and SO_2 in order to entrain the SO_2 into water, which is then collected. The remaining flue gas thereafter returns to the chimney stack and is released into the atmosphere with a much reduced SO_2 content.

An important design consideration associated with wet FGD systems is that the flue gas exiting the absorber is saturated with water and still contains some SO_2. These gases are highly corrosive to any downstream equipment such as fans, ducts, and stacks. Since the

SO_2 is an acid gas the typical sorbents or other materials used to remove the SO_2 from the flue gases are alkaline.

1.2.4 Existing infrastructure at Medupi Power Station (MPS) associated with FGD system

The Medupi Power Station units have been designed, and constructed, with provisions incorporated into the space and equipment designed to accommodate the installation of the wet limestone FGD system. Each of the six generating units of the Power Station operates independently, while common facilities for all 6 generation units are provided for electricity, water, coal supply and coal combustion waste disposal.

Each generating is constructed with fabric filters and Induced Draft (ID) fans. The fabric filters remove most of the particulates from the coal combustion process and the ID fans provide necessary draft to overcome system resistance. The ID fans were designed to accommodate additional system resistance expected due to the installation of the FGD equipment (Harris, 2014).

The ID fans currently discharge flue gas directly to the chimney from each of the three (3) generating units linked to each chimney. The FGD system will include additional dampers and ductwork to divert the flue gas to the FGD absorbers and then return it to the chimney. The chimney flues are lined with corrosion-resistant liners to handle saturated flue gas expected from the operation of the FGD systems.

The inside diameter of the existing flues is adequate to cater for the flue gas volumes, while the existing chimneys will be reused with minor modification. The liner associated with the chimneys has sufficient transitional velocity for condensation re-entrainment to withstand the calculated worst-case design so that re-entrainment of moisture droplets will not occur.

1.3 Existing authorisations, licences and approvals

The Medupi Power Station received an environmental authorisation and other relevant licenses for construction and operation. One of these licences, the Atmospheric Emissions License (AEL), which was received in 2012, had conditions which require that the SO_2 emissions from the Power Station be reduced by more than 90%. This is one of the key reasons for the initiation of the FGD retrofit.

All existing authorisations, approvals and licences received for the Medupi Power Station are summarised in **Table 1-2** below.

Table 1-2: Existing authorisations, approvals and licences issued for the Medupi Power Station

Authorisations / Permits / Licenses	Authority	Reference	Applicable legislation/ code of practice
Medupi Power Station Record of Decision (ROD)	DEA	12/12/20/695	ECA (73 of 1989); GNR 1182 & 1183
Afguns Road ROD	DEA	12/12/20/1179	NEMA (107 of 1998); EIA Regulations 2006; GNR385, 386 &387
Raw Water Dam & Pipelines ROD	DEA	12/12/20/1139	NEMA (107 of 1998); EIA Regulations 2006; GNR385, 386
Raw Water Dam & Pipelines ROD Amendment	DEA	12/12/20/1139	NEMA (107 of 1998); Environmental Authorisation
Environmental Authorisation Raw water Dam & Pipeline	DEA	12/12/20/2069	NEMA (107 of 1998); Environmental Authorisation; EIA Regulations 2010; GN R. 544
Telecommunications Mast ROD	DEA	12/12/20/1228	NEMA (107 of 1998); EIA Regulations 2006; GNR385, 386
Environmental Authorisation for the Coal Stockyard on Ash Dump site	DEA	14/12/16/3/3/1/531	NEMA (107 of 1998) as amended
Ash Dump Waste License	DEA	12/9/11/L50/5/R1	NEM:WA (59 0f 2008)
Environmental Authorisation for the Pollution Control Dams and associated infrastructure	DEA	14/12/16/3/3/2/666	NEMA (107 of 1998)Listing Notice 1 and 2 (GNR 544 - item 12 and 545 item 3, 15)
Coal stockyard (coal supply conveyor alignment)	DEA	12/12/20/695	NEMA (107 of 1998) as amended
Amended Medupi Atmospheric Emission License	LEDET	12/4/12L-W2/A3	NEM:AQA (39 of 2004)
Integrated Water Use License for the Medupi Power Station, August 2017	DWS	01/A1042/ABCEFGI/5213	NWA (36 of 1998)
Water Use License for additional dams and C&I	DWS	07/A42H/IG/6425	NWA (36 of 1998)
Eskom ash dumps designs: Medupi ash dump 1-2 year, Excess Coal Stockyard, temporary coal storage area and temporary effluent containment paddock	DWS	Letter 348-859600	NWA (36 of 1998)
Kroomdraai borrow pit permit	DMR	114/2009	MPRDA as amended
Grootvlei borrow pit permit	DMR	113/2009	MPRDA as amended
Tree removal permit (Eenzamheid)- Ash Site	DAFF	200 - 163625	National Forest Act (84 of 1998) as amended
Tree removal permit (Eenzamheid)- Haul Road	DAFF	200 - 163626	National Forest Act (84 of 1998) as amended
Tree removal permit (Turvlakte, Naauw Ontkomen, Hangklip, Kroomdraii, Kuipersbuilt and Grootvallei) - Medupi Power Station	DAFF	200 - 163627	National Forest Act (84 of 1998) as amended

1.4 Overview of Medupi FGD Retrofit Project

The current environmental authorisation process aims at describing the FGD retrofit process, identifying potential impacts of this process and providing management and mitigation recommendations. Throughout the Environmental Impact Assessment (EIA) under the National Environmental Management Act (NEMA) (Act 107 of 1998 as amended), information on the design, activities and impacts was investigated and documented to inform public comment and authority decision making. The environmental authorisation process was carried out in three phases:

1. The Project Inception;
2. Scoping Phase;
3. Impact Assessment Phase.

The process is currently in the Impact Assessment Phase, the objective of which is to assess significance of impacts generated to the environment and propose mitigation. During this phase specialist consultants undertake investigative work to rate the significance on an impact and to identify an effective mitigation initiative, and ascertain the efficacy of the mitigation to residual environmental impacts.

1.5 Proponent

Eskom Holdings SOC Limited (referred to hereafter as Eskom) is the largest South African utility that generates, transmits and distributes electricity. Eskom supplies approximately 95% of the country's electricity, as well as about 45% of the electricity used in Africa. The utility is the largest producer of electricity in Africa, is among the top seven utilities in the world in terms of generation capacity and among the top nine in terms of sales. Eskom plays a major role in accelerating growth in the South African economy by providing a high-quality and reliable supply of electricity.

To meet the growing demands for electricity in South Africa, Eskom has re-commissioned three mothballed power stations, upgraded existing facilities and built new infrastructure, including transmission lines and two renewable energy plants.

Additionally, Eskom initiated the building of additional power stations, including Medupi Power Station, Kusile Power Station and the Ingula Pumped Storage Scheme, as part of the new build programme to cater for the anticipated future electricity demands. The Eskom capacity expansion budget was estimated at R385 billion up to 2013 and is expected to grow to more than a trillion rand by 2026. Through the capacity expansion programme Eskom will double its capacity to 80 000MW by 2026.

To reduce the impact of emissions from power stations on air quality Eskom is:

- Constructing a FGD Plant at the Kusile Power Station as part of the development of the Kusile Power Station;

- Retrofitting an FGD Plant at the Medupi Power Station concurrently to the construction of the Medupi Power Station (this project);
- Retrofitting some of the existing power stations with better particulate emission reduction technologies; and
- Investigating the retrofit of desulphurisation technology at other power stations.

1.6 Details of Environmental Assessment Practitioner

Eskom appointed Zitholele Consulting (Pty) Ltd. to undertake the regulatory Environmental Authorisation (EA), amendment of existing Waste Management License (WML) Application and Water Use License Application (WULA) processes for the proposed Medupi FGD Retrofit Project. These processes are being undertaken independently as separate processes. This document deals with the Environmental Impact Assessment process for the proposed Medupi FGD Retrofit Project

Zitholele Consulting (Pty) Ltd. is an empowerment company formed to provide specialist consulting services primarily to the public sector in the fields of Water Engineering, Integrated Water Resource Management, Environmental and Waste Services, Communication (public participation and awareness creation) and Livelihoods and Economic Development. Zitholele Consulting (Pty) Ltd has no vested interest in the proposed project and hereby declares its independence as required in terms of the EIA Regulations. **Table 1-3** provides the Environmental Assessment Practitioner (EAP) details.

Table 1-3: Details of the Environmental Assessment Practitioner

Name and Surname	Mathys Vosloo
Highest Qualification	Phd Zoology
Professional Registration	Pr.Sci.Nat. (400136/12)
Company Represented	Zitholele Consulting (Pty) Ltd.
Physical Address	Building 1, Maxwell Office Park, Magwa Crescent West, Waterfall City, Midrand
Postal Address	P O Box 6002, Halfway House, 1685
Contact Number	011 207 2079
Facsimile	086 674 6121
E-mail	mathysv@zitholele.co.za

1.6.1 Expertise of Environmental Assessment Practitioner

Dr Mathys Vosloo graduated from the Nelson Mandela Metropolitan University with a PhD in Zoology in 2012, after successfully completing a MSc in Zoology and BSc (Hons) in Zoology. Dr Vosloo is a member of the International Association for Impact Assessments (IAIA) and is a registered professional natural scientist (*Pr. Sci. Nat*.) in the field of Ecological Science with the South African Council for Natural Scientific Professionals (SACNASP) since 2012.

Dr Vosloo has been involved in electricity generation, transmission and distribution projects and their potential impacts on the environment for a large part of his career. Mathys has gained extensive experience in managing integrated environmental authorisation processes and has successfully managed large projects through the phases of EIA in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and National Environmental Management Waste Act, 2008 (Act No. 59 of 2008). Mathys has also been involved in Water Use Licensing as a component of integrated authorisation processes.

Mathys has a comprehensive understanding of the relevant environmental legislation and works intimately with specialist consultants to ensure that potential impacts are accurately identified, assessed and mitigated. With his experience in similar projects, Dr. Vosloo is ideally positioned to manage this environmental authorisation process with integrity and independence, while advising the client toward alternatives that have less potential for environmental impact. Dr Vosloo' CV is attached to this report as **Appendix B**.

2 NEED AND DESIRABILITY OF THE PROJECT

2.1 Environmental and Health Motivation

One of the most significant air quality impacts of coal-fired electricity generation is the emission of SO_2 to the atmosphere. SO_2 reacts with other compounds in the environment to form particles that are a risk to human health. These small particles penetrate the tissue of the lungs and can cause emphysema and bronchitis and can aggravate existing heart disease (UN Environmental Protection Agency; 2014). Evidence has been documented of a connection between short term SO_2 exposure and adverse respiratory symptoms including bronchoconstriction and aggravated asthma.

At Medupi Power Station the uncontrolled SO_2 emissions for the design coal will be about 3,405mg/Nm^3, dry at 6% O_2. The Air Quality Act currently stipulates that the SO_2 emissions limit for existing plants is 3,500mg/Nm^3 at 10% O_2 by 31st March 2015, and 500mg/Nm^3 at 10% O_2 by 1st April 2020. The Eskom Air Quality Strategy currently stipulates that emissions should comply with 20% below legislated SO_2 emissions limit. This relates to a required compliance of 2800mg/Nm^3 at 10% O_2 by 2015, and 400mg/Nm^3 at 6% O_2 by 2020.

The flue gas desulphurisation process proposed for retrofit at the power station will reduce the SO_2 emissions by more than 90%. This brings the emissions to below the environmental protection threshold and reduces the impacts of the power station on the environment.

2.2 Socio-Economic Motivation

It must be noted that the Medupi Power Station is funded by the World Bank. In complying with one of the conditions of the World Bank loan agreement, Medupi Power Station must effectively reduce SO_2 emissions. The Medupi Power Station is part of an integral building plan to ensure that Eskom can meet the electricity demand projected for the future. Eskom must double its capacity to 80 000MW by 2026 for this purpose (Eskom website; 2014).

Medupi Power Station will increase the current Eskom generation capacity by 4 800MW. This is crucial to addressing the electricity demand in South Africa. Without the addition of the new power stations, such as Medupi and Kusile, the demands for electricity will not be met. This will significantly impact on the provision of basic services to a large percentage of the South African population.

Electricity brown-outs and black-outs have considerable social effects, which are most devastating on the low-income populations. These include compromise of health and safety to vulnerable communities. Furthermore, the loss of consistent electricity supply has massive repercussions on industry and economics of the country. Short and medium term unreliable electricity supply may have devastating impacts to large and small businesses due to loss in production and damage to equipment. This in turn will have a definite implication on our country’s economy.

The reduction in SO_2 emissions by the FGD will mitigate potentially significant health impacts associated with SO_2 emissions. This is an important motivation for FGD, in terms of human health and welfare for the communities residing especially near the Medupi Power Station.

2.3 Need and Desirability

In accordance with the Regulation 31(2)(f) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations published in Government Notice No. R.543, this part of the Environmental Impact Report provides a detailed account of the Need and Desirability of the proposed Medupi FGD Retrofit project.

In considering the need and desirability of the proposed project, the strategic concept of the project along with the broader societal needs and public interest has been taken into account. In the Guideline on Need and Desirability (DEA, 2010) a number of questions formulated to guide the identification of the Need and Desirability of a proposed development are provided. The information provided in **Table 2-1** affords answers specific to the project at hand for each of the guiding questions contained in Section 5 of the Guideline on Need and Desirability (DEA, 2010).

Table 2-1: Assessment of the Need and Desirability of the Medupi FGD Retrofit Project

No.	Question	Description	Answer
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant authority?	Medupi Power Station was approved and is currently in construction phase. Therefore, it is evident that industrial development to promote economic growth and improvement to human welfare, in terms of provision of electricity, is an acceptable land use to the authorities for the period that the Medupi Power Station will operate. The Flue Gas Desulphurisation retrofit project is supplement to the Medupi Power Station to mitigate emissions to an acceptable level.	Yes
2.	Should the development, or if applicable, expansion of the town / area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time.	Since the Flue Gas Desulphurisation Project is a supplement to the existing and approved Medupi Power Station in order to mitigate emissions from the operation of the power station, it is imperative that the Flue Gas Desulphurisation retrofit is implemented and operational at the power station 6 years after the power station becomes operational.	Yes
3.	Does the community / area need the activity and the associated land use concerned (is it a societal priority)?	The Flue Gas Desulphurisation retrofit is proposed to mitigate the potential health impacts of the Medupi Power Station emissions on the airshed and the local/affected communities. Therefore, the community does indeed need this project to go-ahead as a societal priority in order to protect human welfare.	Yes
4.	Are the necessary services with adequate capacity currently available or must additional capacity be created to cater for the development?	Electricity will be made available by Eskom itself to power the FGD system at the Medupi Power Station. Sewage and waste water treatment infrastructure will be constructed as part of the development to cater for these services. Potable water will furthermore be procured via the existing raw water treatment plant associated with Medupi Power	Yes

No.	Question	Description	Answer
		Station, hence potable water for use within the station will be available. Sufficient raw water is currently available to operate the entire Medupi Power Station, as well as 3 of the 6 absorber units associated with the FGD system through Eskom's current water allocation from Mokolo Crocodile Water Augmentation Project (MCWAP) phase 1. Additional water, however, is required for the operation of the outstanding 3 absorber units associated with the Flue Gas Desulphurisation retrofit project. Eskom is currently undertaking the water use licence application process for the additional water requirements which will be abstracted via the MCWAP phase 2 to the Department of Water and Sanitation.	
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?	This supplement to the Medupi Power Station is provided for within the municipal infrastructure planning and the project is a mitigation activity linked to the authorised power station. No additional development is required as all aspects of the retrofit will occur within and in close proximity to the Medupi Power Station and will be directly related to the operation of the Medupi Power Station.	Yes
6.	Is this project part of a National programme to address an issue of National concern or importance?	This project is a part of the Eskom project to address current and future electricity demand within Southern Africa. Ingula Pump Station, Kusile Power Station and Medupi Power Station are the key generation developments within the Eskom "build programme" to secure electricity supply for the next 50 years and has been identified as a Strategic Infrastructure Projects (SIP) (SIP 9: Electricity Generation to support socio-economic development) in terms of the Infrastructure Development Act, No 23 of 2014, and the National Development Plan (NDP).	Yes

Based on the answers that have been provided in **Table 2-1** it is evident that ample consideration has been given to the need and desirability of the proposed project. The determination of the need and desirability project also served as further confirmation that all reasonable measures have been taken to determine the best practicable environmental option.

3 PLAN OF STUDY (SCOPING PHASE)

3.1 Introduction

The Medupi Power Station has received environmental authorisation in 2007. The AEL was received by the Power Station in 2012 and stipulated conditions requiring the SO_2 emissions from the Power Station to be reduced by more than 90%. This is one of the key reasons for the initiation of the FGD retrofit.

Eskom appointed Zitholele Consulting in 2013 to act as independent Environmental Assessment Practitioner and undertake the EIA for the retrofit of the Medupi FGD system. Zitholele undertook a scoping phase during which a number of aspects related to the development of the Medupi FGD were considered. The Scoping Phase concluded with the submission of a Scoping Report to the Department of Environmental Affairs (DEA), which was subsequently accepted with Plan of Study approved, thus setting the scene for the environmental impact reporting phase to follow.

The approved Plan of Study is summarised in the following sections.

3.2 Proposed Plan of Study

The Plan of Study (PoS) for the EIR phase identified specialist studies that would be undertaken, detailed terms of reference for each specialist study, the proposed impact assessment methodology to be used, proposed public participation process that would be followed during the EIR phase, as well as the steps that will be followed during the EIR phase up to the submission of the Final Impact Assessment Report (FEIR) and announcement of the Competent Authority's decision.

A summary of the proposed actions relating to the proposed specialist studies as discussed in the PoS are provided below.

3.2.1 Utilisation of existing specialist studies

Considering that existing studies were undertaken for environmental aspects within the MPS footprint where the FGD infrastructure is earmarked to be constructed, the Plan of Study proposed that original specialist studies be utilised for the purposes of the FGD EIA process. These existing studies included:

- Soils, land capability and agricultural potential;
- Geology and Geotechnical investigations (Phase 1 geotechnical investigations);
- Surface water resources (aquatic) and wetlands (including wetlands delineation);
- Groundwater resources.
- Noise pollution;
- Visual impact;

- Ecology (Terrestrial flora and fauna and Avifauna assessment);
- Heritage impact studies;
- Traffic impact studies; and
- Socio-economic investigations.

Only summaries of these studies could be obtained and not details studies received. As such these studies could not be utilised. Due to process delays these studies moved out of the 5 year validity period and could therefore not be utilised.

3.2.2 Proposed specialist studies

Detailed terms of reference were provided in the PoS for the following specialist studies:

1. Waste Classification: The waste classification study would include the classification of ash, FGD gypsum, FGD WWTP sludge, and FGD WWTP Crystalliser Solids.
2. Socio-economic Impact Assessment for the proposed Medupi Flue Gas Desulphurisation Retrofit project. The focus of this SIA is on the impacts that the project is expected to have on the local socio-economic environment.
3. Ecology Assessment for Rail Yard and Limestone off-loading area: This would include assessment of floristic and faunal species composition, assemblages, communities, red data probabilities and general environmental attributes.
4. Air Quality Assessment for the assessment of the impact of the FGD system on the surrounding air quality and sensitive receptors.

3.2.3 Specialist studies related to the proposed waste disposal facility

The proposed waste disposal alternatives would be investigated in the EIR Phase of the project and as such the specialist studies that would be required would be site-specific and could not be confirmed at the conclusion of the Scoping Report. The Scoping Report thus concluded that additional specialist studies would be required specific to the location alternatives for the new disposal facility/ies. All required specialist studies would be carried out at the three alternative sites in order to inform the selection of the preferred site and the impact assessment on the preferred site.

3.3 Acceptance of Scoping Report and approval of Plan of Study

The Department of Environmental Affairs (DEA) received the FSR on 12 June 2015 and acknowledged receipt of the report on 26 June 2015. After assessment of the FSR and PoS, the DEA accepted the FSR and approved the PoS on 28 July 2015. Specific conditions associated with the acceptance included:

- All comments and proof of correspondence with relevant stakeholders must be submitted together with the FEIR;

- Should no comments be received, proof of attempts to obtain comments must be submitted together with the FEIR;
- Application form must be amended to include applicable waste listed activities as per GN R.921;
- FEIR to include one A3 regional map and locality maps that illustrate different proposed alignments and above ground storage of fuel;
- An application for Environmental Authorisation must be subject to the provisions of the National Heritage Resources Act, No 25 of 1999, and a letter from the pertinent heritage authority will be required; and
- Two copies of the EIR and at least one electronic copy (CD/DVD) of the complete final report must be submitted to the DEA.

4 PROCESS FOLLOWED DURING EIR PHASE

The Environmental Impact Reporting Phase commenced after acceptance of the Scoping Report and approval of PoS. During the execution, deviations on the development packaging were necessary to streamline the EIA application process for the Medupi FGD. These aspects shaped the EIR phase of the project which is discussed in the following sections.

4.1 Deviation from project packaging

Following the delay in the project schedule experienced during the compilation of the Screening Report, the proponent reached a decision in July 2016 to review the scope of the current EIA in order to fast track the application for authorisation and licensing of the FGD retrofit. The decision took the project schedule into account as well as commitments of the power station to other authorisation and license conditions, most notably the condition for the MPS to have the FGD infrastructure installed and operational 6 years after commissioning the first generation unit.

This section discusses the process of streamlining the EIA scope effected between July 2016, subsequent to acceptance of the FSR and approval of the PoS, and prior the release of the Draft Environmental Impact Report (DEIR) in February 2018.

4.1.1 Bridging Document 1

Due to the addition of an additional site to the screening process and changes to the EIA scope, a Bridging Document was prepared towards the end of 2016 and released to I&APs in November 2016 for information and comment. The Bridging Document is attached as **Appendix F-1** to this DEIR. The purpose of this document was:

1. To update all I&APs on relevant activities that had taken place between the end of the Scoping Phase (August 2015) and August 2016; and
2. To inform all registered I&APs of the changes in the scope of the EIA.

The Bridging Document highlighted the following changes in project scope:

- **New Disposal Facility:** Since the existing ADF at the MPS could only accommodate disposal of waste for the first 20 years of operational life, an additional facility was required to accommodate the remaining 30 years of power station operation. A new disposal facility for the disposal of gypsum, ash, FGD salts and FGD sludge for year 21 to year 50 post commissioning was required and the scope added to the EIA scope. Site screening was undertaken as discussed in **section** Error! Reference source not found. above.
- **Splitting of Integrated EIA:** Due to the requirement of the MPS to comply with the conditions of the AEL by April 2025, the installation of the appropriate FGD technology is time critical, and the application for an integrated authorisation must be accelerated in

order for the power station to remain compliant to the AEL conditions. The inclusion of future waste/ash disposal facility was creating challenges with respect to timeous project execution. A decision was, therefore, made to split the EIA into two (2) separate environmental authorisation processes, namely the future waste/ash disposal facility and the FGD-complex. The assessment of a new waste disposal facility for the disposal of gypsum, ash, FGD salts and FGD sludge were resultantly removed from the EIA scope and would be undertaken as a separate process under a new application and reference number. This process will follow Eskom's procurement processes to appoint an independent Environmental Assessment Practitioner to undertake the process. The assessment of the FGD-complex would continue under the current application.

- **Removal of existing ADF from EIA scope:** During the splitting of the EIA, it was recognised that the existing ADF already has a WML and thus the disposal of gypsum with ash at the authorised ADF would require amendments to the current WML. Therefore, it was decided to remove the existing authorised ADF from the scope of this EIA process. As a result, an amendment application will be submitted to have the existing WML amended to accommodate the disposal of gypsum at this facility.
- **Water Use Licence Application for this EIA:** A Water Use License Application (WULA) Process for all water uses associated with this EIA scope and application is currently underway. However, this WULA will not include the water use license for the abstraction of water from MCWAP Phase 2 take-off point. The abstraction water use license will be done separately as Eskom will be applying for the bulk water license that includes both water requirements for Medupi and Matimba. Eskom plans to submit the bulk water use license application with DWS before end of April 2018.
- **Environmental authorisation for the water supply pipeline from MCWAP Phase 2 take-off to Medupi Power Station Water Reservoir:** A separate environmental authorisations (EIA and WULA) will be undertaken for the transportation of water from MCWAP Phase 2 take-off point to Medupi Power Station raw water reservoirs. Zitholele Consulting has not been appointed to undertake this process. Therefore, this is not part of this application.

Bridging Document 1 concluded that the scope of this Integrated EIA process would not include assessment of the impacts of a new off-site waste disposal facility nor assess impacts associated with the disposal of gypsum together with ash on the existing authorised ADF. A separate WML amendment process was undertaken by Zitholele to assess such impacts. Zitholele Consulting would undertake a WULA for water uses associated with the FGD infrastructure, railway yard and water uses triggered due to the disposal of gypsum and ash together on the existing ADF.

4.1.2 Bridging Document 2

Towards mid-2017, some additional refinements to the EIA process were proposed. Resultantly, it was decided to draft a second Bridging Document to update all I&APs on the progression of the project since the first document in November 2016. A second Bridging Document was prepared towards the end of 2017 and released to I&APs in November 2017 for information and comment. This Bridging Document is attached as **Appendix F-2** to this DEIR. This document had three key objectives:

1. To update all I&APs on relevant activities that have taken place between the first bridging report and November 2017.
2. To update all registered IAPs of amendments to the Ash Disposal Facility Waste Management Licence (ADF WML) and licencing processes and updated project scope to complete the relevant applications.
3. To inform all registered IAPs on the way forward regarding the EA processes underway and expected timelines to completion and submission of the Final Environmental Impact Report (FEIR) and WULA to the authorities.

This Bridging Document highlighted the following changes in project scope:

- **Updates to specialist studies for WML amendment process:** The surface water and wetland study identified the need to reduce the approved footprint of the existing ADF in order to reduce potential impacts to the tributaries of the Sandloop River system, located to the south of the current ADF; and raise the height of the facility to optimise the facility. Resultantly, a flood line assessment was updated with fine-scale contour data, the ADF design was revisited to reduce the footprint, undertake amendment of the wetland specialist report and undertake a Visual Impact Assessment (VIA) to assess the impact of raising the authorised ADF height to 72m, from 60m.
- **Changes to the Integrated EIA application:** The scope of the Integrated EIA included assessment of the FGD infrastructure, temporary storage of WWTP solid waste (salts and sludge), temporary trucking of WWTP solid waste from the temporary storage facility to an appropriately designed and authorised off-site waste disposal facility, facilities for storage of limestone, construction of pollution control facilities and associated infrastructure, and construction of the rail yard. In order to further streamline the EIA process for the FGD system and in light of when detailed design information becomes available, a decision was made to remove the WML component relating to the storage of salts and sludge at a waste storage facility from the integrated EIA process. It is therefore proposed that the storage of hazardous waste, WWTP salts and sludge, would be registered in terms of Schedule C of GN 921 (list of waste management activities) of the NEM:WA. Management of these wastes in terms of Schedule C would require compliance with the relevant requirements and standards stipulated in the Norms and Standards for Storage of Waste (GN 926 of 29 November 2013). This registration process would therefore be undertaken independently of this EIA process, and resultantly does not form part of this EIA application going forward. This process will consider and assess the applicable NEMA activities in support of this registration process. The integrated EIA/WML application has therefore effectively changed to a standard EIA application.
- **Management of wastewater and effluent runoff from PCDs:** Activities relating to the storage of effluent, wastewater or sewage were removed from the NEM:WA and List of waste management activities (GN 921) subsequent to the last amendments to the

regulations. Assessment and management of the Pollution Control Dams (PCDs) now fall under the ambit of the NWA. This process will consider and assess the applicable NEMA activities in support of this registration process. Management and operation of the PCD will therefore invoke a water use and will be included in the current WULA being undertaken. The PCD will furthermore be designed to comply with GN 704 of 4 June 1999: Regulations on use of water for mining and related activities aimed at the protection of water resources.

The 2nd Bridging Document therefore concluded that the application for a WML for the operation and management of hazardous waste storage facilities for salts and sludge was no longer required and would be authorised through a registration process in terms of the Norms and Standards for the Storage of Waste. Operation and management of the PCDs would be licenced in terms of the WULA.

4.2 Confirmed scope of EIA application

Since submission of the FSR, a number of changes to the scope of the EIA became necessary. These changes relating to the scope of the EIA application are summarised in the foregoing sections. As a result the confirmed scope of work, this assessment in this DEIR includes assessment of the following activities and infrastructure:

1. Construction and operation of a rail yard/siding to receive Limestone via rail from source defined point at the existing rail network to the Medupi Power Station and proposed rail yard / siding, including a diesel storage facility for locomotives, and associated buildings and infrastructure. A second diesel storage facility will be constructed within the FGD footprint for refuelling of FGD generators;
2. Construction and operation of limestone storage area, preparation area, handling and transport via truck and conveyor to the FGD system located near the generating units of the Medupi Power Station;
3. The construction and operation of the wet FGD system that will reduce the SO_2 content in the flue gas emitted;
4. Construction and operation of associated infrastructure required for operation of the FGD system and required services to ensure optimal functioning of the wet FGD system;
5. The handling, treatment and conveyance of gypsum and effluent from the gypsum dewatering plant. Disposal of gypsum on the existing ADF is not included in this EIA and will be addressed in the ADF WML amendment application.
6. Pipeline for transportation of waste water from the gypsum dewatering plant and its treatment at a WWTP that will be located close to the FGD infrastructure within the Medupi Power Station;
7. Construction and operation of the WWTP;
8. Management, handling, transport and storage of salts and sludge generated through the waste water treatment process at a temporary waste storage facility. In terms of the EIA process impacts related to the management of salts and sludge will be considered in the

EIR. However, licencing of the storage activity and requirements relating to the waste storage facility will be assessed in the WML registration application process.

9. The transportation of salts and sludge via trucks from the temporary waste storage facility to a final Waste Disposal Facility (WDF) to be contracted by Eskom, for the first 5 years of operation of the FGD system. Long term disposal of salts and sludge will be addressed though a separate independent EIA process to be commissioned by Eskom in future.

4.3 Specialist assessments

Specialists were appointed to undertake the relevant assessments to identify, assess impacts and propose appropriate mitigation and management measures for the identified impacts. The specialists were initially contracted to investigate impacts associated with the development of a new waste disposal facility to receive ash, gypsum, and WWTP salts and sludge, however after the screening phase for this proposed facility the scope was removed from the current EIA process and specialists were tasked to assess impacts associated with the current scope provided in **section 4.2** above. Some specialists, subsequently, provided professional opinions of the expected impacts with the already transformed footprint within the MPS, based on previous studies undertaken in these areas. The specialists assessments, or in some cases opinions, that were commissioned include:

- Air Quality Impact Assessment
- Noise Impact Assessment
- Geology and Soils Assessment
- Geotechnical Assessment
- Geohydrology Impact Assessment
- Surface Water Assessment
- Traffic Impact Assessment
- Terrestrial Ecological (Fauna, Flora, incl. Avifauna) and Wetland Impact Assessment
- Social Impact Assessment
- Heritage Impact Assessment
- Waste Assessment

Although a Visual Impact Assessment was undertaken for the WML Amendment application due to the increased height of the ADF, this study did not take into account visual impacts associated with construction of the FGD infrastructure within the MPS or construction of the rail yard as potential visual impacts were deemed negligible because the existing visual character of the Medupi Power Station infrastructure surrounding the proposed infrastructure overshadows the FGD infrastructure.

4.4 Compilation of the DEIR and EMPr

The DEIR was compiled towards the end of 2017 and early 2018 as detailed information relating to the proposed engineering designs and specialist assessment became available. The Environmental Management Programme (EMPr) that is included in the DEIR as an appendix represents a concise document of impacts identified, proposed mitigation and management measures as well as monitoring requirements for the proposed development.

4.5 Public participation during the EIR Phase

This section deals with the Public Participation Process that was undertaken ongoing prior to the release of the DEIR. Due to the volume of the DEIR, the public participation process undertaken during the Scoping Phase was not

4.5.1 Purpose of the PPP

The purpose of the public participation process during the EIR Phase is to source comments and input on the DEIR and Draft Environmental Management Programme (DEMPr) by the public. I&APs are requested to comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The DEIR includes the latest version of the CRR (**Appendix F**), which lists every issue raised with an indication of where the issue is dealt with in the technical evaluations, and the relevant findings, and also provides responses to the comments submitted. Through the PPP, stakeholders are notified of the availability of the DEIR and DEMPr for review and comments, and afforded an opportunity to engage with the project team at the public meetings to be held during the review period of the DEIR.

4.5.2 Availability of the DEIR and DEMPr

All I&APs registered on the proposed project's database will be notified of the availability of the DEIR and DEMPr, which will be made available at public places utilised during the Scoping Phase. Identified public places are provided in **Table 4-1**. The DEIR and DEMPr are also freely available in electronic format on Eskom's and Zitholele's websites as indicated in Table 4-1 below.

Table 4-1 : Public places where the DEIR is available

Venue	Address	Contact details
Printed Copies		
Lephalale Public Library	Civic Center Onverwacht, Cnr Joe Slovo and Douwater Road, Lephalale	Tel.: 014 762 1484, 014 762 1453 or 014 762 1518
Marapong Community Library	916 Phukubye Street, Marapong	Tel.: 073 210 8954
Lesedi Tshukudu Thusong Centre	Lesedi Tshukudu Thusong Centre, Steenbokpan	Tel.: 082 927 2399
Agri SA /Farmers Association	NTK Building, 1 Jan Louis Botha Avenue, Lephalale	Tel.: 014 763 1888
Electronic Copies		

Venue	Address	Contact details
Zitholele Consulting Website	http://www.zitholele.co.za/environmental/ under heading "EIA for Medupi FGD"	
Eskom website	http://www.eskom.co.za/OurCompany/SustainableDevelopment/EnvironmentalImpactAssessments/Pages/Environment_Impact_Assessments.aspx under the heading "Medupi FGD"	
Mathys Vosloo / Lebo Petlane	fgd@zitholele.co.za to request CD copy	

4.5.3 Invitation to Meetings

A Key Stakeholder Workshop (KSW) will be undertaken with all registered key stakeholders on the project database, including Organs of State (i.e. Government Departments / District & Local Municipalities), NGOs / NPOs Representatives, Representatives from the local Chamber of Commerce and Landowners.

Furthermore, it is proposed that three Public Meetings (PM) be undertaken. PMs are proposed to be undertaken within the Marapong and Leseding local communities to make it as easy as possible for members of these communities that do not have their own transport to be able to walk to the meeting venues. The third PM is proposed in the town of Lephalale. All I&APs are invited to any or all of these public meetings.

The date, venue and meeting arrangements for these meetings will be communicated with all I&APs together with the announcement of the availability of the DEIR for review and comment. The agendas, presentations, attendance registers and minutes for all meetings will be included in the FEIR to serve as a record of these meeting taking place and discussions held at these meetings.

4.5.4 Notification to I&APs of the submission of the FEIR

Once the FEIR and EMPr reports are submitted to the CA, a letter of notification will be sent to registered I&APs, indicating that the reports have been submitted and are available for review and should they want to receive an electronic copy, they can submit their request in writing to the Public Participation Office. The letter will also outline the next steps in the EIA process.

4.5.5 Announcement of Authority Decision

Once the DEA issues a decision, Eskom must, in writing and within 12 days of the date of the decision notify all registered I&APs of the decision. The DEA's reasons for decision, as contained in the copies of the DEA's decision, will be attached to the notice.

In addition to the notification to the registered I&APs, place a notice in the same newspaper(s) used during the foregoing PP Process for the project. The notices will inform I&APs of the DEA's decision and describe where copies of the DEA's decision can be accessed.

5 ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

This part of the EIR is intended to provide a detailed account of all environmental legislation which may have bearing on the proposed project. Attention will be paid to the National Environmental Management Act, No 107 of 1998 (NEMA). NEMA is regarded as South Africa's Environmental Management Framework Act. An overview of sector specific environmental acts which govern specific elements or project activities and the relevance on the proposed project will also be provided. To ensure that Environmental Management Best Practice Principles are adhered to, all guidelines which are relevant to the proposed project activities have also been taken into consideration during the preparation of this EIR. Determining the applicability of all environmental management legislation is also fundamental in ensuring that all required authorisations, licences and permits are applied for and facilitating compliance with the applicable provisions of these Acts.

5.1 The Constitution of the Republic of South Africa, 1996 (Act No. 108 Of 1996)

The Constitution of the Republic of South Africa, 1996 (hereafter referred to as "the Constitution") is the Supreme Law in South Africa. The Bill of Rights is included in Chapter 2 of the Constitution. The Environmental Right is set out in Section 24 of the Constitution and states that –

Everyone has the right –

- to an environment that is not harmful to their health or well-being; and
- to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
- prevent pollution and ecological degradation;
- promote conservation; and
- secure ecologically sustainable development and use of natural resources,
- while promoting justifiable economic and social development.

5.2 National Environmental Management Act, 1998 (Act No. 107 of 1998)

The National Environmental Management Act, No. 107 of 1998 (NEMA), as amended, is the primary statute which gives effect to Section 24 of the Constitution. The Environmental Right contained in Section 24 of the Constitution also places responsibility on the EAP, Applicant and Competent Authority to ensure that this right is not infringed upon. The Sector Guidelines for Environmental Impact Assessment (2010) (Government Notice 654[1]) describe

[1] Government Notice 654: National Environmental Management Act (Act 107 of 1998) Implementation Guidelines, Sector Guidelines for Environmental Impact Assessment Regulations, published in Government Gazette 33333, dated 29 June 2010.

several responsibilities which are placed on the EAP, Applicant and Competent Authority to ensure conformance with the statutory Environmental Right.

These responsibilities include:

- All parties to the EIA Process have a duty not to infringe other persons' rights in terms of Section 24 of the Constitution.
- The Applicant must ensure that while the development incorporates measures that prevent or control environmental pollution or degradation, it also maximises the positive environmental impacts.
- There must be an equitable balance between the rights of the applicant and the broader public. In this regard, the consideration of need and desirability is critical as it requires the strategic context of the development to be considered with the broader societal needs and public interest.
- The provisions of the Bill of Rights are binding on decision-makers.
- Decision-makers must ensure that their decisions are in keeping with the environmental right and promote an environment that is not harmful to health or well-being.

5.3 Environmental Impact Assessment Regulations, 2010

Because the Medupi FGD project was initiated and registered with the DEA in 2013, the EIA process is being completed in accordance with the (then active) EIA Regulations of 2010. This set of regulations (GN R 543 – 545) has subsequently been repealed by the EIA Regulations of 2014 (GN R982 – 985), as amended by GNR 325 - 327 (2017). **Appendix A** of the DEIR contains the amended EIA Application Form for the Medupi FGD project.

The Medupi FGD complex includes activities which trigger activities listed in the EIA Regulations Listing Notice 2 (GN R 545), therefore requiring Environmental Authorisation before they may be initiated. The proposed activities prompt a full Scoping and Environmental Impact Reporting Process. Each of the project activities as well as the corresponding listed activity is provided in **Table 5-1**. This table furthermore provides a comparison between the listed activities as presented in the EIA Regulations of 2010 and EIA Regulations of 2014, as amended.

Table 5-1: Description of Listed Activities

Activity listed in GNR 544 – 546 (2010)	Activity listed in GNR 325 & 327 (2017)	Applicability of the project activities to the Listed Activities
GN 544, Activity 9 The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water - (i) with an internal diameter of 0,36 metres or more	**GN 327, Activity 9** The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more;	Construction of clean and dirty water infrastructure associated with the rail yard and FGD infrastructure is expected to be greater than 360mm and 1km in length.
GN 544, Activity 18	**GN 327, Activity 19**	It is likely that infilling or excavation

Activity listed in GNR 544 – 546 (2010)	Activity listed in GNR 325 & 327 (2017)	Applicability of the project activities to the Listed Activities
The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from: (i) a watercourse.	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	of more than $10m^3$ within a watercourse may occur during construction of the rail yard and associated infrastructure.
GN 545, Activity 3 The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	**GN 325, Activity 4** The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	The construction of facilities or infrastructure for the storage, or for the storage and handling, of diesel within the FGD footprint and rail yard.
GN 545, Activity 11 The construction of railway lines, stations or shunting yards.	**GN 325, Activity 12** The development of railway lines, stations or shunting yards.	The construction of a railway tie-in line and yard for purposes of transport of products to the Power Station and waste products from the Power Station.
GN 545, Activity 15 Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more.	**GN 325, Activity 25** The clearance of an area of 20 hectares or more of indigenous vegetation.	The total development footprint of the railway yard and associated infrastructure will be greater than 20ha, therefore the clearance of more than 20ha indigenous vegetation will be required.
GN 546, Activity 14(a)(i) The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (*Exclusions not applicable*), (a) In Limpopo, in (i) All areas outside urban areas	**GN 325, Activity 25** The clearance of an area of 20 hectares or more of indigenous vegetation.	The area where construction of the rail yard and associated infrastructure will occur falls outside an urban area and is likely to result the clearance of 5ha of indigenous vegetation.

5.4 National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

The National Environmental Management: Air Quality Act, No 39 of 2004 (NEM:AQA) is focused on holistic and integrated effects-based air quality management. It aims to manage adverse impacts of air pollution on the ambient environment and sets standards for pollutant levels in ambient air. At the same time it sets emission standards to minimise the amount of pollution that enters the environment.

Chapter 4 of the NEM:AQA specifically deals with air quality management measures, which are listed and include:

- Declaration of Priority Areas where ambient air quality standards are being exceeded
- Listing of activities that result in atmospheric emissions which may have a detrimental effect on the environment
- Declaration of controlled emitters and controlled fuels
- Implementation of Pollution Prevention Plans or Atmospheric Impact Reports; and
- Requirements for dust, noise and offensive odours.

Chapter 5 specifically deals with the licencing of listed activities through an Atmospheric Emission Licence. The MPS received an AEL for operation of the power station in 2015. An important condition of the AEL was that SO_2 abatement technology should be retrofitted to the power station within 6 years of each generation unit coming into operation. Regulatory requirements applicable to the MPS are discussed in the following sub-sections.

5.4.1 Minimum Emission Standards

Activities associated with the MPS trigger the Listed Activity - Category 1: Combustion Installations in terms of Government Gazette No. 37054 published on 22 November 2013, under the NEM:AQA. Additional Listed Activities that will be undertaken at the Medupi Power Station include Subcategory 2.4: Storage and Handling of Petroleum Products and Subcategory 5.1: Storage and Handling of Coal and Ore, and has also been licenced under the existing AEL.

The minimum emissions standards it is understood that the MPS would have to comply with "existing plant" standards until 1 April 2020, where the more stringent "new plant" standards would be applicable, i.e. compliance with SO_2 levels below 500mg/Nm^3 under normal conditions of 10% O_2, 273 K and 101.3 kPa.

5.4.2 National Ambient Air Quality Standards for Criteria Pollutants

The air quality guidelines and standards are fundamental to effective air quality management, providing the link between the source of atmospheric emissions and the user of that air at the downstream receptor site. The ambient air quality standards are intended to provide safe hourly, daily and annual exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. The National Ambient Air Quality Standards (NAAQS) were determined based on international best practice for $PM_{2.5}$, PM_{10}, SO_2, NO_2, carbon monoxide (CO), ozone (O_3), lead (Pb) and benzene (C_6H_6), and is presented in Table 5-2 below.

Table 5-2: National Ambient Air Quality Standards

Pollutant	Averaging Period	Concentration (µg/m³)	Permitted Frequency of Exceedance	Compliance Date
Benzene (C_6H_6)	1 year	5	0	1 January 2015
Carbon Monoxide (CO)	1 hour	30000	88	Immediate
	8 hour[(a)]	10000	11	Immediate
Lead (Pb)	1 year	0.5	0	Immediate
Nitrogen Dioxide (NO_2)	1 hour	200	88	Immediate
	1 year	40	0	Immediate
Ozone (O_3)	8 hour[(b)]	120	11	Immediate
$PM_{2.5}$	24 hour	65	4	Immediate till 31 December 2015
	24 hour	40	4	1 January 2016 till 31 December 2029
	24 hour	25	4	1 January 2030
	1 year	25	0	Immediate till 31 December 2015
	1 year	20	0	1 January 2016 till 31 December 2029
	1 year	15	0	1 January 2030
PM_{10}	24 hour	75	4	1 January 2015
	1 year	40	0	1 January 2015
Sulfur Dioxide (SO_2)	10 minutes	500	526	Immediate
	1 hour	350	88	Immediate
	24 hour	125	4	Immediate
	1 year	50	0	Immediate

5.4.3 Waterberg-Bojanala Priority Area

The Medupi Power Station falls within the Waterberg-Bojanala Priority Area. Under the NEM:AQA, airshed priority areas can be declared where there is concern of elevated atmospheric pollutant concentrations within the area. The DEA identified the potential of an airshed priority area in the vicinity of the Waterberg District Municipality (Government Gazette, Number 33600; 8 October 2010). This was later expanded to include the Bojanala Platinum District Municipality, North-West Province (Government Gazette, Number 34631; 30 September 2011) and the Waterberg-Bojanala Priority Area (WBPA) was officially declared on 15th June 2012 (Government Gazette, Number 35435).

The Waterberg-Bojanala Priority Area Air Quality Management Plan: Baseline Characterisation was released for public comment on the 7th August 2014 (SAAQIS, 2014, access date: 2014-08-21). The Baseline Characterisation of the WBPA reported that power generation activities contribute 95% of SO_2, 93% of NO_2 and 68% of the particulate emissions across the Waterberg District Municipality.

5.5 The National Environmental Management Waste Act, 2008 (Act No. 59 of 2008)

All Waste Management Activities are regulated by the National Environmental Management Waste Act, No. 59 of 2008 (NEM:WA), as amended, and the regulations thereunder.

In order to regulate waste management activities and to ensure that they do not adversely impact on human health and the environment, the NEM:WA introduced a licensing process for the assessment and authorisation of waste management activities. A list of waste management activities that are likely to have a detrimental effect on the environment (GN 921 of 29 November 2013) was promulgated in terms of the NEM:WA, which included a number of amendments to date with the latest amendment effected on 24 July 2015 through the promulgation of GN R633.

5.5.1 List of waste management activities that have, or are likely to have, a detrimental effect on the environment (GN 921 of 29 November 2013)

All waste management activities which are listed in Government Notice (GN) 921, as amended, requires authorisation from the Competent Authority (CA) before these activities may proceed. GN 921 furthermore group waste management activities in this list according to the potential environmental harm that may result from the activity and as a result waste management activities were divided between 3 schedules.

Schedule A contain waste management activities that require a Basic Assessment Process to be undertaken in an integrated fashion with an application for a WML, while Schedule B contain waste management activities that require an EIA and Scoping processes to be undertaken together with an application for a WML. The third schedule, Schedule C, contain waste management activities that is subject to the conditions and specifications of promulgated Norms and Standards developed to prevent serious environmental harm from known impacts associated with each waste management activity.

Conformance with the stipulated Norms and Standards in Schedule C therefore avoids the need to apply for a WML with the CA. The proponent will however need to demonstrate conformance with the stipulations of these Norms and Standards through a registration process with the CA prior to constructing the waste facility.

5.5.2 Norms and standards for the classification, assessment and disposal of waste to landfill

Norms and standards for the classification, assessment and disposal of waste to landfill were promulgated in 2013 in 3 separate notices to manage the disposal of waste to landfill:

- GN R. 634: NEM:WA: Waste Classification and Management Regulations
- GN R. 635: NEM:WA: National norms and standards for the assessment of waste for landfill disposal
- GN R. 636: NEM:WA: National norms and standards for disposal of waste to landfill.

Owing to the nature and composition of the gypsum, sludge and salts, these by-products of the FGD process were classified in terms of the NEM:WA: Waste Classification and Management Regulations (GN R634 of 23 August 2013).

5.5.3 Norms and standards for the storage of waste

National norms and standards for the storage of waste were also promulgated in 2013 in GN R. 926 (29 November 2013), which provided norms and standards for the storage of hazardous and general waste. In terms of GN R. 926 a WML would not be required for waste storage facilities that conform to the stipulations and conditions in these norms and standards, however the waste activity and storage facility would need to be registered before commencement of the proposed waste activities with the relevant authorities.

5.5.4 Applicability of the NEM:WA

During the course of the EIA process the site screening assessment to investigate feasible alternative waste disposal sites for a new waste disposal facility indicated that most of the sites had challenges that would require extensive interventions, wchih would compromise delivery of this application. As a result the proponent reached the decision to remove the assessment and authorisation of the new waste disposal facility from the scope of this EIA process.

Furthermore, the disposal of gypsum together with ash on the existing authorised waste disposal facility west of the MPS would be licenced through an amendment application to the existing WML.

Due to the decision to remove the assessment of a new waste disposal facility for ash, gypsum, and WWTP salts and sludge from the scope of this EIA process, the management of the storage facility for the storage of salt and sludge would be undertaken through a registration process of the proposed waste storage facility in terms of GN R. 926, although triggered NEMA listed activities will be addressed in this application.

The licencing of proposed waste disposal and storage activities and facilities is resultantly removed from this EIA process although any activities associated with the waste facility will still be considered and included in terms of the NEMA Listed Activities..

5.6 The National Water Act, 1998 (Act No. 36 of 1998)

The activities associated with the proposed Medupi FGD Retrofit project trigger a number Water Uses that are defined in Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) (refer to Table 5-3). Accordingly, these Water Uses may not be undertaken without being granted a Water Use License from the DWS.

In accordance with Sections 40 and 41 of the NWA (1998), a Water Use License Application Process will be carried out. The resultant documents from the WULA process will include completed WULA forms as well as a Technical Report. These documents will be submitted to DWS for review and decision making. Although a joint PPP is followed for the WULA within the EIA Phase, these two processes constitute separate applications and submissions are made to the respective Competent Authorities.

Table 5-3: Description of Water Uses

Water Use	Applicability
Section 21 (c) Section 21 (i)	Construction activities associated with FGD system and rail yard carried out within the 500 m buffer of the water resources.
Section 21 (g)	Disposal of ash and gypsum into the ADF located on Eenzaamheid farm; storage of limestone at the limestone yard and gypsum at the gypsum storage facilities; disposal of runoff from the limestone and gypsum storage areas into the dedicated pollution control dams; using wastewater to undertake dust suppression on the ash disposal facility; temporary storage of waste materials before disposal at the licensed hazardous waste site outside Medupi Power Station; disposal of runoff from the ash and gypsum dump into the pollution control dams.

5.7 Additional Legislative Requirements

Several additional legislation and guidelines may have a bearing on the proposed Medupi FGD Retrofit project. Although authorisation in terms of these various acts may not necessarily be mandatory the requirements of these acts have been considered.

Table 5-4: List of additional applicable legislation

Act, Policies, Programmes and Guidelines	Relevance to project
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Relevant sections include Section 34: Structures. Structures which are older than 60 years may not be demolished without a permit issued by the relevant provincial Heritage Resources Authority. No structures older than 60 years were recorded in the Heritage Impact Study.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Relevant sections include Section 35: Archaeology, palaeontology and meteorites. The findings of the Heritage Impact Study indicated that the possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site could not be ruled out. It is likely that the fossils may be present on the site and the probability of finding fossils during the excavation phase is high. Any archaeological or paleontological objects that are found on the site, must be reported to the provincial Heritage Resources Authority. The discovered archaeological or paleontological objects may not be removed from its original position and damaged, destroyed or altered prior to a permit being issued by the heritage resources authority.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Relevant sections include Section 36: Burial grounds and graves. Any graves that are discovered may not be destroyed, damaged, altered, exhumed or removed from its original position without a permit issued by SAHRA or a provincial heritage resources authority.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Relevant sections include Section 38(1)(c): Heritage Resource Management. As the proposed development area may exceed 5000 m^2, with the submission of the Heritage Impact Assessment to SAHRA, the responsible heritage resources authority has been notified of the project and provided with information relating to the project. Authorisation to proceed with the development is required from SAHRA.
Hazardous Substance Act, 1973 (Act No. 15 of 1973)	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances, e.g. the storage and handling of diesel on site.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Relevant sections include Section 53(1) and Section 53(2). The National Environmental Management: Biodiversity Act, No 10 of 2004 (NEM:BA) is aimed at protecting threatened ecosystems amongst other. This list is

Act, Policies, Programmes and Guidelines	Relevance to project
	published in Government Gazette 34809, 09 December 2011 (GN 1002: National list or ecosystems that are threatened and in need of protection). No listed threatened ecosystems are located within the proposed development footprint of the MPS or FGD.
National Environmental Management Protected Areas Act, 2003 (Act. 57 of 2003)	The NEM:PAA is focussed on the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes, and addresses, inter alia: • The protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; • The establishment of a national register of all national, provincial and local protected areas; • The management of those areas in accordance with national standards; • Inter-governmental co-operation and public consultation in matters concerning protected areas.
Water Services Act, 1997 (Act 108 of 1997).	This Act provides for, among other things, the effective water resource management and conservation.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	Relevant sections include Section 6. Provisions included in the act regarding the implementation of control measures for alien and invasive plant species must be adhered to. This act furthermore allows the control and prevention of veld fires through prescribed control measures.
National Forests Act (No 84 of 1998) and regulations	Relevant sections include Section 7. No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a licence issued under section 7(4) or section 23; or an exemption from the provisions of this subsection published by the Minister in the Gazette.
	Relevant sections include Sections 12-16. These sections deal with protected trees, with the Minister having the power to declare a particular tree, a particular group of trees, a particular woodland, or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.
Infrastructure Development Act, 2014 (Act No. 23 of 2014)	Relevant sections include Sections 7 – 8, and Schedule 1 and 3. This act provide for the facilitation and co-ordination of public infrastructure development of significant economic or social importance to the Republic, and to ensure that infrastructure development in the Republic is given priority in planning, approval and implementation. This Act identifies the development of power generation facilities as Strategic Infrastructure Projects (SIP) that must be fast-tracked to ensure realisation of socio-economic benefits.
National Road Traffic Act (Act No. 85 of 1993) (NRTA) and National Road Traffic Regulations, 2000 (GN R225, 17 March 2000) (NRTR)	Relevant sections include Chapter VIII of NRNR. Notwithstanding the conformance relating to driver fitness, vehicle fitness, adherence to road traffic signals and vehicle load transport regulations, Chapter VIII of the NRTR stipulated regulations for the transportation of dangerous goods and substances by road. Fuel, chemicals and hazardous substances will be transported to and from the MPS during construction and operation phases.
National Key Points Act, 1980 (Act 102 of 1980)	Provides for the protection of significant state assets, relative to national security. The act furthermore regulates the flow of information regarding Key Point activity and allows measures to be implemented to maintain the security of a Key Point. MPS is a national Key Point and the relocation of the security fence is required to accommodate the rail yard.

Act, Policies, Programmes and Guidelines	Relevance to project
Fencing Act (No 31 of 1963)	Relevant sections include 17. Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)	Relevant sections include Section 8. General duties of employers to their employees.
	Relevant sections include Section 9. General duties of employers and self-employed persons to person other than their employees.
Hazardous Substances Act (No 15 of 1973) and regulations	Regulates the classification, use, operation, modification, disposal or dumping of hazardous substances.
National Development Plan 2030 (NDP)	The National Development Plan aims to eliminate poverty and reduce inequality by 2030, through amongst others, accelerated economic growth. Security in power supply is critical for this to happen therefore development of the Medupi Power Station is key.
NEM:WA: National Waste Management Strategy (GN 344 of 4 May 2012)	The objects of the NEM:WA and National Waste Management Strategy (NWMS) are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority: waste avoidance and reduction, re-use and recycling, recovery, and treatment and disposal as the last resort. It is therefore necessary to consider the re-use and recycling of all waste produced by MPS, especially marketable wastes such as gypsum.
Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)	This Act repealed the former Lebowa, Gazankulu, Venda and Northern Province Acts and the Nature Conservation Ordinance (Ordinance 12 of 1983). It provides the lists for Protected and Specially Protected species under Schedule 2, 3 and 12 as well as the stipulation for permit applications to remove these species. In addition it gives protection measures for the terrestrial and aquatic biota and systems. Schedule 9 lists aquatic plant species that are prohibited in the province.
Lephalale Local Municipality Final Integrated Development Plan (IDP) 2017/2018	The Integrated Development Planning is regarded as a tool for municipal planning and budgeting to enable municipalities to deliberate on developmental issues identified by communities. The Lephalale LM IDP recognises the vast socio-economic benefits that could be generated from the development and operation of the MPS. However, the development of the power station has also put tremendous pressure on the Municipality for the provision of more potable water, electricity, expansion of waste water treatment systems, and provision of acceptable transportation routes.
Lephalale Local Municipality Draft Spatial Development Framework (SDF) – May 2017	The Lephalale LM Draft SDF recognises the importance of the construction of the MPS and has highlighted the need to develop a multi modal transport network to optimise the movement of people and goods between nodes in the province to amongst other, the MPS.
Lephalale Local Municipality By-laws	Relevant bylaws include Waste Management By-law and Waste Management By-laws Offences and Fines.
White Paper on Environmental Management Policy for South Africa (1998)	Through this Policy, Government undertakes to give effect to the many rights in the Constitution that relate to the environment.
National Biodiversity Strategy and Action Plan (NBSAP)	The development of the NBSAP is part of South Africa's obligations as a signatory to the CBD, and was compiled by the Department of Environmental

Act, Policies, Programmes and Guidelines	Relevance to project
	Affairs and Tourism (DEAT 2005). Through the NBSAP it is recognized that biodiversity cannot be conserved through protected area networks only. All stakeholders, from private landowners and communities to business and industry must get involved in biodiversity management. The NBSAP highlights, in particular, that South Africa's rivers are poorly protected and that the present status of many of these freshwater ecosystems is disturbing. To ensure further protection and sustainability of South Africa's wetlands, the DWS (DWAF at the time) initiated the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP) and River Health Programme (RHP)
National Aquatic Ecosystem Health Monitoring Program (NAEHMP) & River Health Program (RHP)	The NAEHMP is a national programme managed by DWS's Resource Quality Services with support from the Water Research Commission (WRC), the Council for Scientific and Industrial Research (CSIR) and various regional and provincial authorities. The overall purpose of the NAEHMP is to provide ecological information for South African rivers and the broader aquatic ecosystems required to support the rational management of these systems. The best-known component of the NAEHMP is the RHP.
National Freshwater Ecosystem Priority Areas (NFEPA)	The NFEPA project is a multi-partner project between CSIR, South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA), Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The NFEPA project aims to: • Identify Freshwater Ecosystem Priority Areas (hereafter referred to as 'FEPAs') to meet national biodiversity goals for freshwater ecosystems (through systematic biodiversity planning); and • Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.
National Water Resource Strategy (NWRS) 2	The NWRS2 (DWA 2013) builds on the first NWRS published in 2004. The purpose of the NWRS2 is to ensure that national water resources are protected, used, developed, conserved, managed and controlled in an efficient and sustainable manner towards achieving South Africa's development priorities in an equitable manner over the next five to 10 years.
Limpopo Conservation Plan version 2, 2013	This conservation plan is consistent with NEMA principles and the NEMBA. It is designed to support integrated development planning and sustainable development by identifying an efficient set of CBAs that are required to meet national and provincial biodiversity objectives, in a configuration that is least conflicting with other land uses and activities. Where alternatives are available, the CBAs are designed to avoid conflict with existing IDPs, EMFs and SDFs in the region by favouring the selection of sites that are least conflicting with other land-uses.

To ensure that a best practice approach was adopted for the EIA Process and to ensure that the EIR provides sufficient information require by the DEA to reach a decision, the following guidelines have been considered in the compilation of this Environmental Impact Report:

- National Environmental Management Act, 1998 (Act 107 of 1998) Implementation Guidelines Sector Guidelines for Environmental Impact Assessment Regulations Government Notice 654 of 2010, published in Government Gazette 3333, dated 29 June 2010.

- National Environmental Management Act, 1998 (Act 107 of 1998) Publication of Need and Desirability Guideline in terms of the Environmental Impact Assessment Regulations, 2010, Government Notice 792 of 2012, Government Gazette 35746, dated 05 October 2012.
- Department of Water Affairs & Forestry, 1998. Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste.
- DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria
- Department of Environmental Affairs, 2011. A user-friendly guide to the National Environmental Management: Waste Act, 2008. South Africa. Pretoria.
- DEAT (2004) Criteria for determining Alternatives in EIA, Integrated Environmental Management, Information Series 11, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

6 PROJECT DESCRIPTION

6.1 Introduction

Eskom's Air Quality Strategy (Eskom Holdings SOC Limited, 2015) established a SO_2 emissions target of 400mg/Nm^3 at 6% O_2 for power stations commissioned between 2002 and 2017. This target complies with the minimum emissions standards stipulated by the National Environmental Management: Air Quality Act (Act 39 of 2004), which requires a concentration of 500mg/Nm^3 at 10% O_2. The Air Quality Strategy further recommended that the Medupi Power Station be fitted with a flue gas desulphurisation technology in order to comply with the emissions standards set.

In response to the Eskom Air Quality Strategy and funder requirements, the Medupi Power Station units have been designed, and constructed, with provisions incorporated into the space and equipment design to accommodate the installation of the wet limestone FGD system.

The Medupi FGD retrofit is designed to accommodate varying coal qualities ranging from design coal with low sulphur content up to "worst" coal quality with a higher sulphur content. The actual limestone composition that will be utilised is not yet defined as sourcing is still underway, but the process caters for the worst-case scenario limestone quality (with a 85% $CaCO_3$).

The development of the Medupi FGD system has been ongoing over a number of years, with a number of engineering specialists and service providers designing different aspects of the overall FGD system. As a result several documents have been compiled dealing with specific aspects, structures or infrastructure associated with the FGD system as a whole. A list of the relevant documents and reports that that were considered in this report are provided below:

- Harris, 2014. Medupi FGD Retrofit Conceptual Design Report. Unique Identifier 200-61771, Reference No.: 174330.40.1000. Eskom Holdings SOC Limited, 966pp
- Harris, 2014. Medupi FGD Retrofit Basic Design Report. Eskom Holdings SOC Limited, 105pp
- Black and Veatch, 2014. Medupi Power Station 6 x 800 MW (GROSS) Units Wet Flue Gas Desulfurization (FGD) Retrofit: Project Design Manual, 129pp
- Bosch Holdings Consortium, 2015. Basic and Detailed Design of Medupi Rail Yard and Offloading Facility, Project No.: P1184-099-1. Eskom Holdings SOC Limited, 124pp
- Harris, 2014. Medupi FGD Retrofit Technology Selection Study Report, Unique Identifier 474-10175, Reference No.: 178771.41.0050. Eskom Holdings SOC Limited, 23pp
- Knight Piésold Consulting, 2017. Medupi Power Station: Conceptual design of stormwater management, sewage infrastructure and access roads between boiler edge slab and road no.3 (ring road west) and design of the new gypsum offtake infrastructure

slab, associated drainage, and access roads, KP Ref No.: 303-00828/01 and Eskom Ref No.: 200-605353. Eskom Holdings SOC Limited, 130pp

- Aurecon, 2017. Medupi FGD Retrofit: Stormwater Design Report, Rev B. Document Ref. No.: 500332-0000-REP-WD-0001., Pretoria: Aurecon, 8pp
- Aurecon, 2017. Medupi FGD Retrofit: Water Balance Report, Rev B. Document Ref. No.: 200332-0000-REP-WW-0001., Pretoria: Aurecon, 17pp

The proposed Medupi FGD system does not only encompass the construction and operation of the FGD plant, but also include a number of associated services and infrastructure aimed at managing the transportation and handling of input material required to make the system work. The FGD process also deals with the management of waste and by-products resulting from the operation of the FGD plant and associated infrastructure.

To illustrate the basic concept of the FGD process a simple diagram is presented in **Figure 6-1**. The *FGD system* shown by the centre rectangle represents the infrastructure directly involved in the reduction of SO_2 levels. To the left of the *FGD system*, the FGD process receives **input material in the form of water and limestone**. The FGD process uses these input materials, amongst others, to "treat" **flue gas high in SO_2**, which is represented by the red rectangle below *FGD system*. Through the FGD process the SO_2 content of the flue gas is reduced significantly and **flue gas low in SO_2**, represented by the green rectangle above *FGD system* is released to the environment. The FGD process however produces **waste products as output** that must be handled, stored, transported and disposed. As a final step the FGD process must therefore cater for the management and disposal of the waste products in an environmentally responsible manner.

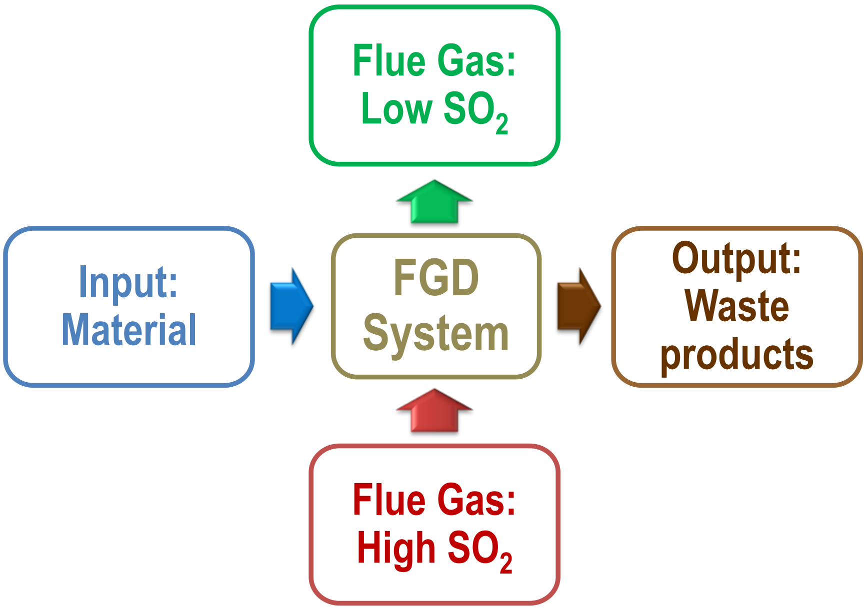


Figure 6-1: Simple diagram of FGD process

Box 1: The FGD process simplified and contextualised

A simplified process is described in **Box 1** below to contextualise the FGD processes for non-technical stakeholders.

6.2 Study area defined

The development site is located within the existing Medupi Power Station footprint. A detailed description of the development site is provided in **Table 6-1** below.

Table 6-1: Description of the project development site

Province	Limpopo	
District Municipality	Waterberg District Municipality	
Local Municipality	Lephalale Local Municipality	
Ward number(s)	Ward 4	
Nearest town(s)	Lephalale	
Farm name(s) and number(s)	Eenzaamheid 687 LQ	Naauw Ontkomen 509 LQ
Portion number(s)	Portion 0	Portion 0
Surveyor-general 21 digit site reference numbers	T0LQ00000000068700000	T0LQ00000000050900000
Current Land Use	Industrial	Industrial
Property Owner	Eskom Holdings SOC Limited	Eskom Holdings SOC Limited

The proposed development site has the following battery limits within the MPS property boundary, i.e. within the farm portions Eenzaamheid 687 LQ and Naauw Ontkomen 509 LQ.

Figure 6-2: Development footprint for the FGD Retrofit project

The development footprint for the proposed FGD system, Rail Yard and associated infrastructure is shown in **Figure 6-2**. The development footprint corner points are shown as points A – D, while the development footprint shape centre point, which was calculated by determining the centroid point, is shown as point E in **Figure 6-2**. The Latitude and longitude coordinates, in Degrees, Minutes and Seconds (DMS), are provided in **Table 6-2** below.

Table 6-2: Coordinates for the Medupi FGD Development Footprint within MPS

Development footprint point	Latitude (DMS)	Longitude (DMS)
Corner Point A	23°42'34.88"S	27°32'40.66"E
Corner Point B	23°42'6.17"S	27°33'41.45"E
Corner Point C	23°42'35.61"S	27°33'59.47"E
Corner Point D	23°42'59.82"S	27°32'35.65"E
Shape Centre Point E (Centroid)	23°42'42.03"S	27°33'15.92"E

6.2.1 Rail yard and associated infrastructure

The extent of the rail yard development area including associated infrastructure are defined as follow:

- The northern extent of the proposed rail yard development area is defined as the existing overland ash conveyor belt starting from the existing ash transfer house 8 in the east to last ash conveyor transfer house before the ADF.
- The eastern extent of the proposed rail yard development area is the approximate point where the existing ash transfer house 8 and existing railway mainline between Thabazimbi and Lephalale coincide.
- The southern extent of the proposed rail yard development area is defined by the existing railway mainline between Thabazimbi and Lephalale, from the existing ash transfer house 8 in the east to the an existing access road crossing over the railway line approximately 1.7km to the west of existing transfer house 8.
- The western extent of the proposed rail yard development area extends from the existing access road crossing over the railway line at the south eastern extent of the existing ADF for approximately 750m northeast to the last ash conveyor transfer house before the ADF.

Proposed gypsum and limestone conveyor belt system will cross the existing overland ash conveyor to complete the conveyance system in order to link the proposed rail yard with the FGD infrastructure within the Medupi Power Station footprint. The battery limits described above essentially form a scalene triangular shaped area and is shown in **Figure 6-3**.

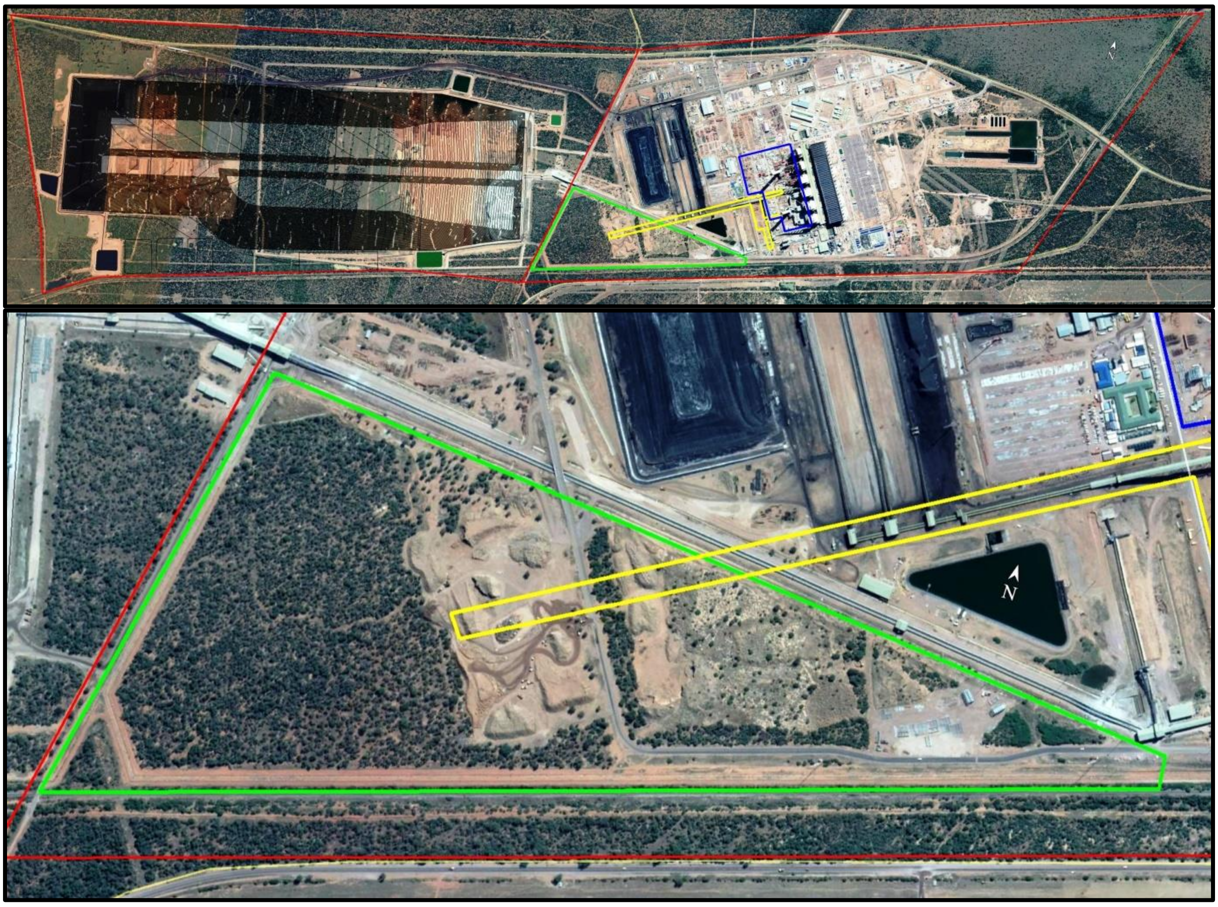


Figure 6-3: Proposed rail yard development area, including limestone and gypsum handling and associated infrastructure (green outline) between the MPS and existing ADF

6.2.2 FGD system and associated infrastructure

The FGD infrastructure is located within the footprint of the MPS. The area is currently under construction and totally transformed as can be seen in **Figure 6-4**.

The extent of the FGD infrastructure development area including associated infrastructure are defined as follow:

- The northern extent of the FGD infrastructure development area is characterised by an internal road, identified as North Street, and extends from the intersection with the internal road Ring Road West at the western extent for approximately 435m east to generation unit 1.
- The eastern extent of the FGD infrastructure development area is defined by the western front of the 6 generation units of the MPS. It is at this eastern extent where the FGD absorbers will be retrofitted to each Generation Unit.
- The southern extent of the FGD infrastructure development area aligns loosely with the southern extent of Generation Unit 6 and extends from Unit 6 westward along the inclined coal conveyor belt feeding the generation units up for approximately 230m westward to an internal road Ring Road West.

- The western extent of the FGD infrastructure development area follows Ring Road West a short distance northward after which it turns to the west up to the coal conveyor belt. From here it runs northward along and cross the northern coal conveyor belt where it turns to the left and extends to Ring Road West all the way to North Street.

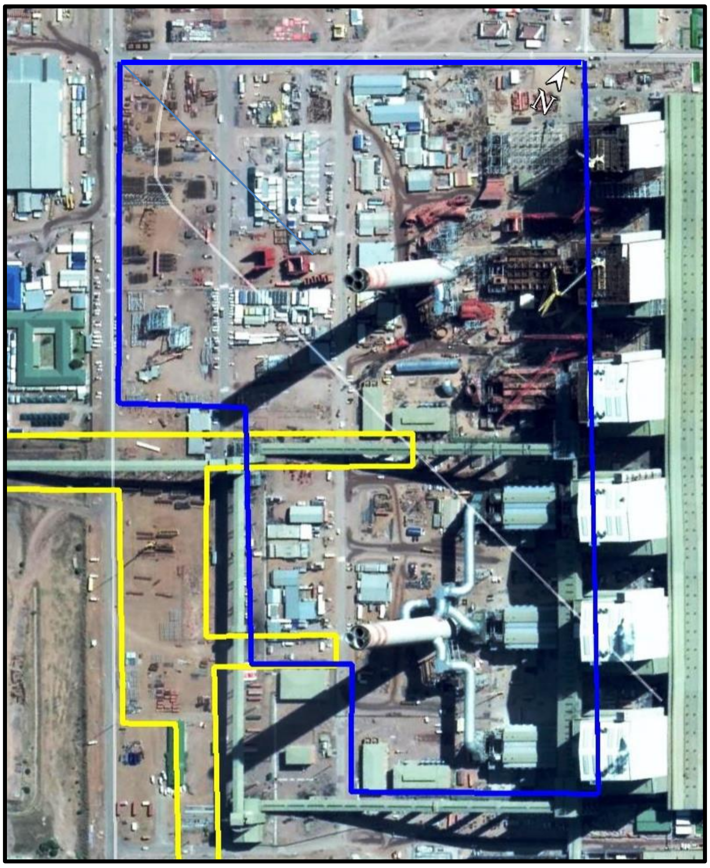


Figure 6-4: Proposed FGD development area (blue outline) within the MPS footprint

The approximate outline of the FGD infrastructure development area is spatially represented in **Figure 6-4**, as shown by the blue outline.

6.2.3 Conveyor alignment area

The conveyor alignment area that links the proposed rail yard infrastructure with the FGD infrastructure is represented by the yellow outlined area in **Figure 6-5**. This infrastructure follows the existing coal conveyor belt alignment from the rail yard in the west to the FGD plant in the east to deliver limestone for use in the FGD process.

Dewatered gypsum from the gypsum dewatering building is transported via conveyor southward to link with the overland ash conveyor system for disposal of gypsum on the existing ADF. Alternatively, it can be loaded onto vehicles at the transfer station prior to conveyance to the ADF.

In the event that a commercial offtaker of gypsum is secured, dewatered gypsum can be conveyed northwards to follow the existing coal conveyor belt back to the rail yard for temporary storage or loading onto locomotives for transport via rail.

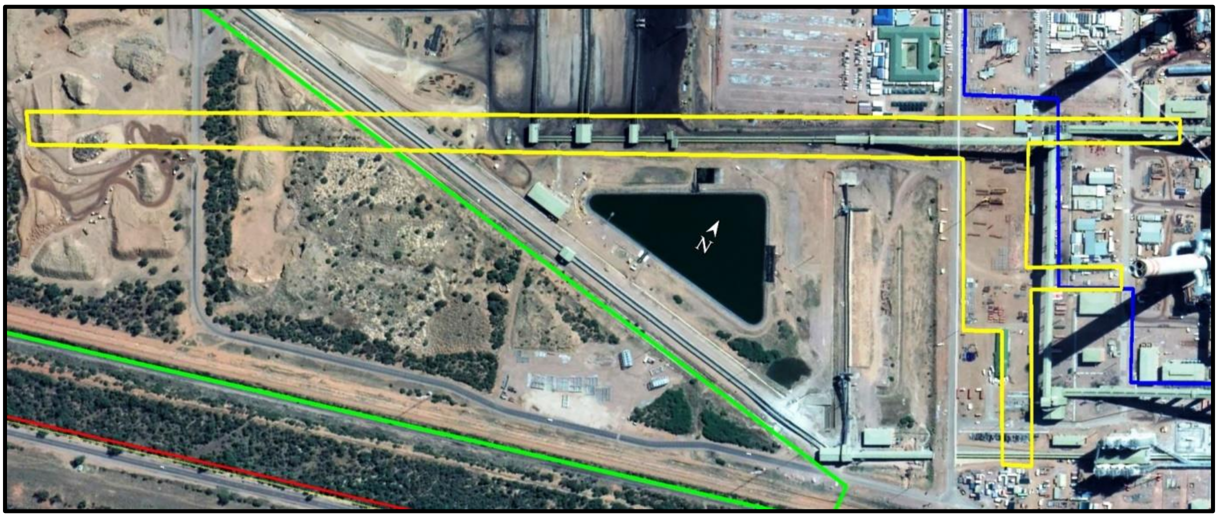


Figure 6-5: Conveyor alignment area linking the rail yard and FGD

6.2.4 Zone of influence of proposed development

Although the proposed infrastructure is confined to a development area within the MPS property boundary and footprint, the zone of influence of potential impacts that may result from the construction and operational activities associated with FGD retrofit may have a wider influence on the surrounding environmental and socio-economic environment. This may for example be the case where potential air quality impacts may extend beyond the Medupi Power Station footprint and impact surrounding communities. This zone of influence is characterised and contextualised during the specialist impact assessments that will be discussed in subsequent sections of the DEIR.

6.3 Structured overview of proposed FGD system

Medupi Power Station will be retrofitted with a wet limestone forced oxidation FGD system, in which limestone ($CaCO_3$, sorbent) reacts with gaseous SO_2 to form gypsum crystals ($CaSO_4$•$2H_2O$), as a by-product.

During this process, as eluded to in Box 1, the FGD system will be dependent on a number of associated infrastructure and processes to receive and store limestone, prepare the limestone for use in the FGD system, divert flue gas from the 6 power generation units to the FGD system where it is scrubbed to extract SO_2, and is finally released to the environment. Lastly the waste and by-products from the FGD system is transported to storage areas prior to disposal or removal to a registered landfill site.

In order to better understand this intricate and complex system a basic process diagram is included in **Figure 6-6** below to aid understanding of how the system works and what inputs and outputs are associated with each stage of the process. As such, an overview of each of the process “blocks” is provided below to contextualise each of the key processes and infrastructure requirements that forms part of the overall FGD system. The FGD system is represented by nine (9) process blocks as follows:

Block 1: Limestone is purchased off-site and is transported to the Medupi Power Station by rail. The limestone is offloaded at the proposed rail siding to be located south-west of the 6 power generation units within the Medupi Power Station footprint. The rail siding is a component of this environmental authorisation process. The initial deliveries will be by road, until the rail is commissioned.

Block 2: Limestone is prepared on site at an allocated facility. Preparation includes handling, stockpiling, milling and transportation via elevated pipe network.

Blocks 3: All the blocks numbered as “3” indicate the inputs to the absorber. These include the untreated flue gas from the power station, process water and oxidation air to facilitate the reaction, and the limestone which is the reagent. All of these are introduced to the absorber in appropriate states and volumes for the removal of sulphur from the flue gas.

Block 4: Represents the absorber where the reaction takes place to remove the sulphur from the flue gas. This reaction results in some output products (waste and by-products) that require treatment, re-use or disposal.

Block 5: Treated flue gas, with a much reduced sulphur content, is expelled from the system through the stacks (also referred to as chimneys) of the Medupi Power Station. The reaction will have reduced the sulphur content by up to 95% in order for the flue gas to comply with the minimum emissions requirements of 500mg/Nm^3 at 10% O_2.

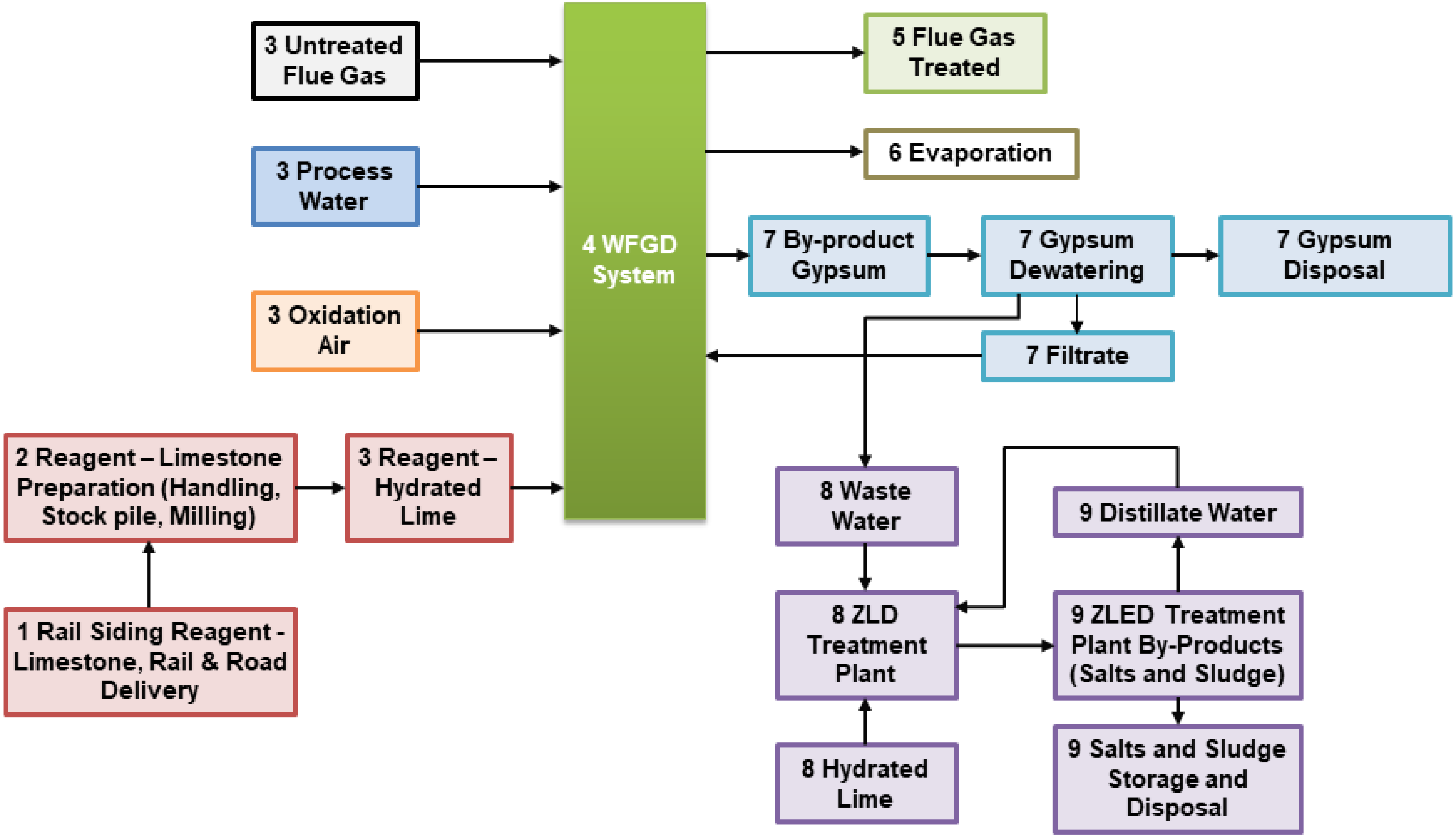


Figure 6-6: Basic Flow Diagram of Medupi FGD Process

Block 6: Some of the water utilised during the reaction is evaporated and lost by the system.

Blocks 7: Gypsum is formed as a by-product of the chemical reaction with the limestone. The gypsum exist the absorber (Block 4) in the form of a slurry, which needs to be dewatered in order to minimise loss of water from the system and to prepare the gypsum for re-use and/or disposal. The water or filtrate that is separated from the gypsum is reused within the process by returning it to the absorber as make-up water. The dewatered gypsum will be in crystallised state and will be stored for re-use or disposed of at a Class C Disposal Facility at the power station, together with the ash from the power generation process.

Blocks 8: Waste water is generated during the Gypsum dewatering process (Block 7) and is transported to a Waste Water Treatment Plant (WWTP) where lime is added in order to treat the waste water. This process produces by-products that will be either re-used or disposed in an environmentally responsible manner.

Blocks 9: By-products of the WWTP include a distillate, which is reused within the FGD process, and salts and sludge, which are Type 1 wastes and require disposal at an appropriately licenced facility. The salts and sludge will be disposed of at an existing Class A disposal facility (Holfontein, as an example) as a temporary measure, while a new Class A disposal facility located close MPS is investigated, designed, appropriately licenced and constructed.

A detailed description of each of the process blocks and associated infrastructure that forms part of the FGD system is provided in the sections that follow.

6.4 FGD System component: Railway siding (Block 1)

Block 1 of the Medupi FGD basic process diagram represents the construction and operation of a railway yard and siding west of the MPS between the power station and existing ADF. The rail yard will primarily handle bulk limestone, which will be used as a sorbent in the retrofitted FGD plant. The rail yard will provide a facility for the loading of bulk gypsum from the adjacent temporary storage area, which will be despatched from the rail yard depending on market demand (Bosch Holdings Consortium, 2015).

All information pertaining to the proposed railway siding was obtained from the *Basic and Detailed Design Report for the Medupi rail yard and offloading facility* compiled by the Bosch Holdings Consortium in 2015.

6.4.1 Rail yard overview

The scope of the new rail yard is to provide the MPS with a rail yard solution and rail operations that will ensure that the yard is capable of receiving and offloading approximately 1 200 000 tons per annum (t/a) of Limestone, and to be able to load and despatch approximately 400 000 t/a of Gypsum that has been generated through the FGD process and temporarily stored at the Gypsum Storage Facility adjacent to the rail yard, prior to dispatch (Bosch Holdings Consortium, 2015).

The proposed yard is situated just north of the existing Transnet Freight Rail (TFR) mainline which runs between Thabazimbi and Lephalale. The consideration of the railway yard site selection was governed by the following factors:

- The decision to use the existing rail way network to deliver limestone to the power station.
- The position and layout of the proposed FGD plant.
- Available space within the existing Medupi Power Station fence boundaries.
- The availability of existing services such as potable water, fire water and storm water drainage structures.

The location of the proposed siding take-off point is situated at kilometre point 107+128m on the Thabazimbi – Lephalale railway. A runoff line will be constructed from the TFR mainline into the Medupi Rail Yard, to allow the mainline train to rapidly exit the mainline and thus not to cause delays to train operation on the mainline. The rail yard will provide sufficient track to shunt 30 CAR wagons from the tippler and place them onto the departure line within the yard (Bosch Holdings Consortium, 2015).

The yard layout is in linear type configuration with six lines parallel to each other, and split into two separate yards and sections linked by means of a locomotive run-around line (**Figure 6-7**). The rail yard is designed to accommodate the simultaneous staging of two trains consisting of 60 type CAR wagons within the limestone yard and two trains consisting of 50 type CAR-wagons within the gypsum yard (Bosch Holdings Consortium, 2015).

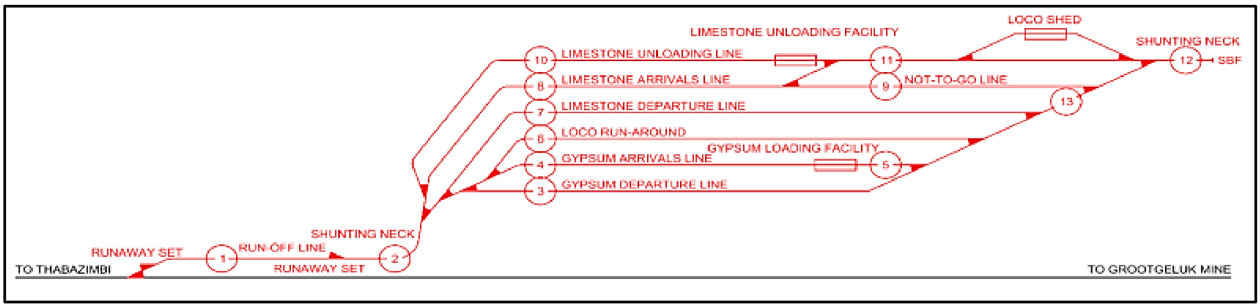


Figure 6-7: Schematic drawing of proposed railway line and yard configuration

It is anticipated that rail yard will include the following structures and infrastructure:

- Rail infrastructure;
- Administration building and operations tower for Eskom and TFR employees;
- Diesel locomotive workshop, utilities rooms and ablutions;
- Fuel Storage Area;
- Security office and infrastructure;
- Limestone offloading facility (Tippler building);
- Gypsum loading facility;
- Conveyor infrastructure;

- Sewerage and effluent management infrastructure; and
- Associated infrastructure (water, storm water, roads, lighting).

These structures and infrastructure are presented in the site layout drawing of the proposed rail yard which is attached as **Appendix D-1.** Relevant structures and infrastructure associated with the rail yard development is discussed in short in the sections that follow.

6.4.2 Limestone requirements and origin

Limestone will be purchased off-site and transported to the Medupi Power Station by rail and/or road. It is anticipated that limestone will be transported via existing rail/road network to the MPS from either Lime Acres in the Northern Cape, or Pienaarsrivier or Marble Hall in Limpopo. Confirmation of the Limestone source was not available at the time of compilation of the Environmental Impact Report (EIR).

6.4.3 Rail infrastructure

The rail infrastructure proposed to be installed within the rail yard is shown in the schematic drawing presented in **Figure 6-7**.

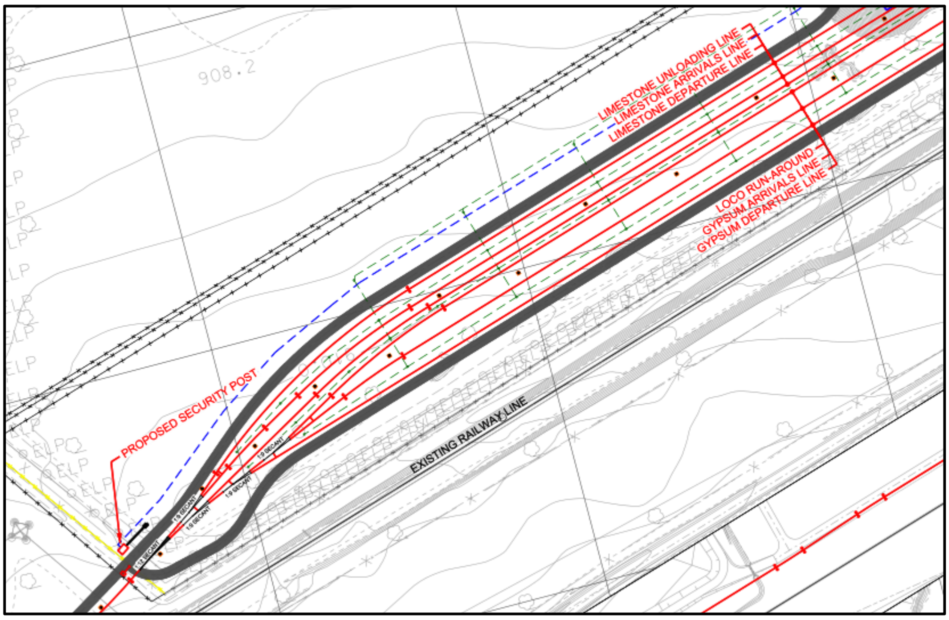


Figure 6-8: Proposed alignment and layout of the rail infrastructure

The general arrangement and layout of the rail infrastructure is shown in **Figure 6-8** and include the following:

- Limestone offloading line, shunt locomotive shed and shunting neck;
- Limestone arrivals line;
- Limestone departure line;
- Locomotive run-around line;
- Gypsum arrivals line with loading facility; and

- Gypsum departure line.

Figure 6-8 represents an excerpt from the General Arrangement Drawing of the proposed rail infrastructure provided in **Appendix D-2.**

6.4.4 Administration and operations tower

The proposed administration building will be located north east of the proposed new limestone offloading facility (tippler building) within the proposed rail yard (**Figure 6-9**). The administration building will allow for a staff contingent of 18, ablution and change room facilities, kitchen, entrance foyer, offices and operations tower. The rail yard operations room to be elevated to provide a view of the tippler building.

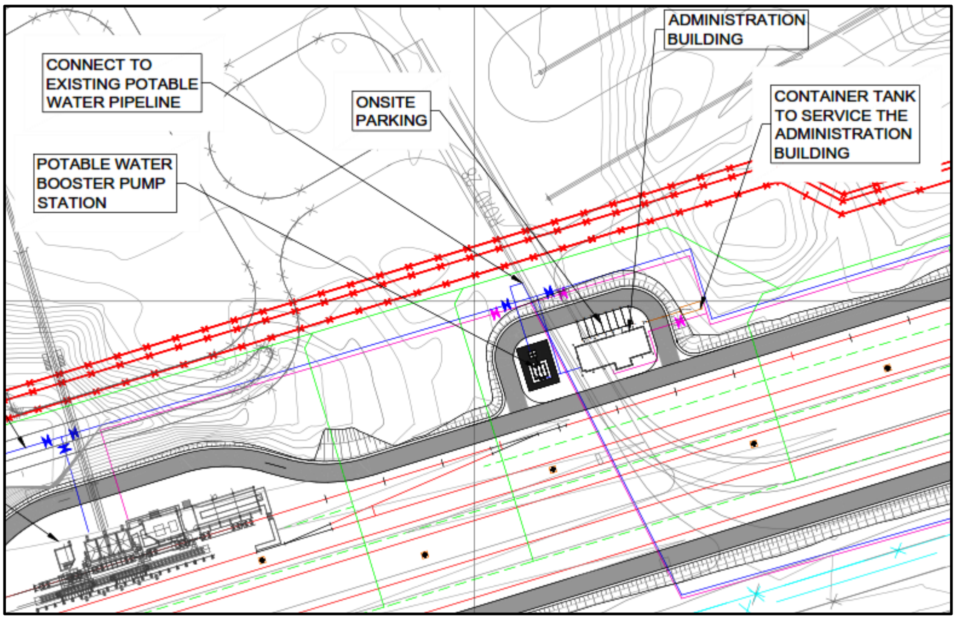


Figure 6-9: Proposed administration building and water booster pump station

Figure 6-9 represents an excerpt from the Site Layout Plan Drawing of the proposed rail infrastructure provided in **Appendix D-1**.

6.4.5 Diesel locomotive workshop, utilities rooms and ablutions

A diesel locomotive workshop area, including utilities rooms and ablution facilities, will be constructed toward the eastern extent of the rail yard (**Figure 6-10**). This area will be located south of the proposed Pollution Control Dam (PCD) 210. This workshop area will have approximately 600m² service area for the shunting locomotive and has various offices and store rooms (180m²) attached to one end of the building.

Fluids that will be stored in small quantities within the workshop building will include Benzene class 1 flammable liquid, trichloro-ethylene, carbon tetrachloride, engine oil, viscous oils, hydraulic oil, grease, battery acid and radiator fluid. With the exception of Benzene these fluids are all high flash point non-flammable products.

This building will typically fall under SANS classification D3 Low Risk Industrial therefore safety considerations for the storage of these fluids include a local standalone foam deluge system to provide fire protection to cover the benzene storage area.

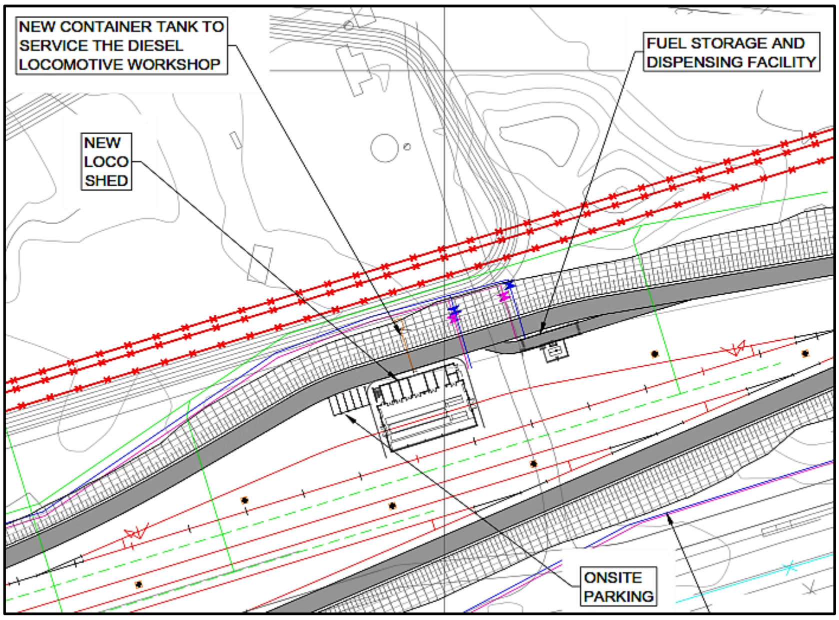


Figure 6-10: Proposed diesel locomotive workshop and fuel storage area

Figure 6-10 represents an excerpt from the Site Layout Plan Drawing of the proposed rail infrastructure provided in **Appendix D-1**.

6.4.6 Fuel Storage and Dispensing Facility

A Fuel Storage and Dispensing Facility will be located adjacent to the diesel locomotive workshop area where refuelling of the shunt locomotive will take place (**Figure 6-10**). This structure will consist of an open bunded area of approximately 6m wide x 10,5m in length for location of the diesel storage tank, which will be located in the centre of the bunded area. Diesel fuel is considered combustible but not flammable and the diesel storage tank will have a maximum installed storage capacity of 14 000 litres in one or two above-ground horizontal storage tanks. A covered road tanker decanting area will be located alongside the bunded area.

A second fuel storage area will be located close to the FGD complex area within the MPS and will contain a second diesel tank with a maximum installed capacity of 14 000 litres, which will be similarly bunded. This fuel tank will service the Emergency Generator at the FGD plant.

A third diesel tank will be located in the FGD common pump building with a capacity significantly less than the two larger tanks. It is anticipated that the maximum installed capacity of all diesel storage tanks will not exceed 28 000 litres.

The dispensing structure will be located immediately adjacent the fuel storage facility, and will consist of a concrete slab 4m wide x 10,5m long. The area will be covered by a monopitch clad structural steel roof, supported on steel columns. Foundations for the columns will be located below the floor slab level.

6.4.7 Security office and infrastructure

The security office will be located adjacent the fence line at the western extent of the proposed rail yard where the proposed rail infrastructure ties in with the existing rail network (**Figure 6-11**). The existing three tier national key-point security fence will be moved from its current position to the northern boundary of the rail way yard in order to restrict direct access to the MPS from the railway yard due to National Key-point Security concerns. The existing service road fence will be used as the boundary fence to the rail yard.

Figure 6-11 represents an excerpt from the Site Layout Plan Drawing of the proposed rail infrastructure provided in **Appendix D-1**.

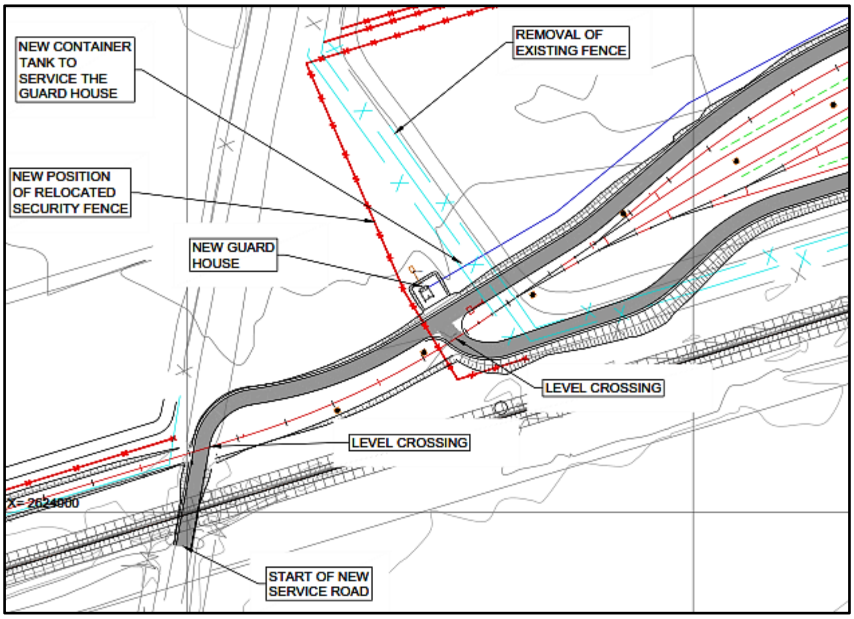


Figure 6-11: Proposed security office and relocated security fence

6.4.8 Sewerage infrastructure

The security office, locomotive workshop and administration building will be served with ablution facilities with a sewerage conservancy tank system each (**Figure 6-12**). The security office will be constructed with a 3200ℓ conservancy tank, while the administration building and locomotive workshop building will be constructed with an 8500ℓ capacity conservancy tank each. The container tank option is proposed due to the general site topography, distance from the network and limited information regarding the existing sewers. Draining of the conservancy tanks will occur every two weeks by means of a tank truck (Honey Sucker).

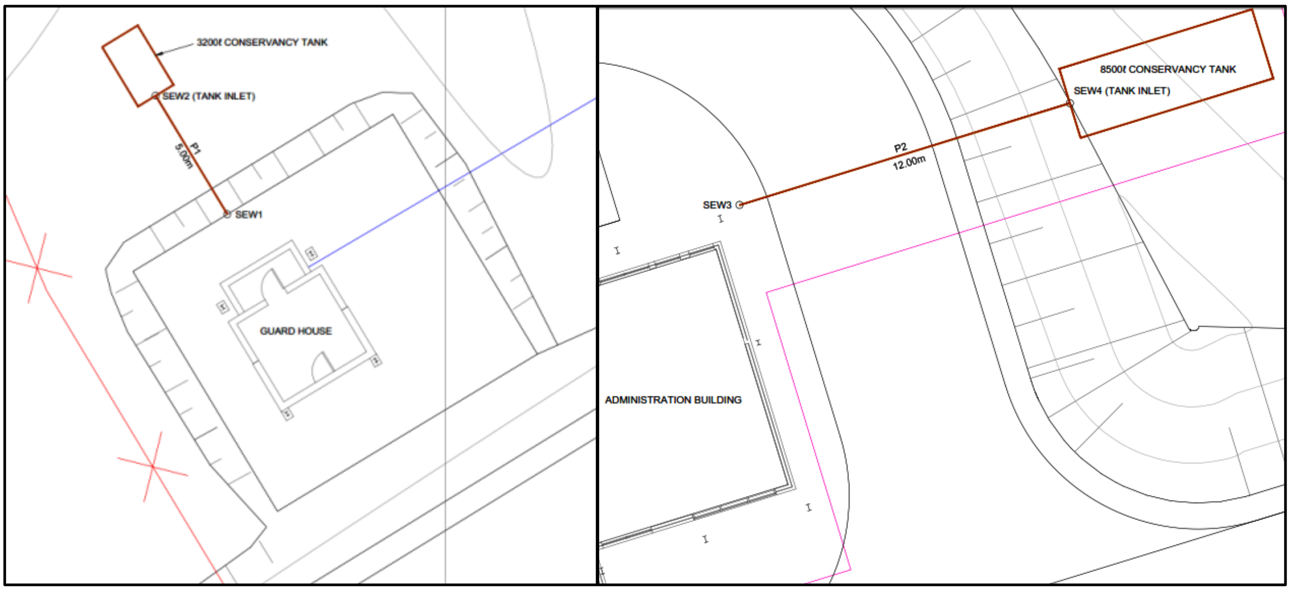


Figure 6-12: Conservancy tank sewerage systems located at the security office and administration building

Figure 6-12 represents an excerpt from the Sewer Layouts and Long Sections Drawing of sewerage infrastructure located within the proposed rail infrastructure provided in **Appendix D-3**.

6.4.9 Limestone offloading and conveyance

The limestone offloading infrastructure that will be associated with the railway yard will include the following infrastructure:

- Limestone rail offloading and receiving building, which will include the construction of a Tippler building to offload limestone from the locomotive cars (**Figure 6-13**);
- Limestone truck offloading and receiving area, located north of the limestone rail yard offloading facility and directly west of the limestone storage area;
- Limestone underground link conveyor 1 (**Figure 6-14**), which will transport limestone from the rail offloading facility to the Limestone transfer house 1;
- Limestone transfer house 1, which will transfer limestone received from the limestone underground link conveyor, and the Limestone Truck Off-loading Facility (**Figure 6-15**), to the limestone stacking conveyor; and
- Emergency limestone offloading area at the Limestone Stockpile itself, including associated access road network. Emergency offloading of lime from trucks will be done directly onto the limestone stockpile.

The Tippler building and infrastructure is shown in **Figure 6-13**. The Tippler is essentially a large cylinder or C-shaped metal structure into which locomotive cars are pushed. Once inside the Tippler the individual locomotive car is clamped and rotated to “tip” over the content of the car into a receiving structure called a hopper located below the tippler. A clip of a tippler machine and how it works can be viewed on the Youtube website at https://www.youtube.com/watch?v=KDTgYb9qv3U (www.youtube.com, accessed on 09 January 2017).

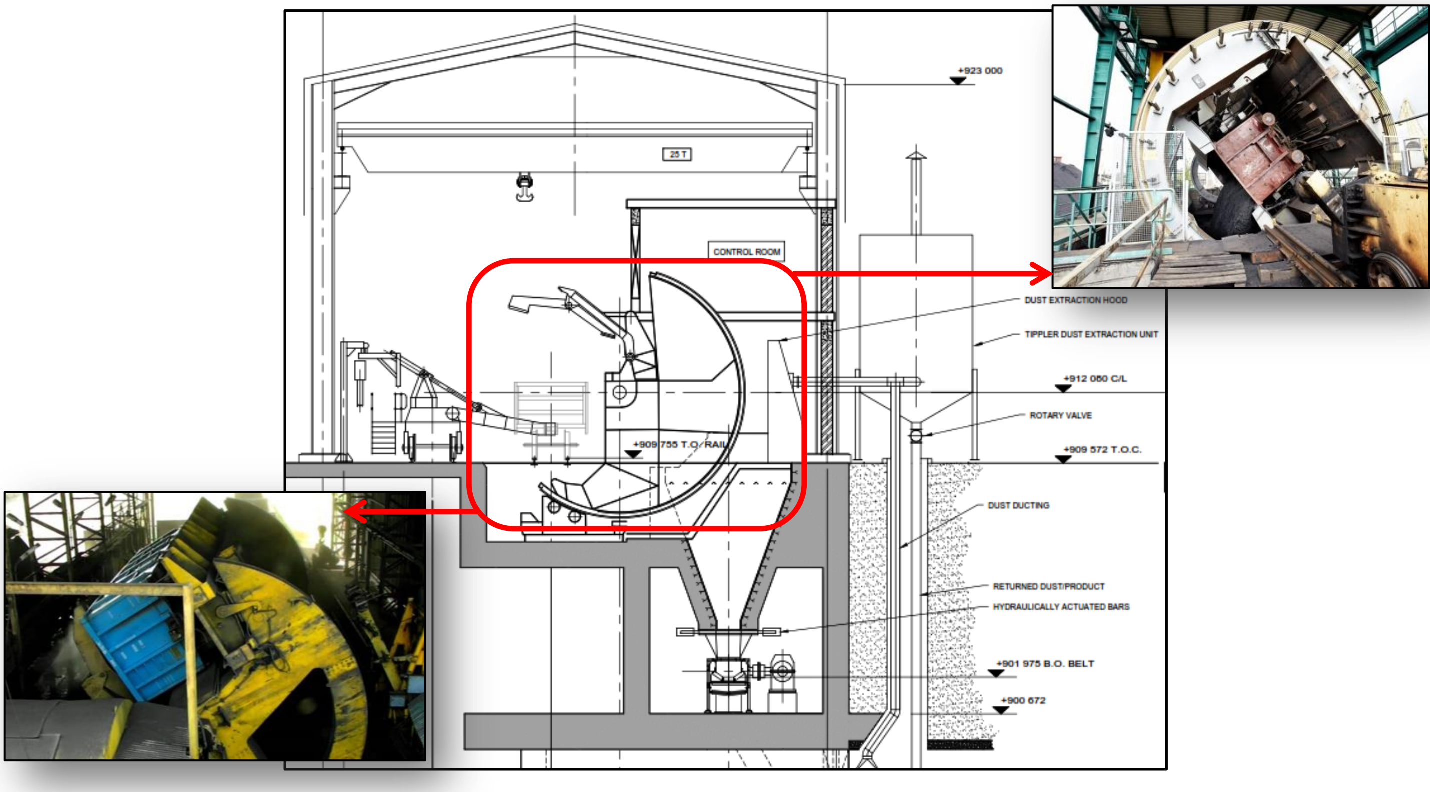


Figure 6-13: Tippler, hopper and vault layout of the limestone offloading area

The proposed limestone material handling system will receive limestone delivered via rail wagons or trucks, and transport the material via conveyor to the limestone stockpile area. Locomotive cars containing limestone transported to the Tippler will be lifted into the air and rotated by the Tippler, which will dump the limestone into the feed hoppers below the tippler. The Tippler building will require excavation of up to 15m below ground to house the necessary hopper and conveyer infrastructure. Belt feeders will feed via a chute onto the inclined belt conveyor, in the vault beneath the tippler.

Limestone will be conveyed from the tippler vault (below ground) via an inclined concrete tunnel, which daylights as the conveyor climbs at the specified gradient, supported by a steel structure mounted to the tunnel concrete floor at approximately 2.5m intervals. Thereafter, the conveyor will be supported by a conveyor gantry structure at ground level. As the conveyor leads into the transfer house, it rises above the ground, supported by small box girders with walkways on both sides and span between steel trestles. The steel trestles will be located at approximately 15m centres, and will be founded on concrete foundations on engineered layerworks.

The limestone will be stockpiled and evaluated before it is conveyed to the limestone silos located in the reagent preparation area.

Figure 6-13 represents an excerpt from the Tippler and Vault Layout Drawing provided in **Appendix D-4** and show semi-circular shape of the Tippler to the right of the locomotive car.

The V-shapes structure to the right and below the Tippler represents the Hopper that guides the dumped limestone onto the limestone feeder conveyor.

Figure 6-14 represents an excerpt from the Inclined Limestone Conveyor Drawing provided in **Appendix D-5** and demonstrates the link between the Tippler, Hopper and inclined limestone conveyor that is located approximately 15m below ground level.

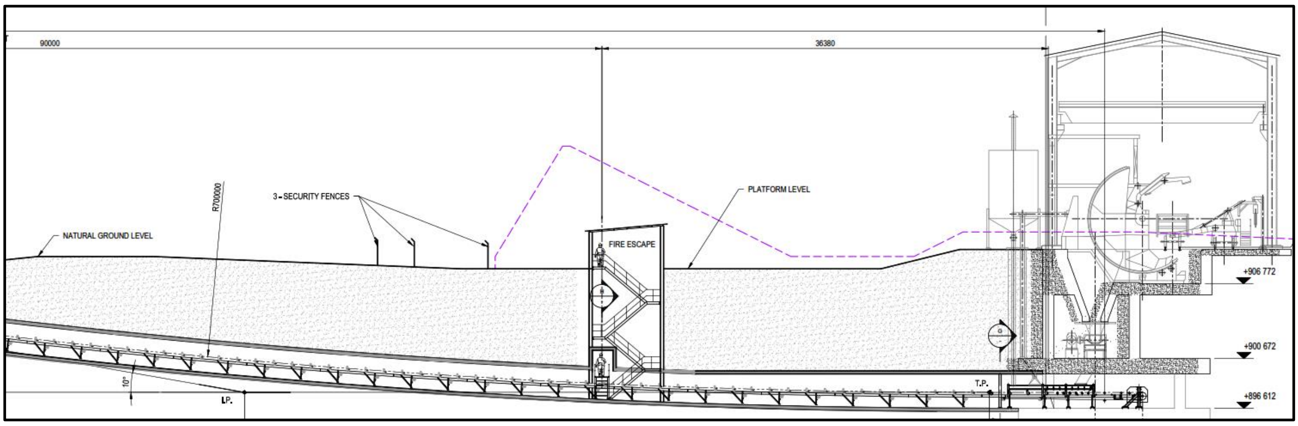


Figure 6-14: Inclined limestone conveyor from Tippler building below ground level

Figure 6-15 represents the elevated limestone truck offloading facility and hopper arrangement. Limestone transported to the MPS by trucks will be offloaded from the elevated platform structure through hoppers onto a conveyor, from where it will be conveyed to the limestone storage area.

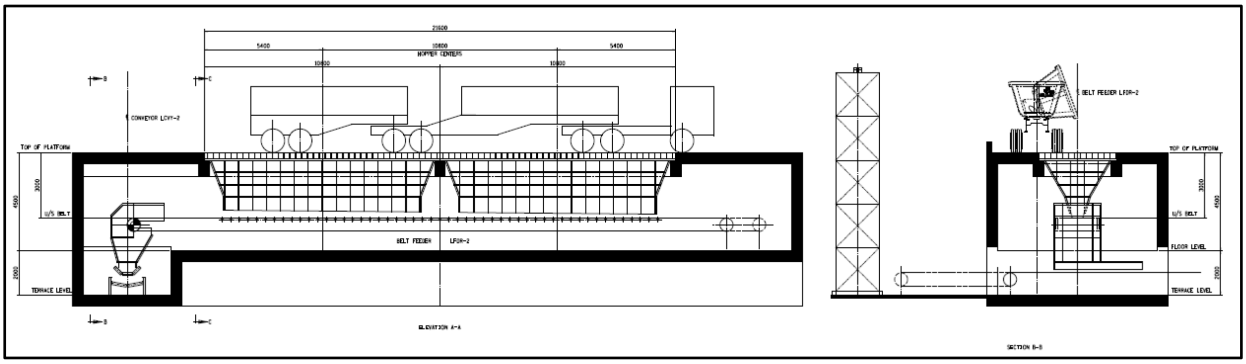


Figure 6-15: Elevated Limestone Truck Off-loading Facility and Hopper Arrangement

The overall Bulk Material Handling (BMH) layout indicating the layout of the limestone offloading facility and gypsum loading facility is provided in **Appendix D-6**.

6.4.10 Gypsum loading facility and conveyance

The gypsum handling system will include the following infrastructure, as presented in **Figure 6-16** below:

- Gypsum reclaim hoppers that receive gypsum from the mobile reclaim equipment and discharge to the gypsum reclaim belt conveyor;
- Gypsum reclaim belt conveyor that discharges to the inclined gypsum belt conveyor;
- Inclined gypsum belt conveyor that discharges to the bin at the loading facility; and
- Gypsum bin, which is an overhead bin feeding the rail wagons with a controlled discharge.

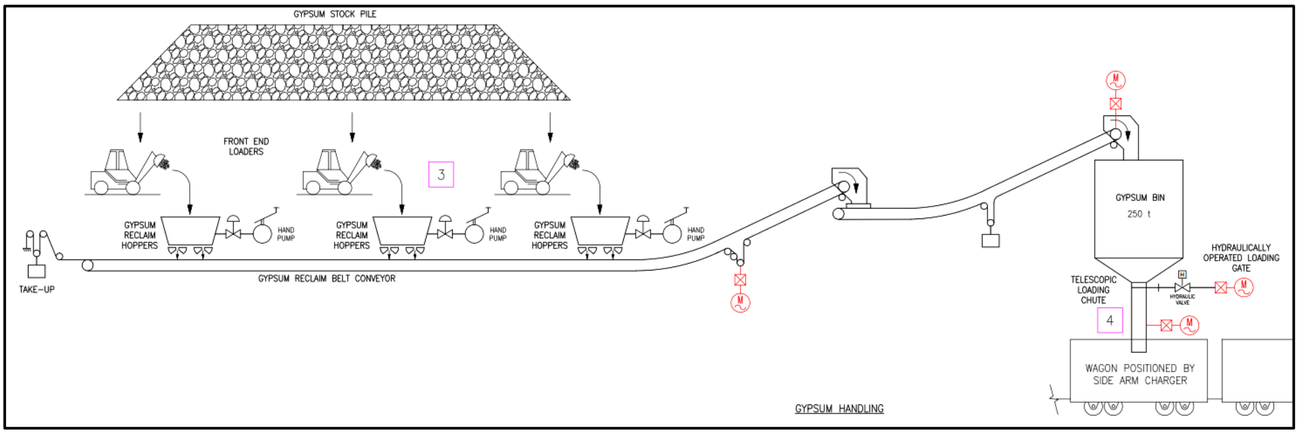


Figure 6-16: Gypsum handling infrastructure and process

Figure 6-16 represents an excerpt from the Materials Handling PFD Drawing relating to limestone and gypsum handling provided in **Appendix D-7**. As per **Figure 6-16** the gypsum stockpile will be manually reclaimed by mobile wheeled or tracked loaders feeding reclaim hoppers which will in turn load gypsum onto two gypsum reclaim belt conveyors.

One of these gypsum reclaim belt conveyors will discharge to an inclined conveyor feeding a single elevated surge bin which will provide the necessary buffer capacity before the gypsum is discharged to the receiving rail wagons.

The second gypsum reclaim belt conveyor will discharge to another belt conveyor which will feed onto either of the two overland ash conveyors to facilitate disposal of gypsum together with ash, which are both Type 3 waste, to the an Ash Disposal Facility (ADF).

The overall gypsum belt conveyor system is provided in **Appendix D-8** indicating the layout of the gypsum loading facility.

6.4.11 Storm water management

Storm water channels and structures are designed to provide a division between storm water and the dirty water from the gypsum loading facility.

The portion of the rail yard north of the rail way line will drain to an earth lined channel at the northern side of the rail yard. This channel drains from west to east and will exit at a newly upgraded storm water culvert. Clean storm water will be collected using concrete channels and underground pipes to drain into a proposed earth lined channel that will drain to an existing newly upgraded culvert. This existing culvert size will be evaluated using the 1:20 year peak flow to determine the required culvert size to deal with the increased run off from the rail way yard.

Dirty storm water from the gypsum loading facility will be collected into an independent concrete channel and underground pipe network that will drain to the proposed Pollution Control Dam (PCD) that will form part of the FGD infrastructure. The estimated run off contribution to the PCD is expected to be 0.05m^3/s for a 1:20 year return period.

6.4.12 Infrastructure common to the rail yard

Power supply

The power supply demand to the rail yard will include provision of power for the rail yard infrastructure as discussed in the preceding sections, as well as for lighting of the rail yard and provision of electrical power supply for the bulk material handling equipment, lighting for the rail yard, electrical feed for signalling and all other equipment that requires a power source. The electrical system is therefore expected to provide all equipment within the rail yard boundaries with electrical power.

Power supply infrastructure proposed for the rail yard includes a planned 6.6 kilovolt (kV) / 400 volt (V) limestone handling plant substation where the supply for the rail yard will be delivered. A maximum of 5 Mega Volt Amp (MVA) will be required to run the rail yard. Cabling will be selected to have a volt drop less than 5%. Existing mini-subs will be used for high mast lighting. Yard Lighting required will be at a 20 Lux minimum average.

Eskom will provide the required power supply, while the rail yard mini substations will be constructed in accordance with Eskom's specification.

Water supply

The Medupi plant operates with two separate water networks supplying fire water and potable water. The water network required for the rail yard was designed to tie into connection points within the existing water network of the MPS.

Currently MPS receives water from Phase 1 of the Mokolo Crocodile Water Augmentation Project (MCWAP). Additional water capacity is expected to be obtained from Phase 2A of the MCWAP, which is currently being implemented by the DWS. A more detailed description of the water supply and requirements is provided in **Section 6.12.1**.

<u>Access road</u>

The service road will be designed as a 6m wide gravel ring road to service all facilities in the rail yard. It is proposed that the service road will be designed on the same platform as the rail way to provide level access to all facilities. The start position will be at the existing service road rail way crossing. Concept details of the proposed ring road are provided in the Site Layout Plan Drawing in **Appendix D-1**.

6.5 FGD System component: Limestone handling and preparation (Block 2)

An overview of the limestone handling infrastructure is presented in **Figure 6-17** indicated by the yellow shaded areas. **Figure 6-17** represents an excerpt from the Medupi FGD Plan Plan Revision 7 that is included as **Appendix D-9**. The limestone handling area will include the following infrastructure:

- Limestone stacking conveyor. Enclosed conveyor gantries are employed for the belt conveyors. See Figure 6-18 for an example of a typical enclosed conveyor gantry;
- Limestone storage area (stockpile);
- Boom Stacker and Portal Scraper Reclaimer Machines
- Emergency limestone offloading area;
- Mobile Scraper Chain Feeder;
- Limestone reclaim conveyor;
- Limestone and gypsum handling substation;
- Storm Water Pollution Control Dam. The conceptual storm water management design has resulted in two separate PCDs being proposed in this area. It is also proposed that each of these PCDs is portioned to cater to maintenance activities in the future. A layout of proposed PCDs are presented in **Appendix D-12**; and
- Lined channels for diversion of dirty water to Pollution Control Dams.

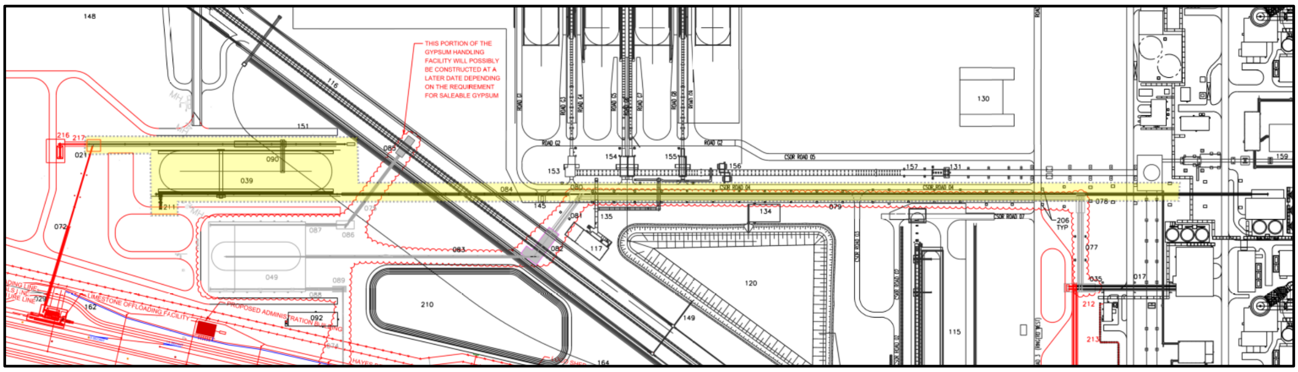


Figure 6-17: Proposed limestone handling infrastructure (Block 2) shaded in yellow

Limestone received from the limestone underground link conveyor, originating at the limestone offloading facility at the rail yard, is transferred to the limestone stacking conveyor via the limestone transfer house 1. Limestone is also loaded onto the tail end of the limestone stacking conveyor via the Truck Off-loading Facility. The limestone stacking conveyor stockpiles the limestone in the limestone storage area (stockpile) prior to preparation for use in the FGD process. The limestone storage area will provide 30 days' worth of limestone storage for the FGD system, and will be equipped with dust suppression sprayers.

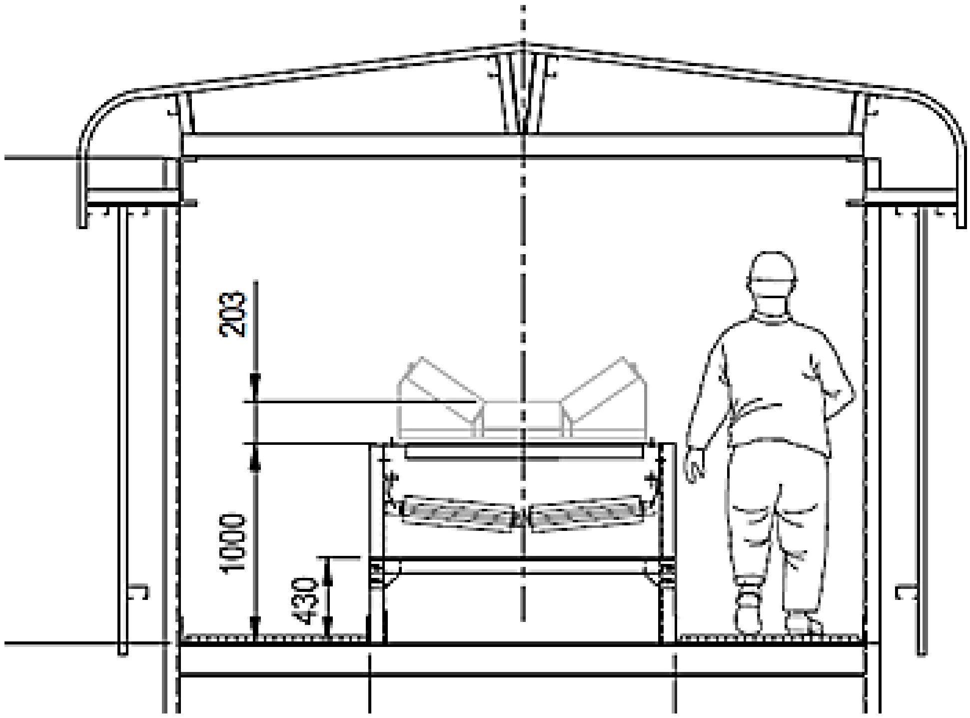


Figure 6-18: Conveyor belt typical cross section

At the limestone storage area, limestone is loaded onto the limestone reclaim conveyor (**Figure 6-18**), which is located at the southern extent of the limestone storage area. The conveyor belt infrastructure will be fully enclosed within a housing structure to prevent interference of the elements with the limestone on the conveyor system, as is evident from **Figure 6-18**, and transported to the limestone silos located at the Limestone Preparation Building. Each of the three limestone silos will have a storage capacity of 24 hours catering to 50% of the design consumption.

From the limestone silos limestone is transferred to the reagent preparation system housed in the Limestone Preparation Building. Here limestone is ground into fine particles in a wet milling process where limestone slurry is produced. Limestone will be fed by weigh belt feeders into the wet ball mills. The mill itself will primarily consist of a rotating drum containing steel balls. The total mill feed flow will be composed of water and new limestone feed, which will pass through the grinding chamber and be reduced in size. The ground slurry will be collected in the mill recycle tank and classified by means of pumps and a hydrocyclone station.

Limestone slurry will flow from the hydrocyclone overflow by gravity to the limestone slurry feed tank, with oversize particles being recycled to the mill inlet for additional grinding. The limestone slurry will be pumped via piping on the elevated FGD utility rack to each absorber for utilisation in the FGD system. The limestone slurry is fed into the wet FGD system absorber (indicated as Flue Gas Cleaning), which is a large cylindrical tower where the flue gas comes in contact with the limestone slurry to “scrub” the unwanted SO_2 from the flue gas.

6.6 FGD System component: Input materials (Block 3)

6.6.1 Limestone

The limestone slurry is received from the limestone preparation process.

6.6.2 Process water

Raw water for the FGD system, including the MPS as a whole, will be supplied by the existing raw water reservoir, which is in turn supplied by the MCWAP scheme. A back-washable strainer pre-treatment system will filter the water to appropriate quality required by the FGD equipment. Once strained the raw water is considered makeup water for use in the FGD system.

Makeup water is also used in the FGD Closed Cycle Cooling Water System and the FGD WWTP. The backwash from the back-washable strainers will be discharged into the existing dirty water drains system. Other uses for the makeup water include the washing of the gypsum and preparation of the fresh limestone suspension.

Water will be supplied by gravity feed or by two of the low pressure raw water pumps drawing water from the reservoir. After pre-treatment the water is sent to the Process Water Tanks for utilization in the FGD process.

Three Process Water Tanks (two operational and one backup for redundancy) will have a storage capacity of 8 hours of full load operation, supplying all FGD plant water demands. Six process water pumps, each providing 100% redundancy, and one spare pump for each tank, will secure the necessary backup water supply. Water will be supplied from the pumps to all systems requiring clean process water.

Appendix E-2 provides a visual representation of the process followed for water handling associated with the FGD process.

6.6.3 Untreated Flue Gas

Untreated flue gas leaving the existing ID fans will be diverted to the absorber inlet, via additional dampers. Flue gas will enter the absorber and flow from the bottom to the top. Existing ductwork will be used for the bypass. The inlet, outlet and bypass dampers will be double louver dampers. Seal air blowers will operate between the dampers to minimize any leakage of flue gas through the closed damper.

6.6.4 Oxidation Air

Oxidation air will be added to the FGD absorbers to aid the formation of gypsum crystals in the process.

6.7 FGD System component: Wet FGD system (Block 4)

6.7.1 FGD core infrastructure

The site arrangement of the FGD system for the Medupi Power Station is provided in **Appendix D-10**. The FGD system includes infrastructure that is located within the previously cleared and transformed footprint of the power station. Infrastructure includes:

- An absorber unit associated with each of the 6 x generation units;
- Each absorber unit will include a flue gas duct, absorber tower, absorber pump building and absorber substation;
- Absorber drain and gypsum bleed tanks associated with each cluster of 3 absorber units, i.e. absorber units 1 – 3 and absorber units 4 – 6; and
- FGD above-ground elevated utility racks containing piping to direct fluid from and to relevant systems within the absorber area.

Appendix D-11 provides drawings of the absorbers for unit 1 and 4, with general geometric dimensions, to be used for the FGD retrofit. **Appendix D-11** also shows the open spray tower diagram. These appendices serve to provide a visual representation of the infrastructure associated with the FGD operation for SO_2 reduction.

Also, included in **Appendix D-10** is the site arrangement drawing, for a visual representation of the additional infrastructure to be introduced to the existing Medupi Power Station footprint.

6.7.2 FGD associated infrastructure

6.7.2.1 FGD closed cycle cooling water

A new, independent Closed Cycle Cooling Water (CCCW) system will provide heat rejection for the heat exchangers associated with the FGD equipment that requires water cooling. This system will reduce heat emissions especially via the cooling towers for the MPS. The CCCW system will provide cooling to:

- Limestone ball mill lubrication system;
- FGD system air compressors;
- Brine concentrator/crystalliser equipment in the WWTP area.

Cooling water for the CCCW system will be of condensate quality and will be supplied by the existing plant to the CCCW expansion tank which is elevated to allow for gravity fill of the system. The CCCW heat exchangers will transfer heat from the circulating cooling water to the auxiliary cooling water. The open cycle cooling water pumps will pump the auxiliary cooling water through the CCCW heat exchangers and to the wet cooling tower. The wet cooling tower will reject heat from the auxiliary cooling water to the atmosphere and will return it to the system at a specified temperature.

6.7.2.2 Fire protection

The existing fire protection system will be extended to the FGD areas and the new rail yard area. Existing firewater pumps will provide pressure for FGD fire protection. New fire water booster pumps will be used to maintain fire water pressure at elevated points within the system.

6.7.2.3 FGD blowdown system

The FGD blowdown system collects and conveys process waste fluids by means of drain trenches, sumps and sump pumps. The sumps and trenches will be below grade (underground), reinforced concrete structures. Process waste water and slurries will be discharged into the trenches, which are sloped for gravity feed into the associated sumps. Sumps that receive slurry will have agitators to maintain solids suspension. Each sump will contain two sump pumps to transfer the contents to the WWTP. Sump level measurement will start and stop the sump pumps in an alternating mode that automatically cycles between pumps to ensure even run time. Sump pumps and pipelines that transfer slurry will be flushed with process water upon pump shutdown.

6.7.2.4 Control system

The existing Medupi control and instrumentation system will be extended to include all equipment required to allow the operation and monitoring of the FGD system and associated activities. A DCS will provide control, display, alarming, reporting and archive capabilities for the retrofit of the new FGD system. A bi-directional loop is provided for reliability so that a break in a fibre will not affect the network. The FGD WWTP system will be provided with a dedicated control room in the FGD WWTP building.

6.7.3 FGD process

The Wet Flue Gas Desulphurisation (WFGD) process system can be categorised into 3 main plant areas as indicated in **Figure 6-19**. The limestone slurry is then fed to the wet FGD system absorber (indicated as Flue Gas Cleaning), which is a large cylindrical tower where the flue gas comes in contact with the limestone slurry to “scrub” the unwanted SO2 from the flue gas.

The limestone slurry along with a mixture of reaction by-products and water is circulated from the absorber reaction tank to spray headers in the upper part of the absorber by-means of recirculation pumps. The spray headers distribute the slurry formed and unreacted limestone by atomizing the mixture to fine droplets with a network of sprays nozzles. As the atomized falling droplets meet the counter current flue gas, the slurry droplets will absorb SO_2, from the flue gas. The water from the slurry will evaporate and saturate the flue gas.

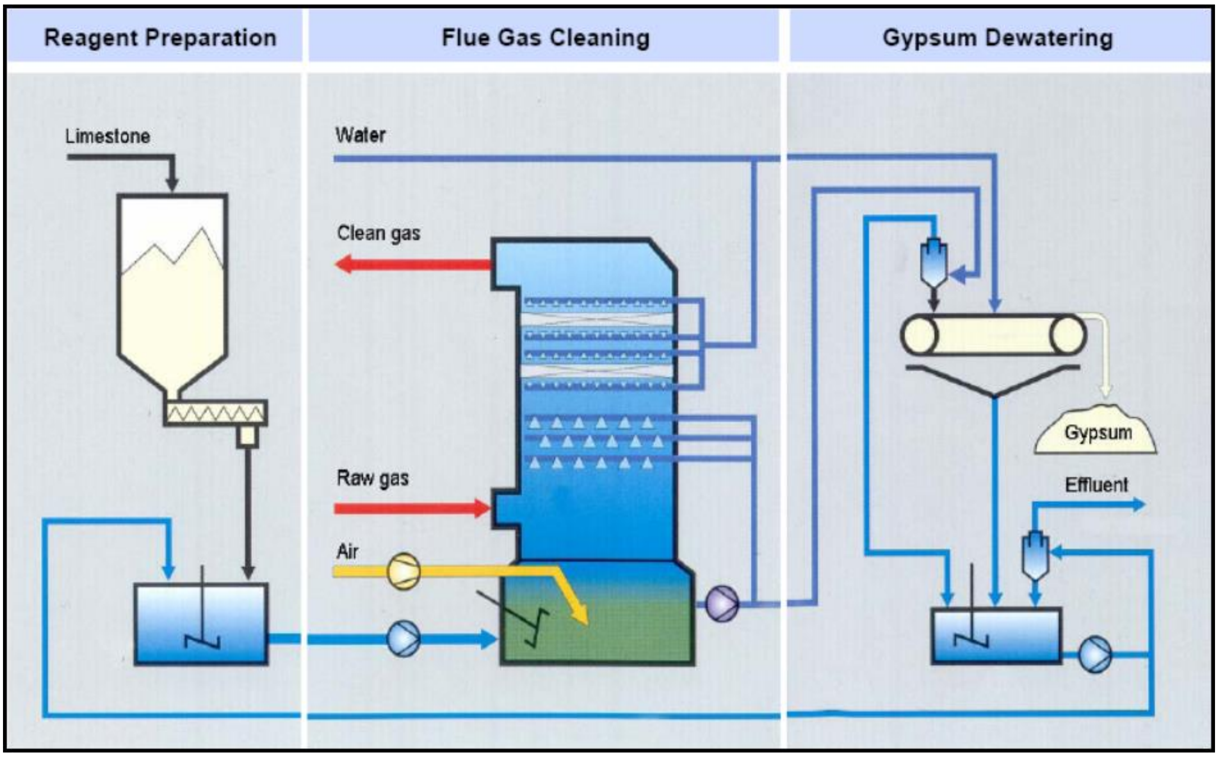


Figure 6-19: Simplified process flow diagram for the FGD system

Makeup water will be consumed entirely by the FGD process plant and no water will be returned to the existing plant. However, effluent water (backwash) from the FGD makeup water pre-treatment plant will be returned to the dirty water drains system. Furthermore, makeup water will also be used to replace evaporation losses in the absorbers. This is done via mist eliminator washing.

The solids will be retained in the absorber and will form gypsum crystals ($CaSO_4$) due to the addition of oxidation air. The formed gypsum slurry is then “bled” from the absorber and then sent to the dewatering plant. The gypsum is then washed and dewatered and conveyed to potential off-takers or for disposal.

The flue gas coming from the boiler will pass through a fabric filter and an ID fan upstream of the FGD plant. In order to protect the absorbers in the case of an emergency, the existing ductwork from the ID fans to the chimney will be retained as a flue gas bypass ductwork around the FGD plant. The bypass is necessary to protect the absorbers in case of failure or emergency conditions. This will avoid complete plant shutdown in the case of absorber malfunction by routing the flue gas through the bypass ductwork system until the absorber can be restarted. The flue gas leaving the existing ID fans will be diverted to the absorber inlet, via additional dampers. Flue gas will enter the absorber and flow from the bottom to the top. Existing ductwork will be used for the bypass. The inlet, outlet and bypass dampers will be double louver dampers. Seal air blowers will operate between the dampers to minimize any leakage of flue gas through the closed damper.

6.7.4 Interface with existing infrastructure

The Medupi Power Station units have been designed, and constructed, with provisions incorporated into the space and equipment design to accommodate the installation of the wet limestone FGD system. Each of the six generating units of the Power Station operates independently, common facilities are provided for electricity, water, coal supply and coal combustion waste disposal. Each unit is constructed with fabric filters and Induced Draft (ID) fans. The fabric filters remove most of the particulates from the coal combustion process and the ID fans provide necessary draft to overcome system resistance. The ID fans were designed to accommodate additional system resistance expected due to the installation of the FGD equipment.

The ID fans currently discharge flue directly to the chimney at each unit. The FGD system will include additional dampers and ductwork to divert the flue gas to the FGD absorbers and then return it to the chimney. The chimney flues are lined with corrosion-resistant liners to handle saturated flue gas expected from the operation of the FGD systems. The existing ID fans have been constructed with sufficient pressure capacity in their original design in order to provide additional pressure increase required to overcome the system resistance of the FGD retrofit.

Each of the two existing chimneys contains the flues from three boilers. The existing chimneys will be reused with minor modification. The inside diameter of the existing flues is adequate to cater for the flue gas volumes. The liner associated with the chimneys has sufficient transitional velocity for condensation re-entrainment to withstand the calculated worst-case design so that re-entrainment of moisture droplets will not occur.

The steel flue liner material for Medupi Power Station is borosilicate identical to that used for Kusile Power Station and has to be modified in certain areas to cater for the high chloride levels associated with the wet stacks. Furthermore, modifications to the chimney drain piping and the chimney drain system are necessary to return collected condensation to the gypsum bleed tanks.

6.8 FGD System component: Treated Flue Gas (Block 5) and evaporation (Block 6)

Treated flue gas is redirected from the absorbers via the flue gas ducts back to the chimneys for release with much reduced SO_2 content. During the process evaporation losses are incurred.

6.9 FGD System component: Gypsum handling, re-use and disposal (Block 7)

6.9.1 Gypsum dewatering and conveyance

Gypsum will be produced from the FGD process as a by-product of the wet scrubbing process. Slurry exiting the FGD process will comprise gypsum, a mixture of salts

(Magnesium Sulphate ($MgSO_4$) and Calcium Chloride ($CaCl_2$)), limestone, Calcium Fluoride (CaF_2), and dust particles.

Effluent generated in the process is directed to the Waste Water Treatment Plant (WWTP), while the overflow of the gypsum dewatering hydro cyclones goes to the Waste Water Hydro Cyclone (WWHC) feed tanks. The tanks are located in the gypsum dewatering building. From the WWHC feed tanks, the water goes through the WWHC where the underflow is directed to the reclaim tanks and the overflow to the Zero Liquid Discharge (ZLD) holding tanks. The ZLD holding tanks feed the WWTP.

The gypsum discharged from the dewatering infrastructure will be dropped onto a collecting conveyor by means of bifurcated chutes. An online monitoring system installed within the gypsum production process will be utilised to assess gypsum quality. The collecting conveyor will take the gypsum to the transfer house where the gypsum will be transferred to one of two link conveyors feeding a series of gypsum conveyors.

The site arrangement of the FGD system for the Medupi Power Station is provided in **Appendix D-10** and shows the infrastructure associated with the gypsum dewatering and conveyance. Infrastructure associated with the gypsum dewatering and conveyance includes:

- Gypsum bleed tanks and forwarding pumps;
- Piping and elevated FGD utility rack;
- Gypsum dewatering building containing gypsum hydrocyclones and waste water hydrocyclones;
- Belt filter and reclaim tank;
- Gypsum conveyer belt system;
- Gypsum truck loading facility; and
- Gypsum storage building and offtake via rail.

6.9.2 Gypsum re-use or disposal

Dewatered gypsum generated during the dewatering process can be sold commercially given the right quality and demand. In order to produce commercial-grade gypsum, it is necessary to keep the chloride content under a certain limit. For this reason, during the dewatering process, the filter cake will be washed with FGD makeup water to decrease the chloride content to an acceptable level for saleable gypsum. A refinement process is carried out to separate and dewater the gypsum.

Gypsum leaves the Gypsum Dewatering Building via gypsum collecting conveyor in an eastward direction. At the gypsum transfer house 1, gypsum is either transferred onto gypsum link conveyors that will transport gypsum to the gypsum storage building, or onto a gypsum link conveyor that will link the gypsum stream to the overland ash conveyor that transports ash to the existing ADF. A direct gypsum offtake area will be constructed at the gypsum transfer house 1 for small scale off-take of gypsum by offtakers. This will consist of a road leading off an internal road and loading bay area where gypsum will be loaded on to vehicles. At this point, the ground will be prepared for management of any gypsum that is not contained and the trucks will be washed before leaving this area. The washing is a means to minimise the spreading of the gypsum.

Given demand and off-take potential from commercial off-takers, infrastructure to convey gypsum from the gypsum transfer house 1 to the gypsum storage building and rail way yard for transport of large volumes of gypsum via rail will be constructed at a future date. At the gypsum storage facility commercial grade gypsum will be fed onto an elevated mobile tripper car. Material from the car will be stacked into three indoor day storage stockpiles. The separate storage piles will allow for one pile to be stacked while another is being reclaimed and a third is quality tested.

The gypsum storage facility will accommodate 100% of the total gypsum production for three days, but it is anticipated that only 20% of the gypsum will be required for commercial sales. Eskom is currently investigating markets for gypsum resale. This will have a significant impact on the amount of gypsum that will require disposal. The gypsum storage building will be used in conjunction with the rail siding only. The storage building is a future use facility that will be built with the rail siding. There will be no facilities for gypsum recovery from the storage building to be loaded onto trucks. Use of gypsum will be subjected to quality assessments, which will be done at the storage facility. If the quality is not usable, the gypsum will be taken for disposal.

In the event that no large-scale commercial offtake of gypsum is secured, gypsum from transfer house 1 will be conveyed to the existing overland ash conveyor. In this conveyor system, the gypsum will be mixed with ash and will be disposed together on the footprint of the existing authorised ADF. The conveyor route and transfer houses for gypsum onto the overland ash conveyor are shown in **Appendix D-9**. It should be noted that gypsum disposal at the ADF will be carried out from the 6th year of the power station operation, at which point the ash facility will have a Class C liner, which is appropriate for the gypsum and ash waste types (Type 3).

In terms of the previous ash classification processes, i.e. the Minimum Requirements Documents Series, ash was considered to be hazardous and thus the 0 to 2 year area was designed and authorised according to the Department of Water and Sanitation (DWS) Minimum Requirements, resulting in a H:h liner system being installed, at the ADF. However, regulations were promulgated by the DEA in terms of NEM:WA on the 23 August 2013. In terms of the NEMWA regulations, ash and gypsum now classify as Type 3 wastes, and require to be disposed of on a Class C barrier system. This barrier will be implemented at the existing ADF from the 4 to 19.2 year area.

A separate application to amend the existing ADF Waste Management Licence is being undertaken for disposal of gypsum and ash together on the existing footprint of the authorised ADF and is therefore not part of this authorisation application process.

Appendix E-3 provides a flow diagram of the activities involved in gypsum handling.

6.10 FGD System component: Waste Water Treatment (Block 8)

The Medupi FGD Waste Water Treatment Plant is located directly west opposite generation units 1 to 3 at the Medupi Power Station. FGD chloride bleed stream, from the washing of the gypsum, and FGD auxiliary cooling tower blowdown stream are diverted to the ZLD holding tanks. The Total Organic Carbon (TOC) scavenger regeneration waste water from the filter press system / existing water treatment plant (WTP) will also be directed to FGD WWTP located next to the gypsum dewatering plant.

From the ZLD holding tank the wastewater is transported via pipes on the elevated FGD utility rack to the WWTP. The pre-treatment process will include physical/chemical treatment to precipitate solids and heavy metals from the water by making use of slaked lime in a softening clarification process. Quicklime is delivered by bulk tankers and transferred into a quicklime silo, from where it is slaked with water in a detention-type slaker. At the WWTP slaked lime is added to the wastewater to convert the dissolved calcium and magnesium into salts so that the clarified water can be effectively treated in the brine concentrators and crystallisers.

The precipitates from this pre-treatment process are settled out in clarifiers as sludge, 50% of which is sent to a filter press dewatering system. The other 50% of the sludge is returned to the clarifier. The filter press filtrate will be returned to the pre-treatment holding tank. This pre-treatment process produces approximately 160t of sludge per day from 90% limestone.

After chemical treatment, the precipitates are settled out in clarifiers as slurry, 50% of which is sent to a filter press dewatering system. The other 50% of the slurry is returned to the clarifier. The filter press filtrate will be returned to the pre-treatment holding tank. The overflow from the softening clarifier is sent to the brine concentrator and crystalliser processes for further salt removal. Salts are settled out and crystallised during this process. Approximately 80t per day of salts are expected to be generated from 90% lime, and will require environmentally responsible management. The distillate water produced from the brine concentrator and crystallisation process is returned to reclaim tanks for reuse in the process. Chemical storage is likely to exceed 955m^3 to provide sufficient capacity for storage of chemicals in the FGD process.

The distillate emanating from the process will be diverted back to the FGD system for re-use in the FGD process, while dirty water run-off will be utilised in the FGD process to improve water usage.

Appendix E-4 provides a visual interpretation of the activities carried out during the wastewater handling.

6.11 FGD System component: Management of WWTP by-products (Block 9)

Sludge and salts will be temporarily stored in appropriately designed storage facilities next to the WWTP. The storage facilities will have a 7-day storage capacity. Two storage areas will be provided for, with Salts and Sludge Storage Area 1 and 2 sized to approximately 4 800m^2 and 16 000m^2 in size, respectively. The storage areas will conform to the Norms and Standards for the Storage of Waste (GN926 of 29 November 2013) and will be registered as a waste storage facility in terms of these Norms and Standards. This process will be undertaken separately to this authorisation.

Salts and Sludge will, subsequent to storage, be transported (trucked) and disposed of at a registered waste disposal facility for the first 5 years of operation. The waste disposal service provider has not been confirmed yet, although disposal at Holfontein has been considered as a suitable waste disposal service provider, among other suitable service providers. For transportation of this waste to a disposal site, Eskom will utilise the services of a service provider who has all required authorisations and systems in place to manage the waste stream from storage to disposal facility.

6.12 Resource Requirements

6.12.1 Raw water supply and MPS Water balance

Medupi Power Station requires a total volume of 15.4 million cubic metres per annum (Mm^3/a) of raw water to operate the power station including the FGD units which will be retrofitted later as per the water balance in **Appendix E-1**. Currently the power station has a total water allocation of 10.9 Mm^3/a, which is sourced from Mokolo Dam via Phase1 of the MCWAP. This allocation of 10.9 Mm^3/a will be enough to operate the MPS as well as 3 (three) x FGD units. The water shortfall of 4.5 million m^3/a will be sourced via Phase 2A of the MCWAP once implemented by DWS, and will cater for, amongst other requirements, for the remaining 3 (three) x FGD units. Water supply agreements are to be concluded and signed with the DWS by the middle of 2018 for the supply of water to both Medupi and Matimba power stations which will be aligned to WUL (section 21(a). Medupi Power Station must be able to treat up to 100% of its water requirements from Phase 2A of the MCWAP should the need arise to ensure water security to the area.

6.12.2 Potable water

The existing potable water system at the MPS will be extended to ensure supply to the potable water requirements of the FGD area. Two 100% potable water booster pumps will ensure adequate pressure to meet system demands. Backflow preventers will prevent contamination into the potable water system and backpressure regulators will isolate the nonessential water users in the event of low system pressure.

6.12.3 Compressed Air

The compressed air system will supply dry air for all the service and instrument air uses of the FGD and rail yard. Two FGD air compressors and two filter/air dryers will provide compressed, oil-free air at the required capacity and pressure to meet the FGD requirements.

6.12.4 Auxiliary power supply

A new 132kV power supply is under investigation for installation at the 132kV switchyard to provide backup power to the FGD system. This backup power is required to maintain 100% redundancy in the FGD power system.

New auxiliary transformers will transform 11kV three-phase power supplied from the existing 11kV system, to 6.9kV three-phase power as required by the FGD system and the rail yard. The transformers will supply 6.9kV to the FGD plant board switchgear buses through main breakers. The switchgear buses for similar service will be connected through a tiebreaker. The main breakers and the tiebreaker will make it possible for a switchgear bus to be fed from two separate sources.

A new emergency diesel generator (EDG) with a dedicated day tank will be required to provide emergency shutdown power at 6.6kV upon loss of normal 6.6kV AC power supply. The existing 2500kVA Medupi EDG's do not have this additional capacity to support the FGD loads. The EDG will be connected to a 6.6kV AC essential switchgear and provide a backup power feed to the essential 6.6kV process water pumps. The essential power will then be distributed to step-down transformers which will supply 400V AC essential boards in each of the FGD clusters. From there the power will be distributed to loads such as the valves that must operate on the loss of power to the FGD system, etc.

New 230V AC uninterruptible power supply (UPS) systems will be provided for all FGD buildings containing LV 400V boards. These UPS systems will provide essential power for board control as well as functioning as "dip-proof" power supplies to maintain contactor position.

New 220V DC Nickel Cadmium (NiCad) batteries with dedicated chargers will be provided to supply essential power for control of MV boards and will be located within each substation.

6.13 Timelines for the Medupi FGD retrofit

At the time that Eskom had received environmental authorisation for the Medupi Power Station in 2007, the power station design complied with the requirements stipulated by the Air Quality Act (Act 39 of 2004).

The power station was therefore constructed in line with the approved designs. However, on 1 April 2010, after the authorisation of the Medupi Power Station, the list of activities and associated minimum emissions standards in terms of Section 21 of the National Environmental Management: Air Quality Act (Act 39 of 2004) came into effect. These listed activities amended the requirements in terms of emissions standards that needed to be adhered to by industries, including coal-fired power stations. At this stage, it was evident that technology would be required to reduce emissions, particularly SO_x, from the Medupi Power Station in the medium term.

The Medupi Power Station was designed to accommodate a Wet FGD technology retrofit. The Wet FGD retrofit technology aims at reducing the SO2 emissions by up to 95%. Thereby ensuring that Medupi Power Station will comply with the NEM: Air Quality Act air emissions standards for "new plants" by 2030. In the interim, the Medupi Power Station will comply with the minimum emissions standards for "existing plants".

7 ALTERNATIVES ASSESSMENT

7.1 Introduction

A number of alternatives types are generally associated with EIAs. In terms of the EIA Regulations published in Government Notice R543 of 2 August 2010 in terms of Section 24 (5) of the National Environmental Management Act (Act No. 107 of 1998), the definition of "alternatives" in relation to a proposed activity, refers to different means of meeting the general purpose and requirements of the activity, and may include alternatives to:

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

Further, in terms of NEMA and the EIA Regulations, feasible and reasonable alternatives have to be considered within the Environmental Impact Assessment, including the 'No Go' option. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors. Feasible and reasonable alternatives identified are discussed in more detail below.

7.2 Location of activity

7.2.1 Location alternatives: FGD Infrastructure

The location for the FGD retrofit infrastructure does not have feasible alternatives. This is because the FGD infrastructure must be fitted to the existing Power Station infrastructure. Placement of the FGD infrastructure is constrained by space and existing infrastructure alignments, therefore it is accepted that the proposed FGD infrastructure layout and alignment is already the best fit and optimised placement. Therefore, no alternatives were identified or assessed for location of the FGD technology retrofit.

7.2.2 Location alternatives: Rail yard infrastructure

The location of the proposed rail yard was also pre-determined during the design and construction of the Medupi Power Station itself. The proposed yard is situated just north of the existing Transnet Freight Rail (TFR) mainline that runs between the towns of Thabazimbi and Lephalale. The location and placement of the rail yard was governed by the following factors and as a result no feasible location alternatives could be identified:

- The decision to use the existing rail way network to deliver limestone to the power station.

- The position and layout of the proposed FGD plant.
- Available space within the existing Medupi Power Station fence boundaries.
- The availability of existing services such as potable water, fire water and storm water drainage structures.

See **Appendix D-9** for the plot plan indicating how the FGD infrastructure and proposed rail yard are required to be fitted to the existing Power Station facilities.

7.3 Type of activity

The Medupi Power Station Air Emissions License (AEL) dated 1 April 2015 requires that SO_2 emissions be reduced from 3500 mg/Nm^3 at 10% O_2 to less than 500 mg/Nm^3 at 10% O_2. The objective of this activity is to reduce the SO_2 emissions to satisfy the legislative requirements and World Bank loan conditions. This dictates the type of activity, which must be a sulphur dioxide reducing technology to be retrofitted to the existing power station infrastructure. No alternatives to the type of activity have been investigated because the objective of this project determines the activity type.

7.4 Design or layout of activity

7.4.1 Design and layout alternatives: FGD infrastructure

The layout of the FGD infrastructure within the MPS footprint is predetermined by the layout of the power station. Specific infrastructure need to be fitted to the stacks of the MPS, which influences the effective layout for the FGD infrastructure. The remaining infrastructure must be placed where there is adequate space, and this is also determined by the power station layout. **Appendix D-10** shows the proposed layout of the FGD retrofit within the Medupi Power Station footprint.

7.4.2 Design and layout alternatives: Rail yard

The placement of the rail yard infrastructure and associated infrastructure is constrained by the space available at the proposed location. The design and layout of the proposed rail yard has therefore already been optimised to maximise the use of available space while dealing with the alignment constraints of connecting to existing and already operational infrastructure. As such no design or layout alternatives could be considered for the proposed rail yard infrastructure and associated infrastructure.

7.5 Technology to be used

The Scoping Report concluded that the selection of the wet FGD technology was undertaken prior to this EIA and technology alternatives and is therefore the preferred SO_2 reduction technology.

Although water from the MCWAP scheme has been allocated to the Medupi FGD project, Eskom proposed to investigate further water savings, most notably the edition of Inlet Gas Cooler Technology. The use of Inlet Gas Cooler Technology is dependent on whether it will be feasible for implementation based on an acceptable cost-benefit analysis.

Eskom commissioned a cost benefit analysis of the Wet FGD, Dry FGD – Circulating Fluidized Bed (CFB) technology, and Wet FGD with flue gas cooling technology. This report was finalised on 9 January 2018 and is included as **Appendix C-1** to this DEIR. Conclusions from the analysis are summarised in the following sections.

7.5.1 Wet FGD

The Wet FGD has a long history of application to fossil fuelled power plants in units of all sizes, and remains the predominant process utilized today. It has high removal efficiency on high sulphur coals and only requires a single absorber vessel per boiler. The gypsum created through this process can be used in concrete and wall board manufacturing or be landfilled. There is generally a waste water stream created that will require further processing. The amount of water used in Wet FGD is higher than a Dry FGD-CFB technology.

A further benefit of the implementation of WFGD technology is that it has the potential to contribute to the broader socio-economic development of Lephalale and its surrounding areas due to WFGD flexibility of using lower quality limestones that can be sourced from areas closer to the power station which is not the case with the DFGD systems.

Water for the WFGD will be provided from Phase 2A of the Mokolo and Crocodile Water Augmentation Project which is being developed to bring additional water to the Lephalale area from the Crocodile River Catchment" .The development of Phase 2A therefore creates an opportunity for economic development in the area which cannot take place without it.

The WFGD technology is the only of the FGD technologies that has the potential for reduction in its water consumption. Eskom is a strategic water user in the country and based on its commitment to water conservation it has already taken various measures to reduce the plant's water consumption. The implementation of dry cooling technology and the adoption of the zero liquid effluent discharge policy (ZLED) are notably Eskom's most significant water-saving initiatives. Once completed Medupi will be the largest dry-cooled power plant in the world. The implementation of dry cooling reduces the water consumption from approximately 2 l/kWh to 0.14 l/kWh. It is expected that the water use with WFGD (power plant with WFGD≈ 0.35 l/kWh) will still be lower when compared to the conventional wet-cooled power plants (power plant without WFGD≈ 2 l/kWh), excluding water for FGD, within Eskom's fleet.

7.5.2 Dry FGD-CFB

The Dry FGD-CFB has been used extensively around the world and mixes lime, water, and fly ash-laden flue gas in a reactor to remove the sulphur dioxides from the boiler flue gas stream. There is no waste water stream created by this process, however the fly ash generated in the process will require disposal to landfill. This process works best with low to medium sulphur coals and has a current reactor size maximum of 450 MW, so two reactors would be required for each boiler for Medupi Power Station.

The cost-benefit analysis concluded that DFGD technology resulted in a 9% higher capital cost for implementation due to modifications required for existing ductwork design and the addition of a new fabric filter system to the existing Fabric Filter Plant (FFP) in order to retrofit this technology. Although the DFGD processes use slightly less water for the Medupi site, the estimated operating expense for the DFGD is 53% higher than the WFGD system, mostly due to the significantly higher cost of the lime reagent. The use of DFGD is therefore not economically feasible.

7.5.3 Wet FGD with Flue Gas Cooling Technology

The implementation of WFGD with flue gas cooling has the potential to reduce the water consumption associated with WFGD, however the practical challenges cannot be ignored as this is expected to have a significant impact on the maintainability and availability of the power plant and the cost of electricity to the consumer.

Eskom visited 3 power stations in Europe and 2 in China fitted with flue gas cooler installations. All three power stations in Europe experienced significant challenges with operation and maintenance of the gas cooler infrastructure, to the extent that all three power stations from Europe visited by Eskom during a benchmarking exercise advised against the installation of the system due to the problematic operation that it provides. WFGD with flue gas cooling is therefore not considered as a feasible option for Medupi.

It was furthermore concluded that the installation of a regenerative type heat exchanger at Medupi is not possible due to the established layout and space constraints at the plant. When installation of a flue gas cooler before the articulate abatement plant was considered it was concluded such an installation was not possible due to the ash characteristics. The ash characteristics at Medupi are highly abrasive, which will erode the finned tube material easily if the velocity is not kept sufficiently low enough. The velocity reduction in a high ash environment although good for wear protection, will incur both dust fall-out and plugging problems. It is therefore not advisable to install a flue gas cooler before the FFP at Medupi.

When installation of a flue gas cooler after the articulate abatement plant was considered it was concluded that availability of space on the already established footprint and plant layout will cause a significant constraint to the installation of a flue gas cooler. Although the real estate may be found to install the cooler itself, space is conceptually not available to install all the maintenance provisions that is required to service the plant appropriately. Without the increased maintenance provisions, complexity in maintenance and plant downtime will be experienced.

Further disadvantages of installation of a gas cooler at Medupi relate to the cost of the material selection for the flue gas cooler which is high. Elements such as the cooler's weight contributes to the overall cost and considerations such as deep piling for founding conditions which may require blasting at Medupi on an already generating unit. Installation of the flue gas cooler will also reduce the power output of the unit due to increased pressure drop and pumping for water recirculation. This will increase the relative CO_2 per megawatt sent out from the generating unit, which is contradicting to the objective of the FGD plant.

For these reasons the WFGD with flue gas cooling is therefore not considered to be a feasible option at Medupi and was not considered further.

This DEIR therefore only considered the installation of WFGD without gas cooler technology as the only feasible alternative suitable for the conditions at Medupi Power Station

7.6 Operational Aspects of activity

Construction of the WFGD system and associated infrastructure will commence as soon as authorisation is granted in order to meet the legislation requirements of the National Environmental Management: Air Quality Act, No 39 of 2004. No operational aspect relating to the construction of the FGD infrastructure has been considered.

7.7 No Go Option

The no-go option is to continue the operation of the Power Station without the FGD retrofit. However, this will result in the MPS operating in contravention of the conditions of its Air Emissions License. To remain compliant to legislation, the MPS would need to shut down operation. This would have a catastrophic impact on the South African economy and the stability of electricity supply to southern Africa. It can therefore be considered that the No-Go Option is fatally flawed for these reasons.

8 RECEIVING ENVIRONMENT

In investigation of the receiving environment of the Medupi Power Station footprint, information was sourced from the original Medupi Power Station Environmental Impact Assessment Report (Bohlweki Environmental, 2006), existing specialist reports covering the study area and field assessments and specialist reports undertaken by specialists for this EIA.

The receiving environment is discussed in the sections below. It must however be noted that the FGD retrofit activities, besides the proposed area where the rail yard and associated structures will be constructed, will occur predominantly within an impacted footprint. A bird's eye view of the construction at the MPS is provided in **Figure 8-1**. Construction has, however, progressed at the MPS since this photograph was taken.

Figure 8-1: Photograph of the construction of the MPS

8.1 Climate

8.1.1 Regional Climate

The climatic regime of the Lephalale area is characterised by hot summers and mild winters. The long-term annual average rainfall is 485 mm, of which 420 mm falls between October and March. The area experiences high temperatures, especially in the summer months, where daily maxima of >40°C are common. The annual evaporation in the area is approximately 2 281mm. Frost is rare (Bohlweki Environmental; 2006).

The climate within the Lephalale Municipality and Limpopo Province in general results in a negative climatic water balance, and very little water for utilisation by industry, mining, agricultural and domestic land use.

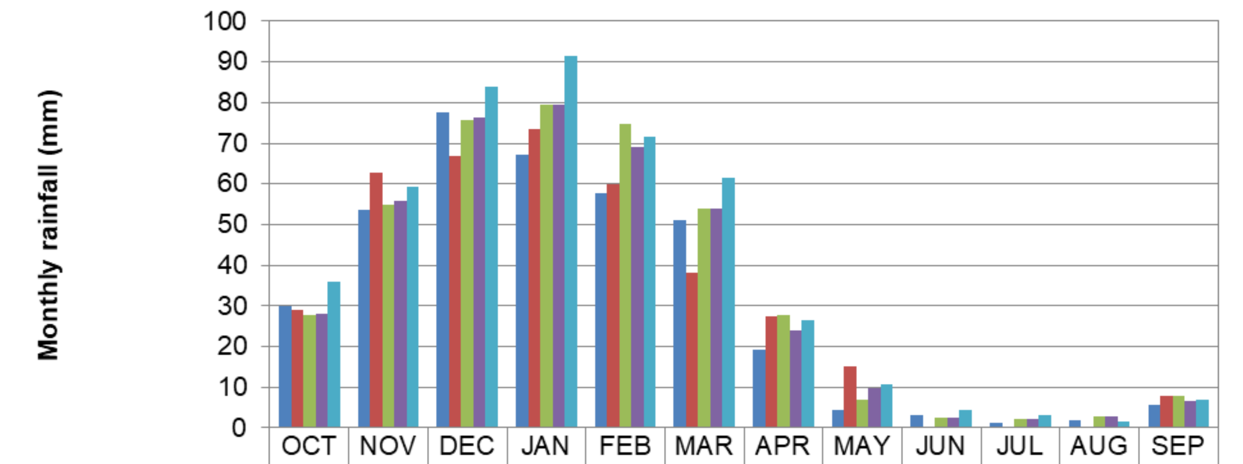
8.1.2 Rainfall at the study area

Climatic data for the area around MPS was sourced from rainfall stations are presented in **Table 8-1**. This table presents rainfall data over a period of approximately 100 years. The Mean Annual Precipitation (MAP) between the 5 stations range from 372.65 mm to 457.30 mm.

Table 8-1: Rainfall Stations in the Lephalale Area around the Medupi Power Station

Station	Name	Altitude (masl)	From	To	No. of Years	MAP (mm)
0717834 W	De Dam	825	1903	2000	97 (73.1% patched)	372.65
0717624 P	Parrs Halt	824	1903	2000	97 (61.9% patched)	380.63
0717595 W	Stockport (POL)	824	1903	2000	97 (35.4% patched)	416.09
0718147 W	Deelkraal	865	1908	2000	93 (86.9% patched)	410.82
0717418 P	Dikgatlong	834	1903	2000	97 (63% patched)	457.30

The monthly rainfall distribution for the five rainfall stations in the Lephalale area presented in **Figure 8-2**. It can be seen from the information presented that the monthly rainfall is fairly uniform.



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
De Dam	29.91	53.53	77.52	67.08	57.73	51.21	19.37	4.52	3.06	1.14	1.85	5.72
Parrs Halt	28.90	62.73	66.79	73.47	59.79	38.28	27.53	15.05	0.08	0.22	0.06	7.74
Stockport (POL)	27.67	54.88	75.84	79.52	74.77	53.80	27.64	6.77	2.50	2.21	2.69	7.82
Deelkraal	28.15	55.82	76.38	79.42	69.05	54.02	24.01	9.74	2.64	2.32	2.76	6.51
Dikgatlong	36.00	59.24	83.96	91.60	71.56	61.57	26.52	10.79	4.40	3.01	1.69	6.96

Figure 8-2: Monthly rainfall distribution for five rainfall stations in the Lephalale area

When the 5 stations were considered, Stockport (POL) roughly corresponded to the average among the 5 stations and is considered the most reliable of the 5 stations. When the rainfall data for the entire period was considered at this station, 75 events measured more than 50 mm/day and rainfall events with more than 100 mm/day were recorded 9 times during the data period. The highest recorded rainfall events at the Stockport (POL) station are shown in **Table 8-2** with the most recent occurrence on 8 February 2000.

Table 8-2: Highest rainfall events measured at Stockport (POL) rainfall station

Maximum recorded daily rainfall (mm)	Date of maximum rainfall
112.9	29 December 1917
120.9	22 April 1951
107.4	6 January 1958
109.2	7 April 1963
103.5	19 December 1970
125.5	11 February 1976
112	26 March 1977
103.5	6 January 1981
145	8 February 2000

The 24-hour storm rainfall gridded data for the 1:2, 1:5, 1:10, 1:20, 1:50, 1:100 and 1:200-year recurrence intervals is provided in **Table 8-3** and was obtained from South African Weather Services (SAWS) Rainfall station 0717595_W (Stockport POL). The rainfall distribution on site is classified as a type 3 design rainfall distribution.

Table 8-3: 24 Hour Rainfall Depths for Different Recurrence Intervals (mm/day)

Recurrence interval (years)	1 in 2	1 in 5	1 in 10	1 in 20	1 in 50	1 in 100	1 in 200
24-hour rainfall depth (mm)	61.7	87.1	105.3	123.9	149.7	170.3	192.0

8.1.3 Evaporation

Monthly evaporation data was available for two Department of Water and Sanitation (DWS) stations namely A4E003 Zandpan and A4E007 Mokolo Nature Reserve at the Mokolo Dam. The Mean Annual Evaporation (MAE) for station A4E003 and A4E007 is calculated at 2 572 mm and 2 014 mm, respectively.

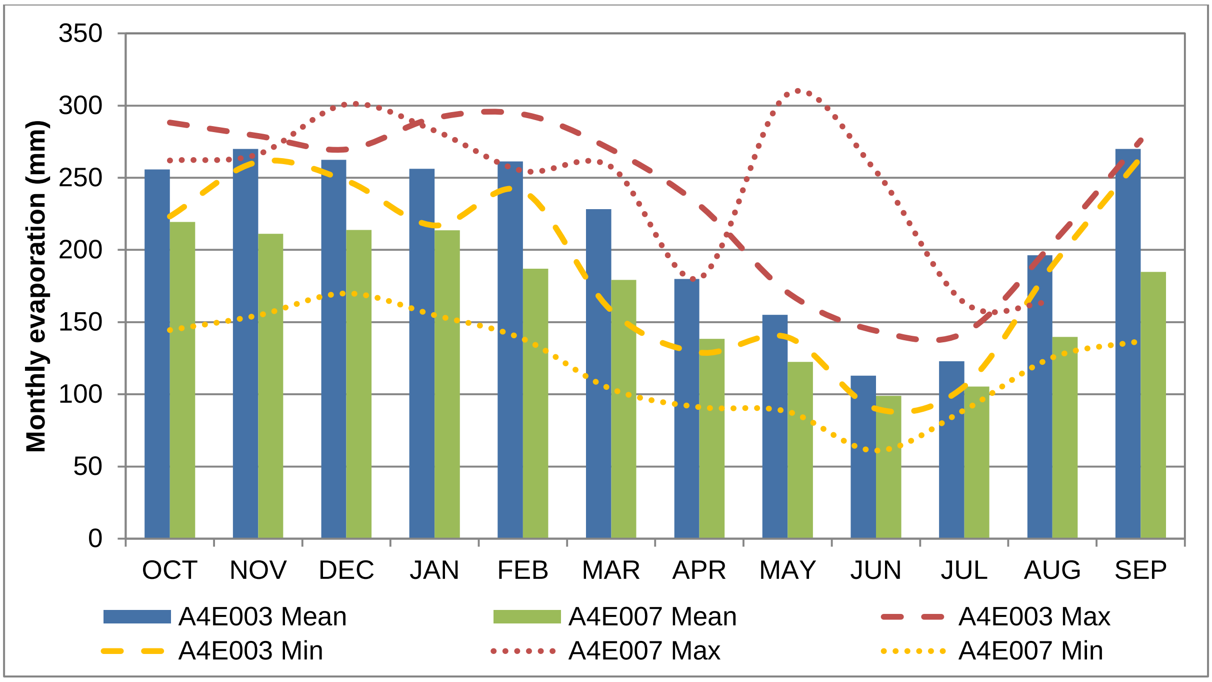


Figure 8-3: Monthly mean, minimum, maximum evaporation for stations A4E003 and A4E007

Monthly mean, minimum and maximum evaporation depths are shown in **Figure 8-3**. The highest evaporation occurs in the summer months from September to March. This is further verified by the in Average monthly evaporation values for stations A4E003 and A4E007 provided in **Table 8-4**.

Table 8-4: Average monthly evaporation values for stations A4E003 and A4E007

Month	Station A4E003	Station A4E007
Oct	255.75	219.38
Nov	270.00	211.21
Dec	262.47	213.81
Jan	256.27	213.56
Feb	261.40	186.99
Mar	228.37	179.34
Apr	180.00	138.32
May	155.00	122.51
Jun	113.00	98.83
Jul	122.97	105.45
Aug	196.33	139.85
Sep	270.00	184.88
Total	2 572	2 014

8.1.4 Wind

Wind data from meteorological data was obtained from the Medupi Power Station site for the period 2011-2013 in order to calculate wind roses representative of period, day- and night-times (von Gruenewaldt, et al., 2018). These wind roses are provided in **Figure 8-4** below.

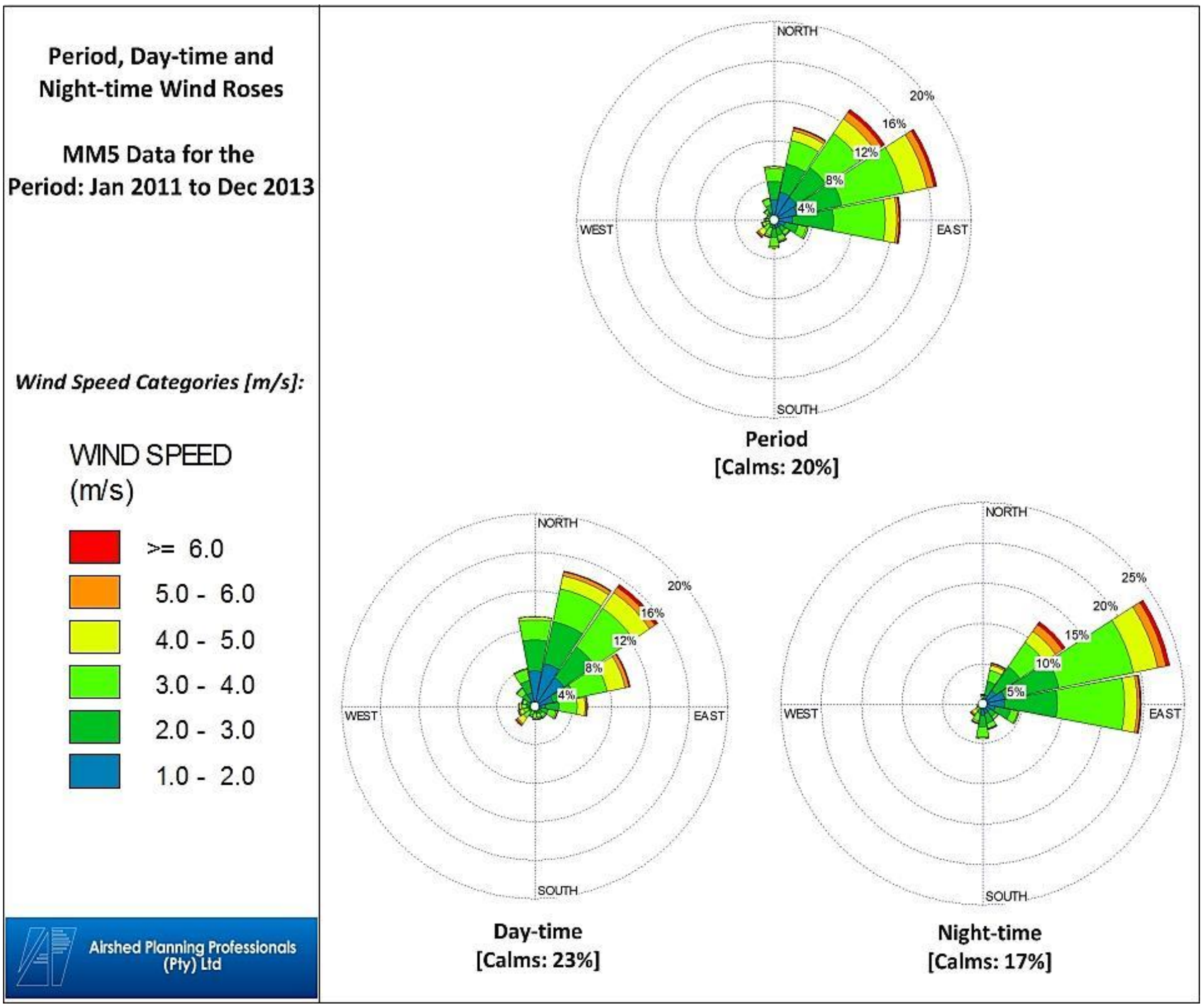


Figure 8-4: Period, day- and night-time wind roses for the period 2011-2013 (taken from von Gruenewaldt, et al., 2018)

Wind roses represent wind frequencies for the 16 cardinal wind directions. Wind frequencies are indicated by the length of the shaft when compared to the circles drawn to represent frequency of occurrence. Wind speed classes are assigned to illustrate the frequencies of high and low wind for each wind vector. The frequency of calm periods, defined as periods for which wind speeds are below 1 m/s, are indicated below the wind rose.

Results obtained for wind speed and direction represented in the wind roses indicate that the flow field is dominated by north-easterly winds, while winds are infrequently experienced from the westerly and southerly sectors. The wind speeds are generally low (1-3 m/s) to moderate (3-5 m/s) throughout the period.

8.2 Geology

Information relating to the geology within the proposed study area were obtained from the Soils and Land Capability Specialist Study (**Appendix G-2**) undertaken by Earth Science Solutions (Jones, 2018), as well as the Geotechnical Assessment (**Appendix G-1**) undertaken by Golder associated Africa (Owens-Collins, 2018), and Groundwater Impact

Assessment Study (**Appendix G-3**) also undertaken by Golder Associated Africa (Brink & van der Linde, 2018), including literature sited within these reports. These specialist study reports are included in **Appendix G** to this DEIR.

8.2.1 Regional Geology

The geological description below is taken directly from the specialist geology assessment as discussed in Sections 8 of the Scoping Report (Bohlweki, 2005) and the EIA Report (Bohlweki; 2006).

The Waterberg Coalfield comprises a graben structure with the Eenzaamheid fault forming the southern boundary and the northern boundary being delineated by the Zoetfontein fault. Archaean granite rocks outcrop to the north of the Zoetfontein fault and sediments of the Waterberg Group outcrop to the south of the Eenzaamheid fault.

The study area is further subdivided by the Daarby fault, a major northeast, then northwest, trending fault. The Daarby fault has a down throw of 360m to the north, at an angle of 50° to 60°. The down throw of 360 m to the north serves to bring the Grootegeluk Formation rocks to the south in contact with the younger Clarens Formation sandstone and Letaba Formation basalts in the north. Thus, the fault divides the coalfield into a shallow (opencast) coal area to the south of the Daarby Fault, and a deep north coal area.

The Eenzaamheid fault has a throw of 250 m to the north and the fault is near vertical. The fault brings the upthrown Waterberg Group sediments on the south side of the fault in contact with shallow coal on the northern side of the fault.

Due to the fact that the groundwater in the area has potential for enhancement, it is important that any activities that have the potential to impact on groundwater should be located away from the fault lines as described above.

Figure 8-5 provides an overview of the underlying geology of the receiving environment and has been obtained from the Hydrogeology Impact Assessment Report (Brink & van der Linde, 2018).

8.2.2 Geology within the study area

The local geology of the area can be subdivided into a northern and southern type. The Matimba Power station and all its facilities, except for the ash disposal facility, as well as Grootegeluk Mine, lies on Karoo sediments. The existing licensed disposal facility, Medupi Power Station and the Matimba ash dump lie on Waterberg sandstone, just south of the Eenzaamheid fault (**Figure 8-6**).

The area is classified as having a climatic N-value of almost 5, which indicates that both chemical weathering and mechanical weathering are likely. From the description of the geology of the area it can be expected that residual soils are generally shallow and transported soils vary greatly in thickness.

Ground conditions within the Medupi Power Station footprint were considered based on groundwater borehole results and include:

- The study site is underlain by a sequence of pebbles, weathered quartzitic conglomerate with fresh variously fractured quartzitic conglomerate at depth.
- The conglomerate is interbedded with bluish grey siltstone (bands). The drilling has shown the siltstone forms discontinuous layers of up to 50cm thick but mostly about 20cm thick.
- Generally surface weathering to shallow depth (<5m) occurs. In some boreholes a second fractured and associated weathered zone is observed and is normally found between 7 - 14m.
- Some boreholes showed no surface weathering.
- Boreholes in the extreme north or west, show the presence of deep weathering, up to 21m.
- Water strikes were made in 14 of the 35 boreholes at depths between 6 and 10.5m below surface.

The groundwater specialist considered Information relating to the railway yard and limestone and gypsum handling facilities based on information contained in an existing geotechnical study undertaken for the rail yard development and offloading facilities (Rockland Geoscience, 2015). This study reported at test pits closest to the proposed rail yard area medium dense silty sand to between 1.1m and 1.8m, underlain by dense gravel to between 1.5m and 2.4m, underlain by very soft rock quartzite, with TLB refusal at 1.8m on medium hard rock quartzite, and refusal on hardpan ferricrete at 2.4m.

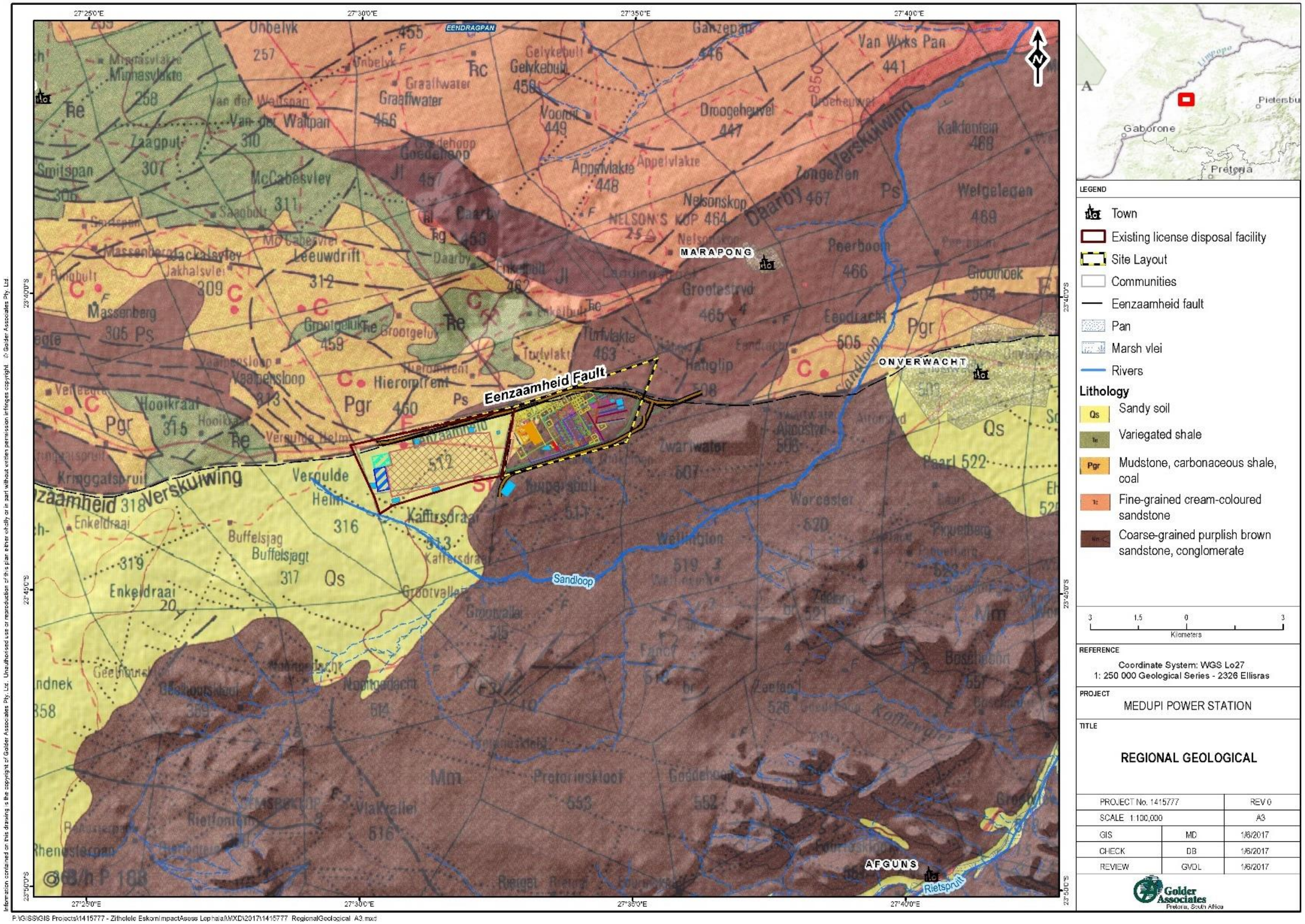


Figure 8-5: Regional geology associated with the development area and surrounds

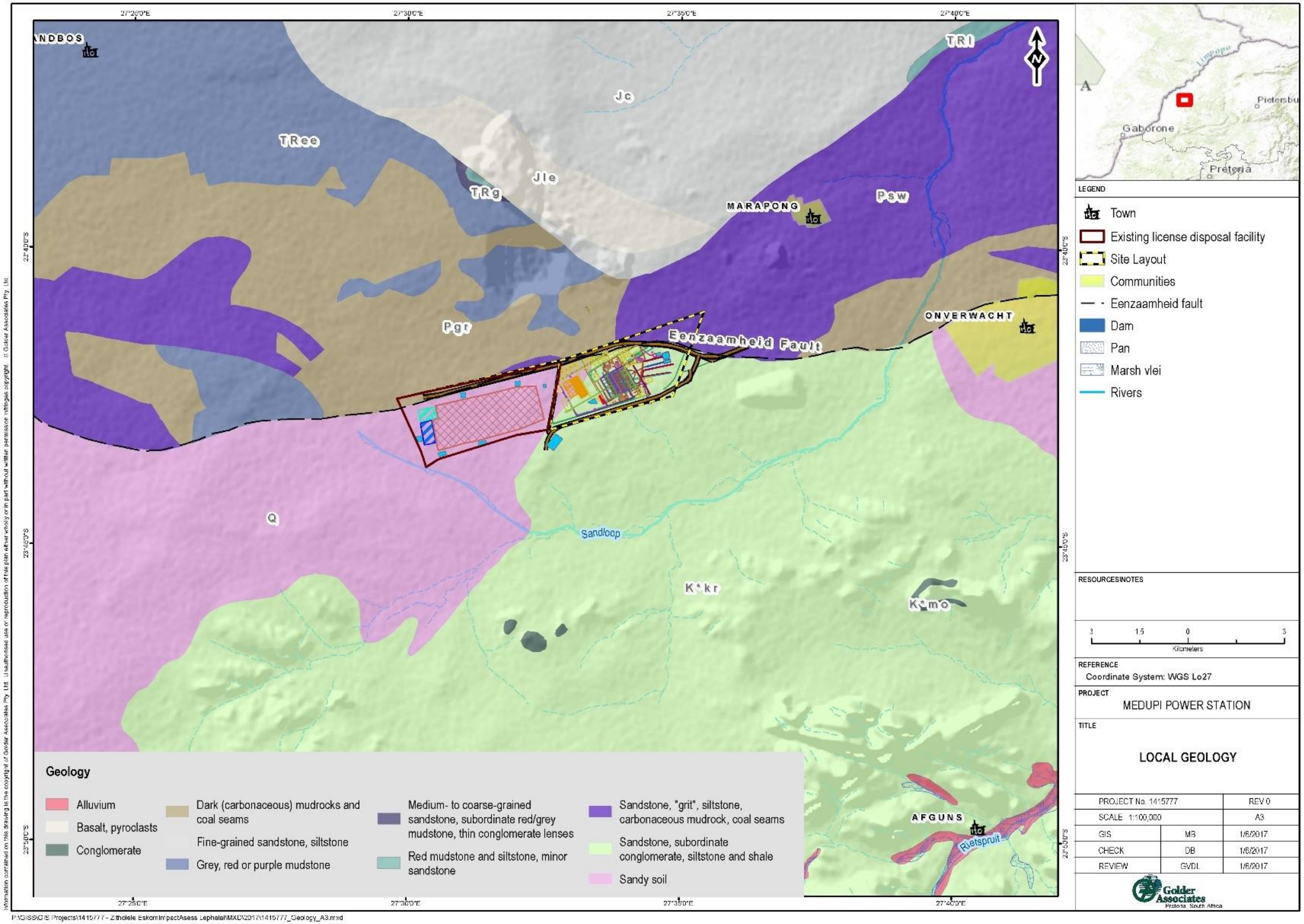


Figure 8-6: Local Geology at the MPS

8.3 Soils, Land Use and Land Capability

Information relating to the soils and land capability within the proposed study area were obtained from the Soils and Land Capability Specialist Study undertaken by Earth Science Solutions (Jones, 2018), including literature sited within the study report. This specialist study report is included in **Appendix G-2** to this DEIR. This specialist study initially focused on the soils and land capability within the proposed alternative sites, including the existing ADF footprint, referred to in the study as Site 13. Site 13 covered the western half of the MPS footprint where the proposed rail yard would be constructed. The specialist subsequently included a professional opinion relating to the sensitivity of the area within the MPS where the rest of the FGD infrastructure would be constructed.

8.3.1 Soils

The major soil types mapped within the study area reflect the host geology / lithologies of the parent materials, while the topography and climatic conditions that prevail have further influenced the pedogenisis and soils forms present in the area.

Noticeable to the area is the presence of the Permo-Carboniferous Waterberg Coalfield, which forms part of the Karoo Sequence. These coalfields extend approximately 90 km in an east-west alignment and approximately 40 km in a north-south alignment near the northwestern border of the RSA, and also continue into Botswana. This coal deposit is fault bounded along the southern and northern margins and can be classified as a graben or structural trough. The Eenzaamheid Fault forms the southern boundary of the deposit, where the Karoo strata abut with the strata of the Precambrian Waterberg Group.

It is these lithologies combined with the subtle topographic changes and changes in the position of the Limpopo River System over geological time that have produced the complex of differing soil Forms and groupings mapped.

The major or dominant soil forms in the area include those of the orthic phase Hutton, Clovelly, Glenrosa and Mispah forms with sub dominant soils of the Tukulu, Valsrivier and Shortlands Form, while the major hydromorphic forms mapped include the Glencoe, Dresden, Avalon, Pinedene, Bloemdal and Westleigh forms.

The semi-arid climate and negative water balance combined with the horizontal attitude of the sedimentary host lithologies that characterise the Karoo sediments in the area have aided in the development of evaporites within the vadose zone. These include calcrete, and in places ferricrete or laterite (Ouklip) formation as a feature of some of the soil profile.

The presence of a hard pan calcrete and in places ferricrete and plinthic horizons is considered of importance to the soil moisture regime and in many cases is the reason for wet features within the soil profile (barrier layer). This moisture is important to the biodiversity, the presence of pans and water features within the landscape, and the success or failure of the wetland systems in the extreme. These soils classify as highly sensitive where they occur within the top 500mm of the soil profile.

In addition to the geomorphological aspects mentioned above, soil texture and structure also played a role in the soil classification and the resultant sensitivity of the materials mapped. The fine to medium grained nature of the top soils, the relatively low clay contents (<12%) and the generally low organic carbon renders the majority of the top soils highly sensitive to erosion. This is only tempered by the relative flatness of the topography for all but a few areas, with a resultant moderate to low erosion index for most of the site if not well protected. Once the cover is disturbed or removed, the potential for erosion is increased.

The study area generally contain moderate to deep soils (**Figure 8-7**) and comprise for the most part fine to medium grained sandy topsoils on lithocutanic subsoil (Glenrosa) or sandy loams on a hard rock base (Mispah). Area of wet based (hydromorphic) soils within the study area.

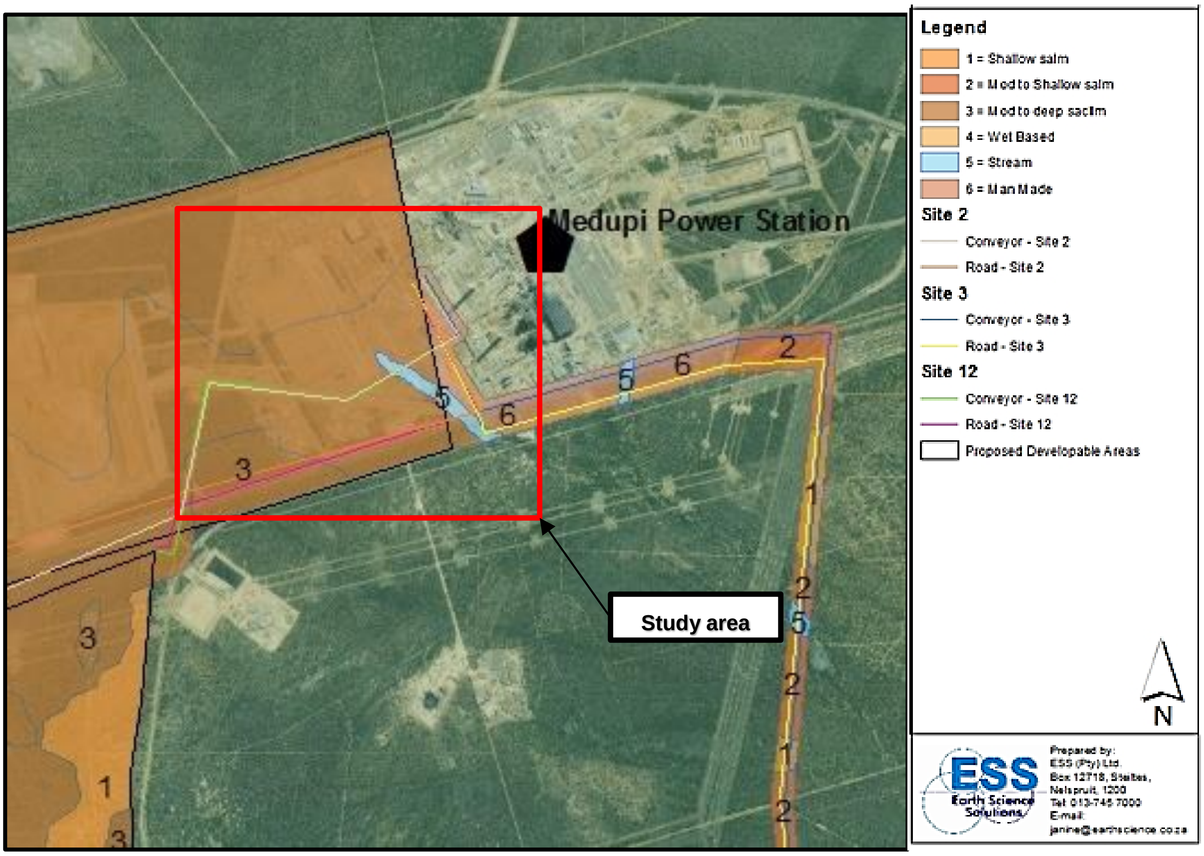


Figure 8-7: Dominant soils in the study area (excerpt from soils specialist study)

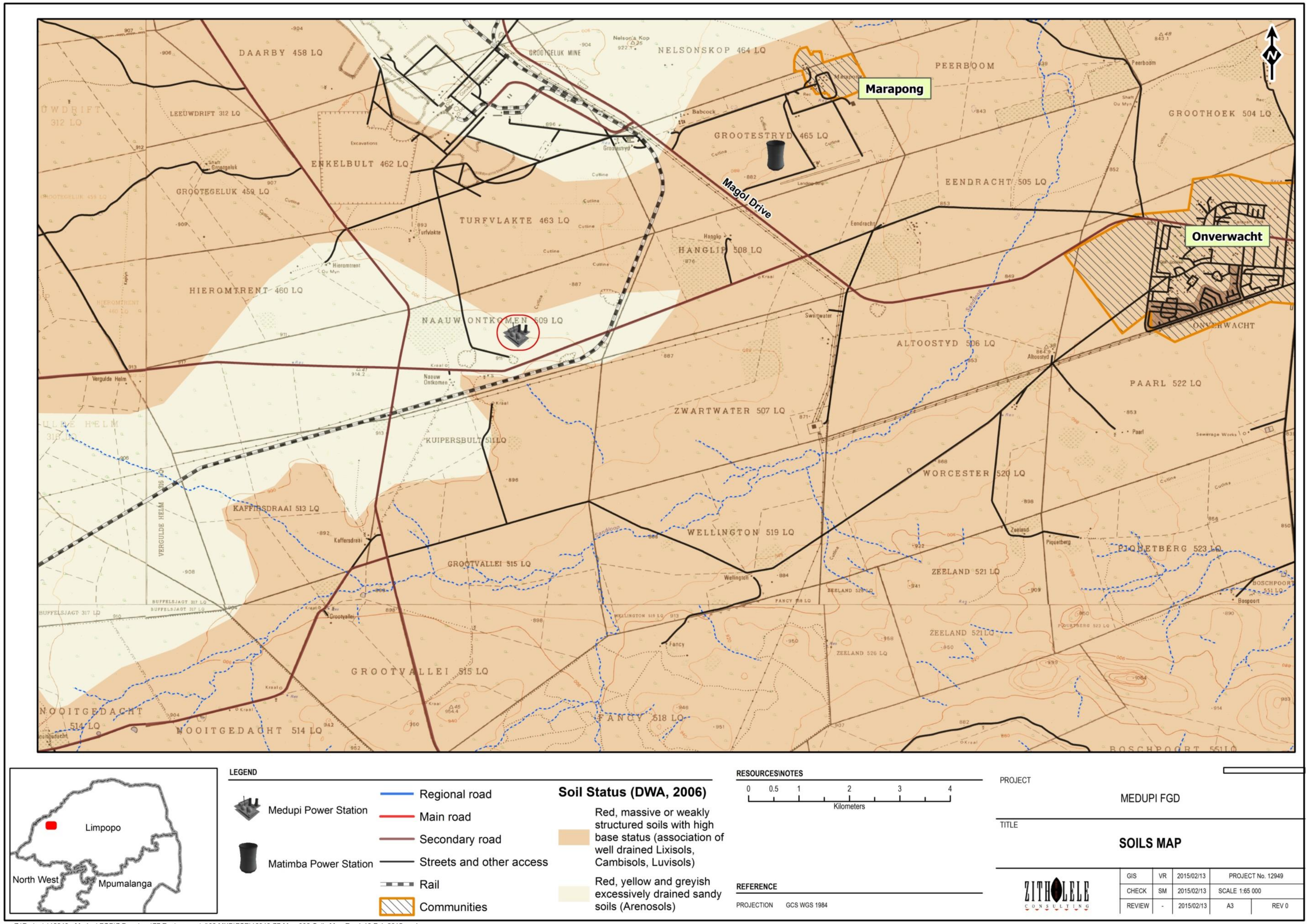


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Figure 8-8: Regional soils profile in the area

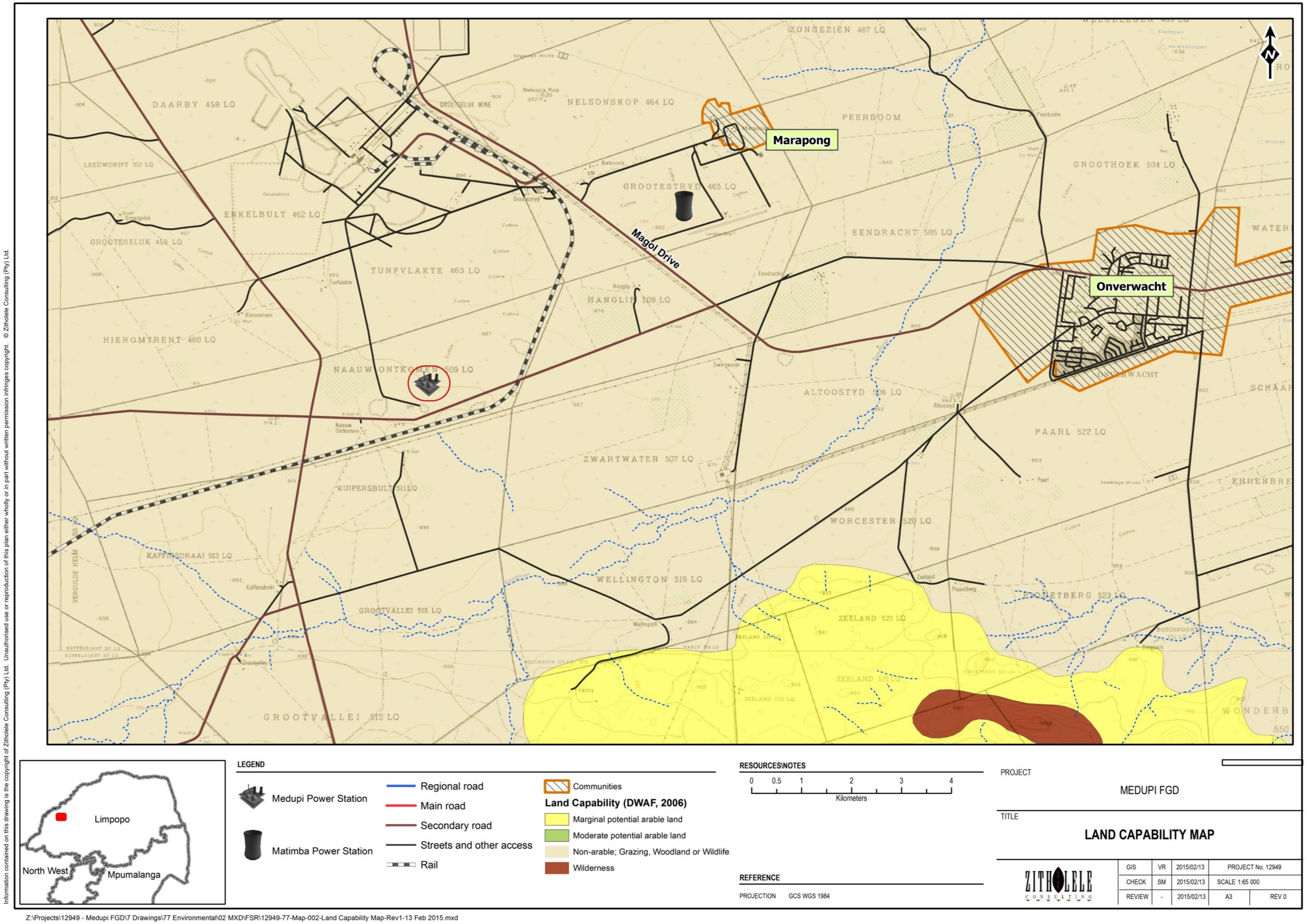

Figure 8-9: Land capability in the area

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The study area contains clay rich soils, shallow soils and light textured soils.

8.3.1.1 Clay rich soils

In general soils with higher clay content are associated with the colluvial derived/transported materials, and are most often found associated with the lower lying streams and river deposits, albeit that the geology and underlying lithologies also influence the soil pedogenisis, with the more basic lithologies producing soils with more structure and heavier clay percentages.

The higher clay contents, and in places the swelling clay (2:1 Montmorillonite clays) have resulted in stronger than average soil structure that varies from pedocutanic to prismacutanic with distinctive slick-n-sides in the wet state and prominent open cracking at surface in the dry state. Stronger than average structure is noted in some of the colluvial and alluvial derived soils associated with the lower lying areas and flood plain deposits.

The sensitivity of these soils to being disturbed (worked on or moved) is evident in the ease of erosion that is noted where over grazing or disturbance of the topsoil has occurred, while the wetness factor and their importance in soil water storage and base flow transfer renders these materials as highly sensitive.

8.3.1.2 Shallow soils

A significant proportion of the soils within the study area are of a shallow to very shallow rooting depth. These soils are almost always founded directly on a hard rock interface, with little to no saprolite at the base of the “B” horizon and are considered of a poor to very poor land capability rating.

These soils are associated with the more resistant host rock lithologies and often form the ridge lines and upper slope positions. The resultant poor vegetative cover, the generally lower clay content and lower organic carbon contents result in a high sensitivity rating for these materials.

8.3.1.3 Light Textured Soils

The light textured soils include the majority of the orthic form soils, as well as some of the deeper hydromorphic soil Forms. The majority of these Forms are characterised by a humic “A” horizon overlying a red or red-brown apedel (poorly structured) B, with indications of mottling within the lower “B” horizons in the case of the hydromorphic soils.

Depths to the “C” horizon or the plinthic layer vary from less than 400mm on the shallow forms to over 800mm on the deep colluvial soils. The soils generally show a very thin saprolitic horizon, with the sub soils founded directly on hard bedrock.

The sensitivity of these soils is highly variable and depended on the depth and relative texture (clay content) of the materials. However, on average, and for the dry soils that are greater than 500mm deep, these soils are of the least sensitive, are generally more easily worked on and with, and can be stored with relative ease and re-used at closure for rehabilitation.

8.3.2 Land capability

The land capability within the study area consists mainly of arable and grazing land. However, it is also important to note that the pre-development conditions or status quo for the area of concern is one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the power station development.

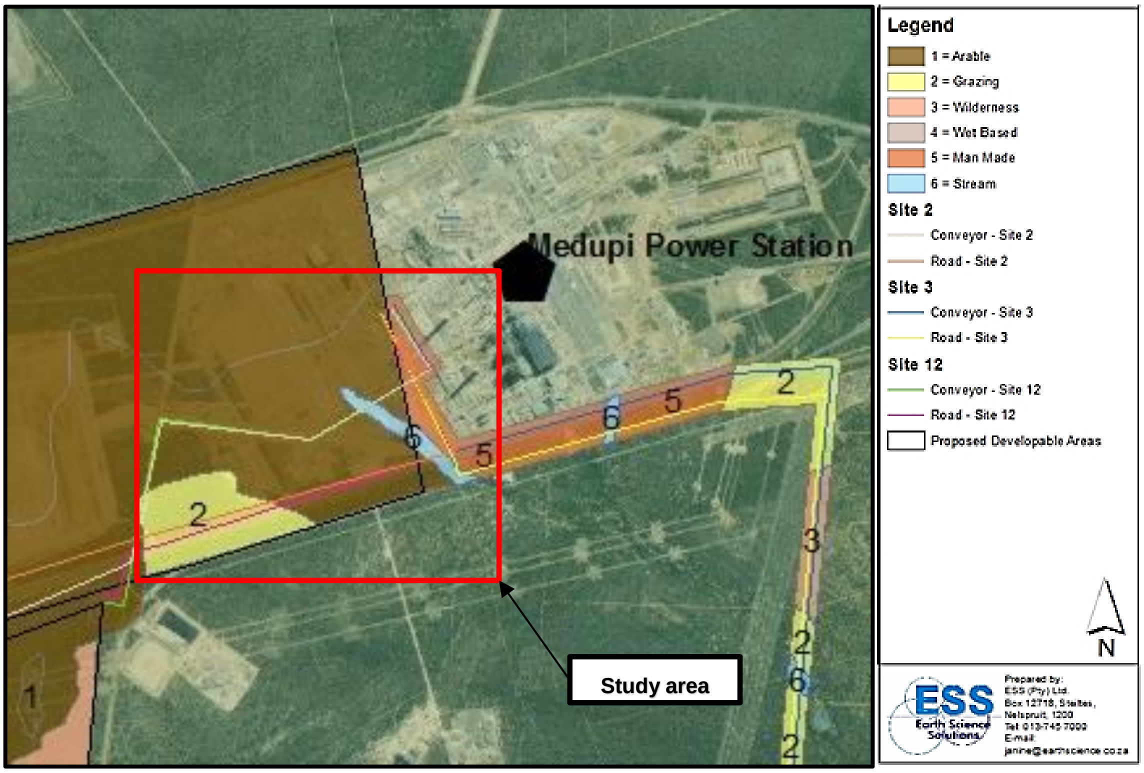

Figure 8-10: Land capability within the study area (excerpt from soils specialist study)

8.4 Groundwater

Information relating to groundwater resources within the proposed study area was obtained from the Hydrogeological Impact Assessment Study undertaken by Golder Associates Africa (Pty) Ltd (Brink & van der Linde, 2018), including literature sited within the study report. This specialist study report is included in **Appendix G-3** to this DEIR.

8.4.1 Regional Groundwater

Two distinct and superimposed groundwater systems are present in the geological formations of the coal fields in South Africa. They are the upper weathered aquifer and the system in the fractured rock below.

The Weathered Aquifer System generally occurs in the top 5-15 m and normally consists of soil and weathered rock. The upper aquifer is associated with the weathered horizon. In boreholes, water may often be found at this horizon. The aquifer is recharged by rainfall.

In a Fractured Aquifer System, grains in the fresh rock below the weathered zone are well cemented, and do not allow significant water flow. All groundwater movement therefore occurs along secondary structures such as fractures, cracks and joints in the rock. These structures are best developed in sandstone and quartzite, hence the better water-yielding properties of the latter rock type. Dolerite sills and dykes are generally impermeable to water movement, except in the weathered state.

8.4.2 Groundwater Quality

An analysis of groundwater monitoring results from 2016 were undertaken and it was found that the water quality of the existing boreholes is largely poor quality, with water quality classes ranging from Class 0 (Ideal water quality) to Class IV (Unacceptable water quality).

8.4.3 Regional Aquifer Recharge

From the published hydrogeological maps (DWAF 1996) the average recharge for the study area is shown as between 10 to 15mm per annum.

8.4.4 Groundwater Vulnerability

Groundwater vulnerability gives an indication of how susceptible an aquifer is to contamination. Groundwater vulnerability at the MPS is shown on the national groundwater is indicated as medium.

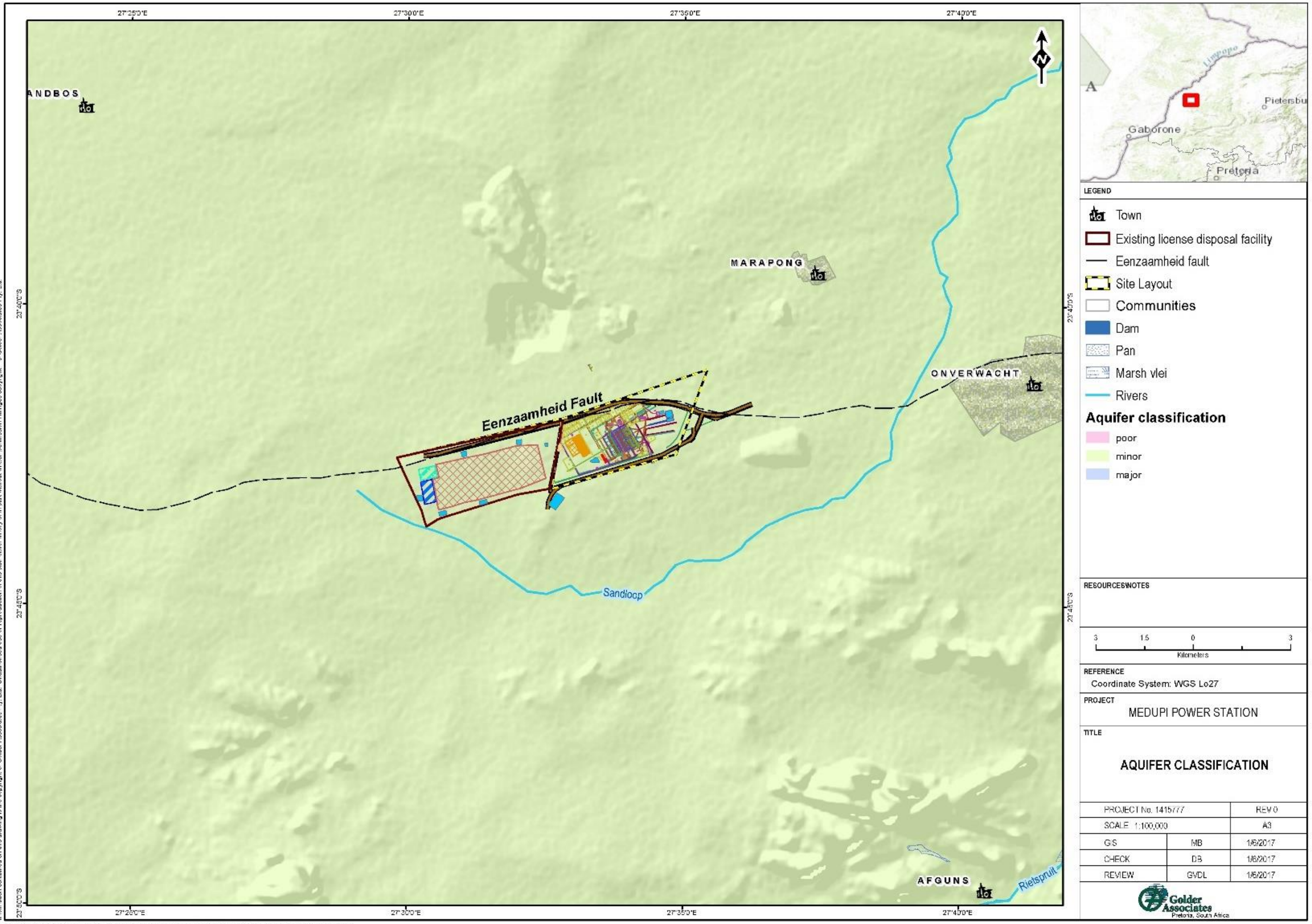

Figure 8-11: Regional aquifer classification

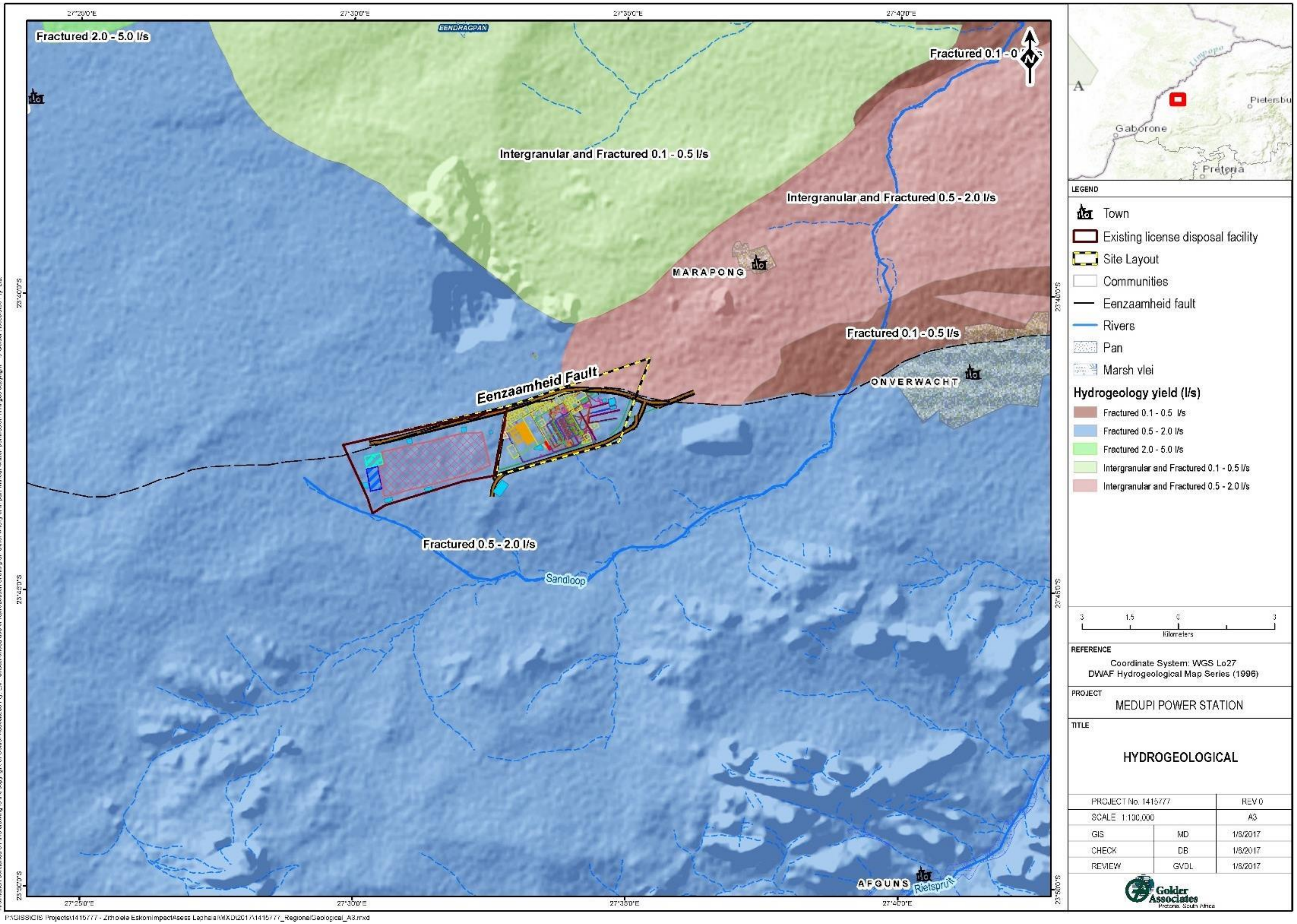

Figure 8-12: Hydrogeology Map

8.4.5 Aquifer Classification and Borehole Yield

The published hydrogeological maps series by DWAF (1996) was used to define the regional aquifer classification (**Figure 8-11**), which is classified as a minor aquifer system with fractured aquifer zones (**Figure 8-12**). The published hydrogeological maps (DWAF 1996) indicate that the average borehole yield in the area is between 0.5l/s and 2.0l/s.

8.4.6 Groundwater Levels and Flow Directions

From the available data and previous groundwater studies undertaken in the area, groundwater levels ranged from between 4.41 to 69.98 meters below ground level (mbgl), with the average water level as 30.4mbgl. The groundwater flow from the study area is primarily away from the site, towards the east/south-east and northeast towards the non-perennial Sandloop River.

8.5 Surface Water

Information relating to the surface water resources within the proposed study area was obtained from the Surface Water Impact Assessment Study undertaken by Golder Associates Africa (Pty) Ltd (Sithole & Jordaan, 2018), and Biodiversity and Wetland Assessment undertaken by Natural Scientific Services (NSS) (Abell, et al., 2018), including literature sited within these study report. These specialist study reports are included in **Appendix G-4** to this DEIR.

8.5.1 Regional Drainage Network

The study area is located within the A42J Quaternary catchment (**Figure 8-13**) to the south of the Lephalale coalfield where numerous mining developments are foreseen predominantly to the north of the Eenzaamheid Fault line. There are no perennial streams originating within the area itself. The closest perennial river is the Mokolo into which the non-perennial Sandloop River drains. The Mokolo flows through A42J to the Limpopo River.

Medupi is situated in the Mokolo catchment, with the non-perennial Sandloop River flowing around the site in an easterly to north easterly direction to confluence with the Mokolo River approximately 16 kilometres downstream of the town of Lephalale. The study site falls in a predominantly flat area of the Limpopo Water Management Area (WMA).

8.5.2 Water uses in the catchment

The water use within the catchment is predominantly agriculture (87%) and industry (13%) related. The Limpopo Province, and in particular, the Lephalale area, is a water stressed area with evaporation significantly higher than precipitation. Agricultural and industrial land uses in the municipal area are water intensive. There is therefore a high demand for water from an already water-stressed catchment.

Within the provisions of the National Water Act (Act 39 of 1998 as amended) as stipulated in the National Water Resources Strategy, there is a need to meet the water requirements of the Reserve (Basic Human needs and Ecological) in terms of water quantity and quality. Taking the requirements into account, there is insufficient water to maintain the current balance. Added to this, it is anticipated that water demand will increase with new developments proposed in the Mokolo Catchment, such as new or expanded mining activities and new power stations (Bohlweki Environmental, 2006).

The MCWAP scheme has been initiated in order to provide adequate water to supply the current and planned water users with allocations of water from the Mokolo Dam. Medupi Power Station already has an allocation for water from the MCWAP phase 1 scheme. There is currently a WULA in process for additional water allocation to Medupi from the MCWAP phase 2 scheme in order to supply for the planned FGD technology operation. This WUL is been applied for at a strategic level by Eskom. The total water requirement will be of 15.4 million m^3 per annum, the pipeline infrastructure is being sized for this and the licence will be for the same amount.

8.5.3 Water Resource Classification and Resource Quality Objectives

The classification of significant water resources in the Crocodile (West), Marico, Matlabas and Mokolo catchments in accordance with the Water Resource Classification System (WRCS) was undertaken in 2011 / 2012 and finalised in 2013.

In terms of the classification system, each quaternary catchment is classified as a Class I, II or III, defined as:

- Class I - Minimally used: Water resource is one which is minimally used and the overall condition of that water resource is minimally altered from its pre-development condition;
- Class II - Moderately used: Water resource is one which is moderately used and the overall condition of that water resource is moderately altered from its pre-development condition; and
- Class III - Heavily used: Water resource is one which is heavily used and the overall condition of that water resource is significantly altered from its pre-development condition.

The recommended Class for quaternary catchment A42J is a Class II (Department of Water Affairs, 2013). In this respect mitigation implemented must be such that it will protect the water resources so that an ecological category of B/C is maintained.

The determination of Resource Quality Objectives (RQO) for the area was undertaken in 2016/ 2017 and will be gazetted during the first quarter of 2018 (DWS, 2017, Report number: DM/WMA01/00/CON/RQO/0516). The proposed RQOs and numerical limits are set out in **Table 8-5**.

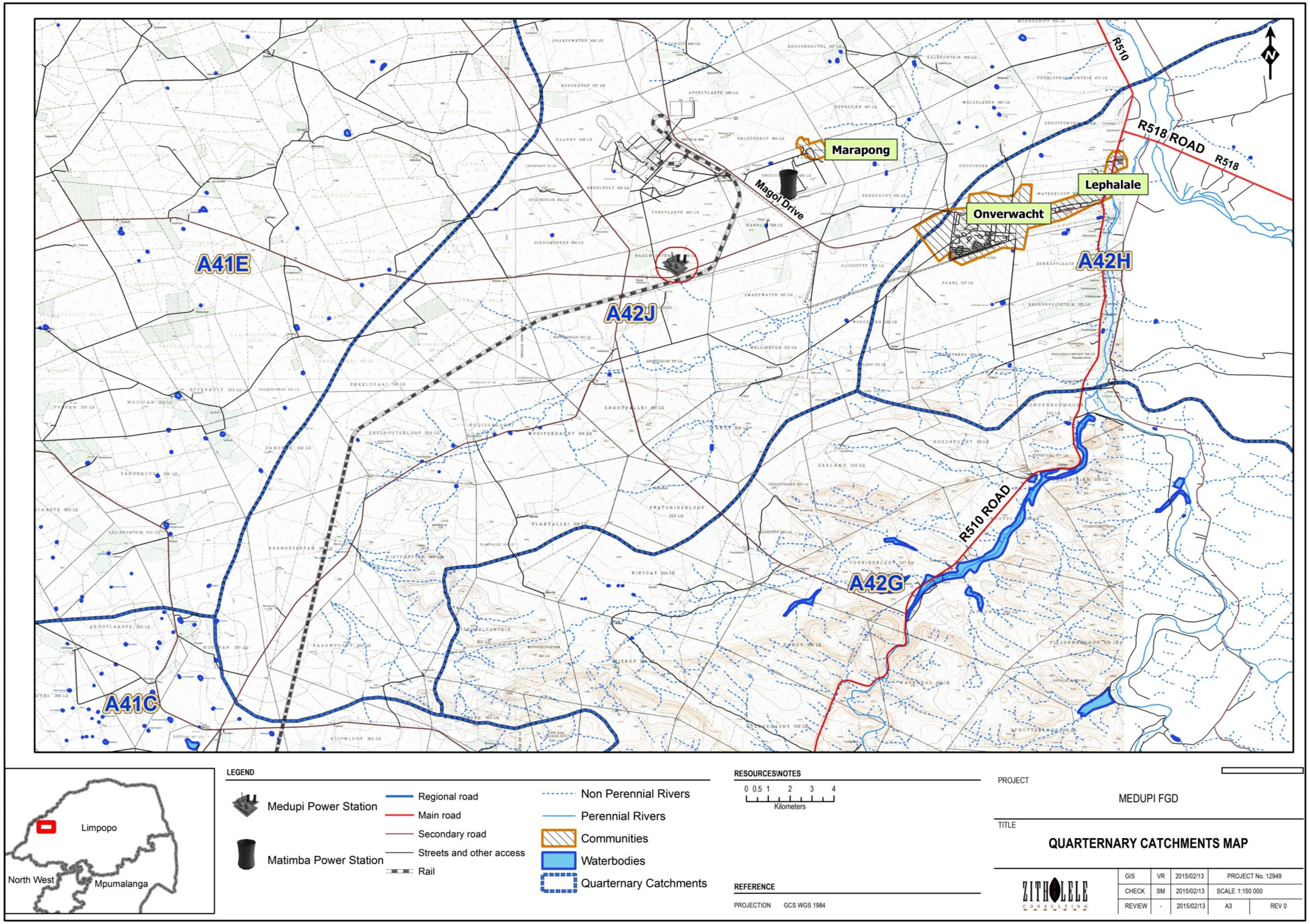

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Figure 8-13: Quaternary catchments map

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Table 8-5: RQOs and numerical limits for quaternary catchment A42J

Component	Sub-component	RQO	Indicator	Numerical Limit	Context/Rationale for RQO/numerical limit
Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Orthophosphate (PO_4^-) as Phosphorus	≤0.05 milligrams/litre (mg/l) (50th percentile)	Present ecological state maintained. Require baseline data.
			Nitrate (NO_3^-) & Nitrite (NO_2^-) as Nitrogen	≤0.1 milligrams/litre (50th percentile	Present ecological state maintained. Require baseline data.
	Salts	Instream concentration of salinity must be maintained to protect present ecological state and the aquatic ecosystem health.	Electrical Conductivity	≤55 milliSiemens/metre (mS/m)(95th percentile)	Maintain present water quality.
	System Variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	6.5 (5th percentile) and 8.5 (95th percentile)	Aquatic ecosystem as the driver. Present ate
		A baseline assessment to determine the present state instream turbidity is required. Limits must be defined to control the impacts of slate mining on the resource.	Turbidity	A 10% variation from background concentration is allowed. Limits must be determined.	No baseline data available. Monitoring required to determine present state.
	Toxics	The concentrations of toxicants must pose no risk to aquatic organisms and to human health.	Atrazine	≤0.078 milligrams/litre (mg/l)	Human health is the driver. Aquatic ecosystem is the driver. Ecological specification. Ecological Reserve manual (2008). No monitoring data.
			Imidacloprid	≤ 0.000038 milligrams/litre (mg/l)	Human health considerations. Environment Protection Authority of New Zealand – Environmental Exposure Limit
			Aluminium (Al)	≤ 0.062 milligrams/litre (mg/l)(95th percentile)	Strictest of Ecological specifications for all metals except manganese. Manganese – domestic user requirements. Ecological Reserve manual (2008), South African Water Quality Guidelines (1996)
			Manganese (Mn)	≤ 0.15 milligrams/litre (mg/l) (95th percentile)	
			Iron (Fe)	≤ 0.1 milligrams/litre (mg/l) (95th percentile)	
			Lead (Pb) hard	≤ 0.0057 milligrams/litre (mg/l) (95th percentile)	
			Copper (Cu) hard	≤ 0.0048 milligrams/litre (mg/l) (95th percentile)	
			Nickel (Ni)	≤ 0.07 milligrams/litre (mg/l) (95th percentile)	
			Cobalt (Co)	≤ 0.05 milligrams/litre (mg/l) (95th percentile)	
			Zinc (Zn)	≤ 0.002 milligrams/litre (mg/l) (95th percentile)	
Habitat	Instream	Habitat diversity should be maintained in a B ecological category.	Index of Habitat Integrity, Rapid Habitat Assessment Method and Model (RHAMM)	Instream Habitat Integrity EC = B ≥ 82%	Maintenance of ecological integrity. Present ecological state.
	Riparian habitat	Riparian vegetation should be maintained within B ecological category.	Index of Habitat Integrity, Vegetation Response Assessment Index	VEGRAI EC = B ≥ 82%	Maintenance of ecological integrity. Present ecological state

8.6 Biodiversity (Terrestrial Ecology) and Wetlands

Information relating to the biodiversity and wetland resources within the proposed study area was obtained from the Biodiversity and Wetland Assessment undertaken by Natural Scientific Services (NSS) (Abell, et al., 2018), including literature sited within these study report. This specialist study report is included in **Appendix G-5** to this DEIR.

The study area investigated by NSS largely cover undisturbed areas within the existing MPS footprint, including the farm portion on which the ADF is located, as well as a buffer area of 500m outside the MPS property boundary. However, in this EIA only wetland resources and possible impacts within the proposed rail yard site or FGD infrastructure footprint within the MPS footprint, or within 500m of these sites were considered.

8.6.1 Regional Biodiversity (Terrestrial Ecology) setting

The Study Area is situated in the Mokolo River Catchment area (8387 km^2), where the Mokolo River system varies from good to fair health (RHP, 2006). The lower Mokolo River is dominated by hardy, pool dwelling species of fish. It is possible that some species may have been lost due to fragmentation of the river from the Limpopo River. No fish species requiring permanent flow were recorded, but several species that require flowing water for breeding purposes still remain, such as the Large Scale Yellowfish (*Labeobarbus marequensis*) and other *Labeo* species. However, no alien fish species were recorded.

The poor habitat diversity within the region caused the invertebrate assemblage to be dominated by hardy families associated with marginal vegetation and sand. The moderately scoring SASS assessments are likely to be as a result of the irregular flow regime.

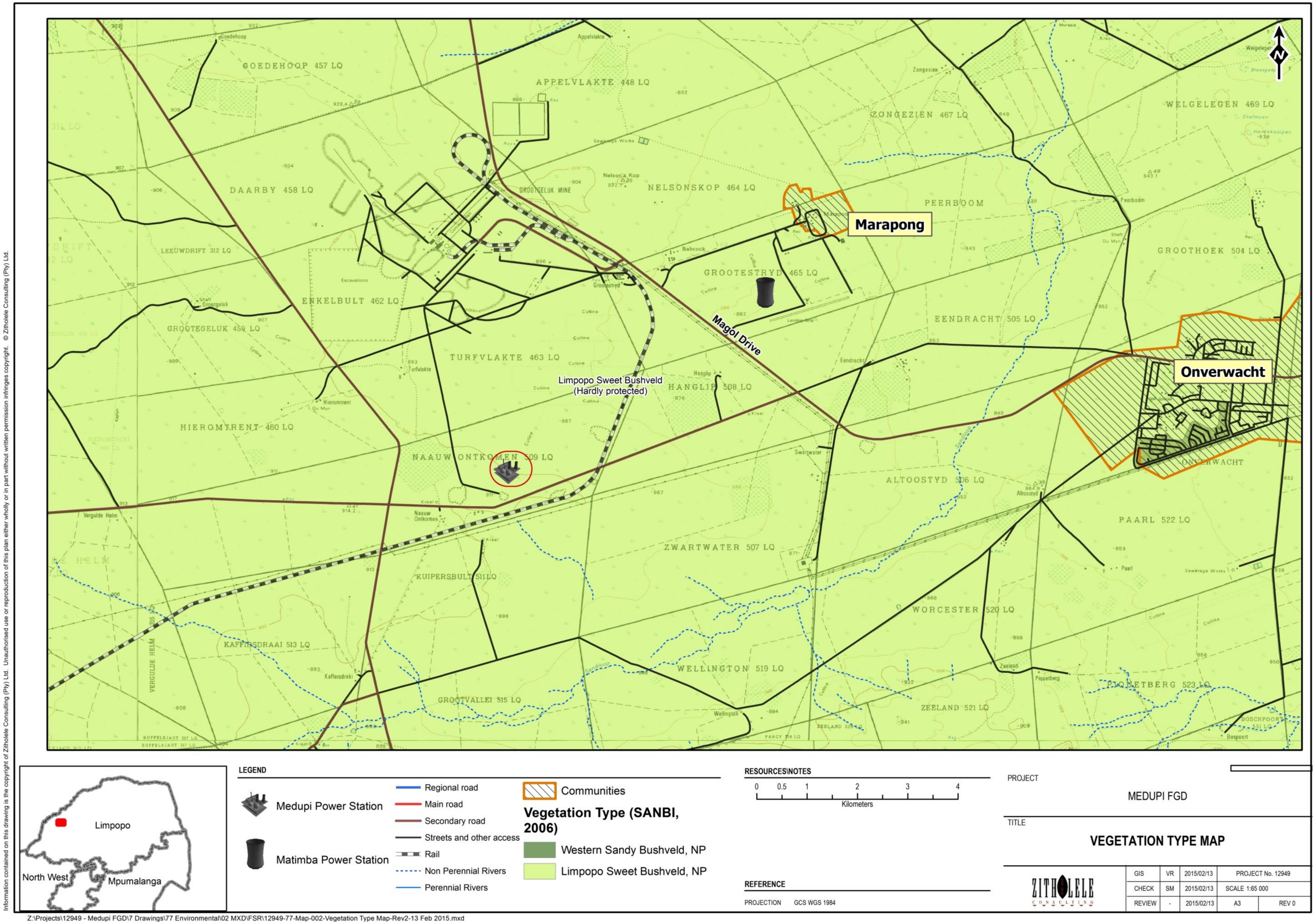


Figure 8-14: Vegetation type within the study area

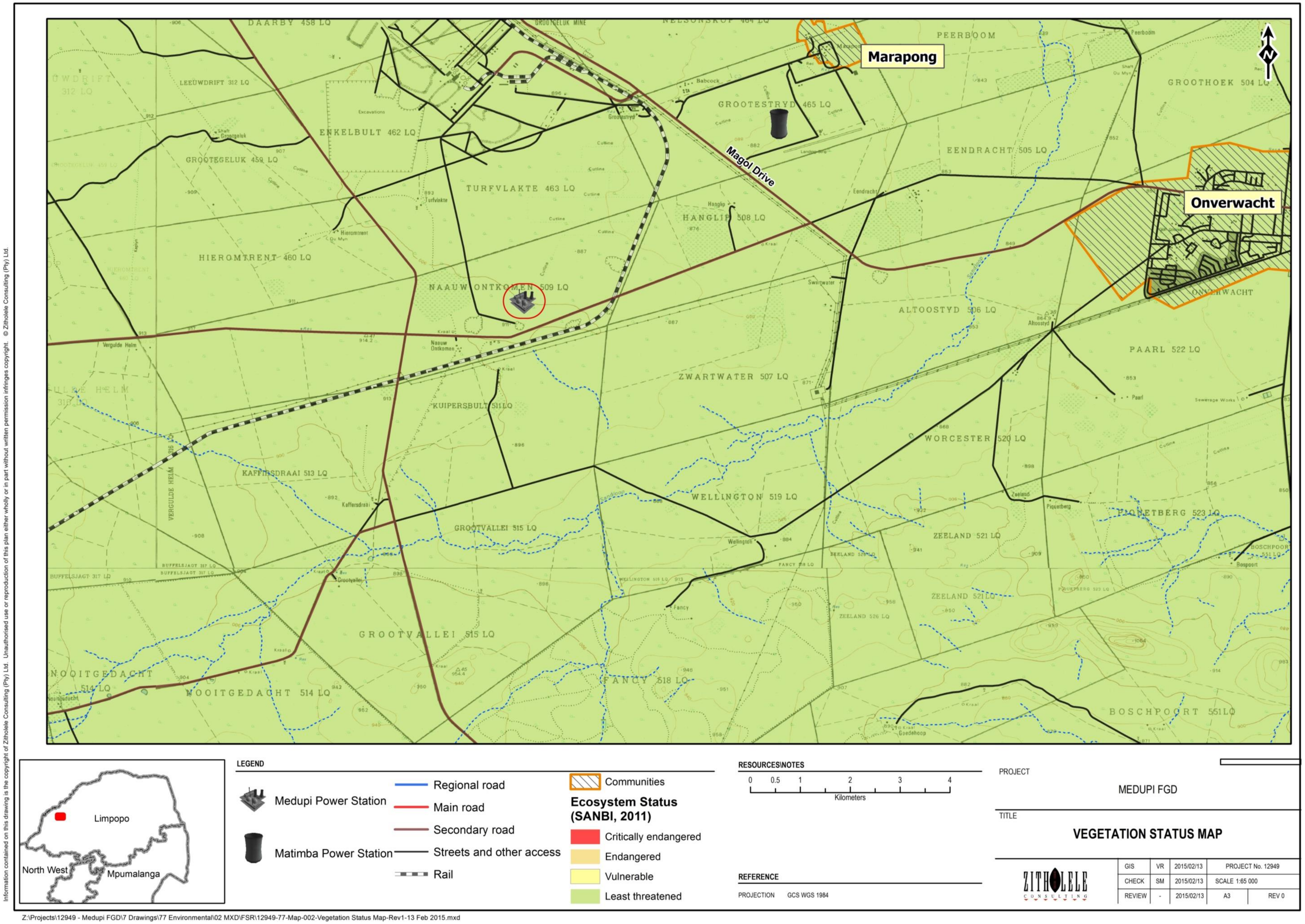


Figure 8-15: Conservation status of the vegetation type within the study area

Table 8-6 provides a comparison of the observed species richness, with that expected at both local and regional scales. From this table it is evident that remaining natural and semi-natural areas in and around Medupi support a considerable proportion of the region's faunal diversity.

Table 8-6: Summary of faunal species richness in the study area as compared to a regional scale (taken from Abell et. al. 2018)

FAUNAL GROUP	SPECIES RICHNESS						
	POTENTIAL			OBSERVED			
	REGION[1]	QDS[2]	MEDUPI[3]	BEC (2006)	FGD	MEDUPI	VICINITY[4]
Mammals	124	41	89	18	43	47	54
Birds	345	314	304	67	158	183	211
Reptiles	96	83	47	7	20	20	46
Frogs	27	22	20	8	16	19	14
Butterflies	176	149	88	3	9	26	15
Dragonflies & Damselflies	66	66	48	0	2	3	1
Scorpions	11	11	11	0	1	1	2
Megalomorph Spiders	4	4	2	0	0	0	1
KEY							
[1]Species recorded during atlas projects within the four regional QDSs 2327CB, 2327DA, 2327CD & 2327DC							
[2]Species that have been recorded during atlas projects within the QDS 2327DA wherein Medupi is situated							
[3]Species that are likely to occur (LoO of 2 or 3) in Medupi							
[4]Species recorded during NSS studies in the vicinity: Grootegeluk and Limpopo West Mines, Mafutha Project and Matimba Power Station							

8.6.2 Biodiversity at the study area

The biodiversity specialist considered vegetation and biodiversity within the MPS and ADF footprints, as well as the area within 500m of the MPS site boundary. The EIA application, however only consider the footprint of the proposed FGD infrastructure, rail yard and associated structures and infrastructure within the MPS footprint as indicated by the red shape in **Figure 8-16**. As a result only aspects and impacts associated with the construction and operation of the rail yard and FGD infrastructure within the MPS were considered in this DEIR.

The Study Area falls within the Limpopo Sweet Bushveld (code SVcb 19) vegetation type (**Figure 8-14**) as described by Mucina and Rutherford (2006). The typical vegetation consists of short open woodland. In disturbed areas thickets of *Acacia erubescens*, *Acacia mellifera* and *Dichrostachys cinerea* are almost impenetrable. The conservation status of the Limpopo Sweet Bushveld is classified as Least Threatened (**Figure 8-15**), however the vegetation type has been facing increasing pressure from numerous coal mining projects within the vicinity with a much greater percentage of land transformed.

Vegetation communities identified within the study site (red boundary indicated in **Figure 8-16**) are mainly *Acacia* dominated Woodlands with associated Wetlands and included:

Acacia nigrescens - *Grewia* Open Veld and Disturbed *Acacia* mixed woodland. No wetlands, water bodies, depressions or washes are present within the rail yard FGD infrastructure footprint.

The main vegetation impact is considered to be reed encroachment and there are clear indications that the regulated flow regime is contributing to this problem. Alien vegetation was very sparse and only a few Syringa (*Melia azedarach*) was recorded. Downstream from Lephalale, disturbance to the riparian zone was limited to bridges, sand mining, and agricultural practices (RHP, 2006).

NSS surveys in and around the FGD study area yielded 43 mammal, 158 birds, 20 reptile, 16 frog, nine butterfly, two dragonfly and one scorpion species, greatly contributing to the overall Medupi inventory (**Figure 8-17**). Of all of these species, only the endangered Tawny Eagle was noted or recorded within the study site boundaries as indicated in **Figure 8-17**.

Notable faunal observations in and around the FGD study area (outside the boundaries of the MPS) included Serval (Near Threatened, abbreviated as NT), Brown Hyaena (NT), White-backed Vulture (Endangered, abbreviated as EN), Tawny Eagle (Vulnerable, abbreviated as VU) and Red-billed Oxpecker (NT), African Bullfrog (Protected Species, abbreviated as PS) and Giant Bullfrog (NT), and also an out of range observation of Sanderling (nearest SABAP 2 record 190km east near Polokwane), and a 300km westwards range extension on Green House Bat (*Scotophilus viridis*) based on recorded bat call data.

Local farmers reported the presence Leopard (VU), Cheetah (VU), African Wild Dog (EN), Spotted Hyaena (NT) and Pangolin (VU) as well as Southern African Python (PS) and Nile Crocodile (EN, now absent). African Bullfrogs were found to be particularly abundant in the more natural areas in and near the southern section of Medupi, where there are a number of breeding sites for this species. As both bullfrog species appear to utilize the same type of breeding habitat (Du Preez & Carruthers, 2009 as cited in (Abell, et al., 2018), this area and its pans might also provide suitable breeding habitat for Giant Bullfrog. However, only a dam along the southern boundary of the ADF yielded potential signs of this species in the form of a single froglet (Abell, et al., 2018).

Heavily fenced game areas immediately south and south-west of Medupi support at least nine of the 22 regionally occurring large game species. These include Plains Zebra, Giraffe, Nyala, Blue Wildebeest, Red Hartebeest, Blesbok, Waterbuck, Eland and Gemsbok. The NT Grey Rhebok was seen just south of Medupi. Multiple fences along boundaries likely prevent access of larger species such as most carnivores, ungulates, Aardvark and Pangolin. Chacma Baboon (*Papio ursinus*) were observed jumping fences without much difficulty to drink at a water trough and as such it is likely that other primates such as Vervet Monkey and Lesser Galago are also present (Abell, et al., 2018).

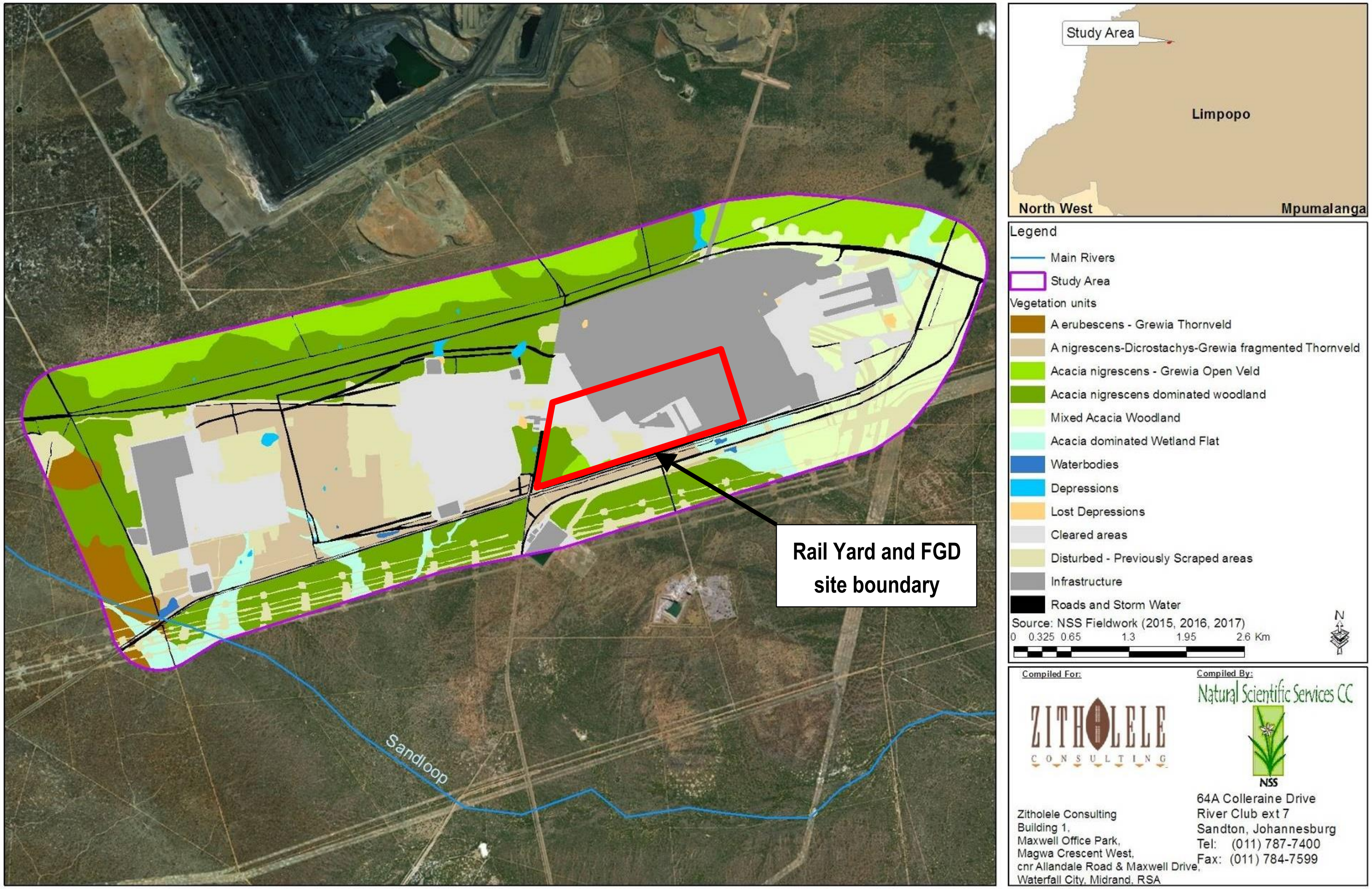


Figure 8-16: Vegetation Units for the study area (from Abell et. al. 2018)

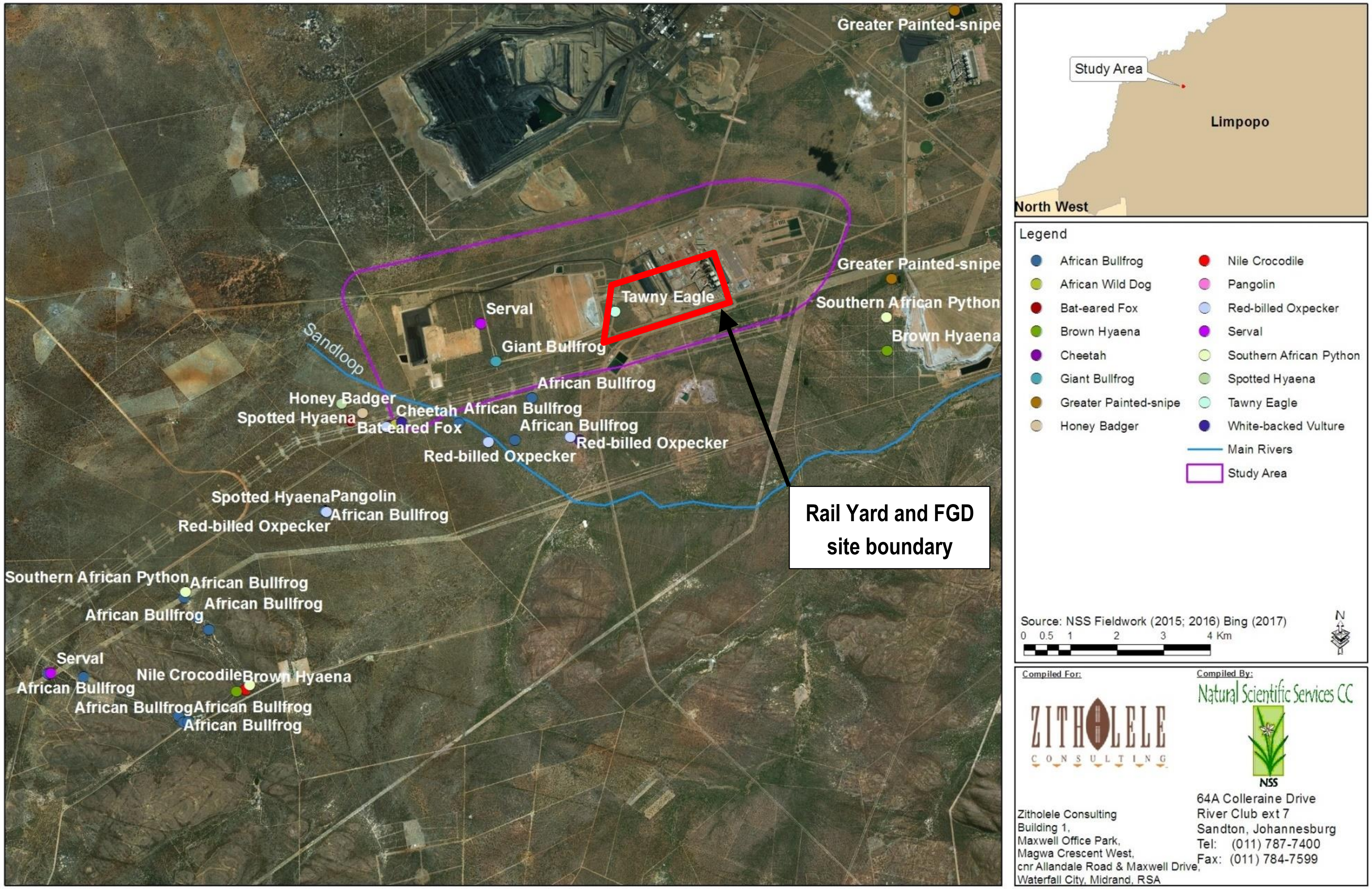


Figure 8-17: Localities of Conservation Important Fauna surveyed in and around MPS (from Abell et. al. 2018)

8.6.3 Regional wetlands and watercourses

The MPS and associated infrastructure is situated on a watershed and comprises both northwards and southwards draining systems. The hot semi-arid plains of the Limpopo Sweet Bushveld covering the study area are characterised by a series of ephemeral pans and drainage features, which were termed Semi-Ephemeral Washes (SEWs). These are situated in the upper reaches of their catchment and characterised by a very gradual slope (<1%) and cross sectional profile. Although a very slight change in vegetation structure (not composition) is sometimes apparent, no clearly defined channel is obvious and it is often difficult to locate these systems on the ground without the aid of aerial imagery.

Ephemeral pans, which are characteristic of hot semi-arid areas, are distinguished by fluctuating and unpredictable changes in their hydrological regime and of physical and chemical conditions (Lahr, 1996, as cited in (Abell, et al., 2018). Their existence, extent and duration therefore depend on climatic factors and on morphometric and sediment characteristics. They contain a uniquely adapted fauna that copes in different ways with changing and often extreme temperatures, oxygen levels, pH, salinity and turbidity.

The typical ephemeral pan is a shallow, closed basin (Belk and Cole, 1975, as cited in (Abell, et al., 2018) that usually contains a well-adapted fauna. Characteristic groups include large Branchiopoda: Anostraca or fairy shrimps, Notostraca or tadpole shrimps, and Spinicaudata and clam shrimps. These three groups of crustaceans are often referred to as phyllopods. Assemblages of species of these groups are found all over the world in hot arid and semi-arid regions.

In addition to the Semi-Ephemeral Washes (SEWs) identified at the southwestern extent of the MPS ADF site, a number of pans are located in the surrounding landscape. The presence of pans within the moisture stressed environment means that these wetlands are key providers (‘hotspots’) of ecosystem services, including water and food supply.

8.6.4 Wetlands within the study area

Due to the extent of the areas to be investigated, NSS identified and delineate watercourses and wetland systems at a desktop level within a 500m buffer of the MPS and ADF and undertook ground truthing mainly within December 2015 and November 2016 within the areas identified. The main focus of the study was therefore to investigate wetlands within the 500m buffer zone from the boundary of the MPS (**Figure 8-18**) since most of the MPS footprint and that of the existing ADF was already either under construction or totally transformed with the installation of infrastructure and support services.

The Sandloop is a tributary of the Mokolo River. The Sandloop has a Present Ecological State (PES) of moderately modified (C category) where the loss and change of natural habitats and biota have occurred but the basic ecosystem functions are still predominately unchanged. The Ecological Importance (EI) and Ecological Sensitivity (ES) are reported as Moderate and Low, respectively.

Four Hydro-geomorphic (HGM) wetland units were identified surrounding the MPS, which include two south–east and one north–east draining Washes (SEW 1 – 3), and multiple inward-draining depressions (D1) (**Figure 8-19**). No wetland units were however identified within the study area depicted by the red shape in **Figure 8-19**, although SEW 2 is located just southeast of the study site outside the MPS property boundary. A summary of the wetland assessment for SEW 2 undertaken by NSS is provided in **Table 8-7**.

The rail yard and FGD infrastructure study site, including associated structures and infrastructure, furthermore do not impact directly on the Sandloop tributary. The upper reaches of this system diagonally bisects the south western corner of the MPS ADF site and is classified as a Freshwater Ecosystem Priority Area (FEPA) in recognition of its reference site suitability as an upper foothill ephemeral system that is still in a largely natural state.

The depressions identified within the greater study area surrounding the MPS are small in extent and ephemeral in nature. Due to the large number of depressions within the CBG4 vegetation type, they are classified as Least Threatened.

NSS utilised the WET EcoServices tool to obtain an understanding on what ecosystem services the four Hydro-geomorphic (HGM) units identified around the study area would provide services. With all four units, the main service is Biodiversity Maintenance. This is evident during high rainfall events when these areas become inundated and provide breeding and foraging habitat for an array of species. In addition to this, the Semi-Ephemeral Washes also provided services for toxicant and nitrate removal as well as phosphate and sediment trapping.

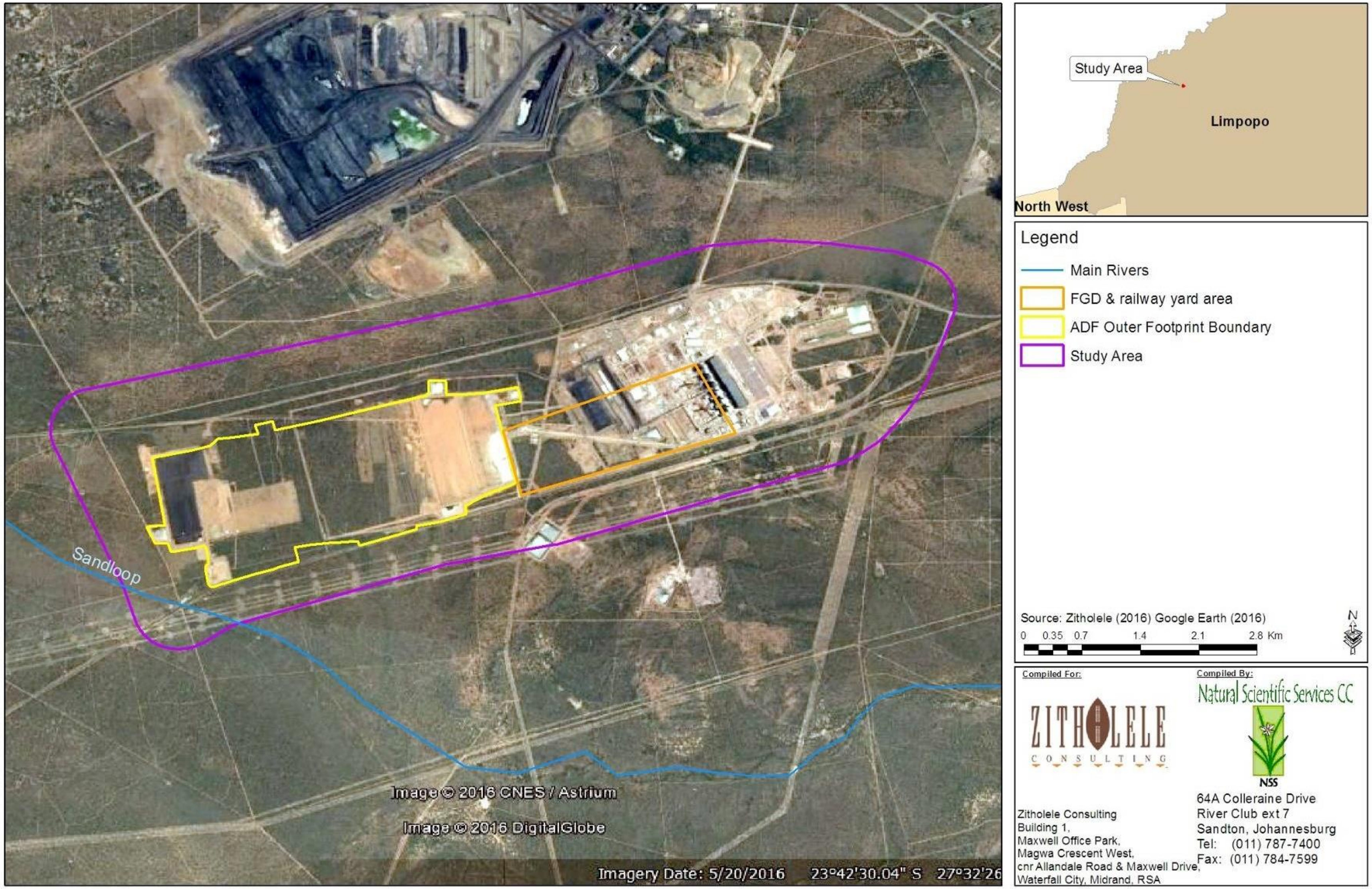


Figure 8-18: Locality map showing the study area for the wetland assessment

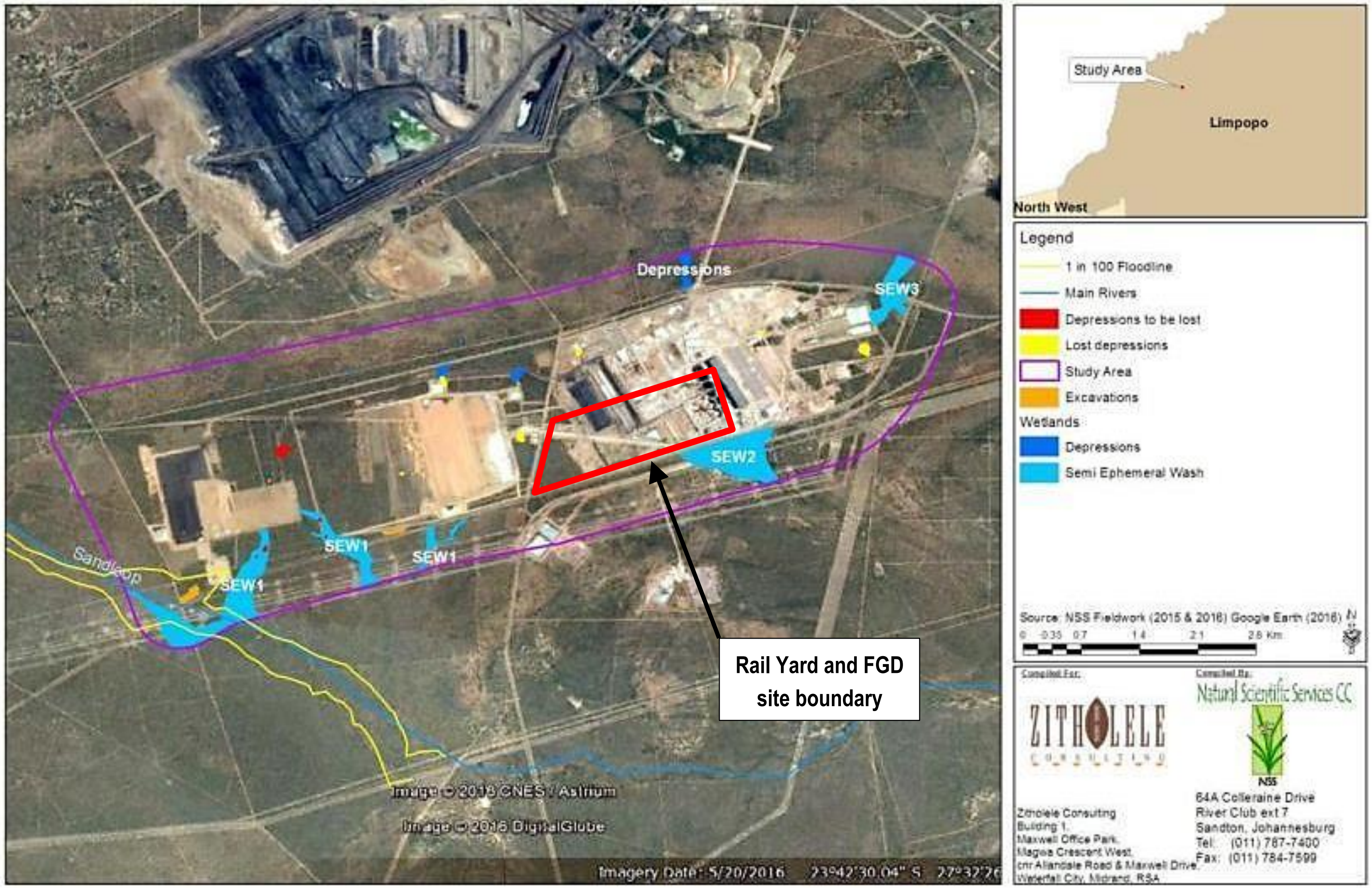
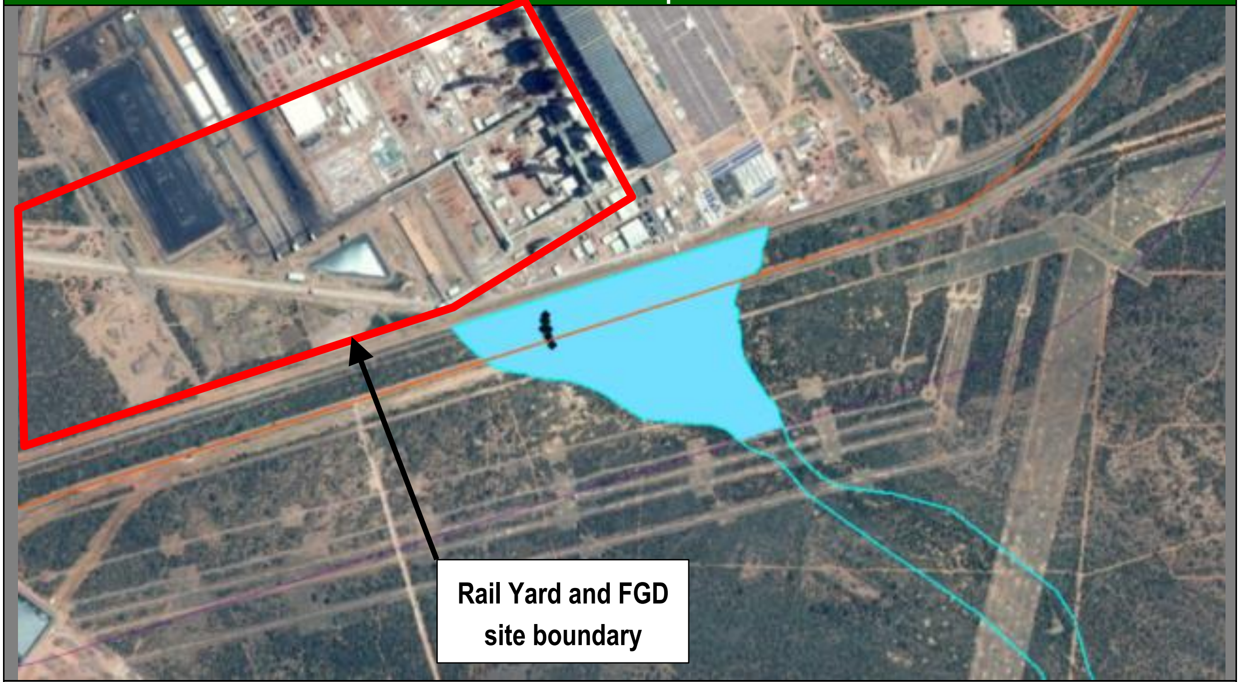


Figure 8-19: Extent of wetlands identified surrounding the MPS

Table 8-7: Wetland summary HGM Unit 2 (taken from Abell et. al. 2018)

HGM Unit 2 – Semi-arid Ephemeral Wash 2



HGM Unit 2 and sampling points

SETTING			
Coordinates (Centroid)	23°42'44.20"S 27°33'57.96"E	Area Within Site (ha)	38.0
Alt (m a.s.l.)	902	Level 1: System	Inland
Aspect	South-east	Level 2a: Ecoregion	1.03
Regional vegetation	SVcb 19 LSB	Level 2b: NFEPA WetVeg	CBG 4
Quaternary catchment	A42J	Level 3: Landscape unit	Plain
Limpopo BCPLAN V2	ESA 1	Level 4a:	NA
Waterberg TCBA	ON	Level 4b:	NA
MBG	E: Low NB and risk		

SITE DESCRIPTION	
Overview	Semi-ephemeral wash, with pockets within the drainage showing wetland characteristics (pooling).
Wetland indicators	Terrain relatively flat and difficult to determine slope. The soil indicators were present along certain points of the system. A number of pools found along system before entering the Sandloop.
Impacts	Likely a fair amount of water is diverted into the system compared to natural flow. MPS acts as a large hardened surface with surface / catchment area runoff increasing flood peaks substantially during high rainfall events but two natural depressions, a borrow pit and a road assist to attenuate flow, create depositional environments, and stem flow. Some excavations have formed more permanent dams. Increased roughness, saturation and nutrient loading. Pits (excavation), tailings (infilling), tailing sediment are washing onto system.
Dominant species	*Non wetland species: Acacia nigrescens, A karoo, Dichrostachys cinerea*; *Grewia bicolor* and *Grewia flava.* Denser Grass Sward in places
Soil characteristics	Mixture of wet-based and man-made soils

Present Ecological State (PES)		
Hydrology	Geomorphology	Vegetation
C	C	D

Wetland Ecosystem Services

Maintenance of biodiversity; Toxicant removal; Phosphate trapping; Sediment trapping; Flow attenuation

Wetland Importance and Sensitivity		
Hydrological	Ecological	Cultural
Moderate (2.1)	**Very High (4.0)**	**Low (1.4)**

8.7 Air Quality

Information relating to the air quality within the proposed study area was obtained from the Air Quality Specialist Report undertaken by Airshed Planning Professionals (von Gruenewaldt, et al., 2018), including literature sited within these study report. This specialist study report is included in **Appendix G-6** to this DEIR.

In the evaluation of air emissions and ambient air quality impacts reference is made to National Ambient Air Quality Standards (NAAQS) for compliance. These standards generally apply only to a number of common air pollutants, collectively known as criteria pollutants. Criteria pollutants typically include SO_2, NO_2, carbon monoxide (CO), inhalable particulate matter, (including Thoracic particulate matter with an aerodynamic diameter of equal to or less than 10 µm (PM_{10}) and Inhalable particulate matter with an aerodynamic diameter equal to or less than 2.5 µm ($PM_{2.5}$), benzene, ozone and lead. For the proposed Project, pollutants of concern included SO_2, NO_2, PM_{10} and $PM_{2.5}$ (screened against NAAQS) and metals within the ash deposition facility (screened against international health effect screening levels).

8.7.1 Regional Air Quality

The DEA identified the potential of an airshed priority area in the vicinity of the Waterberg District Municipality (Government Gazette, Number 33600; 8 October 2010). This was later expanded to include the Bojanala Platinum District Municipality, North-West Province (Government Gazette, Number 34631; 30 September 2011) and the Waterberg-Bojanala Priority Area (WBPA) was officially declared on 15th June 2012 (Government Gazette, Number 35435). The Medupi Power Station therefore falls within the Waterberg-Bojanala Priority Area.

The WBPA Air Quality Management Plan: Baseline Characterisation was released for public comment on the 7th August 2014 (SAAQIS, 2014, access date: 2014-08-21). This Baseline Characterisation reported that power generation activities contribute 95% of SO_2, 93% of NO_2 and 68% of the particulate emissions across the Waterberg District Municipality.

8.7.2 Air Quality at a local scale

Existing sources of atmospheric emissions which occur in the vicinity of the proposed development sites include:

- Matimba Power Station and its associated ash dump;
- Coal mining operations (such as Grootegeluk coal mine situated just north of the MPS);
- Brickworks operating at Farm Hanglip;
- Household fuel combustion;
- Potential veld fires (infrequent);
- Sewage works (Farm Nelsonskop);
- Windblown dust from open areas and agricultural activities;

- Vehicle exhaust releases and road dust entrainment along paved and unpaved roads in the area.

Ambient air quality monitoring data was obtained from two sources close to the study area, i.e. a DEA monitoring station located at Lephalale and an Eskom operated monitoring station located at Marapong. The DEA monitoring station located in Lephalale is the closest monitoring station with sufficient data relating to NO_2, PM_{10}, $PM_{2.5}$ and SO_2 short-term ground level concentrations. The data obtained was for the period January 2013 to November 2014 and are summarised in **Table 8-8** below.

Table 8-8: Summary of the data availability and compliance with NAAQS for the ambient data measured at Lephalale (taken from von Gruenewaldt, et al., 2018)

Pollutant	Monitoring Period	Data Availability (%)	Frequency of Exceedance of Hourly NAAQ Limit	Frequency of Exceedance of Daily NAAQ Limit	Annual Average Ground Level Concentrations (µg/m³)	Within Compliance with NAAQS (Y/N)
SO_2	2013	93	0	0	7	Y
	2014	96	2	0	6	Y
NO_2	2013	93	0		14	Y
	2014	98	2		13	Y
PM_{10}	2013	93	NA	4	32	Y
	2014	98	NA	0	23	Y
$PM_{2.5}$	2013	93	NA	0 [a]	14	Y
			NA	4 [b]		Y
			NA	40 [c]		N
	2014	98	NA	0 [a]	12	Y
			NA	1 [b]		Y
			NA	17 [c]		N

The measured SO_2, NO_2 and PM_{10} concentrations were within NAAQS at Lephalale for the period January 2013 to November 2014. The $PM_{2.5}$ concentrations measured at Lephalale are within the NAAQS applicable till 2029 but exceed the more stringent NAAQS applicable in 2030.

The measured NO_2, PM_{10}, $PM_{2.5}$ and SO_2 short-term ground level concentrations from the Marapong monitoring station operated by Eskom for the period January 2013 to November 2014 are provided in **Table 8-9**.

The measured SO_2 and NO_2 concentrations are within NAAQS at Marapong for the period January 2013 to November 2014, however the PM_{10} concentrations exceed the NAAQS at Marapong for the period 2013 and 2014. $PM_{2.5}$ concentrations at Marapong are within the NAAQS applicable till 2029 but exceed the more stringent NAAQS applicable in 2030.

Table 8-9: Summary of the data availability and compliance with NAAQS for the ambient data measured at Marapong (taken from von Gruenewaldt, et al., 2018)

Pollutant	Monitoring Period	Data Availability (%)	Frequency of Exceedence of Hourly NAAQ Limit	Frequency of Exceedence of Daily NAAQ Limit	Annual Average Ground Level Concentrations (µg/m³)	Within Compliance with NAAQS (Y/N)
SO_2	2013	92	12	1	19	Y
	2014	66	3	0	17	Y
NO_2	2013	98	21		18	Y
	2014	47	0		15	Y
PM_{10}	2013	94	NA	87	59	N
	2014	36		18	40	N
$PM_{2.5}$	2013	90		0 (a)	15	Y
				3 (b)		Y
				34 (c)		N
	2014	94		0 (a)	11	Y
				1 (b)		Y
				5 (c)		N

Air quality sensitive receptors located around the study area include residential areas such as Marapong northeast of the existing Matimba Power Station, a residential settlement to the northwest of Matimba Power Station and Lephalale situated to the southeast and east of the existing power station respectively. Farm households are scattered through the area, with livestock farming (primarily cattle and game) representing the main agricultural land-use in the area.

8.7.3 Air Quality at MPS

Onsite emissions associated with construction and operations at the MPS were qualitatively considered by the air quality specialist. The specialist identified that PM_{10} and $PM_{2.5}$ emissions due transportation of limestone and waste generating nuisance dust were potential impacts that needed consideration. Limestone will need to be transported to site for the FGD and the sludge and salts will be transported from site to a licenced facility, after storage at a temporary hazardous waste storage facility on site.. The transport of these materials and waste will be undertaken by trucks. The trips per day (as provided by the proponent) were given as 13 and 69 for waste (salts and sludge) and limestone, respectively, when all six units are operational.

In the specialist' opinion various local and far-field sources are expected to contribute to the suspended fine particulate concentrations in the region. Contributing local dust sources include wind erosion from exposed areas, fugitive dust from mining and brickmaking operations, vehicle entrainment from roadways and veld burning, while household fuel burning may also constitute a local source of low-level emissions.

8.8 Noise

Information relating to noise within the proposed study area was obtained from the Noise Specialist Report undertaken by Airshed Planning Professionals (von Gruenewaldt & von Reiche, 2018), including literature sited within this report. This specialist study report is included in **Appendix G-7** to this DEIR.

Noise is generally defined as unwanted sound transmitted through a compressible medium such as air. Sound in turn, is defined as any pressure variation that the ear can detect. Human response to noise is complex and highly variable as it is subjective rather than objective. Noise is reported in decibels (dB). "dB" is the descriptor that is used to indicate 10 times a logarithmic ratio of quantities that have the same units, in this case sound pressure.

In South Africa, provision is made for the regulation of noise under the National Environmental Management Air Quality Act, No 30 of 2004 (NEMAQA), but environmental noise limits have yet to be set. It is believed that when published, national criteria will make extensive reference to South African National Standard (SANS) 10103 of 2008 '*The measurement and rating of environmental noise with respect to annoyance and to speech communication*'. These guidelines, which are in line with those published by the International Finance Corporation (IFC) and World Health Organisation (WHO), were considered in this noise assessment.

8.8.1 Noise within the study area

Since the perception of noise is subjective to the observer over a fairly short distance no regional description of noise levels is possible. The noise levels at the study site is however characterised by existing construction activities associated with the construction of the MPS.

Noise Sensitive Receptors (NSRs) generally include private residences, community buildings such as schools, hospitals and any publicly accessible areas outside the industrial facility's property. Homesteads and residential areas which were included in the assessment as NSRs were identified from available maps and satellite imagery. The NSRs identified during the noise assessment study is shown geographically in **Figure 8-20** below.

Airshed conducted a baseline noise survey on 3 September 2015 at three locations around the MPS. The survey consisted of 60 minute samples during the day and 30 minute samples during the. For noise measurements conducted in September, the equivalent day/night noise levels at 2 of the locations correspond to typical noise levels prevalent in suburban districts. The equivalent day/night noise levels at the third location correspond to typical noise levels prevalent in a central business district, which is as a result of fast travelling heavy vehicles on the road in the vicinity of the sampler.

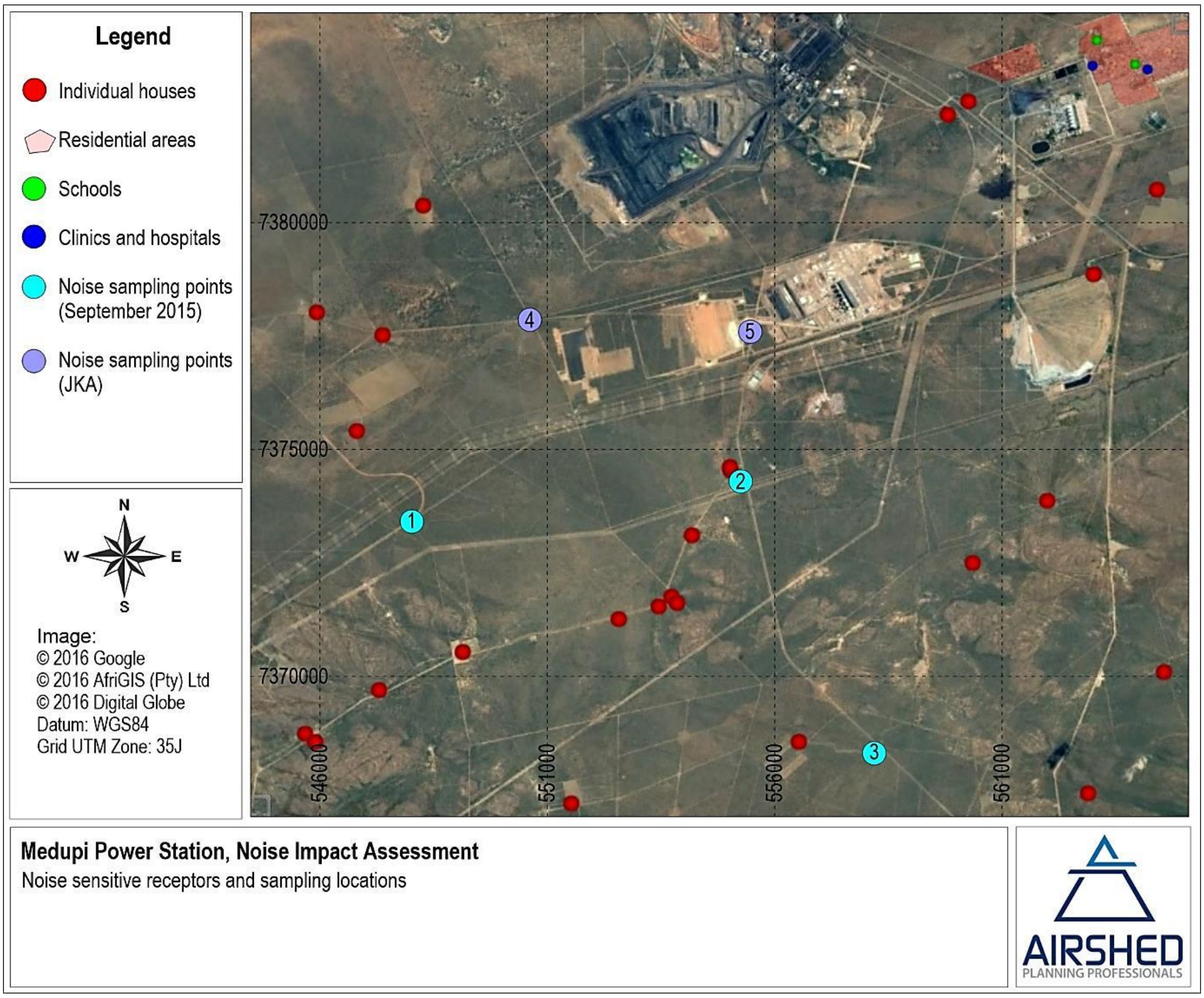


Figure 8-20: Location of identified NSRs surrounding the MPS

For the assessment, an access road was assumed for the transport of the sludge and salts from the site for illustrative purposes. The simulated equivalent continuous day-time rating level ($L_{Req,d}$) of 55 dBA (noise guideline level) extends ~70m from the road. The results for the day-time simulation are presented in isopleth form in **Figure 8-21**.

The simulated equivalent continuous night-time rating level ($L_{Req,n}$) of 45 dBA (noise guideline level) extends ~100m from the road. These distances can be assumed for any road that will be utilised for the transport of the sludge and salts from the site. The results for the night-time simulation are presented in isopleth form in **Figure 8-22**.

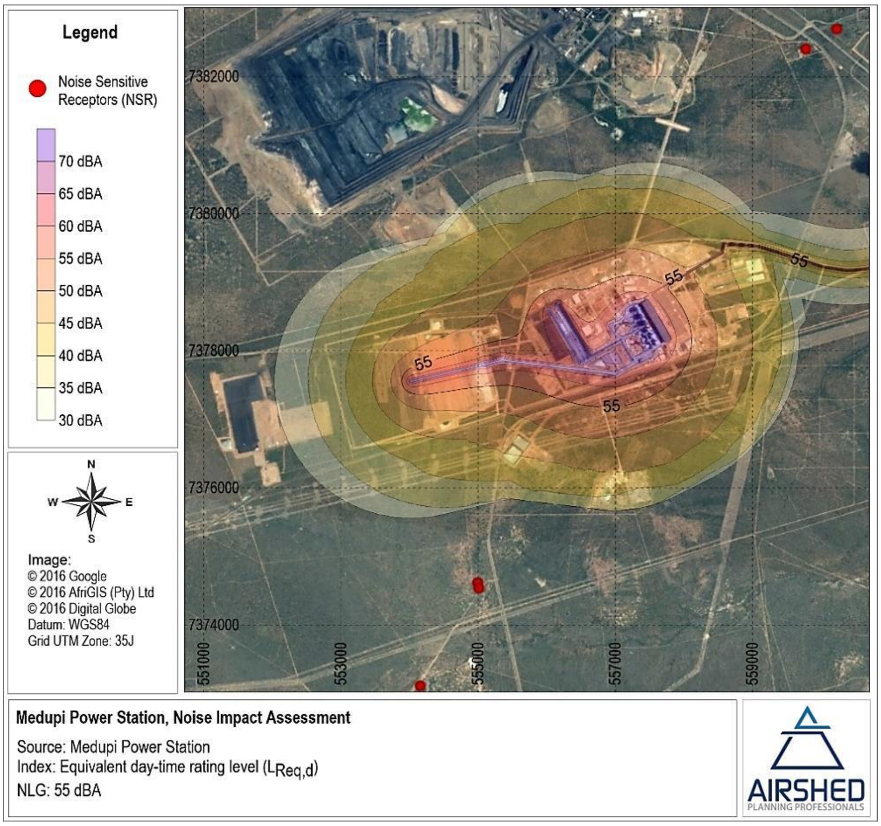


Figure 8-21: Simulated equivalent continuous day-time rating level ($L_{Req,d}$) for project activities

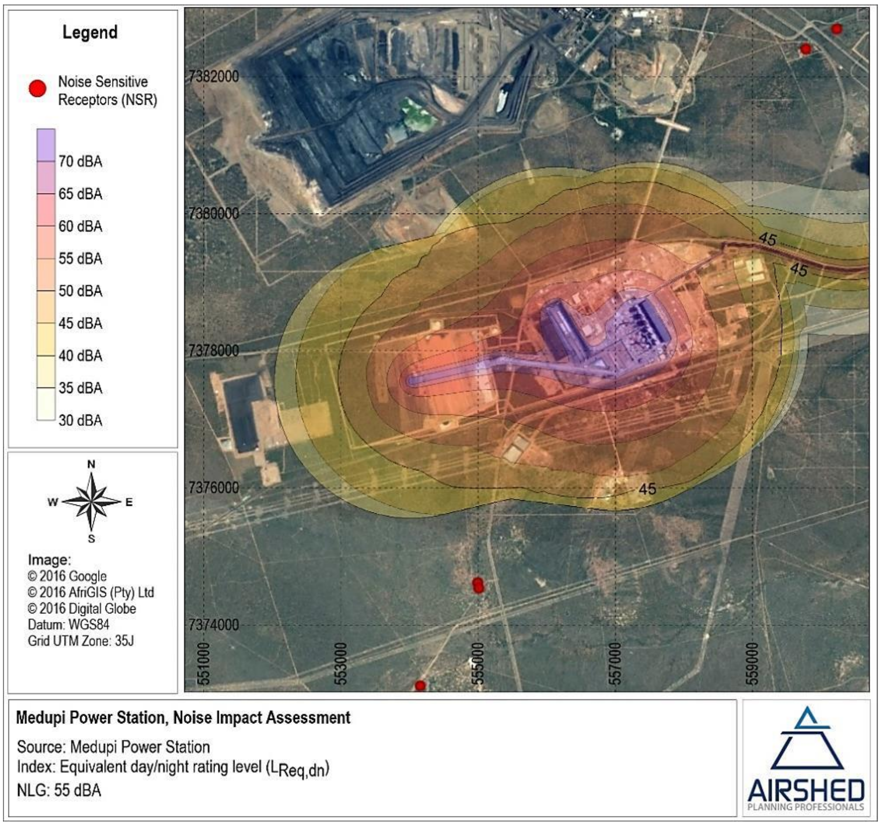


Figure 8-22: Simulated equivalent continuous night-time rating level ($L_{Req,n}$) for project activities

8.9 Socio-economic

Information relating to the social environment within the proposed study area was obtained from the Social Impact Assessment Specialist Report undertaken by NGT Holdings (Tomose, et al., 2018), including literature sited within this report. This specialist study report is included in **Appendix G-8** to this DEIR. Other sources consulted include the Medupi Environmental Impact Assessment Report for the authorisation of the Power Station (Bohlweki; 2006), as well as from the Lephalale Municipality Integrated Development Plan 2017-2018. A Socio-economic report compiled by SRK Consulting (Ismail *et al*; 2013) also provides a more recent summary of the Lephalale Municipality current status.

8.9.1 Regional and local setting

The study area is situated approximately 15km west of Lephalale in the Limpopo Province. The Medupi Power Station is positioned in the area under the jurisdiction of Lephalale Local Municipality (LM), which forms part of the Waterberg District Municipality (DM). The Lephalale LM covers an area of 19 605km^2, and consists of 12 wards with 38 villages.

Lephalale LM is characterised by a mix of human settlements which vary from formal to informal in townships. Marapong is the closest human settlement to MPS and is located approximately 8.6km north-east of the power station. The second closest location is Onverwacht at approximately 10.5km east of the power station. Lephalale Town is third human settlement situated in close proximity to the power station and it is located approximately 12.6km east of Medupi and east of Onverwacht. These three human settlements are located north and east of Medupi and the existing ADF with prevailing winds blowing north-south and north-east to south-west towards Thabazimbi and the village of Steenbokpan (located some 27km west of Medupi). This means that Marapong, Onverwacht and Lephalale will likely not be directly significantly affected by emissions from Medupi as determined by the direction of winds and its variables.

Heavy industries include the newly built Medupi Power Station, the existing Matimba Power Station, Grootegeluk coal mine, Sasol and these are all located west of the town of Lephalale within close proximity to Marapong. A number of new mines are in the planning stages and some have already started operating, mining among other resources coal and platinum among other resources. Coal presents the dominant resources currently being mined in Lephalale due to fact that the Waterberg coal reserves represent 40% of South African coal reserves and are mined to support two coal fired power stations in the area and the Sasol coal-to-liquid petrochemical industry. A third power station is planned in the area and is currently undergoing the approval process.

Land uses of Lephalale LM can be described as a mix of agricultural activities, game farming, cattle ranching, industrial activities such as mining, power generation, domestic and industrial water supply. These activities make up 87% of the total land use of Lephalale LM. Lephalale LM and the Waterberg District are characterised by a number of game farms and conservation areas, with the Waterberg Mountains boasting a national conservation status.

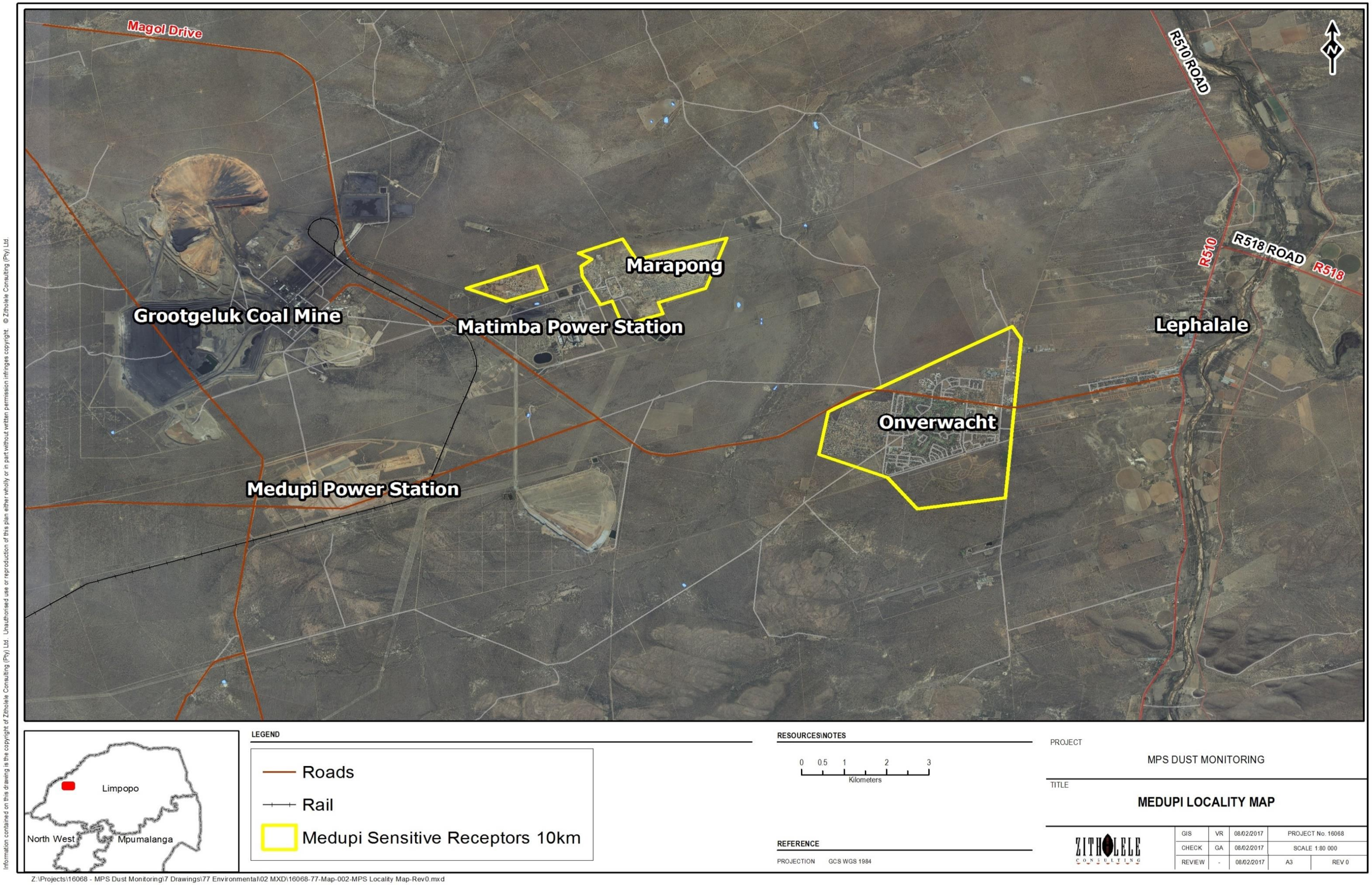


Figure 8-23: Sensitive settlements and communities around the MPS

Within Lephalale LM only one declared conservation area is found and it is situated south-east of the town of Lephalale i.e. D"Njala Nature Reserve.

The study area is characterised by a number of secondary roads, with Nelson Mandela Drive cutting across the Town of Lephalale, past Onverwacht towards MPS. In the east, it joins the R510, which links Lephalale to Thabazimbi in the south, west of Mokolo River. Other secondary roads that are linked to the R510 which provide access to Lephalale include the R518 and R33. A railway line from Grootegeluk mine passes east and south of Medupi Power Station and extends westwards south of the existing ADF, then south towards Thabazimbi. This is the only documented railway line within the study area.

8.9.2 Population Dynamics in Lephalale LM

The Local Economic Development Strategy for Lephalale LM indicate that the population in Lephalale has increased by 45% between 2001 and 2014 from 85 155 to 123 869 (**Figure 8-24**) (LM IDP, 2016-2017 statistics as cited in (Tomose, et al., 2018). Latest statistics reported in the Integrated Development Plan (IDP) for the LM indicate that total population size is around 140 240 residents (Lephalale LM, 2017).

Population growth in the Lephalale town node is among the highest in the Limpopo Province. The surge in population is also experienced south of Lephalale LM; for example, Thabazimbi has experienced a population increase of 35%, Mookgopong an increase of 13%, Modimolle an increase of 11%, Bela-Bela an increase of 36% and Mogalakwena recorded an increase 11% in the same period. In Lephalale LM the influx can be directly attributed to the construction of the Medupi built coal fired power station project and associated ancillary infrastructure. An assumption was also made that the overall increase in population in the region could be as a result of projected future projects associated with the Waterberg coal fields e.g. the expansion of the mining industry as well as coal-to-liquid petrochemical industry project such as Sasol Mafutha 1 in Lephalale (Tomose, et al., 2018).

The latest key population statistics was reported in the Lephalale LM IDP of 2017-2018 and is shown in **Table 8-10** below.

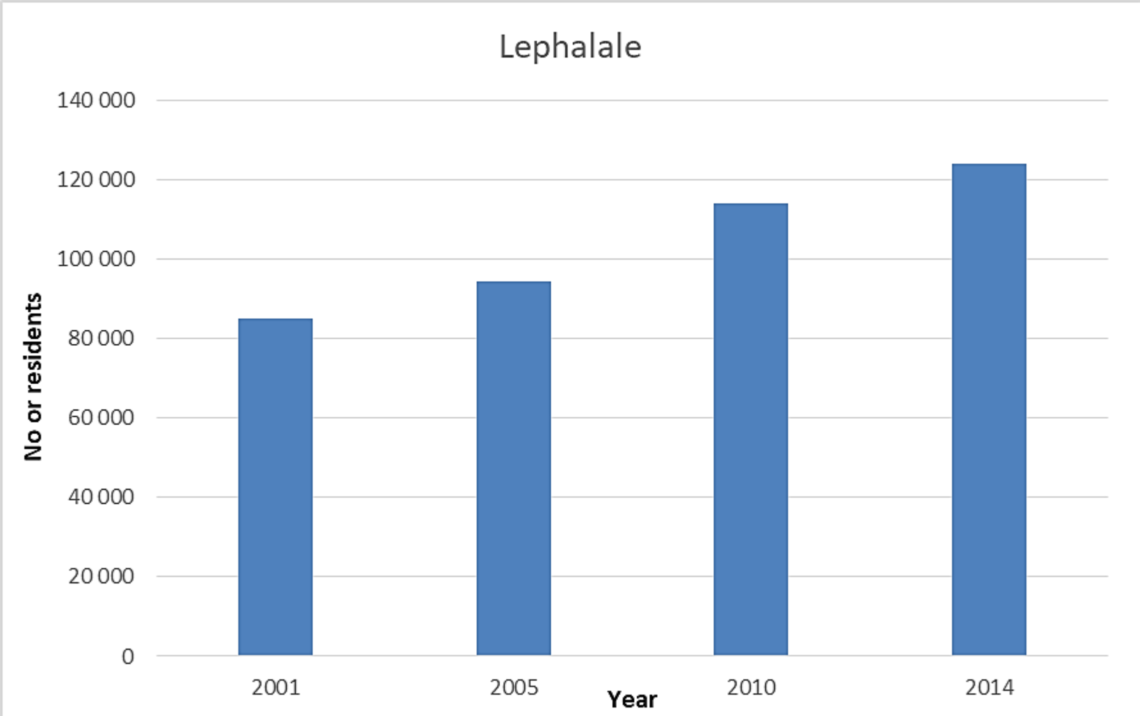


Figure 8-24: Total Population of Lephalale LM 2001-2014 (adapted from Tomose, et al., 2018)

Table 8-10: Key population statistics in Lephalale LM (Lephalale LM, 2017)

Total Household	43 002	100%
Total Population	140 240	100%
Young (0 – 14)	40 358	29.20%
Working Age	95 103	54.80%
Elderly (65+)	5 403	3.50%
Dependency ratio	35 136	33.20%
Sex ratio	121 -5. 6	21-1
Growth rate	2011 - 2016	13.50%
Population density	8 person per km²	
Unemployment rate	2016	22.20%
Youth unemployment rate	2016	27%
No schooling aged 20+	3 769	6.20%
Higher education aged 20+	12 615	16.40%
Matric aged 20+	16 579	23.50%
Number of households	430 002	
Number of agricultural households	6 757	22.60%
Average household size	3.2	
Female headed households	16 443	39.10%
Formal dwellings	34 610	82.30%
Flush toilet connected to sewer	17 536	41.60%
Piped water inside dwelling	17 390	41.30%
Electricity for lighting	37 602	89.40%

8.9.3 Education and Skills Levels in Lephalale LM

Lephalale LM has a total of 94 various educational facilities spread throughout the municipality. According to the LM's IDP report (2015-2016), more than 95% of the population is within 30 minutes walking distance to the nearest education facility. Accessibility to schools in the rural areas is relatively good particularly for primary schools. This is not the case with regards to secondary schools as there are still students who stay more than 10km away from the nearest education facility. Access to secondary education has resulted in low numbers of pupils proceeding to tertiary education. The assumption is made that this could be as the result of learners being despondent of traveling long distance to go to school and the cost of public transport resulting in absenteeism and poor learner performance at the end of the year prohibiting them to proceed further with their education.

In terms of overall performance, the LM seems to be slightly higher than the Waterberg DM and Limpopo Province in terms of education levels but not sufficient to respond to the needs of the growing economy such as that of Lephalale. Statistics on level of education within the Lehpalale LM, Waterberg DM and Limpopo Province is presented in Figure 8-25.

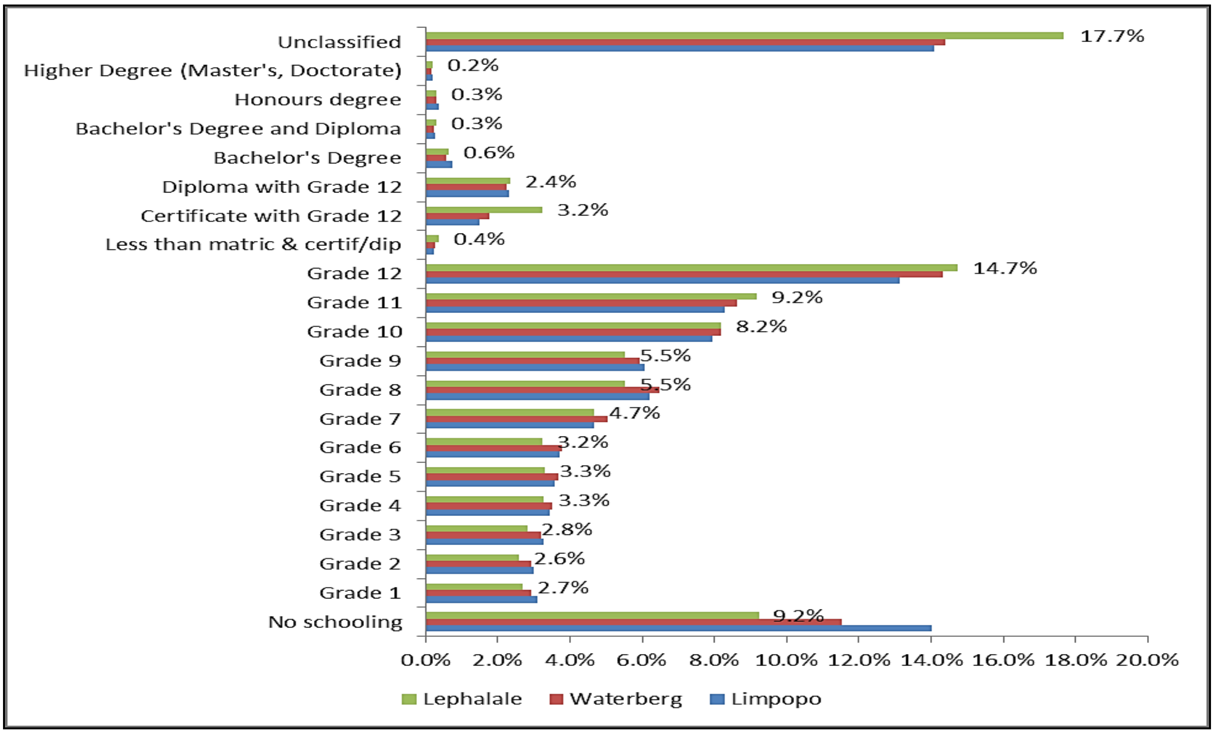


Figure 8-25: Education levels within the Lephalale LM, Waterberg DM and Limpopo Province (taken from Tomose, et al., 2018)

8.9.4 Community Health and Wellness in Lephalale LM

The World Health Organisation (WHO) in 2012 reported that one in eight deaths in the world is due to air pollution. The pollution is either ambient (outdoor) or indoor. WHO further concluded that 88% of premature deaths in middle and low income countries whose economy is coal based to ambient pollution. South Africa is one of such countries whose economy is coal based economy.

In Lephalale, coal is the main source of pollution throughout its life cycle: from extraction, combustion through to disposal. It contributes to pollution of both ambient and domestic air through a wide range of pollutants such as PM (particulates/dust), SO_2, NO_2, O_3 (Ozone) (Itzkin, 2015, as cited in (Tomose, et al., 2018)). Liquid fossil fuel burnt/used by cars contributes to carbon monoxide (CO), while other known general pollutants include lead and volatile organic compounds.

A study undertaken by Itzkin (2015) provides a good insight into amount of pollution experienced by the people in the Waterberg as the result of the combustion of coal. **Figure 8-26** presents a correlation between illnesses generally associated with the combustion of coal and illnesses diagnosed in residents of Lephalale, Marapong and Steenbokpan in the Lephalale LM (Tomose, et al., 2018).

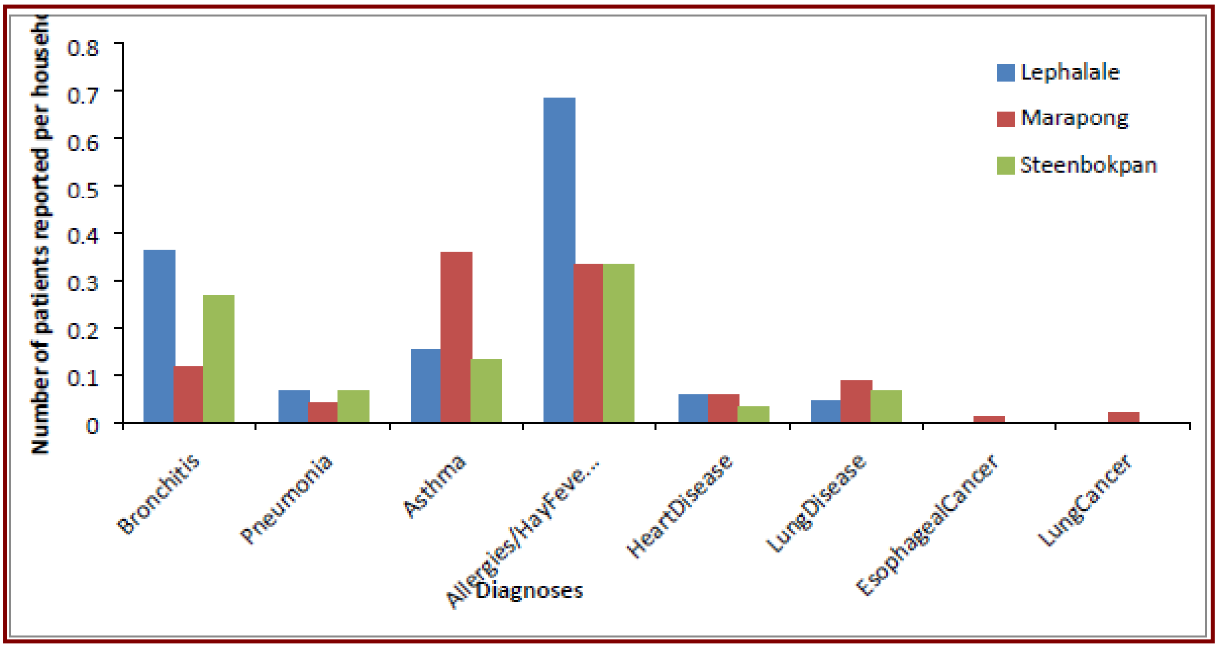


Figure 8-26: Diagnoses of those who went to seek medical assistance for Lephalale, Marapong and Steenbokpan represented as average number per household (from Itzkin, 2015 as cited by Tomose, et al., 2018)

8.9.5 Economic development in Lephalale LM

The Lephalale LM is currently in the second stage of considerable public sector investment which is estimated at R140 billion over six years. With the anticipated Eskom developments, Coal miners are planning developments to meet the increased demand for coal. One such is the Grootegeluk coal mine owned by Exxaro. As part of its mining expansion programme, Exxaro has announced that it will be constructing a new coalmine named Thabametsi. Exxaro is also targeting the development of a 1 200MW independent power plant to be attached to the new mine.

The new coal mines and power stations could lead to a six-fold increase in households in and around Lephalale. This will create a significant demand for building materials and will have positive implications for retail, service and small industry development and it is predicted that the life expectancy of the economic boom will be 30 years due to the additional power station and all the mining activity.

8.9.6 Employment Rate and Occupation in Lephalale LM

The rate of unemployment in Lephalale is at 22.2%, which is well below the provincial average of 32.4% as per the 2011 national census. Unemployment amongst the youth currently stands at 27%, also below the Limpopo provincial average of 42%. This is due in large measure to local developments associated with Medupi power station and the expansion of coal production from the mines which can be taken to have absorbed a lot of the latent labour force.

Sector employment has changed considerably over the last 2 decades with a noticeable drop in agriculture related employment, contrasted by a noticeable increase in mining related employment opportunities since the early 2000s. This is clearly indicated in **Figure 8-27** below.

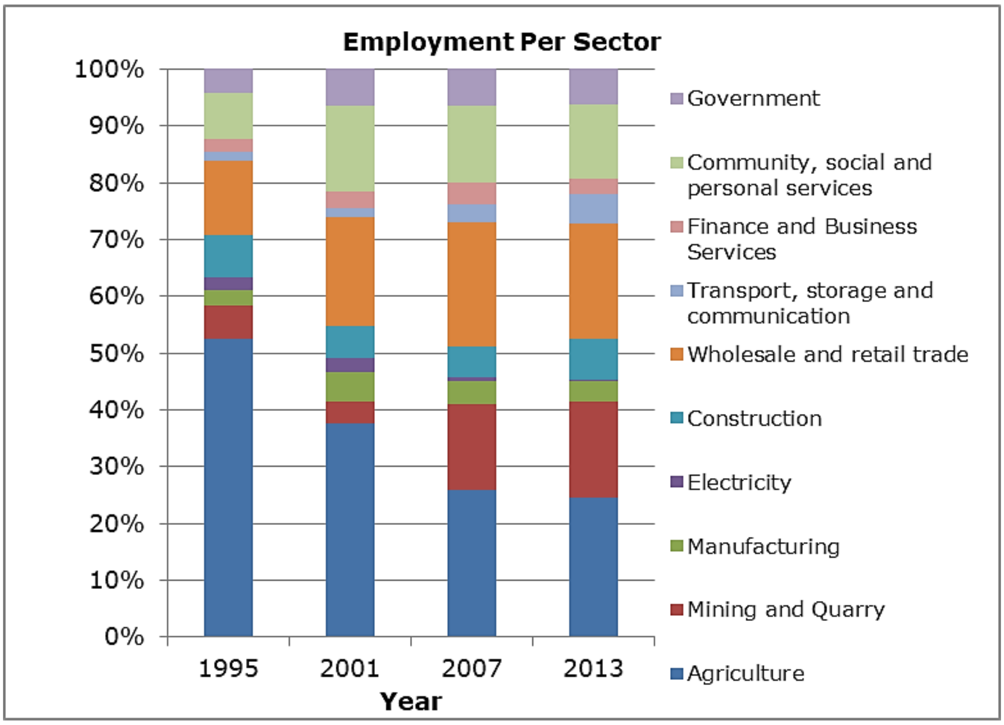


Figure 8-27: Sector Employment within Lephalale LM (taken from Tomose, et al., 2018)

8.9.7 Water resources

Mokolo Dam is a large dam supplying the Lephalale LM and was constructed in the late 1970s and completed in July 1980 (DWS, 2009, as cited in Tomose, et al., 2018). The aim of the dam was to supply water to Matimba Power Station, Grootegeluk coal mine, Lephalale LM for irrigation purposes downstream of the dam (agricultural activities). Therefore, it can be argued that before 2008 Lephalale LM solely depended on the Mokolo Dam for its water.

Due to the rapid industrial growth and urbanisation, the Mokolo Dam could not meet the water supply to the Lephalale LM post 2008. The Department of Water and Sanitation commissioned the Mokolo Crocodile (West) Water Argumentation Project (MCWAP) to meet future water demands in Lephalale LM. MCWAP was staged into two phases, namely Phase 1 and Phase 2.

Phase 1 (augmentation of existing water supplies) aimed at providing drinking quality water to industries and municipality and Phase 2 (transferring the surplus effluent return flow from the Crocodile River (West) / Marico WMA) aimed at providing low quality water to industries. Among the known stakeholders who participated in the project and who require water in the area for current and future needs are the Lephalale LM, Eskom (Matimba, Medupi + 4 coal fired power stations), IPPs, Grootegeluk Mine (coal mining), Exxaro Projects and Sasol (Mafutha 1).

Ninety two (92%) percent of water infrastructure in the Municipality is over 20 years old, while sixteen percent (16%) of the water service system has been identified as being in poor to very poor condition. Additional challenges that are faced around water infrastructure include:

- Poor borehole yields in rural areas.
- Bulk water services in urban areas have reached full utilization.
- Illegal connections in rural areas.
- Lack of accountability to water losses.
- Limited availability of ground water in rural areas.
- Low quality of drinking water in rural areas.

8.9.8 Sanitation services

Sanitation is another social service that is directly linked to the availability of water resources. The assessment of this infrastructure within the project area around Medupi power station has found that 94% of waterborne sanitation infrastructure in the municipality is over 20 years old. About 15% of the sanitation network had been identified as being in very poor condition. The assets have experienced significant deterioration and may be experience impairment in functionality and will require renewal and upgrading (Lephalale Local Municipality, 2014, as cited in Tomose, et al., 2018).

Problems noted around the question of sanitation are that there is a need to redesign the existing sewer networks in Lephalale Town and Onverwacht to reduce the number of pump stations. Further, the area does not have sufficient water resources and infrastructure to accommodate a waterborne sanitation system for all households. More than 50% of households in the municipality are without hygienic toilets (**Table 8-11**). Sanitation backlog is estimated to be 14 250 units, mostly in the farms and rural village. Other than what will be distributed by the Phase 2 MCWAP, there is no clear indication on what percentage of low quality (effluent) water will be derived from the existing Lephalale LM sanitary infrastructure.

Table 8-11: Sanitation within the Lephalale LM (taken from Tomose, et al., 2018)

Type of Toilet	1995		2001		2007		2013	
	No of household	%	No of household	%	No of household	%	No of household	%
Flush or chemical toilet	6,367	33%	9,190	45%	12,119	44%	13,784	45%
Pit latrine	9,647	50%	11,240	54%	12,723	46%	14,435	47%
Below RDP	3,384	17%	207	1%	2,835	10%	2,518	8%
Total	**19,397**	**100%**	**20,638**	**100%**	**27,677**	**100%**	**30,737**	**100%**

8.10 Heritage, Archaeology and Palaeontology

Information relating to the heritage, archaeological and palaeontological resources within the proposed study area was obtained from the Heritage Impact Assessment Specialist Report (Tomose & Sutton, 2018) and Palaeontological Impact Assessment Specialist Report (Tomose & Bamford, 2018) undertaken by NGT Holdings, including literature sited within this report. This Heritage and Archaeological Assessment specialist report is included in **Appendix G-9,** while the Palaeontological Assessment specialist report is included in **Appendix G-10** to this DEIR.

South African cultural heritage extends as far back as 2.0 million years ago (mya) in the form of Stone Age artefacts that represent some of the earliest tool types found. The South African archaeological record covers all the Stone Age periods, Iron Age periods and more recent historical periods. This rich cultural heritage also includes culturally significant places on the landscape that became important to the many varied groups of people that once lived here and whose descendants continue to live here.

8.10.1 Regional heritage, archaeological and palaeontological setting

There have been recorded scattered finds of Stone Age sites, rock paintings and engravings in the larger region. Most of the Stone Age sites can be classified as open (surface) sites which imply that most of the artefacts occur in secondary context. There are a number of known Stone Age sites in the Limpopo Province.

Southeast of the study area, but less than 150km away, is Makapansgat. This site complex includes the Makapansgat Lime Works site which has yielded fossils dated to greater than 4.0 mya. The Lime Works has also yielded hominin fossils of *Australopithecus Africanus* (Tobias, 1973; Reed et al., 1993, as cited in Tomose & Sutton, 2018). Adjacent to the Lime Works is Cave of Hearths. This site has one of the longest sequences of occupation in southern Africa, yielding Early Stone Age (ESA) tools beyond 300k years old up to Later Stone Age artefacts.

Southwest in the Waterberg Plateau area a number of Middle Stone Age (MSA) and Late Stone Age (LSA) sites have been identified.

A large (9,000ha) survey undertaken northwest of the current area identified a number of MSA sites. The scatters of artefacts were primarily located in the calcrete pans of the area. They identified the technological attributes of the stone tools to a post-Howiesons Poort industry that falls <70k years ago. However, no formal sites or sites within primary context were noted. One Rock Art site has been noted in the area. Nelsonskop, near Lephalale contains engravings and cut markings on the rock face (van Schalkwyk, 2005, as cited in Tomose & Sutton, 2018).

Further west in Limpopo along the Makgabeng Plateau there is a higher density of Iron Age evidence. The region has yielded pottery of the Eiland style that falls in the late Early Iron Age. The Eiland facies is contemporary with one of the more important Limpopo Iron Age sites, Mapungubwe.

A number of heritage assessment reports have been conducted in the wider area that reflects varying degrees of heritage present. While these reports did not cover the current project footprint, areas around the project have been surveyed.

8.10.2 Heritage, archaeological and palaeontological resources within the study site

Known archaeological resources within the MPS footprint include Stone Age occurrences, Rock Art, Iron Age occupations and historical activity. The Phase II HIA study of the MPS footprint conducted by Mbofho Consulting and Project Managers has resulted to information that has been used to construct the receiving environment showing areas known to have contained graves. These are graves that according to the local communities were destructed with the construction of Medupi PS and the associated infrastructure.

The study undertaken by Tomose & Sutton (2018) did not result to the identification of any heritage resources. A survey of the existing ADF footprint and the Medupi precinct in which the FGD technology and the proposed railway yard is to be constructed was undertaken by Nkosinathi Tomose in January 2018. The proposed development area for the construction of the FGD technology and the proposed railway yard has been significantly transformed through previous construction activities. For example, the foundations for the FGD technology are within an area that was deeply excavated during the construction of the Medupi PS six units. The proposed railway yard is within an area where there has been disturbances associated with Medupi PS associated infrastructure such as storm water management systems, the existing ADF and site roads.

A potential grave site, however, was identified outside of the current project footprint for the rail yard and FGD infrastructure, but could potentially be impacted by additional construction and expansion of the area. This grave is situated between the Medupi Power Station and the existing ADF (**Figure 8-28**). A summary of the possible grave site is provided in **Table 8-12** below. From **Figure 8-28** it is clear that the possible grave site is located outside the proposed footprint for the rail yard (green triangular shape), conveyor alignment (yellow shape) and FGD infrastructure (blue shape) within the MPS.

Table 8-12: possible grave site located between the MPS and ADF

Site	EMFGD 03 Grave
Type	One possible grave
Location/Coordinates	S23˚ 42' 26.8″ E027˚ 32' 49.5″
Density	One grave, Low Density
Approximate Age (> 60 or <60 years old) or Archaeological Time Period	> 60 years (date is unknown) SAHRA regulations stipulate graves with unknown dates be treated as >60 years
Applicable Section of the NHRA, No 25 of 1999:	Section 36
Site Description:	The possible grave has still not been confirmed as an actual grave. But should be confirmed and area fenced and treated as a no-go area with a 10 meter buffer (*Figure 12*).

Figure 8-28: Aerial map of the area reflecting the location of a possible grave site between the MPS and ADF

With regard to palaeontological resources (fossils), the area to be developed lies on the Sandriviersberg and Mokalakwena Formations, (Kransberg Subgroup, Waterberg Group) which are sandstones and conglomerates 1700 to 2000 million years old and so pre-date any large bodied fossil plant and any vertebrate fossil. Micro-organisms such as algae had evolved by this time but they do not preserve in conglomerates. Sandstones are usually too coarse to preserve such small fossils. The Palaeontological Desktop Study determined that there are no palaeontological fossils or material exists within the geology of the area.

8.11 Traffic Impact

Information relating to the traffic movements and impacts within the proposed study area was obtained from the Traffic Impact Assessment Specialist Report undertaken by Hatch Goba (Venter, 2017), including literature sited within this report. This specialist study report is included in **Appendix G-11** to this DEIR.

8.11.1 Existing road network

The major routes in the study area are the R518 and R510 which links Lephalale to the N1 and Nelson Mandela Drive connects Lephalale with Medupi and Marapong, while the minor routes surrounding Medupi Power station are the D1675 and Afguns Road (**Figure 8-29**).

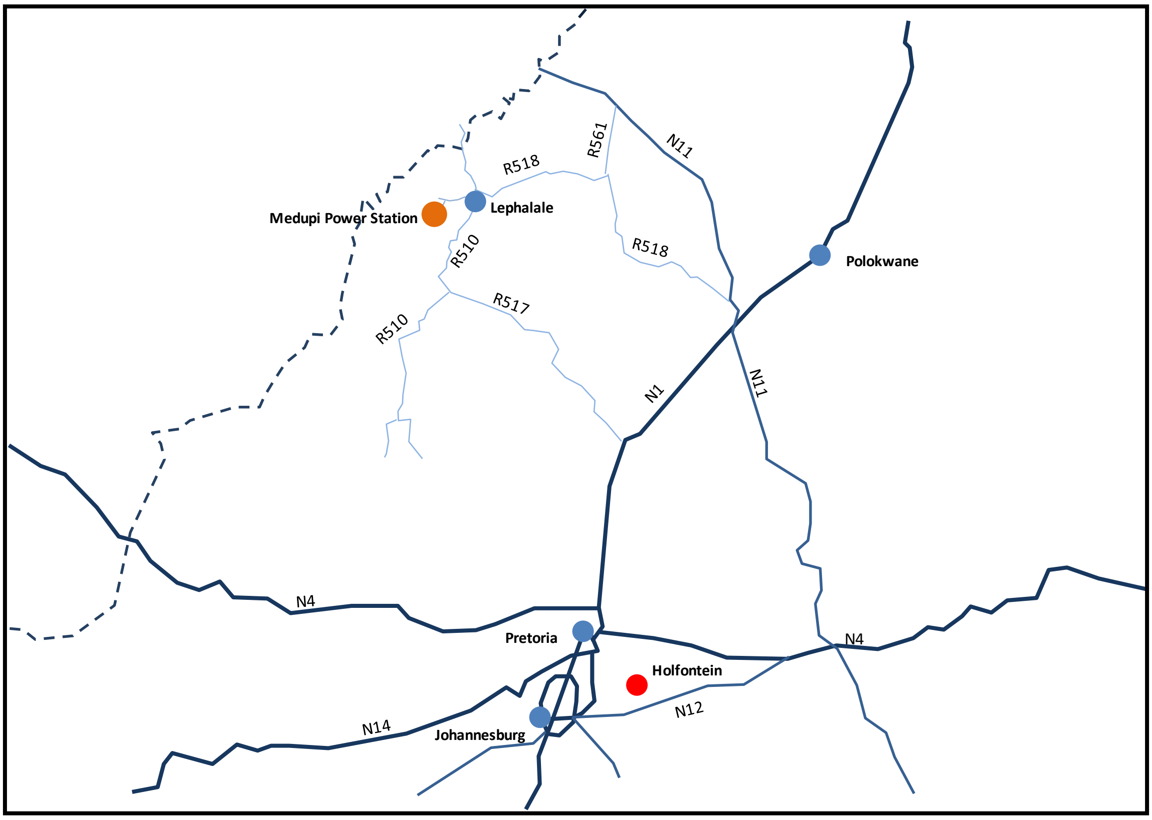


Figure 8-29: External road network to and from the MPS (taken from Venter, 2017)

The most direct traffic route from Johannesburg uses the N1 to reach regional roadways R33, R517, and R510. A single rail line services the Exxaro Grootegeluk coal mine and Medupi Power Station, running approximately north/south adjacent to R510 highway. This line passes through the towns of Thabazimbi, Amandelbult, and Rustenburg.

The closest South African ports to the project site are Durban (925 km, approximately a 9-hour drive via highways N3, N1, R33, R517, and R510); Port Elizabeth (1,445 km, approximately a 14-hour drive via highways N2, N10, N1, R33, R517, and R510); and Cape Town (1,768 km, approximately a 17.1/2-hour drive via highways N1, R33, R517, and R510).

8.11.2 Traffic at the MPS

The FGD plant is situated more or less in the middle of Medupi, and access to this plant will either be from Entrance Gate 1, 2 or 4 (**Figure 8-30**).

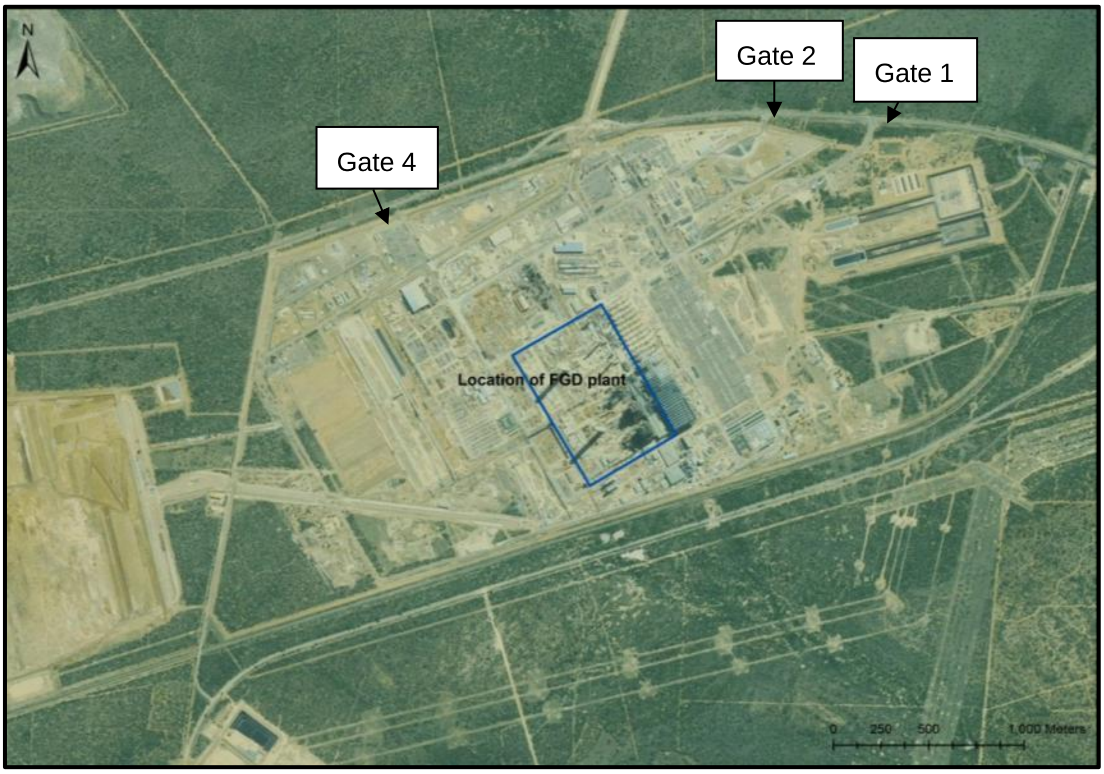


Figure 8-30: Access gates at the MPS

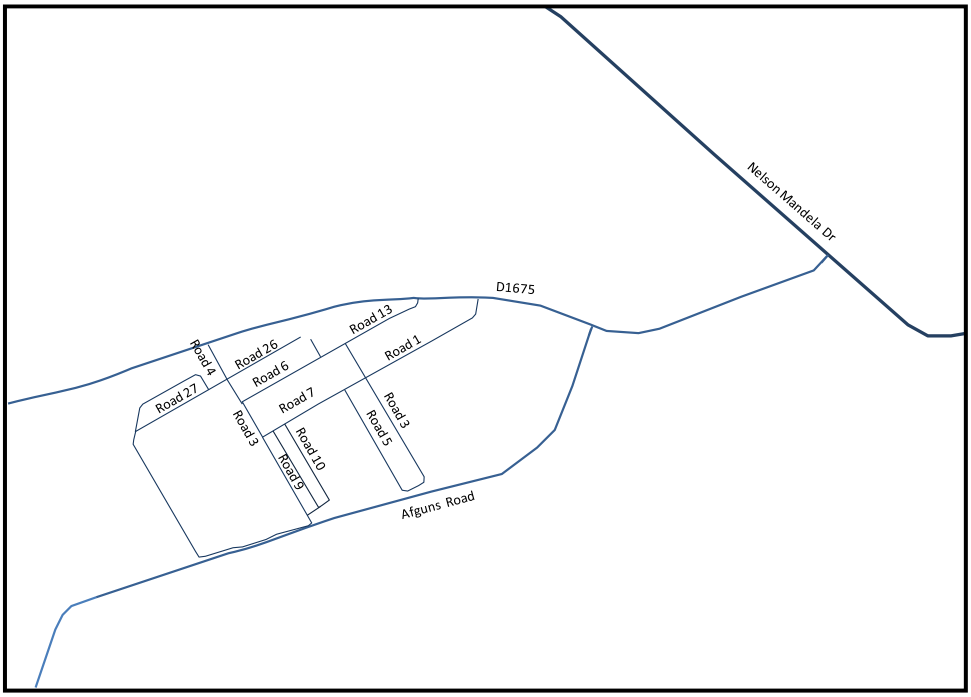


Figure 8-31: Internal road network at MPS

Nelson Mandela Drive and the Afguns Road provides access to Medupi Power station, following onto the D1675 and then through Entrance Gate 1, 2 or 4. Afguns road provides access to farms in the area and connects with the R510 further south (**Figure 8-31**).

The peak hour was identified as 16:00 to 17:00 for the 24-hour period. Traffic counts were undertaken at two locations at junctions along internal roads outside the MPS. The results from a traffic count undertaken at the main access point from Nelson Mandela Drive are shown in **Figure 8-32** below.

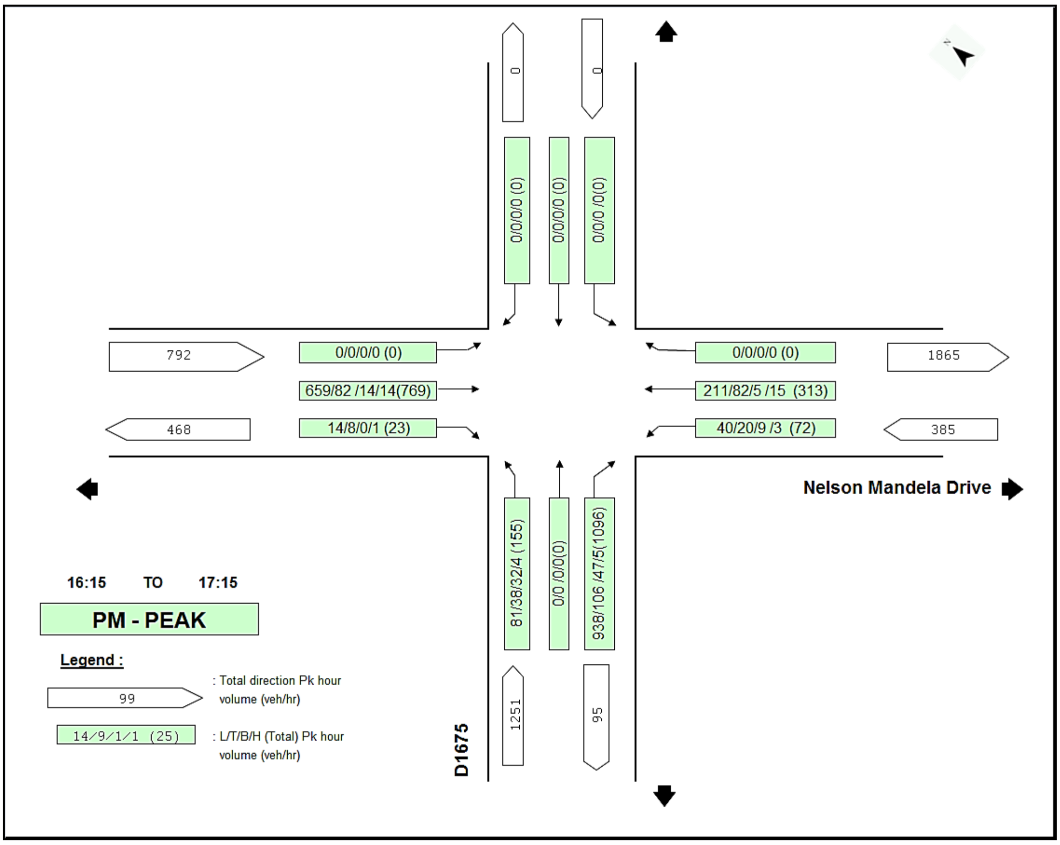


Figure 8-32: PM peak hour traffic volumes – Nelson Mandela Drive/D1675

Level of Service (LOS) ratings have been used to evaluate the existing and future traffic situation. LOS tries to answer how good the present traffic situation is at a particular intersection. Thus it gives a qualitative measure of traffic in terms of delays experienced. It is represented by six levels ranging from level A to level F. Level A represents minimal delays where the driver has the freedom to drive with free flow speed and level F represents uncomfortable conditions accompanied by long delays

Nelson Mandela Drive / D1675 and D1675 / Afguns Road intersections currently operates at a LOS F for the northbound movement during the PM peak hour, and a LOS A for the west- and eastbound movement.

This indicates that it operates well within capacity for the priority movement, but the vehicles coming from Medupi Power Station and Afguns road, wanting to turn into Nelson Mandela Drive are struggling to find a gap and long delays are experienced by motorists.

9 KNOWLEDGE GAPS, LIMITATIONS AND SCOPE CHANGES

Knowledge gaps, assumptions and limitations that have been identified by the EAP and specialists are provided in the following sections.

9.1 Information and data limitations

- Confirmation regarding the source of limestone could not be confirmed during the compilation of the EIR and as such potential impacts associated with the transport of limestone to the MPS was not be considered in this EIA.
- Due to the fact that the source of limestone has not been confirmed, possible impacts associated with the long haul of limestone could not be considered. The scope of this EIA thus considered possible impacts from the point the proposed rail infrastructure ties off from the mainline that runs between Thabazimbi and Lephalale.
- The disposal of WWTP salts and sludge could only be considered in the short term with Eskom's interm measure to truck these wastes to an appropriately authorised landfill site, e.g. Holfontein Waste Disposal Facility. A worst case scenario is that Eskom must truck all gypsum generated once all generation units are operational, however no feasibility assessment has been undertaken to confirm the sustainability and financial feasibility of this. Impacts associated with the trucking of WWTP wastes beyond 5 years are therefore not considered in this EIA.

9.2 Specialist study limitations

Knowledge gaps, assumptions and limitations have been highlighted in the sections below only for specialists that reported on such limitations in their assessment reports. Some specialists, however, did not note any limitations and knowledge gaps.

9.2.1 Groundwater Assessment

The following groundwater information gaps were identified:

- Limited existing groundwater data and borehole information are available for the existing licensed disposal facility. Additional groundwater information may be required for the existing licensed disposal facility;
- The only available aquifer parameters were defined by Groundwater Complete (2017) on five existing monitoring boreholes and at Medupi Power station during 2008 (IGS) and 2009 (Golder). More site specific aquifer parameters are required to the north and west of the existing licensed disposal facility. Hydraulic conductivity (k) and Transmissivity (T) are values that indicate the rate at which groundwater flows in the subsurface. These aquifer parameters can be highly variable in the aquifers systems due to the different geological unit's sandstone, shale, clay, mudstone and coal and geological conditions (faults, dykes, sills, and weathering) that apply. These hydraulic parameters are essential to understand and update the conceptual model and form the basis for estimating

potential contaminant migration rates. These are calculated from borehole testing results.

9.2.2 Surface Water Impact Assessment

The following limitations and assumptions have been made in this specialist study:

- No flow and rainfall data against which the runoff calculations might be calibrated were available. The runoff volumes were therefore calculated theoretically;
- Since there is very limited flow data available for a precise estimation of the roughness coefficients, the Manning's 'n' coefficients were estimated by comparing the vegetation and nature of the channel surfaces to published data (Webber, 1971, as cited in (Sithole & Jordaan, 2018), therefore slightly conservative estimations were adopted.
- With regard to the specialist opinion provide for trucking of salts and sludge, the nature of materials being transported, the mode of transportation, the route chosen for transportation, and the distance over which the materials are transported were of most significance in assessing the potential surface water impacts;
- The assumption was furthermore made that the hazardous waste disposal facility where salts and sludge would be trucked to is within a 15km radius of MPS, the mode of transportation is trucks, and the transportation route does intersect with surface water resources;

9.2.3 Biodiversity (Terrestrial Ecology) and Wetlands

The following limitations and assumptions have been made in this specialist study:

- It is important to note that the absence of species on site does not conclude that the species is not present at the site. Reasons for not finding certain species during the different visits (all conducted in mid-summer) may be due to:
  - The fragmented nature of the remaining natural vegetation within the boundary of the Medupi Power Station FGD Project area.
  - The duration of fieldwork and the period at which rainfall events took place. I.e. while the December 2015 fieldwork took place during a heavy rainfall period – this was beneficial for faunal species. Floral species require some growth time after such events.
  - Some plant species, which are small, have short flowering times, rare or otherwise difficult to detect may not have been detected even though they were potentially present on site.
- As an alternative to other vegetation cover methods (such as the Domin method), the Braun-Blanquet cover-abundance scale was used to analyse vegetation. It is reported that the Braun-Blanquet method requires only one third to one fifth the field time required to other similar methods. Furthermore, cover-abundance ratings are better suited than

density values to elucidate graphically species-environment relationships. For extensive surveys this method provides sufficiently accurate baseline data to allow environmental impact assessment as required by regulatory agencies. However, there are a couple of problems that have been detected with such sampling methods. These are as follows:

- It can be seen as subjective and dependent upon the experience and knowledge of the vegetation type by the surveyor. The cover estimate may vary from observer to observer.
- There also may be a problem when the cover estimate is very close to two different classes (on the border so to speak) and then it is for the observer to decide which class it should be allocated to. In Hurford & Schneider's (2007) experience, in marginal situations, where the cover of a species is close to a boundary between two classes, the chance of two observers allocating the species to the same cover class is no better than 50:50. However, when comparing to other sampling methods such as Domin, Braun-Blanquet scale is better adapted for monitoring (less cover classes and fewer boundaries).

- Several inherent and unavoidable limitations need to be considered when interpreting survey results. Reasons for the lack of detection of some species include:
    - Inductions and security protocol which significantly decreased the amount of time spent in the study area.
    - The small, fragmented nature of the study area, and disturbances from Medupi Power Station.
    - The short duration of each field survey, and the lack of significant rainfall preceding the January survey.
    - The cryptic nature of certain species or simply lack of species presence. Some animal species, which are uncommon, small, migratory, secretive or otherwise difficult to find may not have been detected even though they were potentially present in the study area.
- Even though all attempts were made to take samples under optimal conditions certain limitations were encountered. The limitations to this study included:
    - Wetland assessment techniques are inherently subjective.
    - The PES and EcoServices were also not designed for systems such as Ephemeral Washes
    - The boundary determined by infield wetland delineation can often occur within a certain tolerance because of the potential for the change in gradient of the wetness zones within wetlands.

- The modification of the soil profile related to agricultural activities and the clearing of the site and the modification of the hydrological conditions within disturbed sites limits the accuracy of the resulting boundary as the sampling methodology relies heavily on interpretation of undisturbed soil morphology and characteristic.

- The use of vegetation indicators (seasonal and temporary zones) was limited to non-existent due to the ephemeral nature of the systems. Riparian vegetation was even not evident. Only vegetation structure in comparison to surrounding areas was conducted.

- Water was limited to sandy pools within the drainage features in the study area.

- None of the biomonitoring indices could be used due to the ephemeral nature of these systems (Not within this Scope). Instead Invertebrate hatching at two pans in the ADF site was conducted. Due to time constraints the hatching experiment was allowed to run for 10 days but it would have been ideal to continue for up to 28 days.

9.2.4 Air Quality

The following limitations and assumptions have been made in this specialist study:

- Emissions emanating from all existing sources in the area were not quantified nor were resultant ambient air pollutant concentrations due to such sources simulated, with the exception of the existing Matimba Power Station and its associated ashing operations. Given that Matimba Power Station is the most significant source of ambient SO_2 concentrations in the region, this study limitation is not significant for assessing compliance and health risk potentials due to SO_2. Matimba Power Station is, however, not the major contributor to ambient fine particulate concentrations. In order to project cumulative particulate concentrations other significant sources, particularly local mining operation emissions, would need to be quantified.
- Routine emissions from power station operations were estimated and modelled. Atmospheric releases occurring as a result of accidents were not accounted for.
- For the current assessment, the assumption was made that the ash and gypsum would be mixed and disposed of together at the existing disposal facility. The gypsum material on the disposal facility is expected to provide a crust when mixed with water. To what extent this material will crust will depend on how the material is disposed (i.e. mixed with the ash or deposited as layers of gypsum material in between the ash material) and how much water is added to the disposal facility. The crust may also be disturbed from time to time with activity on the disposal facility, therefore for the current assessment, the effectiveness of this crust in lowering windblown emissions could not be quantified.
- Mesoscale Model version 5 (MM5) was used as the “initial guess” field for the CALMET model. Although two monitoring stations are located within the study area, MM5 could not be used together with the surface measurements as the Eskom-operated Marapong station is sited incorrectly providing questionable wind direction and, with one

representative station (South African Weather Service Station located at Lephalale), CALMET requires 100% data availability which was not present.

- Source parameters and emission rates for these emission scenarios required for input to the dispersion modelling study were provided by Eskom personnel. The assumption was made that this information was accurate and correct.
- A constant NH_3 background concentration of 20 ppb was used in Calpuff (Scorgie et al, 2006, as cited in (von Gruenewaldt, et al., 2018). Measured ozone data from the Marapong station was included for the background data required for the chemical transformation module in Calpuff.

9.2.5 Noise Assessment

The following limitations and assumptions have been made in this specialist study:

- The quantification of sources of noise was restricted to activities associated with the project scope.
- Shielding effect of infrastructure was not considered in simulations. This approach will provide a conservative estimate of the estimated sound pressure levels from the project.
- Terrain was not accounted for in this assessment, providing a conservative estimate of noise levels as no natural shielding is taken into account.
- Source strength calculations were based on theoretical estimates not taking into account acoustic shielding or mitigation as a conservative estimate.
- The background used for the estimation of cumulative change in noise levels was selected from measured data points within the study area.

9.2.6 Social Assessment

The following assumptions and limitations are applicable to this study:

- In order to understand the social environment and to predict impacts, complex systems have to be reduced to simple representations of reality. The experience of impacts is subjective on what one person may see as a negative impact may not be perceived as such by another person.
- The study was based on information available to the author during the assessment process and at the time of compilation of the SIA report.
- In addition to the various drafts of the SIA for the FGD Retrofit Project report compiled by NGT, information on stakeholders and comments received during the various public participation meetings for the project was utilised, as is usually the case with SIAs that form part of the Environmental Impact Assessment (EIA) process. SIAs normally draw heavily from information gathered during public participation (identified stakeholders as well as comments received).
- No economic modelling or analysis was done as part of the SIA. Any data relating to the economic profile of the area was obtained from municipal sources, such as municipality /

provincial websites, Integrated Development Plans (IDPs), Service Delivery and Budget Implementation Plans (SDBIPs) and census data.

- This report only applies to the Medupi Power Station FGD Retrofit Project, the existing authorised ADF, the proposed railway yard with its associated infrastructure and it will not necessarily be accurate for and applicable to similar activities at other sites.

9.2.7 Heritage, Archaeology and Palaeontology

The following assumptions and limitations are applicable to this study:

- Based on the findings made by Mbofho Consulting and Project Managers, NGT cannot rule out the subterranean burial grounds and graves since in some areas they identified areas with soil heaps that are reportedly to have been dumped on top of graves. NGT was not part of this Phase II HIA study conducted on site; it therefore not take full responsibility or liability for any issues that were raised and addressed in this report other than to make reference to it as an important document to consider in dealing with heritage issues at Medupi PS. may be addressed by the current heritage social consultation on site.

9.2.8 Traffic Assessment

- The following gaps existed at completion of the TIA report:
    - The arrival and departure profiles of the traffic/trucks during the construction and operation phases.
    - The origin and destination of the generated traffic during construction.
    - Staff movements and transport during construction and operation.
    - Details regarding abnormally dimensioned machine components required during the construction and operation of the FGD facility.
- Eskom is still in the process of developing their heavy haul/lift plans and thus we could not include any information under this section.

9.3 Changes in project / process scope

Towards the middle of 2017 changes to the authorisation and licencing approach for the Medupi FGD Retrofit Project applications were proposed in order to streamline the application processes to ensure compliance with the NEMAQA compliance requirements by the year 2021. The following changes were subsequently implemented:

- Confirmation that the assessment of an additional multiuse disposal facilities, which could be used for the disposal of ash and gypsum, and maybe salts and sludge have been removed from this current application scope and will be undertaken as a separate authorisation process.

- The application for a Waste Management Licence (WML) for the existing ADF was removed from the integrated Environmental Impact Assessment process hence the EIA application will not be an integrated Environmental Impact Assessment application. The proposed disposal of gypsum together with ash on the existing authorised ADF footprint will be dealt with through a separate amendment process to the existing ADF WML.
- The EIA application in terms of the National Environmental Management Act, 107 of 1998, as amended, will include application for activities associated with the construction and operation of the FGD system within the Medupi PS footprint and the railway yard and siding, including limestone and gypsum handling facilities, e.g. PCDs, diesel storage facilities new access roads, Waste Water Treatment plant, facilities for temporary storage of salts and sludge.
- A Water Use Licence Application will focus on water uses triggered by the construction and operation of the FGD system, railway yard and limestone / gypsum handling areas, and within 500m of the approved ADF footprint.

As a result of these changes the project scope for specialists was updated and specialists were requested to amend their reports to reflect these changes.

10 SUMMARY OF SPECIALIST STUDIES

A number of specialists were appointed by Zitholele Consulting to investigate several aspects of the proposed FGD system and rail yard development. A summary of these specialists' findings and recommendations are provided in the following sections.

10.1 Geology

Based on this limited information, the following brief comments were provided:

- The site is mainly underlain by quartzites, shale, sandstones and conglomerates. Soils and weathered and fractures rock are present to depths typically varying from 10 to 15m, below which the soils become relatively fresh.
- Standard foundation systems are expected to be applicable, comprising generally shallow foundations.
- Excavatability is expected to be soft to intermediate, with hard rock class (drill and blast) for excavation in moderately weathered or harder rock (location dependent, but generally below about 5m depth).
- The Limestone and Gypsum Offloading Facility below the railway yard is proposed to be 15m in depth. Hard rock (drill and blasting) excavation will be required from a depth of about 2m.
- Dependent on the thickness of the surficial soils and any fill materials over the area, a contingency allowance should be made for encountering rock during the installation of such services or shallow foundations, where hard rock excavation (hydraulic rock hammer or drill and blast) may be necessary.
- Standard footing systems such as shallow pad and strip footings are expected to be applicable for the area.
- Deep excavations are expected to require reinforcement and/or stabilisation, particularly at shallow depths. Dependent on the quality of the rock and degree of fracturing, the lower half of the 15m deep excavation may potentially be unreinforced and unstabilised. Core orientated geotechnical drilling and associated structural analysis of the ground will be required prior to design to test for this design solution.
- Groundwater can be expected from a shallow depth in the excavation. The volume of water seepage is expected to be relatively low, and reducing as the excavation proceeds into less fractured rock.
- No significant geotechnical hazards or fatal flaws were identified. All the geotechnical considerations mentioned can be mitigated in the design of the facility. Significant further investigations will be required for all items of infrastructure as the design proceeds.

10.2 Soils and Land Capability

The infrastructure planned for the facility will include some large and heavy structures and relatively deep excavations. These will entail the removal of significant quantities of soil, and possibly the complete removal of soil and soft overburden in places were the foundations for the larger structures are to be excavated.

A number of site-specific baseline (existing environment) conditions are of special significance and need to be taken into account when considering potential impacts associated with the proposed development. These include:

- FGD retrofit infrastructure to be constructed and operated within the Medupi Power Station footprint;
- Temporary storage of FGD WWTP solid waste (salts and sludge) at a hazardous waste storage facility within the Medupi Power Station footprint, to be removed by an accredited service provider to an approved waste disposal facility;
- Temporary trucking of salts and sludge from the FGD WWTP to a designated hazardous waste facility for disposal;
- Construction of a pollution control facility receiving dirty water runoff from the limestone holding area (licencing in terms of the NWA); and
- Construction of infrastructure for the loading and offloading of gypsum and limestone at the proposed railway siding for the possible transport of limestone and gypsum to and from the power station, respectively.

It is furthermore important to note that the pre-development conditions for the area of concern are one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the power station development. The concerns and probable impacts that could affect the soils and associated land capability include:

- The loss of the soil resource due the **change in land use** and the removal of the resource from the existing system (Sterilization) as a result of construction activities. These activities could result in the complete loss of the soil resource for the life of the project. The management of waste could potentially sterilize the soils permanently, if not removed/striped, stored and well managed;
- The loss of the soil resource due to **erosion** (wind and water) of unprotected materials due to the removal of vegetative cover and/or topsoil;
- The loss of the utilization potential of the soil and land capability due to **compaction** of areas adjacent to the constructed facilities by vehicle and construction activities;
- Loss of the resource due to **removal** of materials for use in other activities;
- The **contamination** of the resource due to spillage of raw materials and reagents (Gypsum, limestone etc.) that are transported to the site;
- The **contamination** of stored or in-situ materials due to dust or dirty water from the project area and transport routes;

- The **loss** of the soil utilization potential due to the disturbance of the soils and potential loss of nutrient stores through leaching and de-nitrification of the stored or disturbed materials.

Impacts or impact groups identified and assessed by the soils and land capability specialist are provided in **Table 10-1** below.

Table 10-1: Impacts identified by the soils and land capability specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinization.
Construction	Loss of utilisable resource (Sterilisation and erosion), compaction, de-nitrification and contamination or salinisation.
Operational	
Decommissioning	Net loss of soil volumes and utilisation potential due to change in material status (Physical and Chemical) and loss of nutrient base.

10.3 Groundwater

The study yielded the following findings and conclusions:

- The existing licensed disposal facility is mainly underlain by Waterberg sediments comprising of sandstone, subordinate conglomerate, siltstone and shale.
- The initial regional groundwater conceptual model identifies two aquifer zones namely weathered, and fractured aquifer zones, but needs to be confirmed and updated, supported by future test pumping and borehole logs.
- The average groundwater level measured during the hydrocensus for the area of investigation is 30.4 mbgl;
- Constituents of the hydrocensus groundwater samples that exceeded the SANS 241 (2011) maximum allowable standard include EC (2), TDS (2), Na (2), Cl (3), N (2), Al (3), F (4), Fe (5), and Mn (1). The numbers in brackets indicate the number of boreholes in which these constituents exceeded.
- Two boreholes, BU02 and BU03, showed elevated Nitrate values (Class III; 16mg/l and IV; 66mg/l respectively). This water quality poses chronic health risks is and represents poor and unacceptable water quality. The elevated nitrate concentrations are probably related to point- source pollution caused by animal farming and stockades.
- The baseline water quality of the combined sampled boreholes is summarised in **Table 10-2** below.

Table 10-2: Baseline Groundwater Quality

Item	Physical Parameters			Macro Determinants (Major Ions and Trace Metals)								Minor Determinant		
	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cl mg/l	SO4 mg/l	NO3 mg/l	MALK Mg/l	F mg/l	Fe mg/l	Mn mg/l
No. of Records	10	10	10	10	10	10	10	10	10	10	10	10	10	10
10% Percentile	5.67	15.35	112.8	6.165	1.9525	11.804	2.5892	16.2	5	0.2	8	0.2	0.0408	0.0421
Median	**7.3**	**75.8**	**450**	**27.66**	**21.385**	**80.285**	**6.7065**	**101.5**	**38**	**0.25**	**242**	**1.1**	**1.5715**	**0.106**

Baseline water Quality														
Average	7	103.19	642.2	57.1504	30.3111	105.095	10.1201	207	34.3	8.58	201.2	1.3	2.5966	0.1782
90% Percentile	7.53	212.4	1377.6	140.5	67.629	203.87	18.855	532.6	62.9	21	357.2	2.34	6.6366	0.3691
Max. Allowable Limit (SANS 241:2011)	<5 >9	<170	<1200	<300	<100	<200	<100	<300	<500	<11	-	<1.5	<0.3	<0.5

- Based on the hydrocensus water quality analyses, the background groundwater quality at the MPS is Marginal (Class II) to Poor (Class III - IV) water quality.
- Only boreholes GE06 and VER02 groundwater quality are representative of calcium magnesium bicarbonate type of water (Ca, Mg–(HCO_3). This water type represents unpolluted groundwater (mainly from direct rainwater recharge) and is probably representative of the pristine background water quality.
- The groundwater vulnerability of the study area is shown on the national groundwater vulnerability map as low to medium.

Impacts or impact groups identified and assessed by the soils and land capability specialist are provided in **Table 10-3** below.

Table 10-3: Impact identified by the groundwater specialist for the construction of FGD infrastructure and rail yard

Development Phase	Impact / Impact Group
Planning / Pre-construction	Identical impacts were identified for all phases of the development and include:
Construction	• Impact on the ambient groundwater quality;
Operational	• Impact on the groundwater quantity/recharge;
Decommissioning	• Impact on groundwater flow regime.

The groundwater specialist furthermore undertook a qualitative impact assessment based on professional opinion and knowledge of the study site for the proposed trucking of Type 1 Waste to a Hazardous Disposal Facility for a period of 5 years.

10.4 Surface water

The surface water study yielded the following findings and conclusions:

- The study area is located within the Limpopo Water Management Area (WMA) and within quaternary catchment A42J.
- Based on South African Weather Services (SAWS) weather station number 0717595_W and the DWS's weather station A4E003, the MAP and MAE for the study area were determined to be 416.09 mm and 2 572 mm, respectively.
- Non-perennial streams, mainly the Sandloop River, drain the study area. The general drainage of the area is in an easterly direction towards the Mokolo River. These non-

perennial streams in the area were found to be seasonal and only likely to flow after rainfall events.

- The study area has gentle slopes of 0.5% to 5% in general with relatively steeper slopes to the south of the study area.
- In order to establish baseline water quality for the study area prior to the construction of the FGD and the expansion of the existing ADF, a water quality monitoring programme was established by Golder in 2015. Baseline water quality could not be established during the site visits due to lack of flow. As a result water quality data obtained from the Wetland Assessment (Natural Scientific Services, 2015) was utilised for water quality analysis.
- It was established that the existing water management system at MPS include:
    - A dirty water management system to ensure that polluted water the power station and its associated infrastructure, including the existing ADF, as well as sediment-laden runoff from disturbed areas is separated from clean area runoff and that it is collected in Pollution Control Dams (PCD); and
    - A clean water management system to divert water undisturbed by the power station's operations around the disturbed project footprint.
- The floodline study established that the 1:100 year floodline encroaches on the ADF footprint at its south-western extent. The consideration of the ADF footprint is not considered in this EIA but will be addressed in a separate application for amendment of the existing WML.
- The existing Medupi site and ADF site have a combined area of approximately 1,874 ha (18. 7 km^2) which equates to 1.03% of quaternary catchment A42J with a catchment area of 1 812 km^2 (WRC, 2012).
- The Sandloop River tributary has an estimated catchment area of 4,467 ha (44.7 km^2). The reduction in catchment area from the Medupi site and ADF site of approximately 1,874 ha (18.7 km^2) equates to a 49.95% decrease in catchment area. It is therefore anticipated that during the operational phase of the ADF, there will be a reduction in the total runoff reporting to the Sandloop River tributary, however limited reduction to the Mokolo system.

The potential surface water impacts considered by the Surface Water Impact Assessment are summarised in **Table 10-4**.

Table 10-4: Summary of potential surface water impacts with respect to Medupi Power Station

Development Phase	Impact / Impact Group
Planning / Pre-construction	• Changes in surface water catchment areas • Changes in surface water quality • Change in surface water runoff • Erosion • Off-site water requirements
Construction	
Operational	
Decommissioning	

If not mitigated, the potential surface water quality impacts will ultimately affect the downstream water users. It should be noted that the Sandloop River and its tributaries are generally downstream of Medupi and the topography around the study area is such that runoff generated at Medupi drains towards the Sandloop River and its tributaries. This potentially polluted water will flow towards downstream users via the river system.

10.5 Biodiversity (Terrestrial Ecology) and Wetlands Assessment

A terrestrial ecological assessment and wetland and watercourse assessment was undertaken by NSS for the intact areas within the proposed footprint of the MPS and ADF, as well as within 500m area of the boundary of the MPS. These assessments included a broad description of the biophysical environment coupled with site investigations to assess the regional vegetation and local flora, recorded alien invasive species, local diversity of mammals, birds, reptiles, frogs, butterflies, dragonflies and damselflies, scorpions and megalomorph spiders. Site visits also focused on the delineation of wetlands and pans within 500m of the MPS and sediment and water quality analysis of surface water bodies.

This study made the following conclusions:

- No Red Listed plant species were recorded within the study site.
- Conservation Important (CI) Protected Tree species found within the study area and surrounds include *Boscia albitrunca*, *Sclerocarya birrea* and *Spirostachys africana*. *Boscia albitrunca* and *Sclerocarya birrea* are both Keystone species.
- Vegetation communities occurring within the footprint of the proposed rail yard and FGD infrastructure within the MPS include *Acacia erubescens* - *Grewia* Thornveld, *Acacia nigrescens* - *Grewia* Open Veld, and *Acacia* mixed woodland. The sensitivity ratings of these habitats are presented in **Table 10-5** as reported by (Abell, et al., 2018).
- NSS surveys in and around the FGD study area yielded 43 mammal, 158 birds, 20 reptile, 16 frog, 9 butterfly, 2 dragonfly and 1 scorpion species, greatly contributing to the overall Medupi inventory.
- Semi-ephemeral systems are providing an important foraging, breeding and migration habitat for a diverse array of species and are therefore considered extremely important.
- Four HGM units were identified surrounding the MPS and associated ADF, i.e. two south–east and one north–east draining Washes (SEW 1 – 3) and multiple inward-

draining depressions (D1). It is however only SEW 2 located just south of the MPS generation units that are likely to be impacted by the construction of the rail yard and FGD infrastructure within the MPS footprint.

- For the study area, the NFEPA Project recognises the Sandloop System as a FEPA River. This system is rated regionally as having a Moderately Modified (or C) PES.
- There are currently no Threatened Ecosystems within the larger region around the study site. The closest vegetation type under threat is the Springbokflats Thornveld.
- According to the Limpopo C-Plan, the study area is situated within a provincial Ecological Support Area (ESA) and Critical Biodiversity Area (CBA) 1.
- It is anticipated that the construction of the FGD and associated storage facilities will reduce the health of SEW 2 to an Upper D (Largely modified) without mitigation and a Lower D with mitigation. The drivers likely to be most adversely affected include hydrology and vegetation.
- In terms of hydrology, without mitigation, one would expect an increase in floodpeaks and this potential for erosion as a result of the increase in exposed, impermeable surfaces such as compacted areas, concrete, tar and other structures including the stockpiles themselves.
- Deposition and erosion in turn will likely decrease the state of the vegetation along this system. With implementation of the planned stormwater infrastructure and other suggested mitigation the it is anticipated that there will be less erosion and deposition , however there will still be a reduction in overall water inputs due to catchment loss and the presence of stormwater infrastructure channelling water into Medupi’s large eastern dams.
- In terms of biodiversity the overall goal of the project should be to minimise loss to biodiversity wherever possible. This may be achieved through commitment to the listed mitigation, effective rehabilitation of the ADF and the relocation of bullfrogs and other amphibians to newly created habitat elsewhere. The overall objective of the project as it relates to wetlands should be to ensure that there is no net loss in wetland functionality from the current state as a result of the construction of the FGD
- It is anticipated that at completion of the MPS approximately 3.6 ha of pan habitat will be lost. Although this appears to be a small size, it is significant when considering that this represents 20 possible breeding locations. It is therefore required that wetland offset plan be developed and implemented by Eskom.
- Eskom has affirmed its commitment to commission a wetland rehabilitation and stage 1 offset plan that will serve to offset functional losses to SEW 2, including the other SEWs and pans. NSS has already been appointed to commence with the development of such a plan for presentation to the DEA and DWS.
- Eskom should support the recently commissioned wetland rehabilitation and bullfrog relocation / pan restoration projects in terms of rainfall reporting, labour, machinery and engineering resources to enable the successful creation of new pan habitat, e.g. within Site 12 which is the area just south of the MPS ADF or any other appropriate habitat, and the successful relocation and establishment of bullfrogs therein.

Table 10-5: Sensitivity rating of different habitats / floral communities in the study area (adapted from Abell et. al. 2018)

UNIT	HABITAT & FLORAL COMMUNITY	CURRENT CONDITION & IMPACTS	SUCCESS FOR REHABILITA-TION	CI SPECIES	REGIONAL CONSERVATION VALUE	OVERALL SIGNIFICANCE *
Natural Areas						
	Acacia erubescens - Grewia Thornveld	• Understorey has limited herbaceous cover (sampling in the mid summer season) – only tree cover dominant. • Limited cover for faunal species and limited floral diversity • 2.26% of the study area	Difficult to rehabilitate to a similar natural state due to the soil structure and arid conditions. Extended effort will be required to ensure successful rehabilitation. According to Kevin *et al* (2010), moisture is the most important ecological factor necessary for successful rehabilitation of denuded patches in semi-arid environments.	• Limited Herpetofauna and avifaunal species utilise this area • Scattered PT species	• Least Concern Vegetation Unit • Limpopo C-Plan – CBA and within FEPA buffer	**MEDIUM**
	Acacia nigrescens - Grewia Open Veld	• Typical Habitat for the region with a diversity of tree, grass and forb species • Understorey –grass layer more dominant than shrub • Limited alien invasives present • Fragmentation is occurring • 9.19% of the study area		• Habitat utilisation for numerous faunal species. • Potential foraging area for Giant Bullfrog • PT floral species present	• Least Concern Vegetation Unit • Limpopo C-Plan - ESA	**MEDIUM**
	Acacia mixed woodland	• Highly fragmented • Alien Invasives present – edge effects occurring • Increase in species such as *Dichrostachys cinerea* • 6.59% of the study area		• Potential foraging area for Giant Bullfrog • PT floral species present	• Least Concern Vegetation Unit • Limpopo C-Plan - ESA	**MEDIUM-LOW**
Transformed Areas						
	Conveyor and associated areas; ADF, MPS, Cleared areas and stockpiles; Gravel road and fence line	• Highly transformed • High human presence/activity • 46.61% of the study area	As per statement above	• *Sclerocarya birrea* seedlings present on edges of soil stockpile areas. • Potential for CI species to occur are limited	• Least Concern Vegetation Unit • Limpopo C-Plan - ESA	**LOW**

Impacts identified and assessed by the biodiversity and wetland specialists are provided in **Table 10-6**.

Table 10-6: Impact identified for the rail yard and FGD footprint area by biodiversity and wetland specialists

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No impacts identified during planning / pre-construction phase
Construction (Site clearing and construction activities)	• Loss of Acacia Woodland Habitat • Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinization. • Potential increase in alien vegetation species • Potential loss of CI floral species • Potential loss of CI faunal species (excluding bullfrogs and raptors) • Potential loss of CI raptor species • Loss of foraging habitat for game species • Loss of catchment area and consequent decrease in water inputs as a result of the necessary containment of dirty water runoff • Increased faunal mortality • Increased sensory disturbance to fauna • Increase in floodpeaks, sediment loads and erosion to wetlands
Operational	• Potential increase in alien vegetation species • Loss of catchment area and consequent decrease in water inputs as a result of the necessary containment of dirty water runoff • Increased faunal mortality • Increased sensory disturbance to fauna • Spills, roadkills and other traffic associated impacts due to trucking waste to an appropriatly licenced waste disposal facility, e.g. Holfontein • Contamination of wetlands from storage facilities associated with the ADF and FGD– Consequences for bullfrogs and aquatic invertebrates
Decommissioning	• No impacts identified during planning / pre-construction phase

10.6 Air Quality

The objective of the investigation undertaken by the air quality specialist was to quantify the possible impacts resulting from the proposed activities on the surrounding environment and human health, and included activities associated with the construction and operation of the FGD system within the MPS footprint and the railway yard and siding, including limestone and gypsum handling facilities and diesel storage facilities new access roads.

Impacts from the construction activities were considered but not assessed further as their impacts would be localised and of a temporary nature. The impacts from the railway siding and handling operations as well as vehicle entrainment from the new access road would contribute to the particulate matter, but will be localised and will not exceed ambient National Ambient Air Quality Standards offsite. These changes were therefore not deemed significant and were thus not assessed further.

Furthermore dust emissions potentially resulting from the transportation of limestone and wastes generated by the FGD process were considered. The air quality specialists compiled a screening model in order to qualitatively assess the significance of this potential impact. This qualitative assessment concluded that PM_{10} and $PM_{2.5}$ concentrations resulting from vehicle entrainment as a result of transporting limestone, salts and sludge on a paved road surface (assuming all six units are operational) are well below the NAAQS.

An Impact Prediction Study was undertaken where SO_2, NO_2 and particulate concentrations were simulated using the CALMET/CALPUFF dispersion modelling suite. Ambient concentrations were simulated to ascertain highest hourly, daily and annual averaging levels occurring as a result of the baseline and proposed Project operations.

Three scenarios were assessed: (i) 2014 baseline: the potential impacts due to the Matimba Power Station operations, (ii) 2020 baseline: the potential impacts due to the Matimba Power Station operations and the Medupi Power Station operations including all six units without FGD, and (iii) proposed Project operations: the potential impacts due to the Matimba Power Station operations and the Medupi Power Station operations including all six units with FGD.

The fugitive emissions due to windblown dust from the existing ash facility was also quantified at the existing Ash Disposal Facility (ADF) as an unmitigated operation (no controls in place) and as a mitigated operation (80% control efficiency in place through active re-vegetation and wetting). Stack emissions and parameters were provided by Eskom personnel for the study.

Main findings of the air quality study include:

- SO_2 concentrations were measured to infrequently exceed short-term NAAQ limits at the monitoring stations located at Marapong and Lephalale. Modelled SO_2 concentrations also indicate infrequent short-term exceedances of the National Ambient Air Quality (NAAQ) limits at these sensitive receptors. There is however compliance with the NAAQS.
- Currently, the Matimba Power Station is likely to be the main contributing source to the ambient SO_2 ground level concentrations in the study area due to the magnitude of its emissions. Other sources which may contribute significantly due to their low release level include: spontaneous combustion of coal discards associated with mining operations, clamp firing emissions during brickmaking at Hanglip and potentially household fuel burning within Marapong.
- NO_2 concentrations have been measured to infrequently exceed short-term NAAQ limits (but are in compliance with NAAQS) at the monitoring stations located at Marapong and Lephalale. Low level sources of NO_x in the region include combustion within coal discard dumps, brick firing operations and possibly also household fuel burning and infrequent veld burning.
- Measured PM_{10} concentrations exceed the daily NAAQS at Marapong for the period 2014 but are lower at Lephalale (where levels comply with daily NAAQS). The measured $PM_{2.5}$ concentrations are within the daily NAAQS applicable till 2030 at Marapong and Lephalale, but exceed the more stringent daily NAAQS applicable in 2030. The annual average PM_{10} and $PM_{2.5}$ concentrations measured at Lephalale are within NAAQS.

- The 2014 baseline simulations indicated that the contribution of Matimba Power Station to primary and secondary particulates resulted in no exceedances of the SO_2, NO_2, PM_{10} and $PM_{2.5}$ NAAQS at Marapong and Lephalale.
- Simulation results from the 2020 baseline simulations indicated that the area of non-compliance with the hourly and daily SO_2 NAAQS extended ~30km southwest of the Medupi Power Station due to the cumulative operations of Matimba Power Station and Medupi Power Station without FGD control.

The air quality impact assessment study concluded the following:

- The area of exceedance of the hourly and daily SO_2 NAAQS was significantly reduced when FGD controls on the Medupi Power Station are considered, bringing the simulated ground level concentrations within compliance of the hourly and daily SO_2 NAAQS at all sensitive receptors in the study area.
- Simulated impacts from the Matimba Power Station and the Medupi Power Station without FGD (2020 baseline) was in non-compliance with SO_2 NAAQS on a regional scale resulting in a MODERATE significance.
- The area of non-compliance of SO_2 concentrations reduces significantly for proposed Project operations (i.e. Matimba Power Station operations and Medupi Power Station operations with FGD) and reduces the significance to LOW as no exceedances of the NAAQS are simulated at the closest sensitive receptors in the study area.
- No exceedances of the NAAQS for NO_2, PM_{10} and $PM_{2.5}$ were simulated at sensitive receptors due to proposed project operations, resulting in LOW significance. However, available monitoring data shows that the PM_{10} concentrations are in non-compliance with the daily NAAQS at Marapong. Simulated impacts due to proposed project operations, however, do not contribute significantly to current ambient particulate concentrations.

Air quality impacts assessed in the Air Quality Specialist Report are summarised in **Table 10-7** below.

Table 10-7: Impact identified for the MPS by air quality specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No impact during the planning phase.
Construction	• Impacts not likely to impact the ambient air quality more than the existing (status quo) status.
Operational	• Impact of SO_2, NO_2, PM_{10} and $PM_{2.5}$ emissions on ambient air quality.
Decommissioning / Rehabilitation	• Impacts not likely to impact the ambient air quality more than the existing (status quo) status.

10.7 Noise

The main objective of this study was to establish baseline/pre-development noise levels in the study area and to quantify the extent to which ambient noise levels will change as a result of the proposed project.

In the assessment sampled and simulated noise levels were assessed against the International Finance Corporation (IFC) guidelines for residential, institutional and educational receptors (55 dBA during the day and 45 dBA during the night) since these (a) are applicable to nearby Noise Sensitive Receptors (NSRs) and (b) in-line with South African National Standards (SANS) 10103 guidelines for urban districts. The IFC's 3 dBA increase criterion was used to determine the potential for noise impact.

Noise will be generated during the project's construction, operational and decommissioning/closure phases. Construction and decommissioning/closure phase activities, however, will be for limited time frames and was not assessed in detail for the noise assessment study.

The noise assessment concluded the following:

- Several individual residential dwellings are located within a few kilometres from the MPS. There are also residential areas to the north and northeast of the Matimba Power Station.
- Baseline noise levels are affected by road traffic, mining activities, birds and insects. Noise levels in the vicinity of the MPS are currently comparable to levels typically found in suburban districts. Representative day- and night-time as well as 24-hour baseline noise levels of 48.3 dBA, 43.7 dBA and 50.9 dBA, respectively, were calculated from survey results.
- Noise impacts during the operational phase will be more notable at night.
- The operational phase will result in noise levels that do not exceed the selected impact criteria at the nearest NSR. 'Little' to no reaction from individuals within this impacted area may be expected.
- It was concluded that, given the conservative nature of the assessment, the implementation of the basic good practice management measures recommended by the noise specialist would ensure low noise impact levels. From a noise perspective, the noise specialist recommended that the project may proceed.

Potential noise impacts assessed in the Noise Specialist Report are summarised in **Table 10-8** below.

Table 10-8: Impact identified for the MPS by the noise specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	Increase in noise levels.
Construction	
Operational	
Decommissioning / Rehabilitation	

10.8 Social

The objectives of the Social Impact Assessment (SIA) study included the assessment of potential social impacts of the FGD retrofit and the proposed railway siding and focused on the social benefits of the proposed FGD on the surrounding communities and industries, as well as impacts on the ecosystem such as the biosphere and its natural resources like water and ecology.

Based on the various impact assessment and impact rating processes, the following conclusion were made about the proposed Medupi FGD and the proposed railway siding:

- The significance of positive social impacts generally exceeds the significance of negative social impacts in the implementation of the FGD, the ADF and the railway siding throughout all four stages of the project.
- The implementation of the proposed FGD technology at Medupi will result in reduced levels of SO_2 in the medium and long term. As the result of this, the significance of health risks associated with the SO_2 emissions will be minimized on a long-term basis.
- The outcome of the FGD retrofit will be an improved biosphere in the region and South Africa, which will translate to improved quality of life for the citizens of Lephalale and the communities located south and southwest of the study area who are also affected by pollutants containing SO_2.
- One of the most pressing issues identified during the survey relates to stakeholder relations and project communication. Eskom and its stakeholders have done a significant amount of work in dealing with concerns of various interested and affected parties on the ground. Collectively, they have contributed to the establishment structures entrusted with the management of stakeholder relations and communication as part of the Medupi project. A committee has been established to deal with such issues; for example, the Medupi Environmental Monitoring Committee (EMC) as well as the Stakeholder Relations Office in the region. It is therefore concluded that necessary strategies and measures have been put in place to deal with and manage stakeholder relations and communication.
- Taking into consideration of ecosystem services beneficiaries and drivers, the potential impacts of the proposed railway siding for lime off-taking were assessed. The land on which the proposed siding is to be constructed is already reformed or altered, therefore it was concluded that the railway siding will not have any adverse negative social and economic impacts in terms of increase in traffic volumes and possible road carnage resulting from trucks transporting lime to Medupi.
- In conclusion, the water issue was assessed to be the biggest threat in the project lifespan. The current allocation to Medupi will be able to operate the six generation units at Medupi but will not be able to meet the full water demand for the FGD. The current raw water abstraction from Mokolo Dam of which the Lephalale LM is also dependent on for raw water to support its domestic and farming communities' poses is a biggest socio-economic threat in terms of ecosystems support services.

The social specialist recommended that from a social point of view, the proposed FGD technology retrofit project and the proposed railway siding should be granted authorisation provided that there will be implementation of and adherence to the following:

- Mitigation measures in the SIA must be included in the Environmental Management Programme (EMPr), which will be approved as condition of environmental authorisation.
- Although Eskom has done a lot to address concerns relating to communication with local communities and stakeholders, it is recommended that the EMC should further strengthen its multi-stakeholder engagement strategy or adopt new forms of communication that resonate with the interests of I & APs in the region.
- Strengthening multi-stakeholder engagement should be done in a manner that does not polarise relations between existing stakeholders. One way of addressing this issue is to develop a sub-committee for the Environmental Monitoring Committee (EMC).
- If established, the EMC sub-committee could include a representative from each of the affected communities. This would be in addition to those communities' representatives already listed in the EMC Terms of Reference (ToR).
- Community representatives from Steenbokpan (Leseding) and the farms (farming community) would form part of the EMC sub-committee due to the fact that they feel excluded in programmes and workshops that deal with issues arising from Medupi construction and the associated infrastructure and technology such as the FGD.
- In addition to EMC public meetings and workshops, the sub-committee would ensure that all community concerns and grievances are deliberated on and addressed directly by the EMC and outside the EMC public meetings. The EMC ToR allows for the election of alternates. Therefore, this recommendation for EMC sub-committee is in line with EMC ToR.
- In projects of similar nature to Medupi, a grievance mechanism committee is often established and communicated to the community in line with best practice. The Medupi EMC is a sufficient structure to handle all issues relating to the environment, monitoring and auditing. However, without increasing bureaucracy, Eskom should consider appointing an independent company/specialist that specialises in the management of Social Risks.
- The social specialist recommended that Eskom should fast-track the retrofitting and synchronising of the FGD technology..
- In terms of material transport to and from site for the construction of the FGD and to transport gypsum, salts and sludge by-products of the FGD. This will help mitigate environmental risks associated with the use of public roads to transport these materials. It will also assist alleviate possible increase in traffic volumes associated with the FGD construction material transportation.
- In terms of FGD by-products it recommended that Eskom should considered tendering the offtake of gypsum for commercial purposes instead of its combined disposal with the ash. This will be dependent on the quality of gypsum. In the event poor quality gypsum is produced, it will be disposed of with ash on a WSF.
- The specialist further recommended that Eskom should lobby (together with other industries) DWS to speed up the implementation of Phase 2 MCWAP. This will guarantee Eskom and other industries in Lephalale appropriate water allocation to support the FGD and the growing industries around it such as expanded coal mining due

to coal reserves in the Waterberg region. The speeding up of the Phase 2 MCWAP by DWS would also assist mitigate the potential water risk to Lephalale associated with the abstraction of raw water by industries from Mokolo Dam of which the municipality and its constituencies is also directly dependent on for potable water.

Impacts identified and assessed by the socio-economic specialist are provided in **Table 10-9.**

Table 10-9: Impact identified for the rail yard and FGD footprint area by socio-economic specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	• Developing spin off businesses to support FGD construction phase (Positive) • Employment expectations and influx of migrant labour
Construction	• Employment of skilled, semi-skilled and unskilled labours in the construction of the FGD (Positive) • Tenders and contract opportunities for local businesses in construction of the FGD and ancillary infrastructure (Positive) • Improvement in local road conditions with the construction of the FGD (Positive) • Extension of the construction phase currently underway in Medupi resulting to prolonged contractor activity in Lephalale which benefit local businesses (Positive) • Increase in traffic volumes resulting from a combination of existing road users and an increase in construction vehicles/trucks transporting materials to and from Medupi for the construction of the FGD • Increase in occupation health and safety risks resulting from increase in traffic volumes associated with construction vehicles/trucks working on the FGD as well risks associated with the actual prolonged construction phase at Medupi • Increase in pressure for water demand and allocation to support the construction of the FGD, the ADF, and existing industries and for domestic uses • Improvement in local road conditions with the construction of the FGD and ADF (Positive) • Increase in negative public sentiments about the project FGD
Operational	• Synchronisation and operation of the FGD technology at Medupi will result to reduction in SO2 levels in the atmosphere resulting to improved ambient air quality and improved human health as the result of the FGD (Positive) • Reduction is respiratory related diseases such as asthma, bronchitis, lung cancer, eye irritations, pneumonia and cardiovascular disease resulting from emission such as SO_2 (Positive) • Stabilization of the National Grid and improved electric supply to support the growing economy and achievement of social imperative such as provision of power for domestic use throughout the country (Positive) • Development of the secondary industries as the result of implementation of the FGD through sales of its commercial suitable gypsum to the farming industry-locally, regional, nationally and possibly internationally (Positive)
Decommissioning	• Employment opportunities in disassembling and recycling of recyclable materials from the FGD and the ADF (Positive)

10.9 Heritage, Archaeology and Palaeontology

The objectives of the Heritage Impact Assessment (HIA) study were to assessment potential impacts the FGD retrofit and the proposed railway siding would have on potential heritage, archaeological and palaeontological resources that may occur within the proposed development site. Furthermore, to assess impacts on the identified resources resulting from the proposed development activities in four stages of the project: planning, construction, operational and decommissioning.

The study results and conclusions are also informed by the Phase II HIA study and heritage public participation process (PPP) undertaken within the Medupi PS footprint by Mbofho Consulting and Project Managers. This HIA attempted to reconstruct the environment prior to construction of Medupi and through heritage PPP with the affected community remapped the areas known to have contained graves that were accidental disturbed or desecrated with the construction of Medupi.

The following conclusions were drawn from the HIA:

- It is concluded that there are no heritage and archaeological resources identified within the area proposed for the railway yard and the Medupi PS FGD technology construction sites. The land in which the railway yard is proposed has been transformed from previous construction activities on site.
- There were also no heritage and archaeological resources around the existing and licensed ADF facility – during the survey of the ADF the site were already constructed.
- The assessment of historic maps of the area Medupi PS also did not yield any burial grounds or graves as well as stone walls and historic buildings. However, the assessment of a Phase II HIA report by Mbofho Consulting and Project Manager yielded burial grounds and graves as well as areas that are known to have contained graves.
- Based on the findings made by Mbofho Consulting and Project Managers one cannot rule out the subterranean burial grounds and graves since in some areas they identified areas with soil heaps that are reportedly to have been dumped on top of graves.
- It is concluded that, based on the exiting engineering drawings of the proposed FGD technology development footprint and its survey, thereof that there are no archaeological or heritage resources. Like with the railway yard and the existing and licensed ADF facility the land in which the proposed FGD technology is to be constructed is already transformed through previous construction activities.
- With regards to palaeontological resources (fossils), it is concluded that, there is an extremely small chance of finding any fossils of any kind in the proposed development area.

Impacts identified and assessed by the heritage, archaeology and palaeontology specialists are provided in **Table 10-10**.

Table 10-10: Impact identified for the rail yard and FGD footprint area by heritage, archaeology and palaeontology specialists

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No impacts on heritage, archaeological or palaeontological resources identified.
Construction	
Operational	
Decommissioning	

10.10 Traffic

The purpose of the Traffic Impact Assessment (TIA) is to quantify the impact of normal traffic, as well as the transportation of abnormal loads, on the road network during both construction and operation of the FGD facility.

Level of Service (LOS) ratings have been used to evaluate the existing and future traffic situation. LOS tries to answer how good the present traffic situation is at a particular intersection. Thus it gives a qualitative measure of traffic in terms of delays experienced. It is represented by six levels ranging from level A to level F. Level A represents minimal delays where the driver has the freedom to drive with free flow speed and level F represents uncomfortable conditions accompanied by long delays.

With regards to the trucking of chemical salts and sludge, it is expected that trucks will operate for 12 hours a day, seven days a week and will be the same volume side tipper trucks that deliver coal. Based on waste production rates obtained from Eskom it is estimated that once all 6 generation units are operational, the number of track to transport chemical sludge and salts amount to 10 trucks and 3 trucks, respectively, totalling to 13 trucks daily.

The traffic specialist furthermore calculated the number of truck loads that would be required in the event that limestone had to be trucked to site on a daily basis. It was estimated that a total of 69 trucks would be required to deliver a total of 3456 tons of limestone to the MPS per day when all 6 generation units are operational.

The following conclusions and recommendations were made:

- The trucks delivering building material to the site should follow a similar route as recommended for the trucking of Limestone and salts and sludge.
- There should be a pointsman at the intersection of D1675 / Afguns Rd and Nelson Mandela Drive / D1675 during the peak hours to alleviate the traffic congestion.
- Undertake an assessment study with regards to the proposed weigh bridge design and determine whether it may cause queuing to back up onto the public road, which might have an impact on other road users.
- Ash and gypsum will be conveyed to the existing ADF and therefore this process will generate no additional traffic impacts.

- The sludge and salts will be trucked to an existing licensed hazardous waste facility.
- It is suggested that the trucks delivering limestone to Medupi Power Station could utilise the Afguns Road in order to have a minimal impact on other road users. By utilising the Afguns – Thabazimbi road, the trucks will avoid travelling through Lephalale town and avoid other busy nodes within the study area.
- 10 Year Post development traffic analyses have indicated that both intersections, Nelson Mandela Drive / D1675 and Afguns Rd / D1675 have poor levels of service for the northbound movement. The following road layout changes are proposed:
    - Nelson Mandela Dr / D1675: Provide signals, add a left turning slip lane along D1675 (northbound), introduce a right turning lane for the northbound right movement, provide an additional eastbound lane for the straight movement. It is recommended that the relevant road authority should fund the upgrade of this intersection, since the existing intersection is already operating at a Level of Service (LOS) F.
    - Afguns Rd / D1675 – It is recommended that the priority control intersection should be upgraded, this study is only looking at conceptual design and it is recommended that a detail design study should be undertaken at this intersection to determine the best upgrade option.

Traffic impacts assessed by the traffic specialist are provided in **Table 10-11**.

Table 10-11: Impact identified relating to traffic within the rail yard and FGD footprint

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No traffic impacts during the planning / pre-construction phase.
Construction	• Impact of additional generated traffic due to the construction phase on existing road layouts and road users.
Operational	• Additional generated traffic due to the operational phase of the FGD plant. • Transport of limestone from limestone sources. • Transport of salts and sludge to a hazardous waste disposal facility.
Decommissioning	• Reduction in traffic volumes due to decommissioning.

11 ENVIRONMENTAL IMPACT ASSESSMENT

11.1 Impact Assessment Methodology

Impacts identified during this EIA were ranked according to the methodology described below. Mitigation or management measures were provided to avoid, minimise, reduce or manage potential impacts. In order to ensure uniformity, a standard impact assessment methodology was utilised by all specialists and EAP so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria, as discussed below.

11.1.1 Nature of the impact

Each impact should be described in terms of the features and qualities of the impact. A detailed description of the impact will allow for contextualisation of the assessment.

11.1.2 Extent of the impact

Extent intends to assess the footprint of the impact. The larger the footprint, the higher the impact rating will be. **Table 11-1** below provides the descriptors and criteria for assessment.

Table 11-1: Criteria for the assessment of the extent of the impact.

Extent Descriptor	Definition	Rating
Site	Impact footprint remains within the boundary of the site.	1
Local	Impact footprint extends beyond the boundary of the site to the adjacent surrounding areas.	2
Regional	Impact footprint includes the greater surrounds and may include an entire municipal or provincial jurisdiction.	3
National	The scale of the impact is applicable to the Republic of South Africa.	4
Global	The impact has global implications	5

11.1.3 Duration of the impact

The duration of the impact is the period of time that the impact will manifest on the receiving environment. Importantly, the concept of reversibility is reflected in the duration rating. The longer the impact endures, the less likely it is to be reversible. See **Table 11-2** for the criteria for rating duration of impacts.

Table 11-2: Criteria for the rating of the duration of an impact

Duration Descriptor	Definition	Rating
Construction / Decommissioning phase only	The impact endures for only as long as the construction or the decommissioning period of the project activity. This implies that the impact is fully reversible.	1
Short term	The impact continues to manifest for a period of between 3 and 5 years beyond construction or decommissioning. The impact is still reversible.	2
Medium term	The impact continues between 6 and 15 years beyond the construction or decommissioning phase. The impact is still reversible with relevant and applicable mitigation and management actions.	3
Long term	The impact continues for a period in excess of 15 years beyond construction or decommissioning. The impact is only reversible with considerable effort in implementation of rigorous mitigation actions.	4
Permanent	The impact will continue indefinitely and is not reversible.	5

11.1.4 Potential intensity of the impact

The concept of the potential intensity of an impact is the acknowledgement at the outset of the project of the potential significance of the impact on the receiving environment. For example, SO_2 emissions have the potential to result in significant adverse human health effects, and this potential intensity must be accommodated within the significance rating. The importance of the potential intensity must be emphasised within the rating methodology to indicate that, for an adverse impact to human health, even a limited extent and duration will still yield a significant impact.

Table 11-3: Criteria for impact rating of potential intensity of a negative impact

Potential Intensity Descriptor	Definition of negative impact	Rating
High	Any impact to human health/mortality/loss of a species.	16
Moderate-High	Significant impact to faunal or floral populations/loss of livelihoods/individual economic loss	8
Moderate	Reduction in environmental quality/loss of habitat/loss of heritage/loss of welfare amenity	4
Moderate-Low	Nuisance impact	2
Low	Negative change with no associated consequences.	1

Within potential intensity, the concept of irreplaceable loss is taken into account. Irreplaceable loss may relate to losses of entire faunal or floral species at an extent greater than regional, or the permanent loss of significant environmental resources. Potential intensity provides a measure for comparing significance across different specialist assessments. This is possible by aligning specialist ratings with the potential intensity rating provided h. This allows for better integration of specialist studies into the environmental impact assessment. See **Table 11-3** and **Table 11-4** below.

Table 11-4: Criteria for the impact rating of potential intensity of a positive impact.

Potential Intensity Descriptor	Definition of positive impact	Rating
Moderate-High	Met improvement in human welfare	8
Moderate	Improved environmental quality/improved individual livelihoods.	4
Moderate-Low	Economic development	2
Low	Positive change with no other consequences.	1

It must be noted that there is no HIGH rating for positive impacts under potential intensity, as it must be understood that no positive spinoff of an activity can possibly raise a similar significance rating to a negative impact that affects human health or causes the irreplaceable loss of a species.

11.1.5 Likelihood of the impact

This is the likelihood of the impact potential intensity manifesting. This is not the likelihood of the activity occurring. If an impact is unlikely to manifest then the likelihood rating will reduce the overall significance. **Table 11-5** provides the rating methodology for likelihood.

The rating for likelihood is provided in fractions in order to provide an indication of percentage probability, although it is noted that mathematical connotation cannot be implied to numbers utilised for ratings.

Table 11-5: Criteria for the rating of the likelihood of the impact occurring

Likelihood Descriptor	Definition	Rating
Improbable	The possibility of the impact occurring is negligible and only under exceptional circumstances.	0.1
Unlikely	The possibility of the impact occurring is low with a less than 10% chance of occurring. The impact has not occurred before.	0.2
Probable	The impact has a 10% to 40% chance of occurring. Only likely to happen once in every 3 years or more.	0.5
Highly Probable	It is most likely that the impact will occur and there is a 41% to 75% chance of occurrence.	0.75
Definite	More than a 75% chance of occurrence. The impact will occur regularly.	1

11.1.6 Cumulative Impacts

Cumulative impacts are reflected in the potential intensity of the rating system. In order to assess any impact on the environment, cumulative impacts must be considered in order to determine an accurate significance. Impacts cannot be assessed in isolation. An integrated approach requires that cumulative impacts be included in the assessment of individual impacts.

The nature of the impact should be described in such a way as to detail the potential cumulative impact of the activity.

11.1.7 Significance Assessment

The significance assessment assigns numbers to rate impacts in order to provide a more quantitative description of impacts for purposes of decision making. Significance is an expression of the risk of damage to the environment, should the proposed activity be authorised.

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

Impact Significance = (extent + duration + potential intensity) x likelihood

Table 11-6 provides the resulting significance rating of the impact as defined by the equation as above.

Table 11-6: Significance rating formulas

Score	Rating	Implications for Decision-making
< 3	Low	Project can be authorised with low risk of environmental degradation
3 - 9	Moderate	Project can be authorised but with conditions and routine inspections. Mitigation measures must be implemented.
10 - 20	High	Project can be authorised but with strict conditions and high levels of compliance and enforcement. Monitoring and mitigation are essential.
21 - 26	Fatally Flawed	Project cannot be authorised

An example of how this rating scale is applied is shown below:

11.1.8 Table 11-7: Example of Rating Scale

Nature	Extent	Duration	Potential Intensity	Likelihood	Rating
Emission of SO_2 to the environment in concentrations above the minimum emissions standards. The area is a priority hotspot in terms of air emissions and there are several industrial operations that contribute to extensive emissions of SO_2.	*Global*	<u>Long term</u>	HIGH	**Probable**	High
	5	4	16	0.5	12.5

11.1.9 Notation of Impacts

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Extent- in *italics*
- Duration – in <u>underline</u>

- Potential intensity – IN CAPITALS
- Likelihood - in **bold**

11.2 Geology and Geotechnical suitability

The geology and geotechnical conditions at the proposed rail yard area and FGD infrastructure within the MPS footprint were considered by the geotechnical specialist based on existing geological and geotechnical information obtained from existing studies covering the study area.

Based in this available information the geotechnical specialist undertook a **qualitative assessment** based on professional opinion of the impact of the underlying geology on the proposed infrastructure developments.

11.2.1 FGD system within the MPS footprint

Based on existing information, most notably Golder report reference 12087-8856-1 entitled: *Medupi Power Station: Shallow Groundwater Study*, dated June 2009, the following ground conditions are apparent within the MPS footprint:

- The site is underlain by a sequence of pebbles, weathered quartzitic conglomerate with fresh variously fractured quartzitic conglomerate at depth.
- The conglomerate is interbedded with bluish grey siltstone bands. The drilling has shown that the siltstone forms discontinuous layers of up to 50cm thick but mostly about 20cm thick.
- Generally surface weathering to shallow depth (<5m) occurs, while in some boreholes a second fractured and associated weathered zone is observed and is normally found between 7 - 14m.
- Some boreholes showed no surface weathering, while boreholes in the extreme north or west, show the presence of deep weathering, up to 21m.
- Water strikes were made in 14 of the 35 boreholes at depths between 6 and 10.5m below surface

The specialist concluded that:

- Standard foundation systems are expected to be applicable, comprising generally shallow foundations.
- Excavatability is expected to be soft to intermediate, with hard rock class (drill and blast) for excavation in moderately weathered or harder rock (location dependent, but generally below about 5m depth).

11.2.2 Railway yard, including limestone and gypsum handling facilities and associated infrastructure

A qualitative assessment (professional opinion) of the geotechnical conditions within the rail yard site was undertaken based on the existing Rockland Geocscience report (Ref: RG014/169/Rev0) dated March 2015 entitled: *Report on the Geotechnical Investigation Conducted for a Proposed Rail Siding, Rail Yard and Off-loading Facility at Medupi Power Station, Lephalale, Limpopo Province*.

The following conclusions were reached:

- Excavation of test pits and geophysical surveys across the site encountered medium dense silty sand to between 1.1m and 1.8m, underlain by dense gravel to between 1.5m and 2.4m, underlain by very soft rock quartzite, with TLB refusal at 1.8m on medium hard rock quartzite at one test pit location, and finally refusal on hardpan ferricrete at 2.4m.
- Data and information on two boreholes closest to the rail yard revealed that one borehole was dry while the other supported water levels at 2.6 m below surface. The dry borehole indicates slightly and moderately weathered conglomeratic quartzite in zones below 3.5m depth, becoming fresh from 14.5m depth, whilst the borehole containing water indicated the boundary between slightly to moderately weathered quartzite and fresh quartzite at 16.5m.

The Limestone Offloading Facility at the railway yard is proposed to be 15m in depth. Based on the above, the following is interpreted:

- Hard rock (drill and blast) excavation will be required from a depth of about 2m.
- Dependent on the thickness of the surficial soils and any fill materials over the area, a contingency allowance should be made for encountering rock during the installation of such services or shallow foundations, where hard rock excavation (hydraulic rock hammer or drill and blast) may be necessary.
- Standard footing systems such as shallow pad and strip footings are expected to be applicable for the area.
- Deep excavations are expected to require reinforcement and/or stabilisation, particularly at shallow depths. Dependent on the quality of the rock and degree of fracturing, the lower half of the 15m deep excavation may potentially be unreinforced and unstabilised.
- Groundwater can be expected from a shallow depth in the excavation. The volume of water seepage is expected to be relatively low, and reducing as the excavation proceeds into less fractured rock.

It was concluded, based on available studies and specialist opinion, that no significant geotechnical hazards or fatal flaws were identified. All the geotechnical considerations mentioned can be mitigated in the design of the facilities.

11.3 Soils and Land Capability

When considering the potential impacts of the proposed rail yard and FGD infrastructure on the soils and land capability, firstly, it is important to note that the pre-development conditions or status quo for the area of concern is one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the existing power station development.

11.3.1 Planning / Pre-development phase: Soils and Land Capability

No potential impacts on soils or land use were identified during the planning and pre-development phase. The MPS was constructed to be wet FGD ready, therefore alignment of the FGD system, rail yard and associated infrastructure were pre-determined during the planning phases for the power station itself. Although design of the infrastructure is still required to align with existing infrastructure at the MPS, no pre-construction intrusive work was required to inform the designs.

11.3.2 Construction phase: Soils and Land Capability

Impact 1: Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation

During construction it is expected that soils within the development area will be stripped, followed by preparation of laydown areas, stockpile areas and preparation of the surface for construction of infrastructure.

Existing impact: Most of the proposed development site within the proposed FGD footprint has been stripped of topsoil and transformed for construction purposes, therefore potential loss of topsoil has potentially occurred already. In contrast, a large portion of the rail yard site still has intact vegetation, which will be removed and topsoil stripped during the construction phase.

Cumulative impact: Construction activities especially at the rail yard footprint will contribute to the potential loss of topsoil if not managed and mitigated to acceptable levels. The proposed retrofit project will, if improperly managed and without mitigation, have a **definite,** MODERATE to HIGH negative significance, that will affect the *development site and its immediate* surroundings for the medium to long term (life of the project and possibly beyond), and is *going to occur*.

However, with management, the loss, degree of contamination, compaction and erosion of this resource can be mitigated and reduced to a level that is more acceptable. This can be achieved by implementing the following management and mitigation measures:

- Limiting the area of impact to as small a footprint as possible, inclusive of the resource (soils) stockpiles and the length of servitudes, access and haulage ways and conveyancing systems;

- Avoidance of sensitive soil groups (reduce impact over wetlands and soils sensitive to erosion and/or compaction) where possible;
- The development and inclusion of soil management as part of the general housekeeping operations, and the independent auditing of this management;
- Concurrent rehabilitation of all affected sites that are not required for the operation;
- The rehabilitation of temporary structures and footprint areas used during the pre-construction/feasibility investigation (geotechnical pits, trenching etc.);
- Effective soil stripping during the less windy months when the soils are less susceptible to erosion, if possible;
- Effective cladding of any berms and all soil stockpiles with vegetation or large rock fragments, and the minimising of the height of storage facilities to 15m and soil berms to reasonable height wherever possible; and
- Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction.

Residual impact: The above management procedures will **probably** reduce the negative significance rating and resultant risk impact to a MODERATE or LOW. Based on the historical activities (disturbed nature of the site) these actions are *very likely to occur*.

11.3.3 Operational phase: Soils and Land Capability

Impact 1: Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation

The loss of utilisable soil resources during the operational phase revolve around potential for spillage and contamination of the in-situ and stockpiled materials, contamination due to dirty water run-off and/or contaminated dust deposition/dispersion, the de-nutrification of the stockpiled soils due to excessive through flow and the leaching out of nutrients and metals due to rain water on unconsolidated and poorly protected soils.

Existing impact: A positive impact will be the rehabilitation with stockpiled soils of areas where temporary infrastructure was constructed or areas were cleared during the start-up and construction phase.

Cumulative impact: This impact relates to the cumulative impact on stockpiled topsoil or insitu soil due to spillages of hazardous substances, compaction due to uncontrolled vehicle and pedestrian traffic, and loss of topsoil due to improperly managed erosion and handling.

In the un-managed scenario these activities will **probably** result in a MODERATE to HIGH negative significance that will affect the *development footprint and adjacent sites* for the medium to long term. These effects are *very likely to occur*.

The impacts on the soils during the operational phase can be mitigated with well-initiated management procedures including:

- Minimisation of the area that can potentially be impacted (eroded, compacted, sterilised or de-nutrified);
- Timeous replacement of the soils so as to minimise/reduce the area of affect and disturbance;
- Effective soil cover and adequate protection from wind (dust) and dirty water contamination – vegetate and/or rock cladding;
- Regular servicing of all vehicles in well-constructed and bunded areas;
- Regular cleaning and maintenance of all haulage ways, conveyancing routes and service ways, drains and storm water control facilities;
- Containment and management of spillage;
- Soil replacement and the preparation of a seed bed to facilitate and accelerate the re-vegetation program and to limit potential erosion on all areas that become available for rehabilitation (temporary servitudes), and
- Soil amelioration (rehabilitated and stockpiled) to enhance the growth capability of the soils and sustain the soils ability to retain oxygen and nutrients, thus sustaining vegetative material during the storage stage.

Residual Impact: In the *long term* (Life of the operation and beyond) and if implemented correctly, the above mitigation measures will **probably** reduce the negative impact on the utilisable soil reserves to a significance rating of MODERATE LOW in the medium term, and is *very likely to occur*.

However, if the soils are not retained/stored and managed, and a workable management plan is not implemented the residual impact will definitely incur additional costs and result in the impacting of secondary areas (Borrow Pits etc.) in order to obtain cover materials etc.

11.3.4 Decommissioning and closure phase: Soils and Land Capability

Impact 1: Net loss of soil volumes and utilisation potential due to change in material status (Physical and Chemical) and loss of nutrient base.

Existing impact: The impacts on the soil resource during the decommissioning and closure phase have both a positive (i.e. reduction in areas of disturbance through rehabilitation and return of soil utilization potential), and a negative effect, through loss of soils, erosion, compaction and contamination of the natural resource.

Cumulative impact: The impact will **probably** remain the net loss of the soil resource if no intervention or mitigating strategy is implemented. The intensity potential will remain MODERATE and negative for the medium to short term for all of the activities if there is no active management (rehabilitation and intervention) in the decommissioning phase, and closure will not be possible. The impacts will be confined to the *development area and its adjacent buffer*, and is *likely* to happen.

However, with interventions and well planned management, there will be a MODERATE to HIGH positive intensity potential as the soils are replaced and fertilisation of the soils is implemented after removal of the infrastructure.

Ongoing rehabilitation during the operational and decommissioning phases will bring about a net long-term positive impact on the soils, albeit that the land capability will likely be reduced to grazing status.

Residual impact: On closure of the operation the *long-term* negative impact on the soils will be reduced from a significance ranking of MODERATE to LOW if the management plan set out in the EMPr is effectively implemented. These impacts will be confined to the development site and its adjacent environments, and is *very likely* to occur.

11.4 Groundwater

The groundwater specialist undertook a **qualitative assessment** (professional opinion) of the potential impact that identified aspects or activities may have on groundwater resources underlying the rail yard and FGD infrastructure study area within the MPS. The qualitative assessment took into consideration the existing groundwater studies that were undertaken during the initial EIA application for the MPS itself, as well as subsequent groundwater studies and monitoring reports that was undertaken within the proposed study area. Qualitative assessments were undertaken for the following aspects / activities:

- Trucking of Type 1 Waste to a Hazardous Disposal Facility
- Construction and operation of the FGD system within the Medupi Power Station Footprint, including all associated infrastructure and processes necessary to support its operation;
- Construction and operation of the railway yard, limestone and gypsum handling facilities, including diesel storage facilities and associated infrastructure between the Medupi Power Station and existing ADF;

11.4.1 Professional opinion on trucking of Type 1 Waste to a Hazardous Disposal Facility

For a 5-year period of the operational phase, sludge and salts will be trucked to a licensed hazardous waste disposal site. During transportation of hazardous waste, the trucking contractor should adhere to all regulations and standards of both environmental and mining acts. Save Working Procedures (SWP) for transportation of hazardous waste must be in place, to minimize the risk of contamination to the environment and groundwater should a spillage occur.

A hazardous spillage could contaminate the groundwater, and samples of any nearby boreholes should be analysed and monitored after a spillage incident. Storage of hazardous waste on site will arise to additional disposal facilities and increasing risks to contamination the groundwater regime.

Possible impacts on the groundwater regime associated with trucking process of type 1 waste, to a licensed hazardous waste disposal site are based on a simplified groundwater risk assessment and are presented in **Table 11-8**. The risk rating is based on a possible risk/impact that activities from the trucking process of type 1 waste poses to the groundwater regime. Assessment is based on positive and negative outcome of impact/risk to the groundwater regime.

Table 11-8: Simplified Groundwater Risk Assessment to support specialist opinion

Activity	Positive Impacts	Negative Impacts
Removal of hazardous waste from existing licensed waste disposal facility	Removal of contamination source	None
Transportation of hazardous waste to a licensed hazardous waste disposal site	Removal and transportation of hazardous waste	None
Spillage during transportation of hazardous waste	None	Contamination of groundwater and impacting on existing users in vicinity of spillage
Disposal of hazardous waste	Disposal of hazardous waste	None

It is thus concluded, based on the simplified groundwater risk assessment that trucking of type 1 waste to a licensed hazardous waste disposal site is effectively a positive impact on site since the hazardous waste is removed from site in a responsible manner and disposed of at a licenced waste facility licenced for this purpose.

11.4.2 Impact assessment of the FGD system on groundwater resources

The groundwater specialist provided an **impact assessment** (**Table 11-9**) of whether groundwater resources could potentially be impacted with the construction and operation of the FGD system and all associated infrastructure within the MPS footprint. From the aerial view it is evident that the entire Medupi FGD footprint area is disturbed during the construction activities at the power station.

Table 11-9: Impact assessment of FGD system on groundwater resources

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction Phase						
Groundwater quality	Existing	1	2	4	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	4	**0.5**	4 - MOD
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Volume/recharge	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	4	**0.2**	1 - LOW
	Residual/Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Flow	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	2	2	2	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Construction Phase						
Groundwater quality	Existing	1	2	4	**0.5**	4 - MOD
	Cumulative (current and FGD)	1	2	4	**0.5**	4 - MOD
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Volume/recharge	Existing	1	2	2	**0.5**	3 - MOD
	Cumulative (current and FGD)	2	2	4	**0.5**	4 - MOD
	Post Mitigation	1	1	2	**0.1**	0 - LOW

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Groundwater Flow	Existing	1	2	2	**0.75**	4 - MOD
	Cumulative	2	2	2	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Operational Phase						
Groundwater quality	Existing	2	3	4	**0.75**	7 - MOD
	Cumulative (current and FGD)	2	3	4	**0.75**	7 - MOD
	Post Mitigation	1	3	2	**0.2**	1 - LOW
Groundwater Volume/recharge	Existing	2	3	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	4	**0.5**	4 - MOD
	Post Mitigation	2	2	2	**0.1**	1 - LOW
Groundwater Flow	Existing	2	3	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	4	**0.2**	1 - LOW
	Post Mitigation	2	2	2	**0.1**	1 - LOW
Decommissioning Phase						
Groundwater quality	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	3	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW
Groundwater Volume	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW
Groundwater Flow/recharge	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW

The predicted impact of the FGD system on the groundwater quality, volume and flow is of **Low significance** during all phases if proposed mitigation measures are implemented successfully.

The specialist thus concluded that construction and operation of the FGD system would have a **minor** change in the volume of water entering groundwater storage (reduced recharge in comparison to status quo conditions) and with **negligible** changes expected in the groundwater flow regime.

11.4.3 Impact assessment of the rail yard and associated infrastructure on groundwater resources

The groundwater specialist provided an **impact assessment** (**Table 11-10**) of whether groundwater resources could potentially be impacted with the construction and operation of the rail yard, limestone and gypsum handling facilities and all associated infrastructure.

Table 11-10: Impact assessment of rail yard and associated infrastructure on groundwater resources

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-development phase						
Groundwater quality	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	2	4	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Volume/recharge	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	2	4	**0.2**	1 - LOW

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
	Residual/Post Mitigation	1	1	2	0.1	0 - LOW
Groundwater Flow	Existing	1	2	2	0.2	1 - LOW
	Cumulative	1	2	4	0.2	1 - LOW
	Post Mitigation	1	1	2	0.1	0 - LOW
Construction phase						
Groundwater quality	Existing	1	2	2	0.5	3 - MOD
	Cumulative	1	2	4	0.5	4 - MOD
	Post Mitigation	1	1	2	0.1	0 - LOW
Groundwater Volume/recharge	Existing	1	2	2	0.5	3 - MOD
	Cumulative	1	2	2	0.5	3 - MOD
	Post Mitigation	1	1	2	0.1	0 - LOW
Groundwater Flow	Existing	1	2	2	0.75	4 - MOD
	Cumulative	1	2	2	0.2	1 - LOW
	Post Mitigation	1	1	2	0.1	0 - LOW
Operational phase						
Groundwater quality	Existing	2	3	4	0.75	7 - MOD
	Cumulative	2	2	8	0.5	6 - MOD
	Post Mitigation	1	3	2	0.2	1 - LOW
Groundwater Volume/recharge	Existing	2	3	2	0.2	1 - LOW
	Cumulative	1	1	4	0.2	1 - LOW
	Post Mitigation	2	2	2	0.1	1 - LOW
Groundwater Flow	Existing	2	3	2	0.2	1 - LOW
	Cumulative	1	1	4	0.2	1 - LOW
	Post Mitigation	2	2	2	0.1	1 - LOW
Decommissioning phase						
Groundwater quality	Existing	1	2	2	0.2	1 - LOW
	Cumulative	1	3	2	0.2	1 - LOW
	Post Mitigation	1	2	1	0.1	0 - LOW
Groundwater Volume	Existing	1	2	2	0.2	1 - LOW
	Cumulative	1	2	2	0.2	1 - LOW
	Post Mitigation	1	2	1	0.1	0 - LOW
Groundwater Flow/recharge	Existing	1	2	2	0.2	1 - LOW
	Cumulative	1	2	2	0.2	1 - LOW
	Post Mitigation	1	2	1	0.1	0 - LOW

Based on the impact rating in **Table 11-10**, the specialist concluded that the predicted impact of construction and operation of the rail yard and associated infrastructure **on groundwater quality, volume and flow is of Low significance** during all phases after the proposed mitigation measures has been successfully implemented.

11.4.4 Proposed mitigation measures for impacts on groundwater

Management and mitigation measures proposed by the specialist include:

- Safe working procedures (SWP) for construction work should be in place to specifically minimize the risk of contamination to the environment and groundwater should a spillage occur.
- Any spillages that occur should be logged in a quantitative manner.
- Any accidental spillage should be cleaned up immediately to limit contamination and if intensity is high, the impact must be reversed with the applicable mitigation and management actions.

- Monthly groundwater monitoring is recommended to form part of the mitigation and management of the existing licensed disposal facility. This monitoring must be included in the monitoring network and will function as an early warning system for contaminant migration (if any).
- Frequent inspection during construction and maintenance of constructed infrastructure must be undertaken.

11.5 Surface water

11.5.1 Impact assessment of the FGD system, rail yard and associated infrastructure on surface water resources

The surface water specialist / hydrologist completed an impact assessment for the identified impacts on surface water resources. Impact ratings for these impacts are provided in **Table 11-11**.

During consideration of the potential impacts it was important to note that the MPS already has an allocated footprint into which the proposed activities will be constructed. There is, therefore, already an impact on the environment. Furthermore, due to the existing impact a Storm Water Management System (SWMS) has been implemented on the development site. The surface water specialist concluded that the SWMS appears to be well operated and maintained, therefore, the existing impact is rated as low.

Table 11-11: Impact assessment of the FGD system, rail yard and associated infrastructure on surface water resources

Description of Impact	Impact Type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction						
Pollution of natural surface water features (Water quality).	Existing	2	2	4	0.2	1.6 – LOW
	Cumulative	2	2	4	0.2	1 .6 – LOW
	Residual	2	2	4	0.2	1.6 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Construction Phase						
Pollution of natural surface water features (Water quality).	Existing	2	3	4	0.5	4.5 – MOD
	Cumulative	2	3	4	0.5	4.5 – MOD
	Residual	2	2	4	0.2	1.2 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Operational Phase						
Pollution of natural surface water features (Water quality).	Existing	2	2	4	0.2	1.6 – LOW
	Cumulative	2	2	4	0.2	1.6 – LOW

Description of Impact	Impact Type	Extent	Duration	Potential Intensity	Likelihood	Rating
	Residual	2	2	4	0.2	1.6 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Decommissioning Phase						
Pollution of natural surface water features (Water quality).	Existing	2	3	4	0.5	4.5 – MOD
	Cumulative	2	3	4	0.5	4.5 – MOD
	Residual	2	2	4	0.2	1.6 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW

Cumulatively, there is no expectation for further impact to the environment because of where the activities are proposed to be located. With mitigation the residual surface water pollution impact will be low due to the probability of dirty water spilling over into the environment from Medupi Power Station. Proper maintenance of the SWMP will reduce the rating to low. Ongoing surface water monitoring is important to ensure that this trend continues, especially during high rainfall events.

With the construction and decommissioning phases an increased pollutant load may be expected due to construction and decommissioning activities. This is clearly indicated in the impact assessment in **Table 11-11** with moderate impact ratings being assigned, however with the existing SWMA in place coupled with regular maintenance the residual impact for all phases will be low.

It is furthermore unlikely that a significant reduction in surface water runoff will occur due to the construction of the rail yard and FGD infrastructure within the MPS. The main reason for this is exactly the fact that the proposed infrastructure will be constructed within the MPS footprint. The existing SWMS will continue to ensure clean and dirty water separation as to avoid dirty water from entering the downstream water resources. Therefore the likely impact on surface water runoff will be low as demonstrated in **Table 11-11**. Furthermore, run-off may increase as areas are rehabilitated during the decommissioning phase which would largely result in a limited but positive impact.

In respect of potential flooding, the surface water specialist concluded that the existing SWMS appears to be adequately designed to cater for the existing facilities

The specialist further concluded that the runoff around the facility in the clean areas is not markedly changed for the sub-catchment of the Sandloop, resulting in a potential impact significance of low.

11.5.2 Specialist Opinion on sludge and salts trucking impact

The surface water specialist provided a **qualitative assessment** (specialist opinion) on the significance of the surface water impacts for the proposed trucking of sludge and salts from MPS proposed temporary hazardous waste storage area in Limpopo Province to an appropriately licensed existing hazardous waste facility outside of the Medupi Power Station study area. The specialist made the following observations and conclusions:

- The trucking of salts and sludge from Medupi to the licensed hazardous waste site will pose a **medium potential risk impact** to the water resources in the study area.
- The medium, rather than high, risk impact assessment rating is in light of the fact that MPS has taken significant steps in investigating this matter beforehand. Various specialist studies have been commissioned to investigate this matter and its associated risks thoroughly and give specialist opinions as well as mitigation measures where possible.
- The specialist concluded in his opinion that the transportation of salts and sludge from Medupi Power Station to an appropriately licensed existing hazardous waste facility outside of the study area will **not pose a serious threat to water resources in the region**.

11.5.3 Mitigation and management measures for potential surface water impacts

Considering all potential impacts identified on the surface water resources the specialist proposed the following mitigation and management measures:

- As this will be within the existing footprint, it is unlikely that there will be considerable impacts from the removal of vegetation and/or topsoil during excavation. However, this aspect should be considered and managed to reduce erosion which could cause siltation of the surrounding surface water resources.
- Removal of topsoil should be done systematically, only clearing the necessary areas at a time.
- Clean and dirty surface water channels must be constructed to divert runoff separately to the appropriate storage dams (dirty water to the PCD to avoid eroded soils entering the clean water areas) as required by the relevant legislation and norms and standards.
- The existing SWMS will need to be optimally operated and maintained.
- Ongoing monitoring of the surface water must continue or be commissioned for pH, Total Dissolved Solids, Electrical Conductivity, Alkalinity, potassium, calcium, sodium, chloride, fluoride, sulphate, nitrate, ammonium, Total Hardness, Metals: arsenic, beryllium, cadmium, barium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, uranium, vanadium and zinc using ICP-MS), orthophosphate, Total Suspended Solids, Oil and Grease.
- Monitoring of surface water must be undertaken monthly when water is available or after a rain event.

- To prevent possible pollution of the receiving surface water environment, dirty water containment structures should be designed, constructed, maintained and operated such that they do not spill over more than once in 50 years. A minimum freeboard of 0.8 m above Full Supply Level (FSL) must also be maintained as per GN704 requirements (flow-based hydraulic sizing requirements).
- Water accumulated in the containment facility during the wet season should be used as a priority in the process water circuit to ensure that the capacity requirements are not compromised during periods of heavy and/or extended rainfall.
- It is recommended that an update to both the storm water management plan (SWMP) and the existing water balance be undertaken such that it caters for the proposed FGD and ADF infrastructure as well as be designed and operated in line with the DWS's GN704.
- The proposed water quality monitoring programme must be strictly followed and sustained so that chemical constituent levels can be monitored and analysed over time. Pollution of surrounding surface water features should be avoided at all costs during the lifespan of the Medupi Power Station project. In the unfortunate occurrence of surface water resources pollution, swift and effective corrective measures should be implemented and the relevant authorities notified without delay.
- With respect to the transportation of sludge and salts from Medupi to a hazardous waste disposal site, it is recommended that a route selection study be carried out to determine the least potential water surface impacts, considering other factors such as the traffic impact assessment. From a surface water perspective, a route via a national road (highway) would be most appropriate as the likelihood of accidents and spillages due to poor road conditions will be minimised.

11.6 Biodiversity (Terrestrial Ecology) and Wetlands

11.6.1 Impact assessment of the FGD system, rail yard and associated infrastructure on terrestrial ecology and wetlands

The terrestrial ecologist and wetland specialist undertook an impact assessment for the identified impacts on ecology and wetland resources in and around the study site. Impact ratings for identified impacts are provided in **Table 11-12**.

It should be noted that the scope of the biodiversity specialist assessment included assessment of impact on terrestrial ecology and wetlands resulting from the construction and operation of the FGD system, rail yard and ADF and surrounding sensitive areas. This EIA however only considered the construction and operation of the FGD system, rail yard and associated infrastructure, excluding the ADF area which is assessed and considered in a separate application for amendment of the existing WML. As a result, impacts on the receiving environment as a result of the construction of the ADF were not considered here.

During assessment of the biodiversity and potential wetlands within the proposed FGD footprint, rail yard and associated infrastructure supporting these systems, it was concluded that no direct impact occurred on wetlands within this footprint area. The closest wetland to the proposed infrastructure is situated outside the MPS just south of the proposed FGD infrastructure site. Impact on this wetland (referred to as SEW 2 in the specialist report) would be expected to be minor since the FGD infrastructure is situated within the footprint of the existing MPS, which means that engineering and mitigation management measures to manage dirty water runoff, erosion, for example, is pre-existing at the proposed site, thereby reducing impacts on the receiving environment outside the MPS footprint.

A number of impacts relating to the potential loss of vegetation species, habitat and fauna mortality during the construction phase were identified and assessed by the biodiversity specialist. During the assessment it was concluded that after successful implementation of the proposed mitigation measures the cumulative impact significance could be reduced with the residual impact being reduced to MODERATE or LOW significance. The fact that the proposed development footprint for the FGD and rail yard was presently disturbed and transformed contributed to the impact significance rating.

Another prominent impact feature that was identified during the construction phase is the loss of catchment area contributing to storm water runoff due to the need to separate and contain contaminated "dirty" water. Associated with this is an expected increase in flood peaks and pollution through contaminated runoff. Mitigation measures for the loss of catchment area and decreased water input to wetland areas is limited resulting in an impact significance rating of HIGH. Impacts related to pollution run-off and increased flood peaks can be mitigated to MODERATE to LOW impact significance levels.

Table 11-12: Impact assessment of the FGD system, rail yard and associated infrastructure on biodiversity at the study site

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likeli-hood	Rating
Construction Phase						
Direct Impact: Potential loss of vegetation units.	Existing	1	5	2	1	8 - MOD
	Cumulative	1	5	2	1	8 - MOD
	Residual	1	5	2	1	8 - MOD
Direct Impact: Potential increase in alien vegetation species	Existing	1	3	4	1	8 - MOD
	Cumulative	3	5	4	1	12 - HIGH
	Residual	1	1	2	0.5	2 - LOW
Direct Impact: Potential loss of CI floral species	Existing	1	5	4	1	10 - HIGH
	Cumulative	1	5	4	1	10 - HIGH
	Residual	1	5	2	1	8 - MOD
Direct Impact: Potential loss of CI faunal species (excluding bullfrogs and raptors)	Existing	1	5	4	0.5	5 - MOD
	Cumulative	1	5	8	0.5	7 - MOD
	Residual	1	5	4	0.2	2 - LOW
Direct Impact: Potential loss of CI raptor species	Existing	1	5	4	0.5	5 - MOD
	Cumulative	1	5	8	0.5	7 - MOD
	Residual	1	5	4	0.2	2 - LOW
Direct Impact: Loss of foraging habitat for game species	Existing	1	5	2	1	8 - MOD
	Cumulative	1	5	4	1	10 - HIGH
	Residual	1	5	2	0.2	2 - LOW
Direct & Indirect: Loss of catchment area and decrease in water inputs	Existing	2	3	2	0.5	4 - MOD
	Cumulative	3	4	4	1	11 - HIGH
	Residual	3	3	4	1	10 - HIGH

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likeli-hood	Rating
Direct Impact: Increased faunal mortality.	Existing	1	2	2	1	5 - MOD
	Cumulative	1	2	2	1	5 - MOD
	Residual	1	2	2	0.5	3 - MOD
Indirect: Increased sensory disturbance to fauna	Existing	2	2	4	1	8 - MOD
	Cumulative	2	3	8	0.75	10 - HIGH
	Residual	1	2	4	0.5	4 - MOD
Direct & Indirect: Increased pollution; Increased dust & erosion and ultimately degradation of surrounding wetlands.	Existing	2	2	4	1	8 - MOD
	Cumulative	2	3	8	0.75	10 - HIGH
	Residual	1	2	4	0.5	4 - MOD
Indirect: Increase in floodpeaks, sediment loads and erosion to wetlands.	Existing	2	3	4	1	9 - MOD
	Cumulative	2	3	4	1	9 - MOD
	Residual	1	2	1	0.5	2 - LOW
Operational / Decommissioning Phase						
Direct & Indirect: Loss of catchment area and consequent decrease in water inputs.	Existing	2	3	2	0.5	4 - MOD
	Cumulative	3	4	4	1	11 - HIGH
	Residual	3	3	4	1	10 - HIGH
Direct Impact: Increased faunal mortality.	Existing	1	2	2	1	5 - MOD
	Cumulative	1	2	2	1	5 - MOD
	Residual	1	2	2	0.5	3 - MOD
Direct Impact: Spills -Sedimentation and Surface water contamination	Existing	0	0	0	0	0 - LOW
	Cumulative	3	2	8	0.5	7 - MOD
	Residual	3	2	4	0.5	5 - MOD
Direct Impact: Contamination of wetlands from storage facilities associated with the ADF and FGD– Consequences for bullfrogs and aquatic invertebrates.	Existing	3	5	4	1	12 - HIGH
	Cumulative	3	5	8	1	16 - HIGH
	Residual	3	3	4	0.5	5 - MOD

Impacts identified relating to the operational phase of the MPS FGD and rail yard is largely a continuation of impacts that emerged during the construction phase. Loss of catchment area and decreased water inputs remain after construction, while vehicle traffic within the MPS footprint remains a threat to the fauna present on the MPS footprint. Furthermore contamination from pollution runoff on from the power station footprint remain a concern, although these impacts can largely be reduced to MODERATE impact significance subsequent to successful implementation of the proposed mitigation measures.

A number of management and mitigation measures to prevent impact on fauna, flora, vegetation habitat and downstream wetland systems have been proposed by the specialist and is presented in the next section.

11.6.2 Mitigation and management measures for impacts on terrestrial ecology and wetlands

The following management and mitigation measures were proposed by the biodiversity and wetland specialists:

- All clearing of vegetation needs to occur only within the required construction and operational footprint of the proposed FGD / railway yard area. If at all possible vegetation in the western corner of the railway yard area must remain intact and undisturbed.

- The area of construction should be fenced to prevent encroachment into surrounding vegetation.
- Any bulbous or protected species that can be transplanted must be removed and transplanted to a similar habitat nearby.
- Alien species must be monitored and controlled under the MPS Alien Control Programme.
- Construction crew must be made aware of the alien species that occur on site, specifically Category 1 species and must be trained in the basics for recognition and removal.
- MPS has removed tree species successfully during the construction phase of their MPS. Therefore the same would apply here. The Environmental Officer (EO), or trained botanist will be required to tag all Protected Trees within the footprint for removal and relocation. These individual plants will need to be monitored over the long term.
- Permits will be required from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of sensitive or protected tree species.
- Any other species that may be identified as Conservation Important (CI) must either be translocated (if possible) or specific mitigation must be compiled by a qualified botanist in collaboration with the MPS EO.
- In order to reduce the impact on CI faunal species on site, it is recommended that clearing be undertaken in winter, where possible. It is recommended that immediately prior to clearing that a walk down be conducted by Eskom’s environmental manager or environmental officer in conjunction with a suitable specialist, preferably one with expertise in arachnids, to intensively search the site preferably in the height of the rainy season (December) to detect and relocate any baboon or trapdoor spiders or scorpions frogs, tortoises. If any of these species are encountered during development the specialist with should advise upon and oversee relocation.
- Mitigation is limited and likelihood is very low that nests of CI raptor species would be encountered on site. However if encountered, its location should be marked and reported to the relevant authorities before construction continues. Normally a minimum 1km radius buffer or exclusion zone should is applied to such points but given the complex nature of this project would require in depth consultation with an appropriately experienced ornithologist. As far as possible large trees above 5m should be marked and safeguarded in the unaffected areas.
- Minimise disturbance footprint and restrict construction and operation activities to within the proposed construction and operational footprint area. The Environmental Officer (EO) must monitor the carrying capacity relative the game within the Railyard area and act accordingly to ensure that there is enough grazing land for the existing game within this area, otherwise implement capture and relocation.
- The mitigation with regards to catchment loss is limited and the residual impact risk remains High. Efforts should be centred on minimising catchment loss by minimizing the PCD, coal stockpile and other associated infrastructure to as small an area as possible.

- Mitigation of increased faunal mortality require the site to be searched prior to clearing by an appropriately qualified specialist and any less mobile fauna relocated. Maintain existing tortoise road signs and insert new ones where necessary. Continue to enforce speed regulation controls such as speed humps and limits.
- Keep lighting to a minimum during construction but most significantly during operation to limit the impact of increased sensory disturbance to fauna. Lights should be angled downwards and hooded to lower light pollution. Restrict unnecessary access to the remaining patches of natural vegetation.
- To mitigate impacts from traffic and human activity the following should be applied:
  - Remain outside of the Sandloop buffer area;
  - Service and maintain vehicles regularly;
  - Eskom must ensure that all trucks before leaving the storage area shall be completely covered with a tarpaulin or any other effective measure/device. Trucks must not be over-loaded to ensure no spillage during transportation;
  - Reduce coal movement as much as possible during high wind events;
  - Proper drainage system shall be provided in the coal storage area so that water drained from sprinkling and runoff is collected at a common tank and can be reused after treatment.
  - Traffic and construction activities should be limited to daylight hours.
  - Regular surface wetting is required;
  - Demarcate and restrict anthropogenic disturbances to the construction area.
  - Measures such as speed humps, signage and fines should be implemented to reduce speeding and any off-road driving.
  - Off-road driving must be prohibited in all surrounding natural areas as this could increase the risks of erosion.
- Erosion and Storm Water Management Plan must be revised to allow for heavy rainfall events.
- Measures to reduce the risk of contamination from the trucking spills include a concrete slab layer beneath roads and kerb inlets to the dirty water system.
- Spilt material must regularly be cleaned up and that all drains inlets and stormwater infrastructure is regularly inspected for blockages and cleared out.
- The gypsum offtake structure may be a problem following high rainfall events, however a concrete bunding and a central depression is proposed to prevent spills. Again it is important to ensure this area is kept tidy and regularly cleaned out.
- At the oil transformer areas the pits are proposed to be bunded and have a concrete base of 100 mm thick. These pits need to be emptied regularly.
- Additionally manganese levels in the stockpiles as well as the environment should be monitored through regular water quality testing at the pans immediately south of the FGD and compared to current baseline levels.
- All of these measures however are designed to cope with a 1 in 50 year peak 24 hour rainfall event. However should an extreme rainfall event occur that exceeds this estimate

or if maintenance (clearing drains etc.) has been inadequate these structures may fail and contaminants may enter SEW 2.

11.7 Air Quality

11.7.1 Impact assessment of the FGD system, rail yard and associated infrastructure on ambient air quality

The air quality specialist completed an impact assessment for the identified impacts on ambient air quality at the MPS and locally. During assessment of the air quality impacts, the specialist concluded that the operational phase is considered to be the phase with the largest impact on ambient air quality. Impact ratings for these impacts are provided in **Table 11-13**.

The construction and decommissioning (rehabilitation) phases were considered not likely to impact the ambient air quality more than the existing (status quo) status. As a result only the impact associated with the operational phase of the FGD system, rail yard and associated infrastructure were subjected to quantitative impact assessment.

The proposed Project operations were assessed as the cumulative impact which includes the operations of the Matimba Power Station and the Medupi Power Station including six units with FGD.

Table 11-13: Impact assessment of the FGD system, rail yard and associated infrastructure on ambient air quality during operational phase

Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Increase in SO_2	Existing	4	3	4	4	2.9 - MOD
	Cumulative(b)	3	3	3	3	1.8 - LOW
	Residual	3	3	3	3	1.8 - LOW
Increase in NO_2	Existing	2	3	3	3	1.6 - LOW
	Cumulative(b)	2	3	3	3	1.6 - LOW
	Residual	2	3	3	3	1.6 - LOW
Increase in PM_{10}	Existing	2	3	3	3	1.6 - LOW
	Cumulative(b)	2	3	3	3	1.6 - LOW
	Residual	2	3	3	3	1.6 - LOW
Increase in $PM_{2.5}$	Existing	2	3	3	3	1.6 - LOW
	Cumulative(b)	2	3	3	3	1.6 - LOW
	Residual	2	3	3	3	1.6 - LOW

The area of non-compliance of cumulative SO_2 concentrations reduces significantly with FGD with no exceedances of the NAAQS at sensitive receptors, reducing the significance to LOW.

No exceedances of the NAAQS for NO_2, PM_{10} and $PM_{2.5}$ were simulated at sensitive receptors due to proposed Project operations resulting in LOW significance.

The residual impact of the ash disposal facility shows little impact in magnitude at the sensitive receptors (located upwind of the facility) on a daily and annual averaging period providing no change in significance on PM from cumulative to residual operations.

11.7.2 Mitigation and management measures for potential air quality impacts

Considering all potential impacts identified on air quality the specialist proposed the following mitigation and management measures:

- The FGD control is considered a scenario of the assessment and not a mitigation measure for the significance rating as it is an operational activity that is to take place.
- As the proposed Project operations will significantly reduce SO_2 impacts from the Medupi Power Station, it is recommended that the FGD Retrofit Project be implemented.
- The movement of sludge and salt off-site to a licenced facility will contribute to fugitive vehicle entrainment emissions. It is recommended that the access road being used is properly maintained to minimise the impacts from this source.

11.8 Noise

11.8.1 Impact assessment of the FGD system, rail yard and associated infrastructure on ambient noise levels

The noise specialist completed an impact assessment for the identified impacts on ambient noise levels at the MPS and locally. During assessment of the noise impacts, the specialist concluded that with noise mitigation, noise levels from the project will be low. Impact ratings for these impacts are provided in **Table 11-14**.

Table 11-14: Impact assessment of the FGD system, rail yard and associated infrastructure on ambient noise levels

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction Phase						
Indirect Impact: Increase in noise levels	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	1	0.5	2 - LOW
	Residual	2	1	1	0.5	2 - LOW
Construction Phase						
Indirect Impact: Increase in noise levels	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	2	0.5	3 - MOD
	Residual	2	1	1	0.5	2 - LOW
Operational Phase						
Indirect Impact: Increase in noise levels	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	1	0.5	2 - LOW
	Residual	2	1	1	0.5	2 - LOW
Decommissioning Phase						
Indirect Impact: Increase in noise levels	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	2	0.5	3 - MOD
	Residual	2	1	1	0.5	2 - LOW

The impacts on ambient noise levels relate entirely to the potential increase in noise levels through all phases of the proposed development as shown in **Table 11-14**.

The impact assessment undertaken by the noise specialist rated impact on noise levels during the planning and operational phases as low. The specialist concluded that during these phases the noise levels in the area are representative of suburban districts. Cumulative impacts would be similar to baseline levels during the planning phase, while change in noise levels due to operation is expected to be slight at NSRs.

The specialist identified that during the construction and decommissioning phases the construction and decommissioning activities would result in a Moderate noise impacts, but with noise levels remaining local yet still notable.

The specialist therefore concluded that in the quantification of noise emissions and simulation of noise levels as a result of the proposed project, it was calculated that ambient noise evaluation criteria for human receptors will not be exceeded at NSRs. Therefore, reaction from members of the community within this impact area is not very likely.

11.8.2 Mitigation and management measures for potential noise level impacts

Considering all potential impacts identified on noise levels the specialist proposed the following mitigation and management measures as described below.

For general activities, the following good engineering practice must be applied:

- To minimise noise generation, vendors should be required to guarantee optimised equipment design noise levels.
- A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed.

In managing transport noise specifically related to trucks, efforts should be directed at:

- Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
- Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration.
- Maintain road surface regularly to avoid corrugations, potholes etc.
- Avoid unnecessary idling times.
- Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse ‘beeper’ alarm such as a ‘self-adjusting’ or ‘smart’ alarm should be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level in the vicinity of the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites ‘with

low ambient noise level' (Burgess & McCarty, 2009, as cited in (von Gruenewaldt & von Reiche, 2018).

11.9 Social

11.9.1 Impact assessment of the FGD system, rail yard and associated infrastructure on the social environment

An Impact assessment of the FGD system, rail yard and associated infrastructure on the social environment was undertaken by the appointed social specialist. The impact assessment table provided by the specialist in his specialist report (included as Appendix G to this DEIR) has been simplified, summarised and reduced to highlight the major findings and trends concluded by the social specialist (**Table 11-15**). The reader is urged to peruse the impacts assessment table in the Social Impact Assessment Report as the specialist furthermore aligned recommendations or mitigation measures with each impact in the table, provided a short motivation to support the impact assessment ratings.

For the benefit of I&APs the main impacts and mitigation measures are highlighted in this section in order to provide the reader an overall understanding of impacts and mitigation measures / recommendations concluded by the specialist. A number of positive impacts were identified by the social specialist and for the reader's benefit the impact descriptions (column 1 in **Table 11-15**) of these positive impacts has been shaded in a light shade of green.

All impacts identified during the Operational and Decommissioning Phases were considered positive impacts, whereas half of the impacts identified during the construction phase are positive impacts on the surrounding community.

During the Planning / Pre-construction Phase the establishment of spin-off businesses, e.g. B&Bs, to support the construction phase of the Medupi FGD and rail yard was identified as a positive impact that could contribute to the local economy and employment opportunities. However, the publication of the proposed FGD construction project is likely to attract migrant labourers with employment expectations at the MPS.

Positive impacts associated with the Construction Phase of the FGD, rail yard and associated infrastructure revolve around economic and employment opportunities as well as upgrading of infrastructure such as local roads. However, the Construction Phase is also likely to result in increased traffic within the study area, and higher demand on already stressed water allocation for the Lephalale area.

Positive impacts identified during the Operational Phase of the FGD include the improvement of the ambient air quality through the significant reduction of SO_2 due the operational FGD system, a reduction in respiratory related diseases coupled with an overall improvement in the quality of life, the stabilisation of the national electricity grid to support amongst other local economic development, and the establishment of business and employment opportunities resulting from the sale of gypsum.

Table 11-15: Impact assessment of the FGD system, rail yard and associated infrastructure on socio-economic environment

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction Phase						
Indirect Impact: Developing spin off businesses to support FGD construction phase (B&Bs) (Positive Impact)	Existing	2	3	8	1	13 – HIGH
	Cumulative	2	3	8	1	13 – HIGH
	Residual	2	2	8	1	12 – HIGH
Indirect Impact: Employment expectations and influx of migrant labour	Existing	3	2	2	0.75	5 – MOD
	Cumulative	4	3	8	0.75	11 – HIGH
	Residual	1	2	1	0.5	2 – LOW
Construction Phase						
Direct Impact: Employment of skilled, semi-skilled and unskilled labourers in the construction of the FGD (Positive Impact)	Existing	1	1	1	1	3 - MOD
	Cumulative	2	1	4	1	7 - MOD
	Residual	2	1	1	0.5	2 - LOW
Direct Impact: Development of tenders and contract opportunities for local businesses in construction of the FGD and ancillary infrastructure (Positive Impact)	Existing	2	1	1	1	4 - MOD
	Cumulative	2	1	2	1	5 - MOD
	Residual	2	1	1	1	4 - MOD
Indirect Impact: Improvement in local road conditions with the construction of the FGD (Positive Impact)	Existing	2	4	1	1	7 - MOD
	Cumulative	2	1	1	1	4 - MOD
	Residual	2	2	1	0.5	3 - MOD
Direct Impact: Extension of the construction phase currently underway in Medupi resulting to prolonged contractor activity in Lephalale which benefit local businesses (Positive Impact)	Existing	1	1	1	1	3 - MOD
	Cumulative	2	1	2	1	5 - MOD
	Residual	1	1	2	0.5	2 - LOW
Indirect Impact: Increase in traffic volumes resulting from a combination of existing road users and construction vehicles/trucks transporting materials to and from Medupi for the construction of the FGD	Existing	2	1	1	1	4 - MOD
	Cumulative	2	1	1	0.75	3 - MOD
	Residual	2	1	1	0.5	2 - LOW
Indirect Impact: Increase in occupation health and safety risks resulting from increase in traffic volumes and prolonged construction phase at Medupi	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	1	0.75	3 - MOD
	Residual	2	1	1	0.2	1 - LOW
Indirect Impact: Increase in pressure for water demand and allocation to support the construction of the FGD, the ADF, and existing industries and for domestic uses	Existing	2	2	2	0.5	3 - MOD
	Cumulative	3	2	4	0.75	7 - MOD
	Residual	3	3	8	1	14 - HIGH
Indirect Impact: Increase in negative public sentiments about the project FGD	Existing	2	1	1	0.75	3 - MOD
	Cumulative	2	1	1	0.75	3 - MOD
	Residual	2	1	1	0.5	2 - LOW
Operational Phase						
Direct Impact: Operation of the FGD technology will result to reduction in SO_2 levels in the atmosphere, resulting in improved ambient air quality and improved human health as the result of the FGD (Positive Impact)	Existing	2	4	8	1	14 - HIGH
	Cumulative	4	4	8	1	16 - HIGH
	Residual	5	4	8	0.1	2 - LOW
Direct Impact: Reduction is respiratory related diseases and overall improvements to human health and	Existing	2	2	8	1	12 - HIGH
	Cumulative	2	2	4	0.75	6 - MOD

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
quality of life for the locals and labourers through improved ambient air quality in the receiving environment due to implementing FGD (Positive Impact)	Residual	2	1	8	0.1	1 – LOW
Indirect Impact: Stabilization of the National Grid and improved electric supply to support the growing economy and achievement of social imperative such as provision of power for domestic use throughout the country (Positive Impact)	Existing	4	2	2	1	8 - MOD
	Cumulative	4	2	2	0.75	6 - MOD
	Residual	4	4	2	0.1	1 - LOW
Direct Impact: Development of the secondary industries as the result of implementation of the FGD through sales of its commercial suitable gypsum to the farming or secondary industry (Positive Impact)	Existing	1	1	2	1	4 - MOD
	Cumulative	1	1	2	0.75	3 - MOD
	Residual	1	1	2	0.5	2 - LOW
Decommissioning Phase						
Indirect Impact: Employment opportunities in disassembling and recycling of recyclable materials from the FGD (Positive Impact)	Existing	1	3	1	0.5	3 – MOD
	Cumulative	2	1	2	1	5 – MOD
	Residual	2	1	8	1	11 – HIGH

The social specialist therefore concluded that the significance of positive social impacts generally exceeds the significance of negative social impacts in the implementation of the FGD system and the railway siding throughout all four stages of the project.

What is believed to be the greatest positive impact or benefit of the installation of the Medupi FGD system, rail yard and associated infrastructure by the EAP, the specialist further concluded that implementation of the proposed FGD technology at the MPS will result in reduced levels of SO_2 in the medium and long term in the region and South Africa. As a result of this, the significance of health risks associated with the SO_2 emissions will be minimized on a long-term basis contributing to an improved biosphere in the region and South Africa. This will ultimately translate to improved quality of life for the citizens of Lephalale and the communities located south and southwest of the study area who are also affected by pollutants containing SO_2.

11.9.2 Mitigation and management measures for identified impacts

Proposed mitigation and management measures proposed to enhance positive impacts and minimise negative impacts include:

- Construction activities for the FGD system, rail yard and associated infrastructure should be restricted within the existing Medupi footprint in order to minimise land use impacts on surrounding properties.
- All measures and recommendation proposed by the traffic specialist to reduce traffic impacts must be implemented to reduce social impacts associated with increased traffic volumes. Recommended measures include installation of traffic lights and traffic circles at major intersections such as D1675, Afguns and Nelson Mandela Drive near Medupi

and Matimba Power Station, and the introduction/implementation of appropriate traffic calming measures.

- Eskom must support the DWS in implementation of the MCWAP 1 and 2 schemes that will ensure sufficient water supply for all industrial, agricultural activities and the town of Lephalale and surrounding communities.
- Eskom explore alternative water sources to minimise the risk of overly depending to MCWAP Phase 2 for the implementation of the FGD. Both Eskom and DWS should align their project schedule and ensure that there are no delays in implementing the MCWAP Phase 2.
- Eskom must improve project public participation and communication strategies in order to strengthen multi-stakeholder engagement and participation in the planning and implementation of the FGD retrofit project.
- Eskom must prioritize the tender for construction of the FGD and retrofitting the FGD within time and budget to ensure compliance with AEL timeframes for SO_2 reduction targets.

The social specialist proposed recommendations to be considered by Eskom for implementation. It should therefore be understood that such recommendations may not necessarily be implemented after consideration. Proposed recommendations highlighted by the social specialist include:

- Eskom could develop initiatives to contribute towards educating and developing necessary skills for the locals to take advantage of opportunities associated with the FGD construction and operation.
- Local businesses could be incubated and developed to be able to take opportunities in the FGD BID.
- Eskom to advertise the types of available jobs, the required education and skillset to take up employment opportunities in order to potentially reduce influx of migrant labour.
- Although Eskom has done a lot to address concerns relating to communication with stakeholders, it is recommended that the EMC should further strengthen its multi-stakeholder engagement strategy or adopt new forms of communication that resonate with the interests of I & APs in the region. This should be done in a manner that does not polarise relations between existing stakeholders. One way of addressing this issue is to develop a sub-committee for the EMC.
- The sub-committee should include a representative from each of the affected communities. This should be in addition to those communities' representatives already listed in the EMC Terms of Reference (ToR).
- Community representatives from Steenbokpan (Leseding) and the farms (farming community) should form part of the EMC sub-committee due to the fact that they feel excluded in programmes and workshops that deal with issues arising from Medupi construction and the associated infrastructure and technology such as the FGD.
- In addition to EMC public meetings and workshops, the sub-committee will ensure that all community concerns and grievances are deliberated on and addressed directly by the

EMC and outside the EMC public meetings. The EMC ToR allows for the election of alternates. Therefore, this recommendation for EMC sub-committee is in line with EMC ToR.

- Eskom should consider appointing an independent company/specialist that specialises in the management of Social Risks to advise on the facilitation between the various project stakeholders such as the appointed contractors, the EMC, the Environmental Control Officer (ECO), the affected community and community organisations such as NGOs, local labourers, local Small Medium Enterprises (SMMEs) as well as big industries.

11.10 Heritage, Archaeology and Palaeontology

The Heritage and Palaeontological Impact Assessments did not identify any heritage, archaeological or palaeontological resources within the proposed development footprint for the FGD infrastructure, rail yard and associated infrastructure. Therefore no impacts exist that may have a detrimental impact on any heritage, archaeological or palaeontological resources.

No impact assessment was therefore conducted to establish the significance of a potential impact. However, since the assessment of existing literature and investigation of the development area does not guarantee that no resources would be uncovered during the construction phase, it is recommended that Eskom, and contractors acting on behalf of Eskom, adopt an appropriate identification and monitoring protocol for the identification of potential archaeological and palaeontological resources during construction. This protocol must also advise on all relevant steps to protect or remove resources, or acquire the services of a qualified archaeologist or palaeontologist to undertake the necessary steps required in terms of the current heritage legislation.

11.11 Traffic

11.11.1 Impact assessment of the FGD system, rail yard and associated infrastructure on the social environment

The traffic specialist completed an impact assessment for the traffic impacts resulting from the construction and operation of the FGD system, rail yard and associated infrastructure at the MPS. Impact ratings for identified traffic impacts are provided in **Table 11-16**.

During assessment of the impact impacts, the specialist concluded that by implementing proposed upgrades at major intersections, the Level of Service (LOS) would be increased from LOS F, which is the worst, to at least a LOS of B or A.

Table 11-16: Impact assessment of the FGD system, rail yard and associated infrastructure on traffic to and from the MPS

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Construction Phase						
Direct Impact: Impact of additional generated traffic due to the construction phase on existing road layout and road users	Existing	3	4	4	1	11 - HIGH
	Cumulative	3	1	8	1	12 - HIGH
	Residual	3	3	1	0.1	1 - LOW
Operational Phase						
Direct Impact: Impact of additional generated traffic due to the operational phase of the FGD plant	Existing	3	4	8	1	15 - HIGH
	Cumulative	3	5	16	1	24 - FLAW
	Residual	3	3	1	0.1	1 - LOW
Indirect Impact: Impact of the transport of Limestone from the limestone sources	Existing	4	3	4	0.1	1 - LOW
	Cumulative	4	4	8	0.75	12 - HIGH
	Residual	4	3	4	0.2	2 - LOW
Indirect Impact: Impact of transported salts and sludge to one of the four potential licensed hazardous waste facilities	Existing	4	3	4	0.1	1 - LOW
	Cumulative	4	4	8	0.75	12 - HIGH
	Residual	4	3	4	0.2	2 - LOW
Decommissioning Phase						
Direct Impact: Impact of reduction in traffic volumes due to decommissioning phase	Existing	3	1	16	1	20 - HIGH
	Cumulative	3	1	8	1	12 - HIGH
	Residual	3	1	1	0.1	1 - LOW

No impacts on the road network were anticipated during the Planning / Pre-construction phase, and as a result no impact rating for this phase was determined.

Furthermore it is concluded that all identified impacts were regarded as low once the proposed mitigation measures has been implemented.

11.11.2 Mitigation and management measures for potential traffic impacts

Proposed management measures and recommendations to reduce traffic impacts include:

- Proposed upgrades for the following major road intersections include:

  Nelson Mandela Drive / D1675

  - Provide signals;
  - Add a left turning slip lane along D1675 (northbound);
  - The introduction of a right turning lane for the northbound right movement;
  - Provision of an additional eastbound lane for the straight movement;
  - It is recommended that the relevant road authority should fund the upgrade of this intersection, since the existing intersection is already operating at a LOS F.

  D1675 / Afguns Rd

  - Upgrade the priority control intersection to a one lane roundabout.
- It is recommended that a detail design phase should be carried out as part of the traffic impact assessment for this project. During the detail design process various intersection

upgrade options (roundabout, signals, sliplanes etc) will be tested and compared to ensure that the most optimum and cost-effective intersection upgrade are selected.

- Vehicles delivering limestone to MPS and transporting salts and sludge from the MPS to an offsite service provider must utilise the Afguns Road in order to have a minimal impact on other road users.
- There should be a pointsman at the intersection of D1675 / Afguns Rd and Nelson Mandela Drive / D1675 during the peak hours to alleviate the traffic congestion and assist the northbound traffic.

12 MONITORING AND MAINTENANCE

A number of the specialist assessments, that was undertaken for the construction and operation of the FGD infrastructure, railway yard and associated infrastructure, recommended monitoring and maintenance measures that must be implemented prior, during the construction phase or during decommissioning / rehabilitation phase.

These proposed monitoring and maintenance measures are provided in the sections below.

12.1 Soils

The soils and land capability specialist proposed a soil conservation plan for the construction, operational and decommissioning phases of the proposed development. These soil conservation plans aims to maintain the integrity of the topsoil removed during construction.

Making provision for retention of utilisable material for the decommissioning and/or during rehabilitation will not only save significant costs at closure, but will ensure that additional impacts to the environment do not occur.

The proposed soil conservation plans for the construction, operational and decommissioning phases of the development is provided in **Table 12-1**, **Table 12-2** and **Table 12-3** below.

Table 12-1: Construction Phase – Soil Utilization Plan

Phase	Step	Factors to Consider	Comments
Construction	Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities that are described in the design report, and where a clearly defined end rehabilitation use for the stripped soil has been identified.
	Reference to biodiversity action plan		It is recommened that all vegetation is stripped and stored as part of the utilizable soil. However, the requirements for moving and preserving fauna and flora according to the biodiversity action plan should be consulted.
	Stripping and Handling of soils	Handling	Where possible, soils should be handled in dry weather conditions so as to cause as little compaction as possible. Utilizable soil (Topsoil and upper portion of subsoil B2/1) must be removed and stockpiled separately from the lower "B" horizon, with the ferricrete layer being seperated from the soft/decomposed rock, and wet based soils seperated from the dry soils if they are to be impacted.
		Stripping	The "Utilizable" soil will be stripped to a depth of 750mm or until hard rock/ferricrete is encountered. These soils will be stockpiled together with any vegetation cover present (only large vegetation to be removed prior to stripping). The total stripped depth should be 750mm, wherever possible.
	Delineation of Stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas. All stockpiles will be founded on stabilized and well engineered "pads"
		Designation of Areas	Soils stockpiles will be demarcated, and clearly marked to identify both the soil type and the intended area of rehabilitation.

Table 12-2: Operational Phase – Soil Conservation Plan

Phase	Step	Factors to Consider	Comments
Operation	Stockpile management	Vegetation establishment and erosion control	Enhanced growth of vegetation on the Soil Stockpiles and berms will be promoted (e.g. by means of watering and/or fertilisation), or a system of rock cladding will be employed. The purpose of this exercise will be to protect the soils and combat erosion by water and wind.
		Storm Water Control	Stockpiles will be established/engineered with storm water diversion berms in place to prevent run off erosion.
		Stockpile Height and Slope Stability	Soil stockpile and berm heights will be restricted where possible to <1.5m so as to avoid compaction and damage to the soil seed pool. Where stockpiles higher than 1.5m cannot be avoided, these will be benched to a maximum height of 15m. Each bench should ideally be 1.5m high and 2m wide. For storage periods greater than 3 years, vegetative (vetiver hedges and native grass species - refer to Appendix 1) or rock cover will be essential, and should be encouraged using fertilization and induced seeding with water and/or the placement of waste rock. The stockpile side slopes should be stabilized at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related erosion.
		Waste	Only inert waste rock material will be placed on the soil stockpiles if the vegetative growth is impractical or not viable (due to lack of water for irrigation etc.). This will aid in protecting the stockpiles from wind and water erosion until the natural vegetative cover can take effect.
		Vehicles	Equipment, human and animal movement on the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.

Table 12-3: Decommissioning Phase – Soil Conservation Plan

Phase	Step	Factors to Consider	Comments
Decommissioning & Closure	Rehabilitation of Disturbed land & Restoration of Soil Utilization	Placement of Soils	Stockpiled soil will be used to rehabilitate disturbed sites either ongoing as disturbed areas become available for rehabilitation and/or at closure. The utilizable soil (500mm to 750mm) removed during the construction phase, must be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved post development end land use (Conservation land capability and/or Low intensity grazing), and will attain a free draining surface profile. A minimum layer of 300mm of soil will be replaced.
		Fertilization	A representative sampling of the stripped and stockpiled soils will be analysed to determine the nutrient status and chemistry of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil. based on the analysis, fertilisers will be applied if necessary.
		Erosion Control	Erosion control measures will be implemented to ensure that the soil is not washed away and that erosion gulleys do not develop prior to vegetation establishment.
	Pollution of Soils	In-situ Remediation	If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by the local water authority on a case by case basis, before it is implemented.
		Off site disposal of soils.	If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Local Dept of Water Affairs) and disposed of at an appropriate, permitted, off-site waste facility.

The specialist furthermore proposed the following monitoring and maintenance recommendations:

- During the rehabilitation exercise, preliminary soil quality monitoring should be carried out to accurately determine the fertilizer and pH requirements that will be needed. Additional soil sampling should also be carried out annually after rehabilitation has been completed and until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth.

- Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.
- Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.
- Soils should be sampled and analysed for the following parameters:

pH (H_2O)	Phosphorus (Bray I)	
Electrical conductivity	Calcium mg/kg	
Cation exchange capacity	Sodium mg/kg;	
Magnesium mg/kg;	Potassium mg/kg	Zinc mg/kg;
Clay, sand and Silt	Organic matter content (C %)	

The following maintenance is recommended:

- The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining;
- Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.);
- Traffic should be limited were possible while the vegetation is establishing itself;
- Plants should be watered and weeded as required on a regular and managed basis were possible and practical;
- Check for pests and diseases at least once every two weeks and treat if necessary;
- Replace unhealthy or dead plant material;
- Fertilise, hydro seeded and grassed areas soon after germination, and
- Repair any damage caused by erosion.

12.2 Groundwater

The following recommendations regarding monitoring were made by the groundwater specialist and include:

- Monthly monitoring of exiting monitoring boreholes groundwater levels and quality. Monitoring should be conducted to be consistent with the existing WUL (Licence no.: 01/A42J/4055);
- Proposed geophysical survey to optimize drilling targets for installation of additional monitoring boreholes around the existing licenced disposal facility. The objective of the geophysical survey is to investigate the sub-surface for geological structures and deep weathering zones, which could act as preferred groundwater path ways;

- Drilling of three pairs (deep and shallow) of new monitoring boreholes, which will provide direct geological and hydrogeological control across the existing WDF area as required, and serve as future monitoring points as part of groundwater monitoring network.
- Aquifer testing of new monitoring boreholes to determine hydraulic parameters and update initial groundwater conceptual model. The groundwater conceptual model with aquifer parameters provides the basic input into a groundwater numerical model;
- The newly-drilled monitoring boreholes should be incorporated into the existing monitoring programme. The following monitoring tasks should be conducted to be consistent with the existing WUL (Licence no.: 01/A42J/4055);
  - Bi-annually groundwater monitoring of existing groundwater user's boreholes in the area surrounding the existing licensed disposal facility (In radius of ~ 3.0 km).
  - Update of conceptual groundwater model;
  - Development of a numerical groundwater flow & transport model (or update of existing models) and Impact Assessment. This model to include Medupi Power station (MPS) and the existing licensed disposal facility;
  - Use model predictions to predict the pollution plume from the existing licensed disposal facility and Medupi Power station;
  - Update mitigation and management measures for the existing licensed disposal facility on numerical model outcome and predictions; and
  - Reporting based on the important hydrogeological aspects identified in this report – in support of the EIA, WML and WUL.

12.3 Surface water

Based on the potential contaminants of concern the surface water specialist proposed the following recommended water quality programme:

- The existing (NSS) as well as proposed (Golder) water quality monitoring points should be monitored regularly and are shown in **Figure 12-1**, while the existing water quality and water volumes monitoring points are listed in **Table 12-4**.
- For this study, three monitoring points in the Sandloop River and two points on the unnamed tributary were identified and sampled. The properties of the proposed water quality monitoring locations are listed in **Table 12-5**. The three monitoring locations in the Sandloop River were identified to establish a baseline water quality and flow along the main watercourse.
- The remaining two monitoring sites are located on the unnamed tributary of the Sandloop River that runs to south west of the existing licensed disposal facility. The monitoring points include one upstream of the disposal facility and one downstream of the disposal facility before the confluence with the Sandloop River.

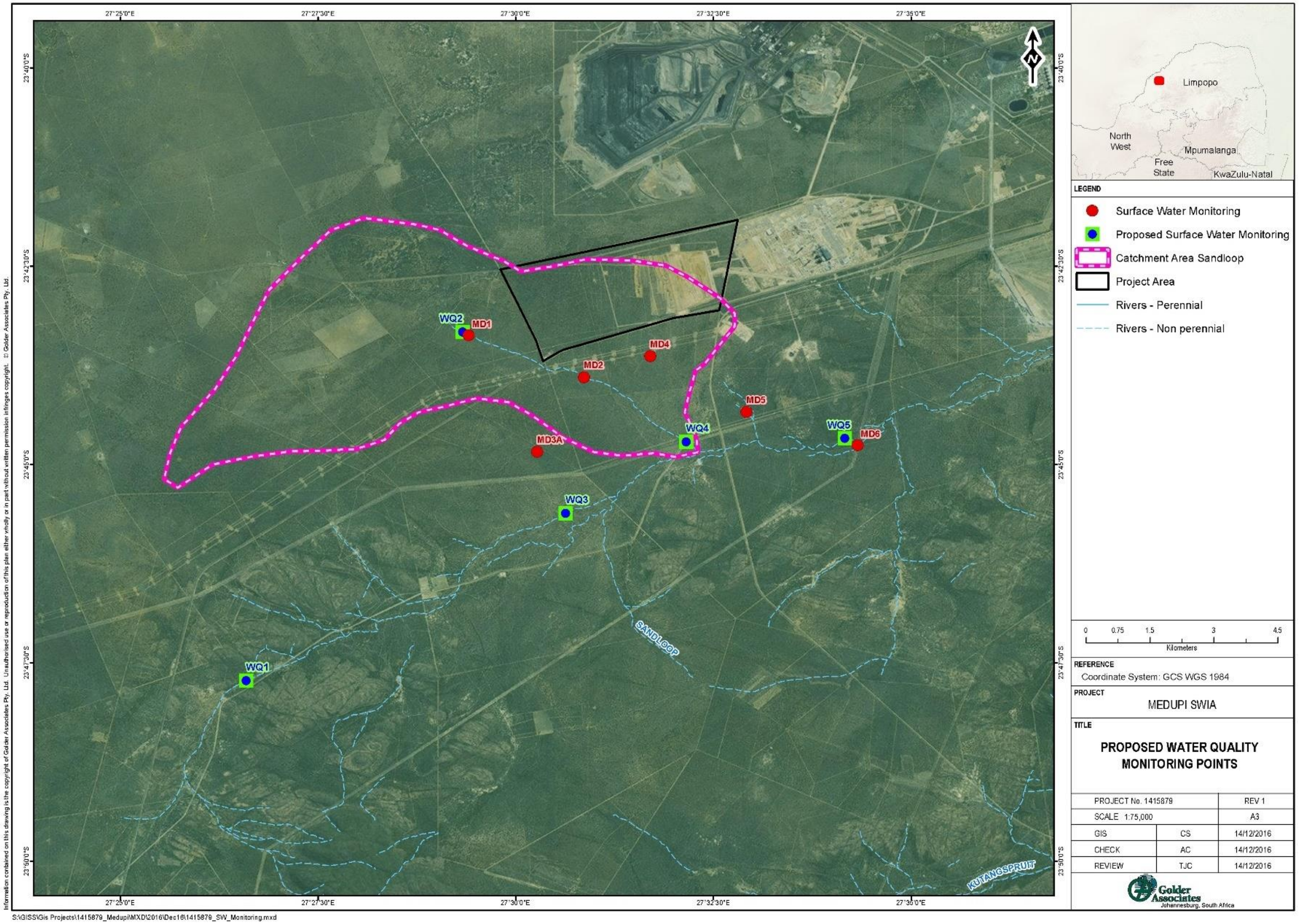


Figure 12-1: Medupi Power Station study area with existing and proposed water quality monitoring points

Table 12-4: Existing surface water quality and quantity monitoring sites at Medupi

Golder Site Name	River/ Location	Latitude	Longitude	Motivation for point location
MD1	Sandloop tributary (major)	23°43'22.38"S	27°29'24.49"E	Provide water quality on major tributary upstream of Eskom operation.
MD2	Sandloop tributary	23°43'54.09"S	27°30'51.95"E	Provide water quality and quantity after tributary passes Site 13 (existing ADF).
MD3	Site 2 (proposed)	23°44'50.52"S	27°30'16.55"E	Provide water quality at proposed Site 2.
MD4	Site 12 (proposed)	23°43'38.15"S	27°31'42.38"E	Provide water quality at proposed Site 12.
MD5	Sandloop tributary (minor)	23°44'20.34"S	27°32'55.28"E	Provide water quality on minor tributary downstream of Eskom operation.
MD6	Sandloop River	23°44'45.55"S	27°34'19.61"E	Establish water quality on the Sandloop River.

Table 12-5: Proposed surface water quality and quantity monitoring sites at Medupi

Golder Site Name	River/ Location	Latitude	Longitude	Motivation for point location
WQ1	Sandloop River (upstream)	27°26'34.96"E	23°47'42.65"S	Establish baseline water quality data furthest upstream Sandloop River.
WQ2	Sandloop tributary (major, upstream)	27°29'19.53"E	23°43'19.53"S	Provide water quality on major tributary upstream of Site 13 (ADF).
WQ3	Sandloop River (central)	27°30'36.07"E	23°45'38.27"S	Establish baseline water quality and flow data in the Sandloop River across Eskom operation.
WQ4	Sandloop tributary (major, downstream)	27°32'10.80"E	23°44'42.77"S	Provide water quality and flow on major tributary downstream of Site 13 (ADF).
WQ5	Sandloop River (downstream)	27°34'10.40"E	23°44'38.95"S	Establish baseline water quality data furthest downstream Sandloop River.

- Samples should be taken monthly or when water is present at the proposed locations. During the dry season, each monitoring site should be visited every two to three months to see if there is water that can be sampled; and
- The parameters to be analysed should include pH, Total Dissolved Solids, Electrical Conductivity, Alkalinity, Potassium, Calcium, Sodium, Chloride, Fluoride, Sulphate, Nitrate, Ammonium, Total Hardness, Metals: Arsenic, Beryllium, Cadmium, Barium, Chromium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Uranium, Vanadium and Zinc using ICP-MS), Orthophosphate, Total Suspended Solids, Oil and Grease.

12.4 Biodiversity (Terrestrial Ecology) and Wetlands

The following recommendations regarding monitoring were made by the specialist and include:

- Biodiversity and wetland monitoring must be undertaken in line with the existing monitoring protocol of the MPS.

- Regular surface and ground water quality monitoring is required to be continued at the identified sampling sites.
- Sediment analysis of depressions and the ephemeral washes must be conducted yearly and compared with the current results for the site. This will then indicate whether heavy metal concentrations are increasing during the Operation Phase of MPS and its ADF.
- Annual monitoring of the aquatic invertebrate assemblage should be conducted at the various remaining sediment sampling sites.
- Amphibian assemblages should be monitored at key sediment sampling sites as well as the newly created pans once a year by means of acoustic, visual encounter transects.
- Measures should be implemented to minimise erosion on site, and potential sedimentation and contamination of the downstream ephemeral watercourse and associated dams;
- It is advised that water quality at local boreholes (if present) be monitored before and during construction of the site. The exact duration, frequency and positioning of the sampling points should be determined from the geohydrological studies commissioned for the site.

12.5 Noise

In the event that noise related complaints are received, short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions.

The following procedure should be adopted for all noise surveys:

- Any surveys should be designed and conducted by a trained specialist.
- Sampling should be carried out using a Type 1 Sound Level Meter (SLM) that meets all appropriate International Electrotechnical Commission (IEC) standards and is subject to annual calibration by an accredited laboratory.
- The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session.
- Samples of at least 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic climate should be taken.
- The following acoustic indices should be recoded and reported:

  L_{Aeq} (T)

  L_{AIeq} (T)

  Statistical noise level LA90

  L_{Amin} and L_{Amax}

  Octave band or 3rd octave band frequency spectra.

- The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.
- Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet.
- A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic climate of each site.

12.6 Heritage, archaeology and palaeontology

If in the extremely unlikely event that any fossils are discovered during the construction of the waste disposal site, then it is strongly recommended that a palaeontologist be called to assess their importance and rescue them if necessary.

13 ENVIRONMENTAL IMPACT STATEMENT

13.1 Key considerations

Given the circumstances of the proposed retrofitting of the FGD infrastructure and associated infrastructure and construction of the rail yard and associated structures and infrastructure a number of key considerations must be considered in order to reach a balanced and sustainable recommendation regarding the proposed construction and operational activities. Key considerations that must be taken into account include:

- The Medupi Power Station is currently under still construction, with 3 generation units already operational, while the remaining 3 units are under construction.
- The FGD retrofit infrastructure will be constructed and operated within the Medupi Power Station footprint currently under construction;
- The rail yard development area furthermore falls within the existing MPS footprint between the power station and existing ADF. A large portion of the rail yard area is currently transformed due to construction, while the remaining portion still has intact vegetation, although characterised by notable alien infestation.
- Existing pollution management measures such as clean and dirty water separation infrastructure, is already installed within the MPS footprint. This already provides some assurance that possible impacts originating from the FGD system and associated infrastructure will be managed within the existing pollution management system.
- The construction of the FGD system and the proposed rail yard has been considered during the initial planning phases of the MPS before construction started. As a result the station has been designed and constructed to allow retrofitting of a wet FGD system, whereas the area earmarked for the rail yard was specifically set aside to allow alignment of the proposed rail yard with the existing mainline between Thabazimbi and Lephalale passing the power station along its southern boundary. The placement and alignment of the proposed infrastructure is therefore already considered optimal and as a result site alternatives were not considered.
- The MPS was granted an Environmental Authorisation for construction and operation of a 20 year ADF. Investigations undertaken to identify an alternative ADF site to receive ash, gypsum (both type 3 wastes) and chemical salts and sludge from the WWTP (Type 1 waste). However this investigation was met with several site constraints relating to biodiversity and social flaws and as a result Eskom made a decision to apply for the long terms waste disposal site in a separate EA application. Resultantly the application to authorise the construction and operation of the FGD system was fast-tracked in order for Eskom to meet its Air Emissions Licence commitments to reduce SO_2 within 6 years of the first generation unit being synchronised.
- This EA application therefore only considered the short term waste disposal option of trucking chemical salts and sludge to a licenced waste disposal facility for the first 5 years of operation. It is therefore understood that the application for a permanent waste disposal facility will be undertaken in due course.

- Temporary storage of FGD WWTP solid waste (salts and sludge) will be occur at a hazardous waste storage facility within the Medupi Power Station footprint, to be removed by an accredited service provider to an approved waste disposal facility;
- Temporary trucking of salts and sludge from the FGD WWTP to a designated hazardous waste facility for disposal will occur for the first 5 years of operation of the FGD system.
- It is understood that the demand for water in the region is high and given the growth of the local economy in Lephalale and influx of labourers, contractors support services the demand is expected to increase. Eskom has already been granted a water allocation from the MCWAP Phase 1 to operate the MPS fully including the operation of 3 of the 6 FGD absorber units. Furthermore, Eskom has engaged the Department of Water and Sanitation (DWS) around a possible water allocation to operate the remaining 3 FGD absorber units from the MCWAP Phase 2, which is currently under development.
- The MCWAP Phase 1 and 2 has been designed not only to supply water to Eskom for operation of the MPS, but also to ensure a supply of water to other industries such as mining, as well as a sufficient supply of potable water to the local municipality and communities in the district. Therefore, it should be noted that the water allocation granted to Eskom will not be in competition with the water demands from other water users in the region.
- The MPS, which is a dry-cooled power station, is furthermore designed and constructed to significantly reduce water consumption when compared to other wet-cooled power stations in the Eskom fleet. Although the operation of the FGD will result in an increased consumption of water due to the implementation of the wet FGD technology, is is estimated that even with the additional consumption of water through from the wet FGD system, the MPS's water consumption will still be significantly less than that of wet-cooled power stations.
- Through the construction and operation of the MPS, Eskom has already established mechanisms to engage with communities that may be affected within the power station's zone of influence through existing forums such as the MPS Environmental Monitoring Committee (EMC) and other initiatives to make a difference in the lives of local residents.

13.2 Key findings

A summary of the key findings and conclusions reached by the specialists commissioning on this project include the following sections.

13.2.1 Geotechnical considerations

The geotechnical specialist concluded, based on available studies and specialist opinion compiled by the specialist, that **no significant geotechnical hazards or fatal flaws were identified within the study area**. Foundation designs for all of the infrastructure to be constructed at the FGD and rail yard areas is expected to consider standard foundation design that does not require additional engineering specification. The only deep excavation that will be undertaken is the 15m excavation for the limestone offloading facility (Tippler building). It is likely that ground water may be intersected, however the specialist concluded that all the geotechnical considerations mentioned can be mitigated in the design of the limestone offloading facility and other facilities.

13.2.2 Soils and Land Capability

The key findings from the soils and land capability specialist indicate the impact of concern is loss of soil resources at the development site. No potential impacts on soils or land use were identified during the planning and pre-development phase. The specialist considered the loss of soil resources during the construction and operational phase and has concluded that with the implementation of proposed soil conservation plans (included in **section** Error! Reference source not found.) and other proposed mitigation measures the **residual impact on soils would be Moderate to Low**.

The fact that the proposed development site is located within an already disturbed area has also contributed to the significance rating although existing and proposed mitigation measures need to continue to manage stockpiled soils for effective rehabilitation during the decommissioning phase.

13.2.3 Groundwater Resources

Key findings highlighted by the groundwater impact assessment are that groundwater levels are generally shallow, i.e. ~2m in some areas, with an average groundwater level of 30.4 mbgl. The hydrocensus water quality analyses concluded that the background groundwater quality at the MPS is Marginal (Class II) to Poor (Class III - IV) water quality, with exceedances of some constituents observed in some boreholes tested.

The specialist also concluded, based on the simplified groundwater risk assessment that trucking of type 1 waste to a licensed hazardous waste disposal site is effectively a positive impact on site since the hazardous waste is removed from site in a responsible manner and disposed of at a licenced waste facility licenced for this purpose.

The groundwater impact assessment furthermore concluded that **residual impacts on groundwater quality, volume and flow** relating to the construction and operation of the FGD, rail yard and associated infrastructure **shows an overwhelmingly Low impact significance**, if proposed mitigation measures are implemented successfully.

13.2.4 Surface water

The surface water specialist raised an important consideration during the assessment of impacts on surface water quality, runoff and flooding. Due to the fact that an existing impact is already occurring on site, a Storm Water Management System (SWMS) has been implemented on the development site. The surface water specialist concluded that the SWMS appears to be well operated and maintained, therefore the existing impact is rated as Low.

It is furthermore **unlikely that a significant reduction in surface water runoff will occur** due to the construction of the rail yard and FGD infrastructure within the MPS. The main reason for this is exactly the fact that the proposed infrastructure will be constructed within the MPS footprint. The existing SWMS will continue to ensure clean and dirty water separation as to avoid dirty water from entering the downstream water resources. Therefore the likely impact on surface water runoff will be of Low significance.

The specialist further concluded that the **runoff around the facility in the clean areas is not markedly changed for the sub-catchment of the Sandloop**, resulting in a potential impact significance of low.

The surface water specialist also compiled a professional opinion to assess the likely impact of trucking salts and sludge to an off-site waste disposal facility. It was concluded that the **transportation of salts and sludge** from Medupi Power Station to an appropriately licensed existing hazardous waste facility outside of the study area **will not pose a serious threat to water resources in the region**.

13.2.5 Biodiversity (Terrestrial Ecology) and Wetlands

It must again be noted here that although the wetland specialist assessed potential impacts on wetlands resulting from the MPS and ADF, wetlands were largely impacted by the development of the ADF. **Impact on semi-ephemeral wash SEW 2 is expected to be minor** since the FGD infrastructure is situated within the footprint of the existing MPS, which means that engineering and mitigation management measures to manage dirty water runoff, erosion, for example, is pre-existing at the proposed site, thereby reducing impacts on the receiving environment outside the MPS footprint.

A key finding of the biodiversity and wetlands specialists relate to the **potential loss of vegetation species, habitat and fauna mortality during** the construction. It was concluded that after successful implementation of the proposed mitigation measures the cumulative impact significance could be reduced with **the residual impact being reduced to Moderate or Low significance**.

Another prominent impact feature that was identified during the construction phase is the loss of catchment area contributing to storm water runoff, increased flood peaks and pollution through contaminated runoff. The specialist concluded that **impacts related to pollution run-off and increased flood peaks can be mitigated to Moderate to Low** impact significance levels.

13.2.6 Air quality

The air quality specialist assessed potential air quality impacts relating to the implementation of the FGD during the operational phase. Other possible impacts resulting from the construction phase, e.g. dust nuisance, were regarded as negligible and was expected not to exceed current air quality levels.

The specialist concluded that cumulative **SO_2 concentrations would reduce significantly** with the implementation of the FGD system, with no exceedances of the NAAQS at sensitive receptors, **resulting in an impact significance of Low**.

The air quality specialist furthermore concluded that **no exceedances of the NAAQS for NO_2, PM_{10} and $PM_{2.5}$** resulted from simulations run at sensitive receptors also **resulting in Low impact significance**.

13.2.7 Noise

The impact assessment undertaken by the noise specialist rated **impact on ambient noise levels during the planning and operational phases as low**. The specialist concluded that during these phases the noise levels in the area are representative of suburban districts. The specialist also found that construction and decommissioning activities would result in a **Moderate noise impact, but with noise levels remaining local yet still notable**.

The specialist therefore concluded that in the quantification of noise emissions and simulation of noise levels as a result of the proposed project, it was calculated that **ambient noise evaluation criteria for human receptors will not be exceeded at NSRs**.

The impacts on ambient noise levels through all phases of the proposed development therefore resulted in overwhelmingly Low impact significance.

13.2.8 Social

A social specialist undertook an extensive impact assessment of the proposed FGD retrofit project on local communities and social aspects characteristic of the Lephalale area. All **impacts identified during the Operational and Decommissioning Phases were considered positive impacts**, whereas half of the impacts identified during the construction phase are positive impacts on the surrounding community.

During the Planning / Pre-construction Phase the establishment of spin-off businesses, e.g. B&Bs, to support the construction phase of the Medupi FGD and rail yard was identified as a **positive impact that could contribute to the local economy and employment opportunities**.

Positive impacts associated with the Construction Phase of the FGD, rail yard and associated infrastructure **revolve around economic and employment opportunities** as well as upgrading of infrastructure such as local roads.

The social specialist therefore concluded that the **significance of positive social impacts generally exceeds the significance of negative social impacts** in the implementation of the FGD system and the railway siding throughout all four stages of the project.

13.2.9 Heritage, Archaeology and Palaeontology

The Heritage and Palaeontological Impact Assessments did not identify any heritage, archaeological or palaeontological resources within the proposed development footprint for the FGD infrastructure, rail yard and associated infrastructure. Therefore **no impacts exist that may have a detrimental impact on any heritage, archaeological or palaeontological resources.**

13.2.10 Traffic

During assessment of the impact impacts, the specialist concluded that by implementing proposed upgrades at major intersections, the **Level of Service (LOS) would be increased** from LOS F, which equates to relatively long delays at intersections, to at least a LOS of B or A, indicating short stoppage times at intersections.

No impacts on the road network were anticipated during the Planning / Pre-construction phase, and as a result no impact rating for this phase was determined.

Furthermore it is concluded that **all identified impacts were regarded as low once the proposed mitigation measures has been implemented**.

13.3 Summary of impacts and risks

The Environmental Impact Statement provides an account of the key findings of the EIA. Based on the significance ratings assigned to the anticipated environmental impacts, the EAP makes the following conclusions relating to impacts and risks:

- Potential impacts on geotechnical aspects, noise levels, heritage, archaeology and palaeontology, and traffic minor and can successfully be mitigated to acceptable levels with proposed mitigation.
- Assessment of the proposed air quality impacts has demonstrated what was anticipated, i.e. that implementation of the FGD system would significantly reduce the SO2 emissions at the MPS to very low levels. However, within the MPS operations the FGD system will be a major consumer of water. This however is offset by a water allocation from MCWAP Phase 1 and 2.
- The potential impact on local communities and social aspects is an overwhelmingly positive impact. Reduction of SO_2 levels is the primary positive impact that will result in better quality of life in the regions. Additionally, indirect positive impacts resulting from growth in the local economy and greater employment opportunities will be significant.
- Overall the impact of the installation of the FGD system, rail yard and associated infrastructure will have a Moderate to High impact on the local biodiversity, and to a lesser degree, wetlands in close proximity to the FGD. Although loss to intact vegetation types and habitat will be permanent for the life of the power station, impacts on fauna can be mitigated to more successfully to a greater extent.

14 REASONED OPINION OF THE EAP

In preparation of the reasoned opinion by the EAP for impacts associated with the proposed construction of the FGD, rail yard and all associated infrastructure, the following aspects were strongly considered:

1. The MPS is currently under construction with 3 of the 6 generation units already synchronised and operational.

2. The MPS was designed and constructed to incorporate wet FGD technology through a retrofit process. The available footprint for the FGD structure is therefore aligned with the existing infrastructure layout of the MPS and changes in technology will result in structural changes to the existing infrastructure.

3. The footprint of the rail yard was also reserved specifically to align with the existing rail infrastructure and MPS infrastructure layout to ensure ease of integration later on.

4. The MPS already has management and mitigation measures installed, whether it is optimised design and construction or the implementation of specific mitigation measures emanating from the original environmental authorisation. Assurance to a large degree already exist that additional impacts that may arise due to the FGD system and rail yard will also be managed within the existing management system.

5. All identified impacts relating to geotechnical conditions, soils and land capability, groundwater surface water resources, noise, social, heritage resources and traffic are largely of Low impact significance or has a positive impact, given that proposed mitigation measures are implemented successfully.

6. The positive impacts of the FGD system on the quality of life, economic and employment opportunities for the local communities resulting from the operation of the MPS with FGD needs specific consideration.

7. It is acknowledged that impacts on biodiversity and existing wetlands are Moderate to High, and therefore stringent mitigation measures must be implemented to offset these impacts. The EAP further believe that the fact that the construction of the FGD system, rail yard and associated infrastructure within the existing MPS footprint, which is zoned and geared for industrial activity, contribute to a large degree in the mitigation of identified impacts. The management of impacts from this infrastructure will be undertaken within the framework of an existing Environmental Management System further contribute to prioritise the mitigation of any significant impacts on the surrounding biodiversity and wetlands.

8. The high demand for water within a water stressed catchment is further acknowledged. It is expected that the demand for water will only increase with the increase in local economic development and influx of employers, labourers and businesses. These facts must however be considered in the light of the

implementation of the MCWAP Phase 1 and development of MCWAP Phase 2 that has been commissioned by the DWS specifically to bring different qualities of water to the region to secure water in the long terms for household use and human consumption, agricultural uses, as well as to support industrial activities such as the MPS, mines in the region and other industrial activities. In this vein it must also be considered that the MPS was designed as a dry-cooled power station specifically to operate sustainably within a water stressed environment, even with the operation of wet FGD technology that is a major water user.

9. Ultimately, when considering the No-Go option, that if the FGD system is not installed, the MPS will not obtain compliance with its AEL conditions and funder requirements, and as a result will likely have to stop operation, the expected negative impact on the supply of electricity, economic growth and extensive economic benefits the No-Go option will approach a fatally flawed impact significance.

Therefore, taking all the aforementioned considerations into account it is the reasoned opinion of the EAP that the negative impacts associated with impacts on biodiversity and wetlands can be successfully mitigated to within acceptable levels, with the development contributing to the overwhelming positive impacts associated with the reduction in SO_2, significant benefits to the local economy and quality of life for local residents, **the proposed activities be authorised**.

The EAP recommends the following general conditions to be included:

- Environmental authorisation (EA) will be subject to the implementation of mitigation measures and conditions stipulated within the EMPr and this Environmental Impact Report.
- Construction must commence within a period of 5 years
- EA will be valid for the life of the Medupi Power Station, subject to revisions and amendments through legislated procedures as the need arise.
- Eskom must continue to investigate water saving measures for its power generation fleet.
- Eskom must continue to investigate mechanisms for waste reduction or minimisation, especially relating to the re-use of ash and gypsum. This has the potential to unlock further economic benefits for local communities living near power stations.

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