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**REPORT ON**

**Environmental Management  
Programme for the Medupi FGD  
Retrofit Project**

**Report No : 12949-46-Rep-002**

**Submitted to :**

Eskom Holdings SOC Limited  
PO Box 1091  
Johannesburg  
2000

23 May 2018

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**TABLE OF CONTENTS**

<b>SECTION</b>	<b>PAGE</b>
1	INTRODUCTION..... 1
1.1	Project background ..... 1
1.2	Existing authorisations, licences and approvals..... 1
1.3	Details of the proponent ..... 3
1.4	Details of the EAP ..... 3
2	PURPOSE AND OBJECTIVES OF THE EMPR..... 5
2.1	Purpose of the EMPr ..... 5
2.2	Applicable documentation ..... 6
2.3	Structure of the EMPr ..... 7
3	ENVIRONMENTAL GUIDELINES, LEGISLATION AND STANDARDS ..... 8
4	DESCRIPTION OF THE ACTIVITIES..... 9
4.1	Rail Yard (Block 1 & 2) ..... 9
4.2	Limestone preparation (Block 2)..... 11
4.3	Input materials and processes (Block 3)..... 12
4.4	Wet Flue Gas Desulphurisation (WFGD) system (Block 4)..... 12
4.5	Treated Flue Gas (Block 5) and evaporation (Block 6) ..... 12
4.6	Gypsum dewatering, re-use or disposal (Block 7) ..... 13
4.7	Waste Water Treatment (Block 8) ..... 14
4.8	Storage and disposal of salts and sludge (Block 9) ..... 14
5	ENVIRONMENTAL MANAGEMENT PROGRAMME ..... 16
5.1	Roles and Responsibilities ..... 16
5.2	Environmental Specifications ..... 16
6	MONITORING AND COMPLIANCE ..... 34
6.1	Compliance monitoring and reporting of construction and operation activities..... 34
6.2	Soils ..... 34
6.3	Groundwater ..... 37
6.4	Biodiversity (Terrestrial Ecology) and Wetlands ..... 37
6.5	Noise..... 38
6.6	Heritage, archaeology and palaeontology ..... 39
7	ENVIRONMENTAL AWARENESS PLAN ..... 40

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## LIST OF FIGURES

Figure 4-1: Basic process Flow Diagram for the FGD process at Medupi Power Station . 10

## LIST OF TABLES

Table 1-1: Existing authorisations, approvals and licences issued for the Medupi Power Station.....	2
Table 1-2: Details of the Environmental Assessment Practitioner.....	3
Table 3-1: Applicable legislation, programmes and guidelines.....	8
Table 5-1: Project Initiation and General Management.....	17
Table 5-2: Management of Surface Water Resources .....	18
Table 5-3: Management of Groundwater Resources .....	19
Table 5-4: Management of impacts on Biodiversity and Wetlands.....	20
Table 5-5: Management of Air Quality impacts .....	22
Table 5-6: Management of Ambient Noise Levels .....	23
Table 5-7: Management of Soil and Land Capability Impacts .....	24
Table 5-8: Management of Heritage, Archaeological and Palaeontological Resources ...	26
Table 5-9: Management of Social Impacts.....	27
Table 5-10: Management of impacts on Traffic and Roads.....	28
Table 5-11: Site management - Site establishment and laydown areas.....	29
Table 5-12: Site Management - On-site workshops and handling of hazardous materials	30
Table 5-13: Site management - Waste management activities .....	31
Table 5-14: Site management - Sanitation.....	32
Table 5-15: Site Management - Fire prevention.....	33
Table 6-1: Construction Phase – Soil Utilization Plan .....	35
Table 6-2: Operational Phase – Soil Conservation Plan .....	35
Table 6-3: Decommissioning Phase – Soil Conservation Plan.....	36

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## LIST OF ACRONYMS

AEL	Air Emissions Licence
ADF	Ash Disposal Facility
CaCl <sub>2</sub>	Calcium Chloride
CaF <sub>2</sub>	Calcium Fluoride
EAP	Environmental Assessment Practitioner
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EMS	Environmental Management System
FGD	Flue Gas Desulphurisation
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IAIA	International Association for Impact Assessments
IEC	International Electrotechnical Commission
MgSO <sub>4</sub>	Magnesium Sulphate
MPS	Medupi Power Station
MW	megawatt
PCD	Pollution Control Dam
ROD	Record of Decision
SLM	Sound Level Meter
SACNASP	South African Council for Natural Scientific Professionals
SDF	Spatial Development Framework
SO <sub>2</sub>	Sulphur Dioxide
SO <sub>3</sub>	Sulphur Trioxide
TOC	Total Organic Carbon
WML	Waste Management License
WWHC	waste water hydrocyclone
WWTP	Waste Water Treatment Plant
WTP	Water Treatment Plant
WULA	Water Use License Application
ZLD	Zero Liquid Discharge

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## 1 INTRODUCTION

### 1.1 Project background

Medupi Power Station is a greenfield coal-fired power station that forms part of the Eskom New Build Programme and is located about 15km west of the town of Lephalale in the Limpopo Province.

The Medupi Power Station (MPS) 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.

In coal-fired power stations electricity is generated 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). 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).

In response to the Eskom Air Quality Strategy, requirements of the MPS's Air Emissions Licence (AEL) and funder requirements, the MPS units have been designed, and constructed, with provisions incorporated into the space and equipment designed to accommodate the installation of the wet limestone Flue Gas Desulphurisation (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.

### 1.2 Existing authorisations, licences and approvals

The MPS received the station's AEL in 2012. The AEL contains conditions that require 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 project. All existing authorisations, approvals and licences received for the Medupi Power Station are summarised in **Table 1-1** below.

**Table 1-1: 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 of 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, Kroomdraai, Kuipersbuilt and Grootvallei) - Medupi Power Station	DAFF	200 - 163627	National Forest Act (84 of 1998) as amended

### 1.3 Details of the 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. Eskom plays a major role in accelerating growth in the South African economy by providing a high-quality and reliable supply of electricity.

### 1.4 Details of the EAP

Eskom appointed Zitholele Consulting (Pty) Ltd. to undertake the regulatory Environmental Authorisation (EA), variation application for existing Waste Management License (WML) for the Ash Disposal Facility, and Water Use License Application (WULA) processes for the proposed Medupi FGD Retrofit Project. These processes are being undertaken independently as separate processes.

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 1-2 provides the details of the Environmental Assessment Practitioner (EAP).

**Table 1-2: Details of the Environmental Assessment Practitioner**

<b>Details of the Environmental Assessment Practitioner</b>	
<b>Name and Surname</b>	Mathys Vosloo
<b>Highest Qualification</b>	Phd Zoology
<b>Professional Registration</b>	<i>Pr.Sci.Nat.</i> (400136/12)
<b>Company Represented</b>	Zitholele Consulting (Pty) Ltd.
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#### 1.4.1 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. Dr Vosloo 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). Dr Vosloo has also been involved in Water Use Licensing as a component of integrated authorisation processes.

Dr Vosloo 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.



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## **2 PURPOSE AND OBJECTIVES OF THE EMPR**

The preparation of an Environmental Management Programme (EMPr) is recognised as a tool in Integrated Environmental Management (IEM) to mitigate or minimise negative impacts and enhances positive impacts of a proposed development on the receiving environment. Typically an EMPr document is aligned to the project life cycle addressing each project phase i.e. the Planning / Pre-Construction, Construction, Operation and Decommissioning phases.

An EMPr provides a link between the impacts predicted and mitigation measures recommended within the Environmental Impact Assessment Report, and the implementation activities of a project to ensure that these activities are managed and mitigated to prevent unnecessary harm resulting from impacts to the receiving environment.

An EMPr, in the context of the Environmental Impact Assessment (EIA) Regulations (2010) under which this application was made, takes a project from a high level consideration of issues down to a detailed workable action plan that can be implemented in a cohesive and controlled manner.

### **2.1 Purpose of the EMPr**

Construction and operation of the MPS is being undertaken subject to an existing EMPr (September 2010) authorised in terms of the Record of Decision for the MPS, as well as addenda to this EMPr resulting from the authorisation of additional construction activities such as the addendum to the MPS EMPr for the proposed pollution control dams and associated infrastructure at the MPS ash dump and coal stockyard (Savannah Environmental, 2013).

This EMPr addresses the construction and operation of additional infrastructure associated with the operation of the MPS within the power station's operational footprint and therefore serves as an addendum to the existing EMPr for the MPS.

The purpose of the EMPr is to ensure continued improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the proposed infrastructure. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The objectives of this EMPr can be articulated as follows:

- To outline mitigation measures, and environmental specifications which are required to be implemented for the construction, operation and maintenance phase of the FGD system in order to improve overall environmental performance and compliance during these phases.
- To identify measures that will optimise beneficial impacts during the project phases.
- To ensure that the proposed activities associated with the FGD system does not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.

- 
- To ensure that all environmental management conditions and requirements as stipulated in the resultant Environmental Authorisation (EA) are implemented throughout the project life-cycle.
  - To ensure that all relevant legislation (including national, provincial and local) is complied with during the project life-cycle of the proposed project.
  - To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
  - To specify a monitoring programme / mechanisms for monitoring compliance to the approved EMPr and EA, and preventing long-term or permanent environmental degradation. The monitoring programmes in this EMPr will be subject to the approval of the Department of Environmental Affairs (DEA) and aligned with the conditions of the EA once authorised. Once approved, the monitoring requirements must be captured in the power stations Environmental Management System (EMS).
  - To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

## **2.2 Applicable documentation**

The development of the Medupi Power Station (MPS) has resulted in a suite of environmental documentation governing the management and mitigation of all potential and real impacts identified for activities taking place during the planning, construction, operation and decommissioning of the power station. Since the proposed FGD system, rail yard and associated infrastructure will occur within the footprint of the MPS and will form part of the operation of the power station, the following environmental documentation is also applicable to the proposed FGD Retrofit project, and must be read in conjunction with this EMPr:

- Final Environmental Scoping Report for the proposed new Coal-Fired Power Station in the Lephalale Area, Limpopo Province (Bohlweki Environmental, November 2005).
- Final Environmental Impact Assessment Report for the proposed new Coal-Fired Power Station in the Lephalale Area, Limpopo Province (Bohlweki Environmental, May 2006).
- Scoping and Impact reports related to all additional authorisations.
- All Environmental Authorisations, licences and permits that have been issued or granted to the MPS, as per Table 1-1.
- Generation Primary Energy Division Primary Energy (water); Medupi power station technical report.
- Eskom's operational specifications (refer to Appendix C).
- The Medupi Power Station EMS, as amended, which include :
  - Medupi Environmental Policy (200-73979)
  - Procedure for the identification and assessment of environmental aspects and impacts (200-73975)
  - Environmental legal and other requirements (200-73977)
  - Medupi EMS scope and manual (200-73971)
  - Environmental training, awareness and competence (200-73973)

- 
- Identification and application of environmental operational controls (200-73969) and the individual operational controls emanating from this procedure
  - Health, Safety and Environmental Communications procedure (200-38432)
  - Environmental Performance Monitoring and Measurement Procedure (200-73970)
  - Handling of HSE non-conformities and corrective and preventative action (200-38426)
  - Health, Safety and Environmental incident management procedure (200-10506)
  - Health, Safety and Environmental audit procedure (200-38428)
  - Management Review procedure (200-73968)

This EMPr has been compiled in accordance with Section 33 of the EIA Regulations of June 2010, as amended, in terms of the National Environmental Management Act 107 of 1998. It must further be noted that the stipulations of Appendix 6 of the EIA Regulations of 2014, as amended, in terms of the National Environmental Management Act 107 of 1998, have also been considered to ensure that the EMPr complies with the intention of the latest regulations.

The EMP is a dynamic document and may be updated as and when required throughout the life-cycle of the proposed FGD retrofit project. This EMPr will furthermore be updated to reflect any authority decisions or requirements communicated during the EMPr approval stage, or as a result of any substantive amendments to the EMPr requiring authority approval thereafter.

In the event that a conflict of interpretation arise between this EMPr and EA to be issued for the FGD retrofit project or any other existing authorisation of approved EMPr, the stipulations in the EA or approved document shall prevail over that of this EMPr, unless otherwise agreed by the Department of Environmental Affairs (DEA) in writing. Similarly, any provisions in current legislation overrule any provisions or interpretations within this EMPr. Any determinations on a conflict must be amended accordingly to ensure consistent and appropriate implementation.

### **2.3 Structure of the EMPr**

This EMPr is specific to the FGD plant, but will serve as an addendum to the Medupi Power Station EMP Revision 2 (September 2010), has been developed as a set of environmental specifications which are appropriately contextualised to provide clear guidance in terms of the implementation of these specifications for this proposed project.

This addendum to the approved EMP for MPS must be read in conjunction with the EIA Report for the Medupi FGD Retrofit Project (February 2018), as well as relevant sections and appendices of the Medupi Power Station EMP Revision 2 (September 2010).

This EMPr has therefore been compiled to address site-specific and project-specific requirements of the proposed project within the MPS development footprint, while general specifications for the management of construction and operational activities as stipulated in the Medupi Power Station EMP Revision 2 (September 2010), relevant addenda and MPS EMS have not been repeated.

### 3 ENVIRONMENTAL GUIDELINES, LEGISLATION AND STANDARDS

Acts, standards or guidelines relevant to the planning, construction, operation and decommissioning of the Medupi FGD, rail yard and associated infrastructure were identified within the EIA process undertaken and is summarised in Table 3-1 below.

**Table 3-1: Applicable legislation, programmes and guidelines**

<b>Act, Policies, Programmes and Guidelines</b>
National Environmental Management Act, 1998 (Act No. 107 of 1998)
Environmental Impact Assessment Regulations, 2010 (GN R 543 – 545)
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
National Environmental Management Waste Act, 2008 (Act No. 59 of 2008)
National Water Act, 1998 (Act No. 36 of 1998)
National Heritage Resources Act, 1999 (Act No. 25 of 1999)
Hazardous Substance Act, 1973 (Act No. 15 of 1973)
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
National Environmental Management Protected Areas Act, 2003 (Act. 57 of 2003)
Water Services Act, 1997 (Act 108 of 1997).
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
National Forests Act (No 84 of 1998) and regulations
Infrastructure Development Act, 2014 (Act No. 23 of 2014)
National Road Traffic Act (Act No. 85 of 1993) (NRTA) and National Road Traffic Regulations, 2000 (GN R225, 17 March 2000) (NRTR)
National Key Points Act, 1980 (Act 102 of 1980)
Fencing Act (No 31 of 1963)
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
Hazardous Substances Act (No 15 of 1973) and regulations
National Development Plan 2030 (NDP)
NEM:WA: National Waste Management Strategy (GN 344 of 4 May 2012)
Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)
Lephalale Local Municipality Final Integrated Development Plan (IDP) 2017/2018
Lephalale Local Municipality Draft Spatial Development Framework (SDF) – May 2017
Lephalale Local Municipality By-laws
White Paper on Environmental Management Policy for South Africa (1998)
National Biodiversity Strategy and Action Plan (NBSAP)
National Aquatic Ecosystem Health Monitoring Program (NAEHMP) & River Health Program (RHP)
National Freshwater Ecosystem Priority Areas (NFEPA)
National Water Resource Strategy (NWRS) 2
Limpopo Conservation Plan version 2, 2013

It must however be noted that the proposed FGD infrastructure, including the rail yard and all associated infrastructure and structures, fall completely within the footprint of the MPS. As such, the Eskom Medupi Power Station legal register, which is to be updated on a regular basis, shall be referred to and will be applicable to all phases of the proposed Medupi FGD Retrofit project to ensure compliance.

## 4 DESCRIPTION OF THE ACTIVITIES

The activities and infrastructure associated with the construction and operation of the Medupi FGD Retrofit project are summarised into a basic process flow diagram and is presented in Figure 4-1 below. Brief descriptions of the infrastructure and activities associated with this process are discussed in the following sections.

### 4.1 Rail Yard (Block 1 & 2)

Limestone is purchased off-site and is transported to the MPS by rail and/or road. The limestone will be offloaded at the proposed limestone storage facility, which includes a rail siding and road access, located south-west of the 6 power generation units within the MPS footprint. Infrastructure associated with the railway yard and limestone / gypsum handling area include:

- Limestone will be initially delivered by road and will be delivered to a truck offloading facility in close proximity to the Limestone Stockyard.
- Rail infrastructure proposed parallel to the existing Thabazimbi – Lephalale railway with a proposed siding take-off point situated at kilometre point 107+250m. The runoff line will leave the mainline approximately 1.8km west of the entry point to the railway yard/siding.
- Linear-type yard layout configuration with six lines parallel to each other and split into two separate yards (limestone offloading and gypsum loading) linked by means of a locomotive run-around line.
- Limestone offloading facility: Tippler Area building will include side dispensing tippler, a limestone rail, truck offloading area and separate receiving area, Tippler for “tipping” limestone onto an underground inclined conveyor, limestone transfer house and emergency limestone offloading area at the stockyard. Excavations up to 15m deep will be undertaken during construction of the Tippler facility.
- Gypsum will be routed to the Gypsum storage facility in close proximity to the railyard, while the other by-products from the FGD process, i.e. salts and sludge, will be temporarily stored in close proximity to the WWTP within the FGD infrastructure footprint. Gypsum storage loading facility will include gypsum reclaim hoppers that receive gypsum from the mobile reclaim equipment and discharge to the gypsum reclaim belt conveyor, which in turn discharges to the inclined gypsum belt conveyor. The inclined gypsum belt conveyor then discharges to the bin at the loading facility that feed the rail wagons with a controlled discharge.
- Administration building and operations tower for Eskom and a Services Provider’s personnel.
- Diesel locomotive workshop, utilities rooms and ablutions. This workshop area will have approximately 600m<sup>2</sup> service space for the shunting locomotive, various offices and store rooms (180m<sup>2</sup>) attached to one end of the building.

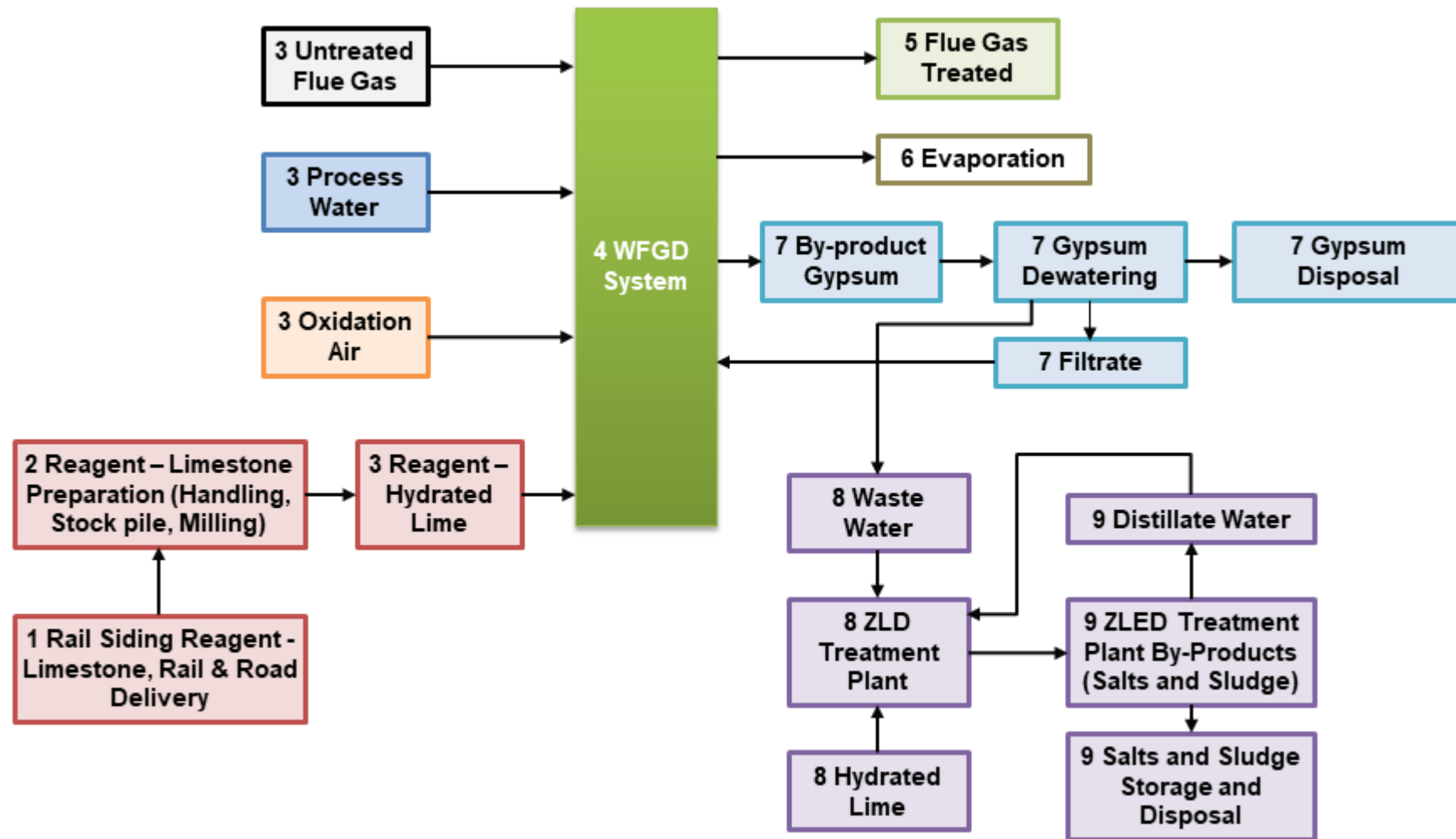


Figure 4-1: Basic process Flow Diagram for the FGD process at Medupi Power Station

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- Two Diesel Storage Facilities (each can be approximately 3.6m in diameter and 3.0m in height) with a maximum installed storage capacity of 28 000 litres each, in two above-ground horizontal storage tanks, and will be bunded. One of these tanks will service the shunting locomotives while the other will service the Emergency Generator, and located at the rail siding area and the FGD complex area, respectively. A covered road tanker decanting area will be located alongside the bunded area. There is a third diesel tank in the FGD common pump building, the capacity of which is significantly less than the other two tanks.
  - Security office and infrastructure: A security office will be located adjacent to the fence line at the western extent of the proposed rail yard where the proposed rail infrastructure ties in with the existing rail network. The existing service road fence will be used as the boundary fence to the rail yard.
  - Conveyor infrastructure to transport limestone to the FGD system, and gypsum from the MPS to the rail yard or waste disposal facility.
  - Sewerage and effluent management infrastructure: The security office, locomotive workshop and administration building will be served with ablution facilities with a sewerage conservancy tank system with capacities of 3200ℓ, 8500ℓ and 8500ℓ, respectively.
  - Associated infrastructure (water, storm water, and lighting): Storm water channels and structures are designed to provide a division between storm water and the dirty water from the gypsum loading facility. 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<sup>3</sup>/s for a 1:20 year return period. Eskom will provide the required power supply, while the rail yard mini substations will be constructed in accordance with Eskom's specification. PCDs will also be provided for the salts and sludge storage facility. 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.

#### **4.2 Limestone preparation (Block 2)**

The limestone handling and conveyance will include the following infrastructure:

- Limestone stacking conveyor;
- Limestone storage area;
- Emergency limestone offloading area;
- Limestone reclaim conveyor;
- Limestone and gypsum handling substation;
- Storm Water Pollution Control Dams. 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 for maintenance activities in the future.

- Lined channels for diversion of dirty water to the Pollution Control Dams.

Limestone is conveyed to the limestone preparation building where it is heated and milled to produce pulverised lime, or Quicklime. Quicklime is then combined with water to form hydrated lime, or Slaked Lime, in slurry form for input into the FGD system. The Slaked lime slurry is pumped to a lime slurry feed tank from where it is pumped, via piping, on the elevated FGD utility rack to each absorber for utilisation in the FGD system. Infrastructure thus includes a limestone preparation building, lime slurry feed tank, and piping on an elevated FGD utility rack.

#### **4.3 Input materials and processes (Block 3)**

Input materials to the FGD process will include:

- SO<sub>2</sub> laden flue gas received from the each generation unit. Untreated flue gas leaving the existing ID fans will be diverted to the absorber inlet, via additional ducting system;
- Process water received from process water tanks (two operational and one backup for redundancy);
- Oxidisation air; and
- Lime slurry (Slaked lime) received from the limestone milling and preparation plant.

#### **4.4 Wet Flue Gas Desulphurisation (WFGD) system (Block 4)**

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;
- FGD above-ground elevated utility racks containing piping to direct fluid from and to relevant systems within the absorber area.

#### **4.5 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<sub>2</sub> content. During the process evaporation losses are incurred.



## **4.6 Gypsum dewatering, re-use or disposal (Block 7)**

### **4.6.1 Gypsum dewatering and conveyance**

Gypsum will be produced from the FGD process as a by-product of the wet scrubbing process. Slurry will comprise gypsum, a mixture of salts (Magnesium Sulphate ( $MgSO_4$ ) and Calcium Chloride ( $CaCl_2$ )), limestone, Calcium Fluoride ( $CaF_2$ ), and dust particles. A refinement process is carried out to separate and dewater the gypsum. Effluent is directed to the Waste Water Treatment Plant (WWTP), the overflow of the gypsum dewatering hydro cyclones goes to the waste water hydrocyclone (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.

Dewatered gypsum is transported via conveyor either to the existing Ash Disposal Facility (ADF) or to an offtake point where it is diverted to a storage facility from which it may be transported by rail or road to users. 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. Road transport is used for immediate offtake for gypsum exploitation.

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. 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.

### **4.6.2 Gypsum re-use or disposal**

Initially, gypsum will be conveyed from the gypsum dewatering building via a gypsum link conveyor to a gypsum transfer house where it will be loaded onto the existing overland ash conveyor. In this conveyor system, the gypsum will be mixed with ash and subsequently disposed together on the footprint of the existing authorised ADF. If there is a market for gypsum in the immediate execution of the project, the project has catered for an offtake point, wherein, the gypsum will be collected by trucks from overhead conveyor system. 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.

#### **4.7 Waste Water Treatment (Block 8)**

The Medupi FGD WWTP is located directly west opposite generation units 1 to 3 at the Medupi Power Station. FGD chloride bleed stream and FGD auxiliary cooling tower blowdown stream are diverted to the ZLD holding tanks. The Total Organic Carbon (TOC) scavenger regeneration wastewater from the filter press system / existing Water Treatment Plant (WTP) will 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<sup>3</sup> 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.

#### **4.8 Storage and disposal of salts and sludge (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 4800m<sup>2</sup> and 16000m<sup>2</sup> 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.

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 designated service provider must comply with all relevant legislative requirements, norms and standards. 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 to manage from the temporary storage to disposal facility.

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## **5 ENVIRONMENTAL MANAGEMENT PROGRAMME**

This EMPr (addendum to the approved EMP for MPS) must be read in conjunction with the EIA Report for the Medupi FGD Retrofit Project (February 2018), as well as relevant sections and appendices of the Medupi Power Station EMP Revision 2 (September 2010), relevant EMPr addenda, and MPS EMS.

The roles and responsibilities in this EMPr must align with the roles and responsibilities stipulated in the approved EMPr and EMS for the MPS.

### **5.1 Roles and Responsibilities**

Specific roles and responsibilities for key stakeholders during the life cycle of a project have been detailed in the approved Medupi Power Station EMP Revision 2 (September 2010) and relevant addenda to this EMPr. Since this EMPr will serve as an addendum to the approved Medupi Power Station EMP Revision 2 (September 2010), key stakeholders associated with the construction and operation of the proposed Medupi FGD Retrofit Project will be subject to the roles and responsibilities as stipulated in approved EMP for the MPS. The key stakeholders as stipulated in the approved EMP for the MPS and relevant addenda to the EMP include:

- Power Station Manager (PSM) / General Manager (GM), the proponent
- Project Director (PD), during planning and construction phases
- Senior Construction Manager (SCM)
- Contracts Manager/FIDIC Engineer (CM)
- Construction and Operations Environmental Manager (EM)
- Construction and Operations Senior Environmental Advisor (EA)
- Construction and Operations Environmental Officer (EO)
- Construction and Operations Environmental Control Officer (ECO)
- Contractor (C), including sub-contractors
- Environmental Monitoring Committee (EMC)
- Eskom Head Office (HO)

### **5.2 Environmental Specifications**

Environmental specifications proposed for the construction and operation of the FGD complex and rail yard development, within the existing MPS footprint, are summarised in table format in the following sections. These environmental specifications reflect site-specific management and mitigation measures proposed by specialists in relation to impacts identified during the impact assessment phase of the EIA.

Environmental specifications for the general management of the development site during project initiation and site management during construction and operations are provided in the following tables.

Table 5-1: Project Initiation and General Management

Environmental Specification		Section			Legend	
<b>PROJECT INITIATION AND GENERAL MANAGEMENT</b>		<b>5.2.1</b>				
<b>Objective:</b>		<b>Expected outcome:</b>			Phase PC : Pre-construction      O : Operational C : Construction            D : Decommissioning	
1	Ensure necessary legal obligations and contractual conditions have been met prior to the commencement of construction	Achieve compliance with EMPs, EA and all relevant legislation, while maintaining good communication with communities and stakeholders			Responsible Party	
2	Ensure staff are aware of their responsibilities and are informed about environmental sensitivities and the consequences of non-conformance				PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
3	Ensure effective communication with all affected stakeholders					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	Ensure compliance and alignment with this document as an addendum to the station's EMP, authorisations and licences.	All	PD, PD, SCM, CM, EM, EA, EO	Approved EMPs, EAs and licenses	Signed agreement statement in contracts	Monthly
2	All persons involved shall attend a compulsory environmental induction and awareness session on an annual basis.	PC	EM	Environmental training material	Signed attendance register	Annual
3	Eskom must appoint a suitably qualified Independent Environmental Control Officer (ECO) who would act on behalf of the applicant, monitor project compliance with the conditions of environmental authorisation, environmental legislation and the recommendations of the approved EMP.	PC	PD, EM, EA	Signed appointment letter and/or contract with a company that provides this service	Appointment letter / Contract	Once off
4	The ECO shall remain employed until all rehabilitation measures are completed and the site is handed over to Eskom by the contractor for operation.	PC	PD, PD, EM	-	Appointment letter / Contract-	Duration of construction
5	Ensure compliance with conditions of the EA for Medupi FGD Retrofit Project elements.	All	GM, PD, SCM, CM, EM, EA, EO	EA, EMPs	Inspection and audit reports	Daily
6	All relevant permits, certificates and permissions must be obtained prior to any activities commencing on site and are strictly enforced / adhered to.	PC	PD, C	Site walkdown	Permits issued	Once off
7	The Contractor shall submit written Method Statements for acceptance to the CM, EM and ECO for the activities identified by the CM, EM and/or the ECO.	PC	C, CM, EM, ECO	Method statements	Letter of acceptance from CM	Once off
8	A Complaints Register must be maintained on Site. The Register shall contain contact details of complainants, the nature of the complaint, details on the complaint itself, as well as the date and time that the complaint was made and resolved.	PC	C, EM, ECO	Complaints register	Compliance monitoring report	Monthly
Monitoring						
1	Compliance monitoring and reporting as per section 6.1.					

Table 5-2: Management of Surface Water Resources

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF SURFACE WATER RESOURCES</b>		<b>5.2.2</b>			Phase PC : Pre-construction      O : Operational C : Construction            D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party PSM : Power Station Manager      GM : General Manager PD : Project Director            SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
1	Prevent pollution of natural surface water features (Water quality)	No measurable impact on water resources observed or reported				
2	Minimise reduction of the surface water runoff footprint					
3	Prevent unnatural flooding of nearby watercourses					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	Removal of topsoil should be done systematically, only clearing the necessary areas at a time.	C	C, EO, EM	EMPr, site layout plan	Compliance monitoring reports	Monthly <u>ECO audits</u>
2	Clean and dirty surface water channels must be constructed and maintained to ensure separation of clean and dirty water.	C, O	C, EM, PD	EA, EMPr, Design drawings	Compliance monitoring reports	Monthly <u>ECO audits</u>
3	Ensure optimal operation and maintenance of Storm Water Management System during all phases by regularly removing sediment and any other obstructive material from dams and channels	All	EM, EA	EA, EMPr, Design drawings	Compliance monitoring reports	Monthly <u>ECO audits</u>
4	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.	C, O, D	SCM, CM, EM, EO, C	Water level data	Water Accounting Framework daily report	Daily <u>site checks / site diary</u>
5	Update storm water management plan (SWMP) and the existing water balance be undertaken, if required, to comply with GN704.	All	Engineering	Existing SWMP, water balance	Updated SWMP, water balance	As required
6	Appropriate erosion control and protection measures must be employed during the rainy seasons to minimise and prevent erosion from occurring at the construction works.	C, O, D	C, PD, EO, EM	EMPr, Detail design drawings	Compliance monitoring reports	Rainy season
7	Propose amendments to the approved EMPr where mitigation measures are proven to be ineffective.	C, O, D	EM, EA, EO, ECO, EMC	Compliance monitoring reports	Non-conformances reported	As required
<b>Monitoring Measures:</b>						
1	Ongoing monitoring of the surface water must continue or be commissioned for all constituents as stipulated in the Environmental Authorisation and permits, e.g. WUL. The existing monitoring programme must be extended to cover additional facilities to be constructed for the FGD plant and associated infrastructure in line with the integrated WUL limits once issued.	C, O, D	EO, EA, HO	EMPr, EA, relevant permits and licences	Surface Water Monitoring Reports and data	Weekly/monthly/quarterly as per WUL requirements
2	Proposed monitoring must be incorporated into the existing surface water monitoring programme for the MPS	C, O, D	EO, EA, EM	EMPr, existing MPS EMPr	Monitoring and Measurement procedure updated	As per existing programme
3	Compliance monitoring and reporting as per section 6.1.					

Table 5-3: Management of Groundwater Resources

Environmental Specification		Section			Legend	
MANAGEMENT OF GROUNDWATER RESOURCES		5.2.3			Phase	
Objective:		Expected outcome:			Responsible Party	
1	Prevent or minimise groundwater pollution	No measurable impact on groundwater resources observed or reported			PC : Pre-construction	O : Operational
2	Compliance of groundwater quality and quantity reserve				C : Construction	D : Decommissioning
<b>Management and Mitigation Measures</b>		<b>Phase</b>	<b>Responsibility</b>	<b>Resources</b>	<b>Reporting / Indicator</b>	<b>Monitoring frequency</b>
1	During transportation of hazardous waste, the trucking contractor should adhere to all environmental acts, regulations and standards.	C, O	C	EMPr, Method Statements	Complaints received spillages from trucks	Monthly
2	Method Statements, Works Instructions and or Operational Controls for transportation of hazardous waste must be in place, to minimize the risk of contamination to the environment and groundwater should a spillage occur.	C, O	C	EMPr, Method Statements, SWPs	Spillage Incident Reports or non-conformity reports	Monthly
3	Any spillages that occur must be logged and reported immediately in line with the EMS requirements in a quantitative manner.	C, O	C, EM, EO	EMPr, Method Statements, SWPs	Spillage Incident Reports	Monthly
4	If the groundwater is contaminated as a result of activities associated with the construction, commissioning and operation of FGD plant and infrastructure, immediate treatment and clean-up must be undertaken according to applicable legislation and Eskom EMS or Contractor processes.	All	C, EM, EO	Groundwater treatment system	Compliance monitoring reports	Monthly
5	Eskom to ensure that groundwater monitoring boreholes are maintained in a good state to ensure continued monitoring can be conducted as per the approved monitoring plan.	All	EM, EA, EO	EMPr, Monitoring Reports	Groundwater Monitoring Reports	Monthly and/or quarterly
6	Aquifer testing of new monitoring boreholes to determine hydraulic parameters and update initial groundwater conceptual model. This must be aligned with the requirement in the existing WUL to update the groundwater model on an annual basis.	All	EM, EA, EO	Existing Groundwater Conceptual Model	Updated Groundwater Conceptual Model	Once off
7	The newly-drilled monitoring boreholes should be incorporated into the existing monitoring programme. The monitoring tasks should be conducted to be consistent with the existing WUL Licence no.: 01/A1042/ABCEFGI/5213, and any subsequent WULs issued for the power station.	All	EM, EA, EO	Groundwater Monitoring Programme, EMPr, MPS EMS	Groundwater Monitoring Reports	Monthly
8	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 Medupi FGD Project. In the event such a model has already been undertake, the existing model must be updated accordingly.	All	EM, EA, EO, C	Groundwater Monitoring Reports, MPS EMS	Numerical groundwater flow & transport model	As required
9	Update mitigation and management measures for the Medupi FGD Project on numerical model outcome and predictions.	All	EM, EO	Numerical groundwater flow & transport model	Updated mitigation measures	As required
<b>Monitoring Measures:</b>						
1	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) as well as with any	All	EO, EA, HO	EMPr, EA, relevant permits	Surface Water Monitoring Reports and data	Monthly

	amendments following the integrated WUL application;			and licences	
2	Compliance monitoring and reporting as per section 6.1.				

**Table 5-4: Management of impacts on Biodiversity and Wetlands**

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF IMPACTS ON BIODIVERSITY AND WETLANDS</b>		<b>5.2.4</b>			Phase PC : Pre-construction      O : Operational C : Construction          D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party	
1	Minimise impacts on wetlands habitat and functionality	No significant measurable impact on biodiversity or wetland resources observed or reported			PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor      EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
2	Minimise loss of protected sensitive or Conservation Important biodiversity					
3	Minimise or prevent spillages of hazardous substances					
4	Control alien invasive species within the development site					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	All clearing of vegetation needs to occur only within the required construction and/or operation footprint of the proposed FGD / railway yard area. If at all possible vegetation clearing in the western corner of the railway yard area must be minimised to the required construction footprint only.	C, O, D	C, EO, EM	EMPr, EA, MPS EMS	Site diary and Internal audit reports	Daily
2	Once the area footprint required for construction is known all other remaining natural areas must be designated as no-go areas and access minimised/prevented where possible.	C, O, D	C, EO, EM	EMPr, EA, MPS EMS	Site diary and Internal audit reports	Daily
3	Any bulbous or protected plant species that can be transplanted must be removed and transplanted to a similar habitat nearby. This must be done during the relevant growth season to maximise search and rescue of these species.	C, O, D	EO, EM, Vegetation specialist	EMPr, EA, Biodiversity Specialist Report	Rehabilitation Strategy and implementation Plan	As required but prior to vegetation clearance commencing within the growing season.
4	Alien species must be monitored and controlled under the MPS Alien Control Programme. Furthermore, a pre- and post-construction alien and invasive control, monitoring and eradication programme must be implemented along with an on-going programme to ensure persistence of indigenous species;	All phases	EO, EM, C, PSM	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Records of aliens removed	Daily, as required
5	Alien invasive plant species in and around the road reserve must be removed in terms of Conservation of Agricultural Resources Act (CARA), and follow-up actions for at least 5 years need to take place;	All phases	EO, EM, C, PSM	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Records of aliens removed	Daily, as required
6	Construction crew must be made aware of the alien species that occur on site, specifically Category 1 species. Where alien species have been identified for removal, the provisions of the Alien and invasive Species Management Plan and relevant legal requirements must be followed.	C, O, D	EO, EM, Vegetation specialist	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Signed attendance register for training	Monthly, or as required
7	Document and tag all Protected Trees within the development footprint. Where removal and/or relocation of such trees are requires, it must be undertaken in compliance with conditions of the relevant tree permits.	C, O, D	EO, EM, Vegetation specialist	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Species relocation plan	As required



8	Obtain permits from the Department of Agriculture, Forestry and Fisheries (DAFF) for the relocation and/or destruction of sensitive or protected tree species.	C, O, D	EO, EM, Vegetation specialist	EMPr, EA, Permit application forms	Permit applications approved and available on site	Once off
9	Any other plant species that may be identified as Conservation Important (CI) must either be translocated (if possible) or specific mitigation specified in the permits must be compiled with.	C, O, D	EO, EM, Vegetation specialist	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Species relocation plan	As required
10	In order to reduce the impact on CI faunal species on site, clearing must be undertaken in winter, where possible. If this is not possible, a search and rescue programme must be implemented to identify and relocate all CI species prior to clear of any vegetation. The search and rescue (or walkdown) be conducted 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.	C, O, D	EO, EM, Faunal specialist/ Ecologist	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Species relocation plan	Height of the rainy season
11	In the event that CI bird species nests, especially raptor nests, are encountered, its location should be marked. The local conservation office must be consulted should permits be required.	C, O, D	EO, EM, AviFauna specialist	EMPr, EA, Biodiversity Specialist Report, MPS EMS	Recorded raptor nests, Internal audit reports	As required
12	Game within the within the Railyard area must be captured and relocated to either Swartwater or Grootvallei Conservation Area or sold.	C, O, D	EO, EM	EMPr, EA, Biodiversity Specialist Report, MPS EMS	EO's site diary, Internal audit reports	Daily
13	Minimise faunal mortality through active search and rescue prior to clearing and relocate less mobile fauna. Maintain existing tortoise road signs and insert new ones where necessary. Continue to enforce speed regulation controls such as speed humps and limits.	All phases	EO, EM, Faunal specialist/ Ecologist	EMPr, EA, Biodiversity Specialist Report, MPS EMS	EO's site diary, Internal audit reports	Daily
14	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.	All phases	PD, C, EO, EM	EMPr, EA, MPS EMS	Internal and external audit reports	Daily
15	<u>All wetlands areas must be avoided by the development activities, including a suitable buffer zone to avoid impacts on these water courses.</u>	<u>C, O, D</u>	<u>C, EO, EM</u>	<u>EMPr, EA</u>	<u>EO's site diary, Internal audit reports</u>	<u>Daily</u>
16	<u>Harvest of hill wash material must be prohibited within 100m of the delineated edge of all identified depressions and semi-arid ephemeral wash wetlands and within 500m radial buffer of the identified bullfrog breeding site.</u>	<u>C, O, D</u>	<u>C, EO, EM</u>	<u>EMPr, EA</u>	<u>EO's site diary, Internal audit reports</u>	<u>Daily</u>
17	<u>Rehabilitation work must be done during low rainfall seasons and soil compaction should be prevented as far as possible.</u>	<u>O, D</u>	<u>C, EO, EM</u>	<u>EMPr, EA</u>	<u>EO's site diary, Internal audit reports</u>	<u>Daily</u>
18	<u>All re-vegetation must be done with local indigenous plant species as specified by the Provincial Co-ordinator and/or Wetland Ecologist.</u>	<u>O, D</u>	<u>C, EO, EM</u>	<u>EMPr, EA</u>	<u>EO's site diary, Internal audit reports</u>	<u>Daily</u>

19	Erosion and Storm Water Management Plan must be revised to allow for heavy rainfall events, if not in contradiction to operation requirements, legislation or construction standards.	C, O, D	PD, EO, EA, HO, PSM, C	EMPr, EA, MPS EMS	Updated erosion and SWMP	As required
20	Prevent or contain spills through installation of effective engineered infrastructure in line with the approved engineering designs.	C, O, D	PD, EO, EA, PSM	EMPr, EA, MPS EMS, Approved designs	Reported contained spills, EO's site diary	Once off
<b>Monitoring Measures:</b>						
1	Existing biodiversity and wetlands monitoring programmes in terms of the approved Medupi EMPr, EA and EMS must be updated to include the areas affected by the proposed FGD Retrofit Project.	C, O, D	EO, EA, HO, PD	EMPr, EA, MPS EMS	EO's site diary, Internal audit reports	As per existing monitoring requirements
2	Manganese levels in stockpiles and the environment must be monitored through regular water quality testing at pans immediately south of the FGD and compared to current baseline levels.	C, O, D	EO, EA, HO, C	EMPr, EA, MPS EMS	EO's site diary, Internal audit reports	Quarterly
3	Compliance monitoring and reporting as per section 6.1.					

**Table 5-5: Management of Air Quality impacts**

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF AIR QUALITY IMPACTS</b>		<b>5.2.5</b>			Phase O : Operational D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager            ECO : Environmental Control Officer EM : Environmental Manager        C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
1	Reduce SO <sub>2</sub> to within NAAQS	Significantly reduced SO <sub>2</sub> concentrations resulting in an increase in quality of life for local residents. No exceedances of the NAAQS for NO <sub>2</sub> , PM <sub>10</sub> and PM <sub>2.5</sub> .				
2	Enhance positive impacts resulting from reduction of SO <sub>2</sub> concentrations					
<b>Management and Mitigation Measures</b>		<b>Phase</b>	<b>Responsibility</b>	<b>Resources</b>	<b>Reporting / Indicator</b>	<b>Monitoring frequency</b>
1	As the proposed operation of the FGD will significantly reduce SO <sub>2</sub> impacts from the MPS, it is recommended that the FGD Retrofit Project be implemented.	O	PSM, PD, EM, HO	EA to be granted for FGD	Air quality monitoring results and reports	Once off
2	Dust control measures, such as watering, chemical stabilisation and the reduction of surface wind speed through the use of windbreaks and source enclosures must be put in place during construction activities.	C, O, D	C, PD, EM, EO	Dust suppression system	Dust fallout results within applicable standards	Monthly
3	All temporary construction, access or gravel roads used during construction and operation must be sprayed down with a water truck on a regular basis, as necessary, to manage traffic generated dust.	C, O, CL	C, PD	Water bowser	Inspections	Weekly
4	All topsoil stockpiles and cleared areas should be re-vegetated, covered or kept moist to prevent dust generation.	C, O, CL	C, PD	Water bowser	Inspections	Weekly
<b>Monitoring Measures:</b>						
1	Monitoring of dust-fall rates (via dust bucket network) and ambient air quality must be updated to include the proposed study area.	C, O, D	EM, EA, PSM, Air quality specialist	Air quality management programme	Air quality audit reports	Monthly
2	Air Quality monitoring in terms of the existing Air Quality monitoring programme must continue for the life of the MPS.	C, O, D	EM, EA, PSM, Air quality specialist	Air quality measurement	Air quality audit reports	Monthly

			equipment	
3	Compliance monitoring and reporting as per section 6.1.			

**Table 5-6: Management of Ambient Noise Levels**

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF AMBIENT NOISE LEVELS</b>		<b>5.2.6</b>			Phase PC : Pre-construction      O : Operational C : Construction            D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party PSM : Power Station Manager      GM : General Manager PD : Project Director                SCM : Senior Construction Manager CM : Contracts Manager            ECO : Environmental Control Officer EM : Environmental Manager        C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
1	Ensure that noise is managed in such a manner that no complaints are received	Noise levels maintained within acceptable range.				
2	Reduce noise generated by activities associated with the construction of the overland ash conveyor and ash disposal facility					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	The management of ambient noise within the MPS through the existing EMS, EA, EMPr and relevant legislation must be expanded to include the management of noise within the FGD, and rail yard areas.	All	EM, EA, EO, HO	EMPR, MPS EMS	Noise monitoring records	Once off
2	Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.	All	C, EM, EO	Equipment maintenance program	Inspection checklists, Environmental audit reports	Monthly
3	Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration.	All	PD, EM, EO, PSM	Approved designs		Once off
4	Maintain road surface regularly to avoid corrugations, potholes etc.	All	PD, EM, EO, PSM	Road maintenance plant	Compliance monitoring report	Monthly
5	Avoid unnecessary idling times.	All	PD, EM, EO	Vehicles and plant	EO's site diary, Internal audit reports	Daily
6	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.	All	C, EM, EO	Vehicles and plant	Compliance monitoring report	Monthly
7	To minimise noise generation, vendors can be required to guarantee optimised equipment design noise levels.	All	C, EM, EO	-	Inspection checklists	As required
Monitoring Measures:						
1	The monitoring of ambient noise within the MPS through the existing EMS, EA, EMPr and relevant legislation must be expanded to include the monitoring of noise levels within the FGD, and rail yard areas.	All	EM, EO, EA, HO	EMPr, EA, MPS EMS	Noise monitoring reports, Compliance monitoring reports	As stipulated per EMS, EMPr
2	Compliance monitoring and reporting as per section 6.1.					

**Table 5-7: Management of Soil and Land Capability Impacts**

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF SOIL AND LAND CAPABILITY IMPACTS</b>		<b>5.2.7</b>			Phase PC : Pre-construction      O : Operational C : Construction          D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party	
1	Prevent or reduce loss of utilisable soil resources	Stockpiling and storage of soils in the manner to maintain soil integrity and seedbed viability until rehabilitation phase.			PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor      EMC : Environmental Monitoring Committee EO : Environmental Officer              HO : Eskom Head Office	
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	Limit the area of impact to as small a footprint as possible.	C, O, D	C, EO, EM	EMPr, EA, MPS EMS	EO's daily site diary	Daily
2	Avoid or reduce impact on sensitive soil groups such as wetlands and soils sensitive to erosion and/or compaction, where possible.	C, O, D	C, EO, EM	EMPr, EA, MPS EMS	EO's daily site diary, Internal audit reports	Daily
3	Extend the existing MPS EMS management and monitoring procedure to include monitoring and auditing of all soil resources within the study site.	C, O, D	EM, EA, EO, HO	EMPr, EA, MPS EMS	Internal and external audit reports	Weekly and Monthly
4	Undertake concurrent rehabilitation of all affected areas that are not under construction or required for operational activities.	C, O, D	C, PD, EM, EO	Manual labour & plant	EO's daily site diary, Internal audit reports	Weekly
5	Undertaken soil stripping during the less windy months when the soils are less susceptible to erosion, where possible.	C, O, D	C, PD, EM, EO	TLB and tucks	EO's daily site diary, Internal audit reports	Weekly
6	Clad berms and all soil stockpiles with vegetation or large rock fragments, while minimising the height of storage facilities to 15m and soil berms to 1,5m wherever possible.	C, O, D	C, PD, EM, EO	TLB and tucks	EO's daily site diary, Internal audit reports	Weekly
7	Restrict movement of vehicles over unprotected or sensitive areas in order to reduce compaction.	C, O, D	C, PD, EM, EO	Demarcating material or fencing	No signs of vehicle traffic in demarcated areas	Monthly
8	Avoid or reduce contamination of soil resources through proper maintenance of all vehicles on site and regular cleaning and maintenance of all haulage ways, conveyancing routes and service roads, drains and storm water control facilities.	C, O, D	C, PD, EM, EO	-	No spillages on soils reported in EO's site diary and audit reports	Daily
9	Ensure soil replacement and 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.	C, O, D	C, PD, EM, EO	Viable soils and manual labour or TLB	Internal and external audit reports	Monthly
10	Undertake 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.	C, O, D	C, PD, EM, EO	-	Approved method statements	As required
11	Implement soil conservation plan proposed for the FGD Retrofit Project	C, O, D	EM, EA, EO, HO	Soil Conservation Plans in EMPr, MPS EMS	Compliance monitoring reports	As required

**Monitoring Measures:**

1	Preliminary soil quality monitoring should be carried out during rehabilitation 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. Nutrient levels to be advised by a relevant specialist for the specific vegetation type.	C, O, D	EM, EO, EA, Soil specialist	EMPr, EA, MPS EMS	Soil quality monitoring report and data	As required during rehabilitation
2	The interval between sampling can be increased once the desired nutritional status has been achieved. An annual environmental audit should be undertaken, but if growth problems develop, ad hoc, sampling should be carried out to determine the problem.	C, O, D	EM, EO, EA, Soil specialist	Soil sampling equipment	Soil monitoring reports, External audit report	Annual
3	Monitoring should always be carried out at the same time of the year.	C, O, D	EM, EO, EA, Soil specialist	Soil sampling equipment	Soil monitoring reports, External audit report	Annual
4	Soils should be sampled and analysed for the parameters: pH (H <sub>2</sub> O), 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, and Organic matter content (C %).	C, O, D	EM, EO, EA, Soil specialist	Soil sampling equipment	Soil monitoring reports, External audit report	Annual
5	Compliance monitoring and reporting as per section 6.1.					

**Table 5-8: Management of Heritage, Archaeological and Palaeontological Resources**

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF HERITAGE, ARCHAEOLOGICAL AND PALAEOONTOLOGICAL RESOURCES</b>		<b>5.2.8</b>			Phase PC : Pre-construction      O : Operational C : Construction          D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party	
1	Prevent or minimise impact on potential heritage, archaeological and palaeontological finds	Protection of heritage, archaeological or palaeontological resources			PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
<i>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. Given the low likelihood that fossil finds would be uncovered the following good practice measures should be implemented as part of due diligence.</i>						
1	Conduct basic awareness training on heritage, archaeological and palaeontological finds and fossils to staff and contractors during construction.	PC	EM, EO	FEIR, EMPr, Heritage specialist report	Training programme, attendance register	Once off, or as required
2	In the extremely unlikely event that any fossils are discovered during the construction of the waste disposal site, a palaeontologist must be called to assess their importance and implement necessary mitigation if necessary.	C	C, EO, EM, Palaeontologist	Uncovered material	Palaeontological assessment report	As and if required
3	Should any remains be found on site that is potentially human remains, the South African Police Service must be informed. Construction activities must cease and a buffer of at least 20 m must be implemented.	C, O	C, EO, EM, SAPS	-	Inspections	As and if required
Monitoring Measures:						
1	Ongoing monitoring of all excavations must be undertaken in the event that archaeological or palaeontological finds are uncovered.	C, O	EO, EM	Heritage specialist report	Potential finds documented in EO's site diary	Daily
2	Compliance monitoring and reporting as per section 6.1.					

Table 5-9: Management of Social Impacts

Environmental Specification		Section			Legend	
<b>MANAGEMENT OF SOCIAL IMPACTS</b>		<b>5.2.9</b>			Phase PC : Pre-construction      O : Operational C : Construction          D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor      EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
1	Minimise social impacts on the receiving communities	Significantly enhance positive social impacts through implementation of the FGD system and indirect socio-economic benefits to the region.				
2	Manage and minimise complaints from the public or landowners					
3	Prevent and manage claims or litigation during all phases of development					
4	Ensure effective transparent communication with stakeholders and I&APs					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	Construction activities must be restricted to within the existing Medupi footprint in order to minimise land use impacts on surrounding properties.	C, O	PD, C, EM	Approved engineering designs	Construction quality assurance	Monthly
2	All measures and recommendation proposed by the traffic specialist to reduce traffic impacts on motorists and commuters must be implemented to reduce social impacts associated with increased traffic volumes.	C, O, D	PD, C, EM, PSM	Approved engineering designs	Construction quality assurance	Monthly
3	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.	PC, C, O	EM, EO, EMC, PSM	EMPr, EA, MPS EMS	No complaints received from public	Monthly
4	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 <sub>2</sub> reduction targets.	All	PSM, PD, EM, HO	EA, Tender adjudication	Appointment of contractor	Once off
5	Eskom to continue to develop and implement initiatives to contribute towards educating and developing necessary skills for the locals to take advantage of opportunities associated with the FGD construction and operation.	All	PSM, EM, HO	-	Reporting on employment opportunities created	Annual
6	Recommendation: 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.	C	PSM, EM, HO	List of skills required	Advertisement placed	Annual
7	Recommendation: The EMC should 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.	All	EM, EO, EMC, PSM	EMPr, EA, MPS EMS	Minutes of EMC meetings	Quarterly
8	Recommendation: 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.	All	EM, EMC, PSM, ECO	EMPr, EA, MPS EMS, minutes of EMC meetings	Report on consultation with stakeholders	Monthly
Monitoring Measures:						
1	Compliance monitoring and reporting as per section 6.1.					

**Table 5-10: Management of impacts on Traffic and Roads**

Environmental Specification		Section			Legend	
<b>TRAFFIC AND ROADS</b>		<b>5.2.10</b>			Phase PC : Pre-construction      O : Operational C : Construction          D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>			Responsible Party	
1	Minimise impacts on the traffic patterns in the area	Reduced or low impacts on local traffic patterns resulting from construction and operational traffic to and from MPS.			PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor      EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office	
2	Minimise damage to existing access roads					
3	Ensure monitor and maintenance of new roads.					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	Management of traffic within and around the MPS must be aligned with the stipulations of the approved MPS EMP Revision 2 (September 2010) and relevant addenda to this EMP, authorisations and licences.	All	PSM, EM, EO	Traffic Impact Assessments, EMPr, EA and MPS EMS	Traffic complaints received, EMC minutes	As required
2	Proposed upgrade of the Nelson Mandela Drive / D1675 intersection to provide signals, addition of a left turning slip lane along D1675 (northbound), introduction of a right turning lane for the northbound right movement, and provision of an additional eastbound lane for the straight movement. This is subject to approval and engagement with the relevant roads authority.	All	PSM, EM, EO, Local Municipality	Approved design drawings	Compliance monitoring reports	Monthly
3	Proposed upgrade of the D1675 / Afguns Rd intersection to include to the upgrading of the priority control intersection to a one lane roundabout.	All	PSM, EM, EO, Local Municipality	Approved design drawings	Compliance monitoring reports	Monthly
4	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.	All	C, EM, EO, PSM	-	Traffic complaints received, EMC minutes	Monthly
5	A points man must be deployed as required 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.	All	C, EM, EO, PSM	Qualified points man	Traffic complaints received, EMC minutes	Monthly
<b>Monitoring Measures:</b>						
1	Compliance monitoring and reporting as per section 6.1.					



Table 5-11: Site management - Site establishment and laydown areas

Environmental Specification		Section	Component		Legend	
SITE MANAGEMENT DURING CONSTRUCTION AND OPERATION OF THE FGD		5.2.11	Site establishment and laydown areas		Phase PC : Pre-construction      O : Operational C : Construction            D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>		Responsible Party		
1	Ensure proper demarcation of the project area prior to construction.	Construction site established without resulting in adverse impacts on the surrounding environment.		PSM : Power Station Manager      GM : General Manager PD : Project Director                SCM : Senior Construction Manager CM : Contracts Manager            ECO : Environmental Control Officer EM : Environmental Manager        C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer            HO : Eskom Head Office		
2	Minimise impact on natural and No-Go areas.					
3	Maintain a safe and clean construction site					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	A demarcated area at or close to the site must be provided for the storage of machinery, plant and trucks as necessary.	All	C, PD, EO, EM	EMPr, ECO recommendations	Compliance monitoring reports	Monthly
2	A Site Layout Master Plan illustrating the location and layout of the proposed site camp and working areas must be produced. This plan must be approved by the PD.	PC	C, EM, PD	Method statements, detail design drawings	Site Layout plan	Once off
3	A photographic record of the area earmarked for the site camp must be produced prior to site establishment. This will serve as a benchmark against which rehabilitation will be measured and shall be kept in the site environmental file.	PC	ECO, EO, PD	Camera, Site Layout Plan	Pre-construction audit report	Once off
4	Where necessary, the No-Go areas shall be demarcated with hazard tape, fencing or equivalent, and enforced.	PC, C, D	C, EO, EM, PD	Site Layout Plan, demarcation material	Photographic evidence of demarcated areas	Monthly
5	Construction activities are limited to the development area as demarcated within the site identified for the construction of the FGD infrastructure and rail yard.	PC, C, O	C, PD, EO, EM	Site Layout Plan	Compliance monitoring reports	Monthly
7	The contractor's camp shall be fenced, with access control, and the contractor shall maintain in good order all fencing for the duration of the construction activities.	C, O	C, EO, PD	Site Layout Plan	Compliance monitoring reports	Monthly
8	Site establishment shall take place in an orderly manner and all amenities shall be installed at Camp sites before the main workforce move onto site.	PC	C, EO, PD	Site Layout Plan	Pre-construction audit report	Once off
9	The Contractor will ensure that delivery drivers are informed of all procedures and restrictions required by this EMP. Such drivers will be supervised during off-loading, by a person knowledgeable of the requirements.	C, O, D	C, EO, PD	EMPr	Delivery supervision	As required
10	Materials will be appropriately secured to ensure safe passage between destinations.	C, O, D	C, EO, PD	Appropriate covering	Delivery supervision	As required
11	The Contractor will be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.	C, O, D	C, EO, PD	-	Delivery supervision	As required
12	All material lay-down areas and stockpiles will be subject to the Project Manager's approval.	C, O, D	PD, C, EO	Site Layout Master Plan	Compliance monitoring reports	Monthly
14	Locate all topsoil stockpiles outside delineated wetland and 32m buffer zone. Install sediment barriers along the lower edge of the soil stockpile. Prevent down wash or erosion of topsoil into wetlands or water courses.	C, O, D	C, EO, PD, EM	Site Layout Master Plan	Compliance monitoring reports	Monthly
<b>Monitoring Measures:</b>						
1	Compliance monitoring and reporting as per section 6.1.					

**Table 5-12: Site Management - On-site workshops and handling of hazardous materials**

Environmental Specification		Section	Component		Legend																					
<b>SITE MANAGEMENT DURING CONSTRUCTION AND OPERATION OF THE FGD</b>		<b>5.2.12</b>	On-site workshops and Handling of Hazardous Materials		<table border="1"> <tr> <th colspan="2">Phase</th> </tr> <tr> <td>PC : Pre-construction</td> <td>O : Operational</td> </tr> <tr> <td>C : Construction</td> <td>D : Decommissioning</td> </tr> <tr> <th colspan="2">Responsible Party</th> </tr> <tr> <td>PSM : Power Station Manager</td> <td>GM : General Manager</td> </tr> <tr> <td>PD : Project Director</td> <td>SCM : Senior Construction Manager</td> </tr> <tr> <td>CM : Contracts Manager</td> <td>ECO : Environmental Control Officer</td> </tr> <tr> <td>EM : Environmental Manager</td> <td>C : Contractor</td> </tr> <tr> <td>EA : Senior Environmental Advisor</td> <td>EMC : Environmental Monitoring Committee</td> </tr> <tr> <td>EO : Environmental Officer</td> <td>HO : Eskom Head Office</td> </tr> </table>		Phase		PC : Pre-construction	O : Operational	C : Construction	D : Decommissioning	Responsible Party		PSM : Power Station Manager	GM : General Manager	PD : Project Director	SCM : Senior Construction Manager	CM : Contracts Manager	ECO : Environmental Control Officer	EM : Environmental Manager	C : Contractor	EA : Senior Environmental Advisor	EMC : Environmental Monitoring Committee	EO : Environmental Officer	HO : Eskom Head Office
Phase																										
PC : Pre-construction	O : Operational																									
C : Construction	D : Decommissioning																									
Responsible Party																										
PSM : Power Station Manager	GM : General Manager																									
PD : Project Director	SCM : Senior Construction Manager																									
CM : Contracts Manager	ECO : Environmental Control Officer																									
EM : Environmental Manager	C : Contractor																									
EA : Senior Environmental Advisor	EMC : Environmental Monitoring Committee																									
EO : Environmental Officer	HO : Eskom Head Office																									
<b>Objective:</b>		<b>Expected outcome:</b>																								
1	Maintain a safe and clean construction site	On-site workshops and storage of hazardous materials managed without resulting in adverse impacts on the receiving environment.																								
2	Ensure safe storage and usage of hazardous materials																									
3	Ensure implemented mitigation measures reduce any adverse impacts on the environment resulting from on-site workshop areas																									
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency																				
1	If at all possible, no workshop should be erected within the site development footprint or Contractor's site camp.	PC	C, EO, PD	Site layout master plan	Compliance monitoring reports	Once off																				
2	If the establishment of a workshop on site is unavoidable, the workshop location must be approved and indicated in the site layout master plan.	PC	C, EO, PD	Site layout master plan	Pre-construction Compliance monitoring	Once off																				
3	Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and remediated to the satisfaction of the ECO.	C, O	EO, PD, ECO	Site layout master plan	Compliance monitoring reports	Monthly																				
4	Where possible and practical all maintenance of vehicles and equipment shall take place in the workshop area.	C, O	C, EO, PD	Site layout master plan	Compliance monitoring reports	Monthly																				
5	Only emergency repairs shall be allowed outside the workshop area on site and a drip tray shall be used to prevent oil spills.	C, O	C, EO, PD	Drip trays	Compliance monitoring reports	Monthly																				
6	All hazardous materials shall be clearly marked with symbolic safety/hazard warning signs, documented in a register, and stored according to best practice guidelines.	C, O, CL	C, EO, PD	MSDS, materials register	Compliance monitoring reports	Monthly																				
7	All hazardous substances shall be stored in suitable containers and storage areas shall be bunded. This includes all carbon substances like fuel and oil as well as herbicides and battery acid.	C, O, CL	C, EO, PD	Method statements	Compliance monitoring reports	Monthly																				
8	Locate temporary waste and hazardous substance storage facilities out of the 1:100 flood line.	C, O, CL	C, EO, PD	Method statements	Compliance monitoring reports	Monthly																				
9	All potentially hazardous raw and waste materials are to be handled by the Contractor's trained staff and stored on site in accordance with manufacturer's instructions and approved method statements.	C, O, CL	C, EO, PD	Method statements	Compliance monitoring reports	Monthly																				
10	Fire extinguishers should be available at conspicuous places and should also be serviced as required.	All phases	C, EO, PD	Clearly visible fire extinguishers	Compliance monitoring report	Monthly																				
11	The relevant Material Safety Data Sheets (MSDS) shall be available on site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.	C, O, CL	C, EO, PD	MSDS	Compliance monitoring reports	Monthly																				
12	The Contractor shall be in possession of an emergency spill kit that must be complete and available at all times on site.	All phases	C, EO, PD	Readily available spill kit	Compliance monitoring report	Monthly																				
13	The location of a fuel storage area for construction activities during the construction phase shall be approved by the PD and ECO, and shall comply with all relevant	All phases	C, EO, PD	Relevant approvals, Site layout Master	Compliance monitoring report	Monthly																				

	legislation and standards.			Plan		
14	All liquid fuels and oils shall be stored in tanks with lids and that these are kept firmly locked at all times. The design and construction of the storage tanks shall be in accordance with a recognised code and as approved by the PD.	C, O, CL	C, EO, PD	MSDS	Compliance monitoring reports	Monthly
<b>Monitoring Measures:</b>						
1	Compliance monitoring and reporting as per section 6.1.					

**Table 5-13: Site management - Waste management activities**

Environmental Specification		Section	Component		Legend	
SITE MANAGEMENT DURING CONSTRUCTION AND OPERATION OF THE FGD		5.2.13	Waste management		Phase PC : Pre-construction      O : Operational C : Construction          D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>		Responsible Party PSM : Power Station Manager      GM : General Manager PD : Project Director              SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager        C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office		
1	Ensure proposed waste management activities are aligned with legislation	No spillages or pollution from the handling or storage of waste during construction.				
2	Maintain a tidy and clean construction site					
3	Minimise potential pollution from waste					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	A certificate of disposal shall be obtained by the Contractor and kept on site. All waste and construction material generated during construction and operation of the facility must be removed and disposed of at a licensed waste disposal facility.	All	C, EO, PD	Appointment of waste service provider	Compliance monitoring reports	Monthly
2	In the case where a registered waste site is not available close to the construction site, the Contractor will be responsible to provide a method statement and/or Waste Management Licence with regard to waste management. This method statement must be approved by the ECO.	All	C, EO, PD	Waste engineer to draft method statement	Approved method statement	Monthly
3	Waste management activities shall be undertaken strictly according to the approved method statement or WML.	C, O	C, EO, PD, EM	Waste engineer to draft method statements	Approved method statements	Once off
4	The Contractor camp shall have the necessary ablution facilities with chemical toilets in the ratio of 1 toilet per 15 staff members.	C, O	C, EO, PD	Sufficient number of chemical toilets	Adequate ablution facilities	Monthly
5	The Contractor will supply waste collection bins where such is not available and all solid waste collected shall either be recycled or disposed of at a registered waste disposal facility.	C, O	C, EO, PD	Waste collection bins	Only temporary waste storage	Monthly
6	Under no circumstances may solid waste be burned on site unless a suitable incinerator is available.	All	C, EO, PD	-	-	Daily
7	The washing of concrete trucks on site is prohibited. Any spilled concrete shall be cleaned up immediately.	C, O	C, EO, PD	Spill kits and clean up material	Incident report	Weekly
8	The Contractor must provide Authorities with proof of confirmation of service provision from waste service providers for the removal of wastes.	C, O	C, EO, PD	Certificate of disposal of waste	Compliance monitoring reports	Monthly
9	Wherever possible, materials such as steel off-cuts, wire, etc will be recycled. To this end, containers for glass, paper, metals, plastics, organic waste and hazardous wastes	All phases	C, EO, PD	Recycling containers	Proof of recycling service provider agreement.	Weekly

	(e.g. oil rags, paint containers, thinners) will be provided in sufficient quantity on the site.					
10	Waste will be removed during off-peak traffic periods, where possible, to minimise impacts on local traffic patterns.	All phases	C, EO, PD	-	-	Weekly
<b>Monitoring Measures:</b>						
1	Compliance monitoring and reporting as per section 6.1.					

**Table 5-14: Site management - Sanitation**

Environmental Specification		Section	Component		Legend	
SITE MANAGEMENT DURING CONSTRUCTION AND OPERATION OF THE FGD		5.2.14	Sanitation		Phase PC : Pre-construction      O : Operational C : Construction            D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>		Responsible Party		
1	Maintain a safe and clean construction site	No spillages or pollution from the handling or storage of sewerage or waste water during construction.		PSM : Power Station Manager      GM : General Manager PD : Project Director            SCM : Senior Construction Manager CM : Contracts Manager          ECO : Environmental Control Officer EM : Environmental Manager      C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office		
2	Ensure implemented mitigation measures reduce any adverse impacts on the environment resulting from construction site activities					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	Where existing ablution facilities and associated infrastructure are available the Contractor shall make use of such facilities.	All	C, EO, PD	Existing ablution facilities	Compliance monitoring reports	Monthly
2	The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities.	All	C, EO, PD	Appropriate ablution facilities	Compliance monitoring reports	Monthly
3	Locate temporary sanitation facilities out of the 1: 100 year flood line.	All	C, EO, PD	Appropriate ablution facilities	Compliance monitoring reports	Monthly
4	The Contractor will ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed provider removes the contents from the site.	All	C, EO, PD	Appropriate ablution facilities	Agreement with service provider	Monthly
5	Disposal of such waste is only acceptable at a licensed waste disposal facility. Disposal certificates shall be obtained from the service provider and included in the site file.	All	C, EO, PD	Honeysucker trucks	Disposal cert. in site file	Monthly
6	Portable ablution facilities to be provided at a maximum ration of 1:15 people with separate facilities for men and women.	All	C, EO, PD	Appropriate ablution facilities	Compliance monitoring reports	Monthly
7	Locate ablution facilities at least 100 m away from the edge of wetland areas outside the direct development footprint.	All	C, EO, PD	EMPr, specialist studies	Compliance monitoring reports	Monthly
8	No washing of machinery or equipment within wetlands areas adjacent to the development sites should be allowed.	All	C, EO, PD	-	Compliance monitoring reports	Monthly
<b>Monitoring Measures:</b>						
1	Compliance monitoring and reporting as per section 6.1.					

Table 5-15: Site Management - Fire prevention

Environmental Specification		Section	Component		Legend	
SITE MANAGEMENT DURING CONSTRUCTION AND OPERATION OF THE FGD		5.2.15	Fire prevention		Phase PC : Pre-construction      O : Operational C : Construction            D : Decommissioning	
<b>Objective:</b>		<b>Expected outcome:</b>		Responsible Party		
1	Ensure effective fire prevention measures are in place	No fires recorded on site.		PSM : Power Station Manager      GM : General Manager PD : Project Director                SCM : Senior Construction Manager CM : Contracts Manager            ECO : Environmental Control Officer EM : Environmental Manager        C : Contractor EA : Senior Environmental Advisor    EMC : Environmental Monitoring Committee EO : Environmental Officer          HO : Eskom Head Office		
2	Prevent occurrences of veld fires					
Management and Mitigation Measures		Phase	Responsibility	Resources	Reporting / Indicator	Monitoring frequency
1	The Contractor will document a fire reduction management plan. The plan will identify fire hazards and appropriate management measures to reduce the identified risks.	PC	C, PD	-	Fire Reduction Management Plan	Once off
2	The Contractor shall have fire-fighting equipment available on all vehicles working on site.	All	C, PD	Firefighting equipment in good working order	Firefighting equipment on all contractor vehicles.	Daily
3	All fire control mechanisms (fire-fighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services. Such mechanisms will be present and accessible at all times.	All	C, EO, PD	Appointment of qualified investigator	Inspection reports	Monthly
4	The contractor shall designate or appoint a suitable and qualified fire officer for full time duty on site.	All	C, EO, PD	Designated fire officer	Fire drills and roll call register	Twice a year
5	All staff on site will be made aware of general fire prevention and control methods, and name of responsible person to alert to the presence of a fire.	All	C, EO, PD	Toolbox talks, fire awareness training	Signed attendance registers	As required
Monitoring Measures:						
1	Compliance monitoring and reporting as per section 6.1.					

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## **6 MONITORING AND COMPLIANCE**

These proposed monitoring and maintenance measures are provided in the sections below.

### **6.1 Compliance monitoring and reporting of construction and operation activities**

Independent monitoring by an ECO must be undertaken on a monthly basis with feedback on contractor and Eskom compliance presented at the contractor's construction management meetings. The ECO will report to the PD, SCM and EM on the compliance with the construction and operational activities during the preceding period in terms of the approved EMPr, EA, MPS EMS.

The Station Environmental Manager or designated person must provide feedback to the Environmental Monitoring Committee on a quarterly basis on the performance of the contractor, Eskom and findings and outcomes of all required monitoring as stipulated in the MPS EMS and approved EMPrs. Where necessary, Eskom shall task the relevant specialists to present monitoring data and findings to the EMC.

### **6.2 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 6-1, Table 6-2 and Table 6-3 below.

**Table 6-1: 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 recommended 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 separated from the soft/decomposed rock, and wet based soils separated 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 6-2: 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 6-3: 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.
- Soils should be sampled and analysed for the following parameters:
 

pH (H <sub>2</sub> O)	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.



### 6.3 Groundwater

The following recommendations regarding monitoring were made by the groundwater specialist and include:

- Monthly monitoring of existing monitoring boreholes groundwater levels and quality. Monitoring should be conducted to be consistent with the existing WUL (Licence no.: 01/A42J/4055);
- 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.

### 6.4 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.

## 6.5 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 recorded and reported:

$L_{Aeq}(T)$

$L_{A1eq}(T)$

Statistical noise level LA90

$L_{Amin}$  and  $L_{Amax}$

Octave band or 3<sup>rd</sup> 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.

## **6.6 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.

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## **7 ENVIRONMENTAL AWARENESS PLAN**

The EO or EM shall be appropriately trained in environmental management and shall possess the skills necessary to impart environmental management skills to all personnel involved in the construction, rehabilitation and operation of the ADF, as applicable.

The PD and EM shall ensure, on behalf of Eskom and the Contractor, that the employees (including construction workers, engineers, and long-term employees) are adequately trained on the stipulations of the EMPr. Further, the EO and EM shall arrange for all employees to attend an induction presentation on environmental awareness.

Where possible, training must be conducted in the language of the employees. The induction and training shall, as a minimum, include the following:

- The importance of conformance with all the specifications of the EMPr and other environmental policies and procedures;
- The significant environmental impacts, actual or potential, of their work activities;
- The environmental benefits of improved personal performance;
- Their roles and responsibilities in achieving conformance with the EMPr and other environmental policies and procedures;
- The potential consequences of departure from specified operating procedures; and
- The mitigation measures required to be implemented when carrying out their work activities.

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