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REPORT ON

Kendal Power Station 30-year Ash Disposal Facility Project Final Environmental Management Programme

Report No: 12935

Submitted to:

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LIST OF ACROYNYMS

ADF ..... Ash Disposal Facility
CA ..... Competent Authority
CO_2 ..... Carbon Dioxide
dBA ..... Decibels
DEA ..... Department of Environmental Affairs
DEA ..... Department of Environmental Affairs
DWS ..... Department of Water and Sanitation
EAP ..... Environmental Assessment Practitioner
EAPASA ..... Environmental Assessment Practitioners of South Africa
ECO ..... Environmental Control Officer
E-Dump ..... Emergency Dump
EIA ..... Environmental Impact Assessment
EIR ..... Environmental Impact Report
EMPr ..... Environmental Management Programme
EO ..... Environmental Officer
FEIR ..... Final Environmental Assessment Report
FEMP ..... Final Environmental Management Programme
GCL ..... Geosystemic Clay Liner
GIS ..... Geographical Information Systems
GNR ..... Government Notice Regulation
I&APs ..... Interested and Affected Parties
IFC ..... International Finance Corporation
IHAS ..... Integrated Habitat Assessment System
IWULA ..... Integrated Water Use Licence Application
kV ..... Kilo Volts
KPS ..... Kendal Power Station
MS ..... Method Statement
NAAQS ..... National Ambient Air Quality Standards
NDCRs ..... South African National Dust Control Regulation(s)
NEMBA ..... National Environmental Management: Biodiversity Act
NEM:WA ..... National Environmental Management: Waste Act
NEMA ..... National Environmental Management Act
NWMS ..... National Waste Management Strategy
PCD ..... Pollution Control Dam
PPE ..... Personal Protective Equipment
RAP ..... Resettlement Action Plan
SACNASP ..... South African Council for Natural Scientific Professionals
SEA ..... Strategic Environmental Assessment
SO_2 ..... Sulphur Dioxide
SOER ..... State of the Environment Reporting
TDS ..... Total Dissolved Salts
WMLA ..... Waste Management License Application

1 INTRODUCTION

1.1 Project Background

Kendal Power Station (KPS) construction commenced in July 1982. The last unit became operational in 1993, eleven years after construction of the power station commenced. Kendal is the largest indirect dry-cooled power station in the world and is designed to generate approximately 4000 MW of electricity.

Kendal has an indirect dry-cooling system, which means that it uses significantly less water in its cooling processes than the conventional wet cooled power stations. The station's cooling towers are the largest structures of their kind in the world with a height and base diameter of 165 m (Eskom, 2016).

The proposed Kendal 30-year Ash Disposal Facility (ADF) site is located north east of KPS which is approximately 40km south of Witbank in the Mpumalanga Province. The proposed site falls within the Emalahleni Local Municipality and the Nkangala District Municipality District Municipality on the Heuvelfontein 215 IR and Schoongezicht 218 IR. Refer to Figure 1-1 for a project locality map.

1.2 Project Overview

The KPS was designed to have an operating life of 40 years. In line with the planned operating life of the Power Station, the initial ADF for the power station was designed to have sufficient capacity to dispose the ash that is generated during the 40-year period, with an eight-year contingency period. After the construction of the existing ADF, the operating life of the KPS was extended to 60 years, plus a 5-year contingency period, up to 2058. Because of the extended operating life of the power station, the storage capacity of the initial ADF will no longer suffice to accommodate the volume of ash that will be generated over the 60 years and 5-year contingency period.

The Kendal 30-year Project is required to cater for ash that will be generated from the electricity generation process (coal burning) at the KPS from the year 2031 to 2058 – approximately 27 years. The preferred site will be approximately 405 ha in area and 75 m high.

The proposed project will require two fixed conveyors to be constructed from the existing Emergency Dump (E-dump) at the power station and will cross under Road 545 where a new E- dump will be constructed. The maximum height that the ADF will reach is 75 m. It will have a ring access road constructed around its perimeter together with stormwater canals intercepting impacted runoff and directing to a pollution control dam.

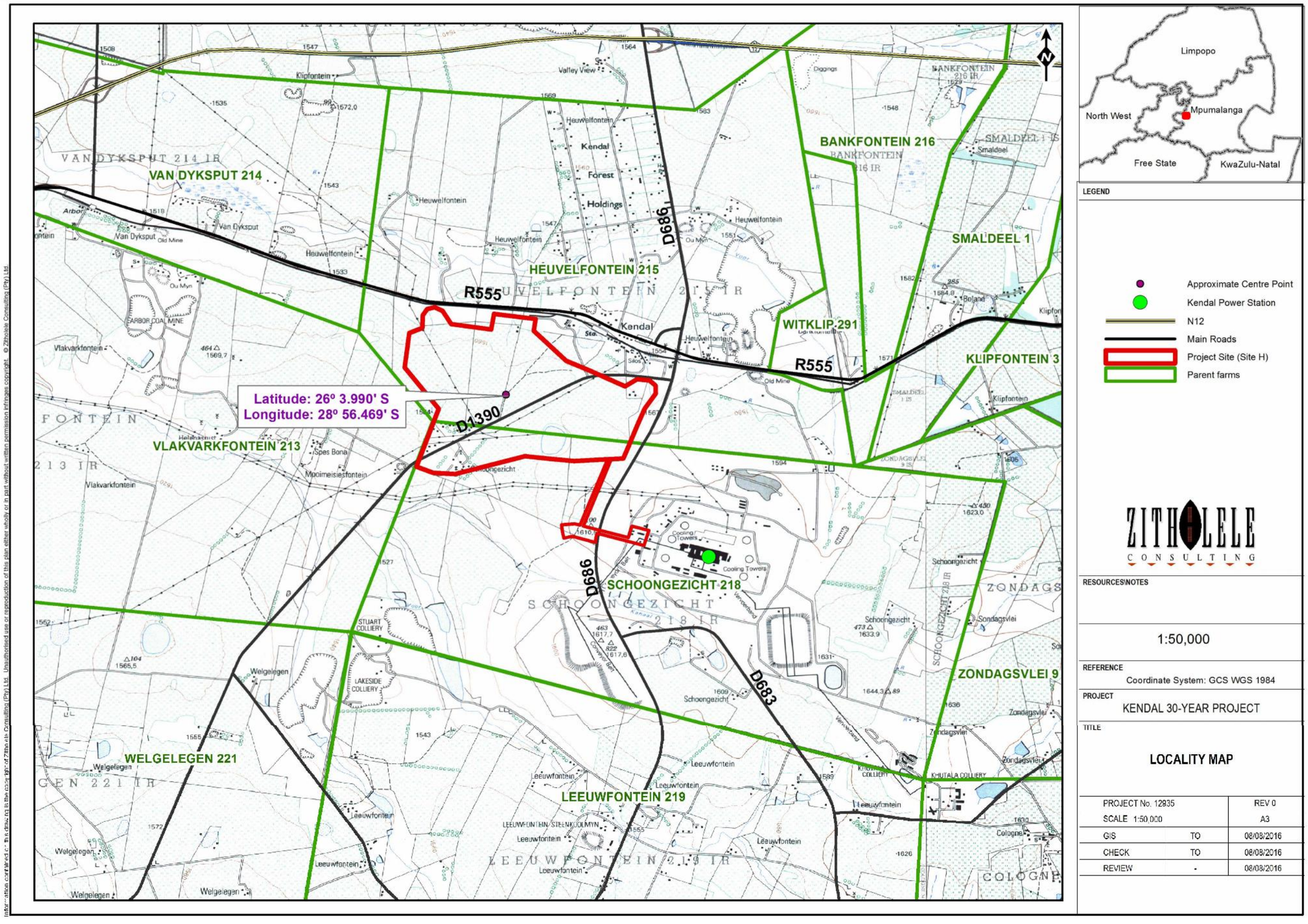

Figure 1-1: Project Locality Map

Zitholele Consulting (Pty) Ltd, hereafter referred to as “Zitholele” has been appointed by Eskom Holdings SOC Ltd, hereafter referred to as “Eskom” to carry out the following Environmental Authorisation (EA)Processes:

a) Environmental Impact Assessment (EIA) Process in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) as amended, and the regulations thereunder;

b) Waste Management License Application (WMLA) Process in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA), as amended, and the regulations thereunder; and

c) Integrated Water Use License Application (IWULA) Process in accordance with the provisions of the National Water Act (Act 36 o 1998), as amended[1].

It should be noted that the integrated application form was submitted to the Department of Environmental Affairs (DEA) in June 2013 and therefore, the EIA and EMPr will be completed in accordance with the EIA Regulations of the time – the 2010 EIA Regulations (GNR 543 – 543). This set of regulations (GN R 543 – 545) have subsequently been repealed by the EIA Regulations of 2014 (GN R 982 – 985).

1.3 Details of the Environmental Assessment Practitioner (EAP)

Eskom appointed Zitholele to undertake the regulatory EIA, WML and IWULA processes for the proposed Kendal 30 year ADF project. Zitholele 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 has no vested interest in the proposed project and hereby declares its independence as required by the EIA Regulations.

Table 1-1 and Table 1-2 provide the details and expertise of the Environmental Assessment Practitioners (EAPs) who are the Project Manager and Project Associate respectively on this project.

Tania Oosthuizen has twelve years working experience in the Environmental Management field. She is certified by the Interim Board of Environmental Assessment Practitioners of South Africa (EAPASA) and registered as Certified Natural Scientist, Level B with the South African Council for Natural Scientific Professionals (SACNASP). She holds a Master’s Degree in Environmental Management from the North West University. Tania manages many large scale environmental authorisation projects and specialises in water use licences

[1] The IWULA is done separately and does not form part of this FEIR

Table 1-1: Details of Tania Oosthuizen (Project Manager)

Name and Surname	Tania Oosthuizen
Professional Registration	Certificated Natural Scientist, Level B, SACNASP (114500) EAPASA Registered
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Dr Mathys Vosloo is a well-qualified and technically proficient environmental and natural scientist with more than 12 years' environmental management experience. His recent experience includes project management and execution of large waste related projects, such as the application for development of ADFs, and large linear projects such as the management EIA process for the implementation of extensive power lines for renewable projects. Mathys also has substantial experience in Geographical Information Systems (GIS), creating and analysing digital terrain models, runoff and stream flow analysis, storm water design and map-making for projects in Africa. Further experience includes the development and completion of State of the Environment Reporting (SOER), Strategic Environmental Assessments (SEAs) and feasibility studies.

Table 1-2: Details of Dr Mathys Vosloo (Project Associate)

Name and Surname	Dr Mathys Vosloo
Professional Registration	Professional Natural Scientist, SACNASP (400136/12)
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2 PROJECT DESCRIPTION

As stated in Chapter 1, the Kendal PS require an additional ADF to accommodate the ash that will be generated from the electricity generation process (burning of coal) from end of 2031 to the end of 2058 – approximately 27 years. Hence, the Kendal 30 year ADF and its associated infrastructure is required.

Zitholele has undertaken a Conceptual Design to investigate feasible disposal options and inform the EIA process for the proposed new ADF, Site H. Please refer to Appendix E1 for the full Conceptual Engineering Report and its appendices which include the geotechnical report, design drawings, water balance etc.

This chapter provides a summary of the project description from the Zitholele (2016) report.

2.1 Ash disposal

The following facts represent a basic understanding of the ADF and its associated infrastructure:

- Two fixed conveyors will be constructed from the existing Emergency Dump (E-dump) at the power station and will cross under Road 545 to the western side of the road where a new E-dump will be constructed.
- A sump will be placed at the conveyor-road crossing with a pipe leading to the new proposed Emergency Dump Dirty Water Dam;
- Two fixed conveyors will extend from the new E-Dump towards the ADF on to each extendable and then shift-able conveyors and stackers will be placed in order to dispose ash on the footprint of the ADF starting from the eastern side of the site and progressing to the western side of the site;
- A starter platform will be built on the eastern side of the site first and will be constructed with bulldozers. The rest of the ADF will be constructed with the conveyor-stacker system;
- A 1:15 sloped ramp will be constructed on the eastern side of the new ADF and will reach a maximum height of 75 metres, which is the maximum height of the ADF;
- The ADF will be in operation for 27 years;
- The new ADF is tapered on the south western corner due to parcels of land that have mining rights attached to them, situated on the western side of the site, and the need to avoid utilising these parcels of land;
- The proposed ADF will have a ring access road constructed around its perimeter together with stormwater canals intercepting impacted runoff and directing to a pollution control dam;
- A distance of 362 metres has been achieved between the existing silos, on the north eastern side of the proposed new ADF, and the perimeter of the proposed ADF;
- There will be three access points to the proposed new ADF, with the main access point being at the south eastern corner of the ADF;

- A proposed Contractor's camp is situated at the south eastern corner of the site;
- A proposed topsoil stockpile area will be situated south of the ADF.

2.2 Deviation of Infrastructure

Several infrastructure elements will require deviation in order to accommodate the footprint area of the new ADF on the site:

Power Lines

The following power lines require diversion:

- 11 kV Distribution Power Line
- 22 kV Distribution Power Line
- Two 88 kV Distribution Power Lines
- Two 132 kV Distribution Power Lines
- Two 400 kV Transmission Power Lines

Road D1390

Gravel road D1390 which runs through the proposed new ADF footprint will need to be diverted. The new diverted alignment of the road is on the southern side of the proposed new ADF and intersects with the access road leading to the Kendal PS main entrance.

The new diverted Road D1390 will have a 40 metre road reserve.

Deviation of the Transnet Pipeline

An existing 18 inch / 450 mm diameter Transnet steel diesel pipeline traverses Site H and runs, directionally, from the south west side of the site to the north east. The existing pipeline runs directly under the proposed footprint area of the new 30 Year ADF.

It is proposed that the pipeline be discontinued throughout the entire length which it traverses under the proposed footprint. This portion of the pipeline is replaced by diverting it to the west of the proposed ADF complex.

Kusile Bulk Water Pipeline

The Kusile Bulk Water Pipeline, which runs from Kendal PS to Kusile PS traverses the southern boundary of the site. This pipeline will not be required to be deviated.

2.3 Barrier system

A waste classification was carried out on the ash and it was classified as a Type 3 waste – low hazard waste (Appendix E). This type of waste requires disposal on a landfill with a Class C barrier system. Refer to Figure 2-1 for an illustration of a typical Class C Barrier System. A Class C barrier system entails the use of clay or a feasible alternative as one of the impermeable layers in the barrier system. Clay is not available on the footprint of the ADF. Tests were done on the *in-situ* soils to be considered as an alternative to the clay component of the barrier. Falling head permeability tests proved that reworking the in-situ material could result in a permeability of 10^{-5} cm/s. It is recommended that the *in-situ* soils, in conjunction with a 2 mm geo-membrane be used in the barrier system. Refer to Figure 2-2 for the proposed Class C barrier system.

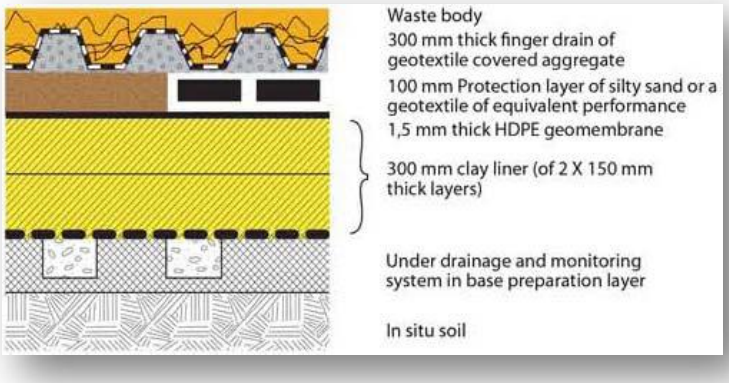

Figure 2-1: Typical Class C Landfill Barrier System

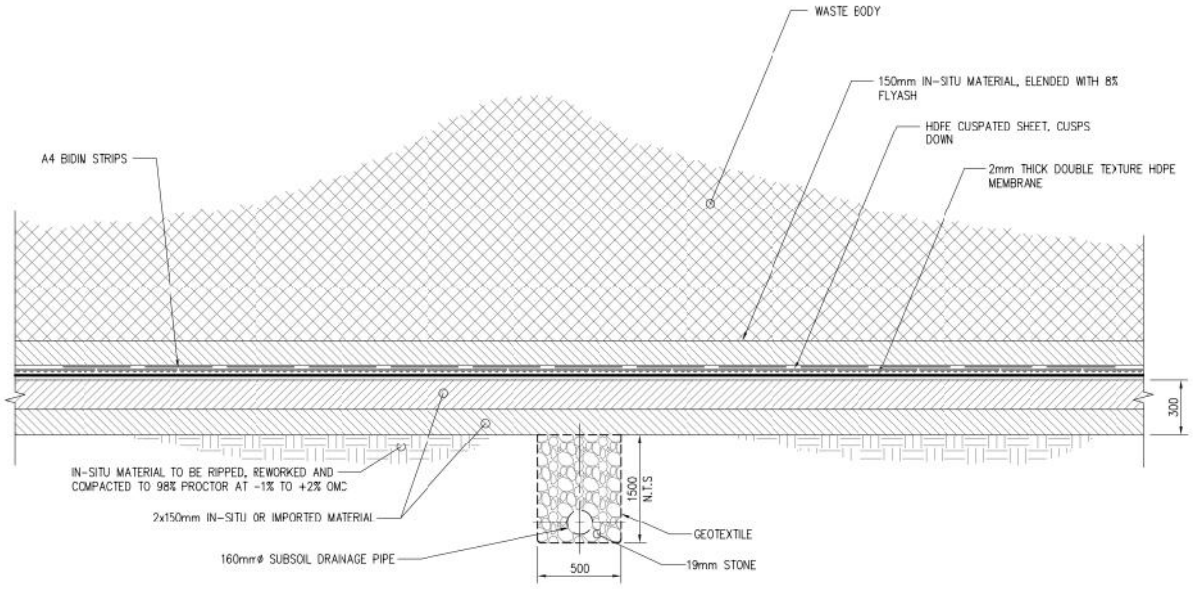

Figure 2-2: Proposed Class C Barrier System

2.3.1 Barrier System Installation

The barrier system will be constructed in stages, as per the ash disposal requirements. At any given point there should be at least one to two years of available footprint of constructed barrier system. The barrier system must be constructed with best practice in relation to manufacturing, transport, storage and installation. The liner system will be installed according to the manufacturer's specifications where applicable.

2.3.2 Sub-soil drainage system

The subsoil drainage system will be installed to prevent hydrostatic pressures on the liner system and to convey clean ground water away from the ash disposal site. The subsoil drain consists of a 110mm or 160mm perforated pipe enclosed in 19mm washed stone. The drains are at a 20m horizontal spacing.

2.4 Capping system

It is proposed that the current system of topsoiling and grassing be continued on the 30 year new ADF site. Refer to Figure 2-3 for an illustration.

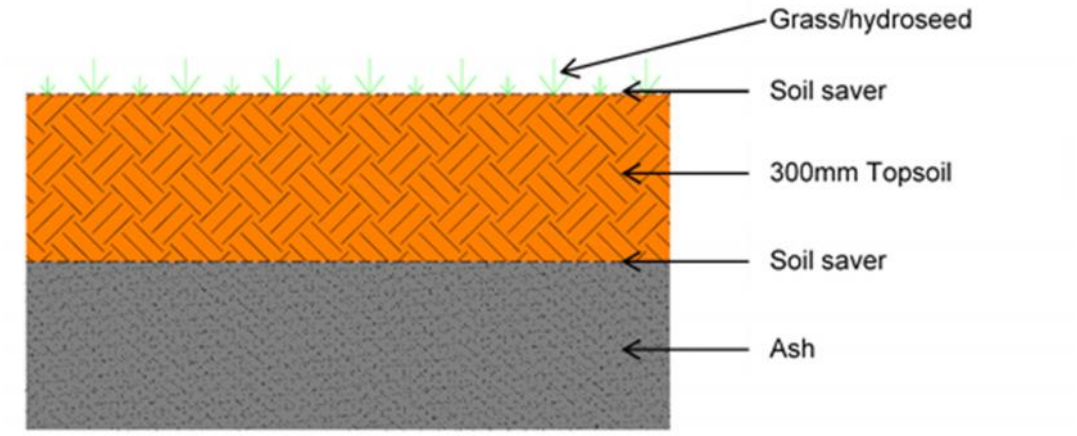

Figure 2-3: Section through rehabilitated ADF

2.5 E-Dump

A new Emergency Dump (E-dump) will be constructed to the south of the ADF. The facility will operate as an emergency storage of ash. Ash will be transported to the new E-dump on the conveyor system, which will run from the existing E-dump near the PS site to the new E-dump.

The storage capacity of the new E-dump will accommodate an ash volume of maximum continuous rating of the station for 7 days' ash production. The total footprint area of the surface bed is 29,024 m^2 and will accommodate a total volume of 190,000 m^3. The area will be bunded within a 1-metre-high reinforce concrete wall. The facility will comprise of an impoundment facility and a silt trap. Water from the impoundment facility will be used in that area for washwater and dust suppression.

The surface bed will be cast in 25 m^2 panels, with expansion joints in between the panels. The expansion joints will comprise of expandable polypropylene filler and will be sealed off at the surface with a two component polyurethane sealant. This will render the joint water tight. The surface beds will be cast with a floor slope of 1 in 200 to facilitate the drainage of storm water off the beds.

It is proposed to use fibre reinforced concrete due to the ease of construction. The strength and durability of the concrete and its functionality will not be compromised by this choice of material.

Refer to Figure 2-4 for a General Arrangement of the proposed project.

2.6 Project Phases

Table 2-1 illustrates how the project phases will develop over the 30 years starting from the start of construction until the end of rehabilitation and closure of the infrastructure.

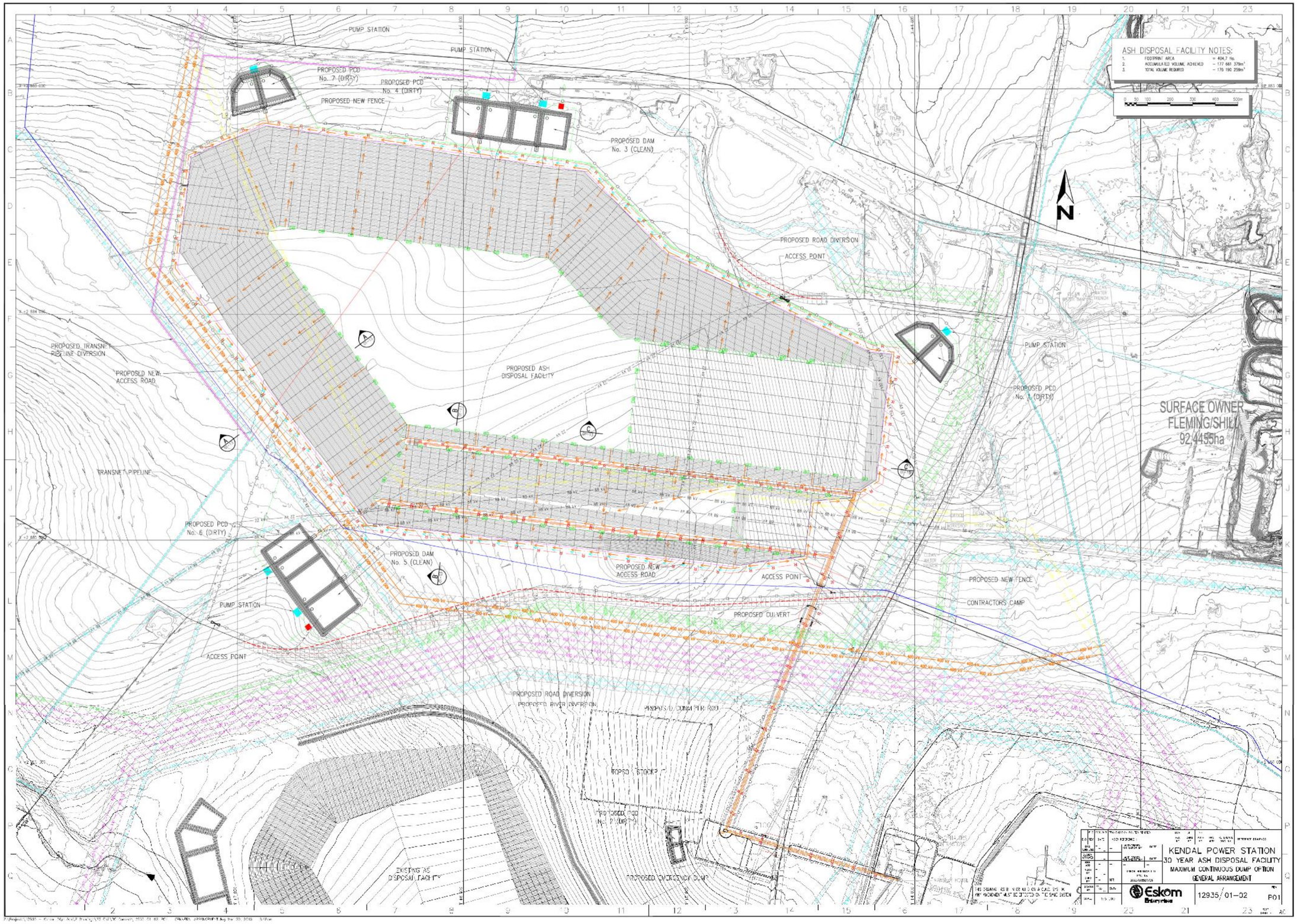

Figure 2-4: General Arrangement

Table 2-1: Project Phases

Project Phase	Period	ADF Progression	Ash body	E-Dump	PCDs and associated drainage channels	Clean Stormwater Contour Cut-off Drains	Clean Stormwater Dams	Site Access Road	Existing Wetlands	Rerouting of existing services	Conveyor	Contractors Camp
Construction	2025 - 2030	0-5	96.6 hectares of first 5 years liner to be constructed including removal and stockpiling of topsoil to designated area	Construction	Dam 1, 2 in construction	A-B (2375 m) and A-C (725 m) in construction	No activity in this phase	Site access road constructed around the first 5-year footprint	Existing Pan to be drained into clean water system and wetland soil removed and stockpiled. Wetland area to be lost in this phase is 73.5 ha.	1.) All transmission & distribution lines to be rerouted. 2.) Road D1390 to be rerouted. 3.) Associated culverts over D1390 for conveyor corridor constructed.	Fixed conveyor from existing E-Dump to ADF footprint via new E-Dump constructed	In construction
Operation	2030 - 2035	5-10	1.) 96.6 hectares of first 5 years' liner to be ashed on 2.) 74 hectares of 2nd 5 years liner to be constructed including removal and stockpiling of topsoil to designated area	In operation	1.) Dam 4 & 6 in construction 2.) Dam 1 & 2 in operation	C-D (525 m) and B-E (1200 m) in construction	Dam 3 & 5 in construction	1.) Site access road around the first 5-year footprint in operation 2.) Site access road around the 2nd 5-year footprint in construction	28.5 ha of existing Wetland to be drained into clean water system and wetland soil removed and stockpiled	1) Rerouted transmission & distribution lines in operation 2.) Rerouted D1390 in operation	Fixed conveyor from existing E-Dump to ADF footprint via new E-Dump in operation	In operation
	2035 - 2040	10-15	1.) 74 hectares of 2nd 5 years' liner to be ashed on 2.) 58.6 hectares of 3rd 5 years' liner to be constructed including removal and stockpiling of topsoil to designated area 3.) 96.6 hectares of 1st 5 years' open ash area to be topsoiled and grassed	In Operation	Dam 1 to be rehabilitated and converted to a clean water dam	D-F (1150 m) in construction	Dam 1 to be operated as a clean water dam	1.) Site access road around the 2nd 5-year footprint in operation 2.) Site access road around the 3rd 5-year footprint in construction	12.5 ha of existing Wetland to be drained into clean water system and wetland soil removed and stockpiled	1) Transnet Pipeline	In operation	In operation

Project Phase	Period	ADF Progression	Ash body	E-Dump	PCDs and associated drainage channels	Clean Stormwater Contour Cut-off Drains	Clean Stormwater Dams	Site Access Road	Existing Wetlands	Rerouting of existing services	Conveyor	Contractors Camp
	2040 - 2045	15-20	1.) 58.6 hectares of 3rd 5 years' liner to be ashed on 2.) 60 hectares of 4th 5 years' liner to be constructed including removal and stockpiling of topsoil to designated area 3.) 74 hectares of 2nd 5 years open ash area to be topsoiled and grassed	In Operation	Dam 4 and 6 in operation	E-G (1480 m) and F-G (775 m) in construction	Dam 1, 3 & 5 in operation	1.) Site access road around the 3rd 5-year footprint in operation 2.) Site access road around the 4th 5-year footprint in construction	6.3 ha of existing Wetland to be drained into clean water system and wetland soil removed and stockpiled		In operation	In operation
	2045 - 2052	20-27	1.) 60 hectares of fourth 5 years' liner to be ashed on 2.) 115.5 hectares of fifth 5 years liner to be constructed including removal and stockpiling of topsoil to designated area 3.) 58.6 hectares of 3rd 5 years open ash area to be topsoiled and grassed	In Operation	1.) Dam 4 and 6 to be rehabilitated and converted to a clean water dam 2.) Dam 7 to be constructed		Dam 1, 3, 4, 5 & 6 in operation	1.) Site access road around the fourth 5-year footprint in operation 2.) Site access road around the fifth 5-year footprint in construction	28.5 ha of existing Wetland to be drained into clean water system and wetland soil removed and stockpiled		In operation	In operation
Closure	2052 - 2055	27-30	1.) 115.5 hectares of fourth 5 years' liner to be ashed on 2.) 60 hectares of 4th 5 years open ash area to be topsoiled and grassed	Decommission and Rehabilitate	Dam 7 to be rehabilitated and converted to a clean water dam		Dam 1, 3, 4, 5, 6 & 7 to remain in perpetuity	Remain in perpetuity			Decommission and Rehabilitate	Decommission and Rehabilitate

3 EMPR OBJECTIVES

The mitigation measures provided in the Final Environmental Impact Assessment Report (FEIR) for the Kendal 30-year ADF have been translated into enforceable EA Conditions and have been incorporated into this EMPr. This document is intended to achieve the following primary objectives:

- Conform to the information requirements stipulated in Regulation 33 of the NEMA EIA Regulations 2010 (Government Notice R.543);
- Ensure that environmental management practices are tailored to the site specific conditions and are implemented throughout the project lifecycle;
- Ensure that the conditions provided in the EA are translated into management actions, and to report on the measures that have been taken to comply with the EA Conditions;
- Ensure that all reasonable measures are taken to prevent the realisation of adverse environmental impacts; and
- Ensure that all mitigation and management measures provided in this EMPr are implemented.

4 PRE-CONSTRUCTION SPECIFICATIONS

The following aspects should be taken into account prior to any construction activities;

- Ensure a reputable contractor is appointed and aware of the responsibilities in terms of the approved EMPr;
- The Contractor shall designate or appoint a suitably qualified Safety, Health, Environment and Quality Officer (SHEQO) to oversee implementation of the EMPr;
- The contractor, site agent and site staff shall attend a compulsory environmental awareness training approved by the DEA
- The Environmental Control Officer (ECO) must be appointed prior to the commencement of construction and preconstruction related activities;
- The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over to Eskom by the contractor for operation;
- Implementation of pre-construction conditions stipulated in the EA issued to the holder
- Relocation of heritage impacted sites;
- Obtaining relevant permits and Pre-construction licences;
- All method statements to be approved by the project manager and ECO prior to such activities being undertaken;
- Development of a surface and groundwater sampling programme; and
- It is recommended that surface water sampling be undertaken on a monthly basis, starting at least 6 months prior to construction start-up.

5 CONSTRUCTION PHASE: ENVIRONMENTAL MANAGEMENT AND MITIGATION

5.1 Management of Air Quality

Table 5-1: Mitigation & Management Measures - Air Quality

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Vehicle and construction equipment activity	Air Quality - exhaust fume gaseous pollutants	To ensure plant are in good working order and to minimise the impact to the environment.	No vehicles with excessive black smoke on site	Regular maintenance of vehicles with associated road worthy certificates.
Vegetation clearing, topsoil stripping and construction activities	Dust generation	Minimise dust generation during vegetation clearing and topsoil stripping	Minimal dust visible during stripping.	Topsoil and vegetation should not be stripped when wet, but ensure that stripping is done on windless day. Ensure that topsoil stockpiles do not exceed 2m All topsoil stockpiles and cleared areas should be re-vegetated, covered or kept moist to prevent dust generation Cleared areas to be rehabilitated as soon as possible.
General Site driving on bare soil surfaces	Dust generation	To minimise dust generation during day-to-day activities on site due to vehicle movement.	Minimal dust visible on site during windy conditions.	Typical dust suppression techniques, for example, water sprays, will reduce particulate emissions to low levels especially during dry and windy conditions
Burning of any material on site	Air Quality	To have no materials burned on site		No burning of any material on site
Construction of the ADF	Air Quality Impact	To measure the impact of construction to the surrounding areas.	Not to exceed legal requirements.	Establish a dust fall monitoring network in the appropriate vicinity of the ADF as per the Air Quality Assessment and also determine a baseline.

5.2 Heritage Resource Management

Table 5-2: Mitigation & Management Measures - Heritage Resources

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Site preparation and excavations	Impact on identified cemeteries and buildings	To ensure all identified heritage sites are moved and/or protected.	No impact to identified heritage sites.	• All seven cemeteries (KAD10, KAD16, KAD17, KAD18, KAD19, KAD20 and KAD21) will need to be relocated. Prior to construction a grave relocation process should be followed. • Ensure all known sites of cultural, archaeological, and historical significance are demarcated on the site master plan, and marked as no-go areas.
	Destruction of unknown heritage sites	To ensure appropriate management of new archaeological finds should these be discovered during construction that, if any,	Correct handling of newly discovered sites.	• Develop heritage awareness section to include in environmental induction programme for employees during construction • Should any remains be found on site that is potentially human remains, the South African Police Service and SAHRA should also be notified. Construction activities must cease and a buffer of at least 20 m is required • Under no circumstances may any heritage material be destroyed or removed form site. • If the Vryheid formation will be exposed and impacted during the construction of the ADF then a qualified professional palaeontologist needs to be hired as part of the Environmental Construction Team. His responsibilities as a palaeontologist is to obtain a mitigation permit from SAHRA and monitor the ground clearance and deep excavations during the excavation phases, for any fossils that may be uncovered. He/she will compile a phase 2 report to SAHRA after the construction phase detailing any finds, if any.
				• Comment on site KAD15 the farmstead must be obtained from the Mpumalanga Heritage Resources Agency (Mr Ben Moduka).

5.3 Management of Noise Pollution

Table 5-3: Mitigation & Management Measures - Noise

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Construction related activities	Noise from construction activities	Ensure that noise is managed in such a manner that no complaints are received	No complaints from neighbouring areas w.r.t noise.	• To prevent noise impacts resulting from construction activities, working hours are to be limited to weekdays between 06h00 to 18h00. • All equipment must be regularly maintained and inspected and repaired if not within requirements. • Develop a mechanism to monitor noise levels, record and respond to complaints. • Should certain construction require work outside of these hours, the ECO, PM and all adjacent landowners have to be informed prior to any construction outside of the specified hours commences. • Locate noise-generating permanent facilities away from community areas if possible. • Reverse hooters of heavy earthmoving vehicles must be set at such a level that the • beeping sound does not create a noise nuisance to surrounding communities.

5.4 Management of Social Environment

Table 5-4: Mitigation & Management Measures - Social Environment

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Generation of dust due to construction activities	Health impacts	Minimise and manage the health impact associated with dust emissions during construction	No health impacts due to construction dust	• Establish environmental forum. Erect physical dust barriers. • Implement recommendations of air quality study. • Conduct human health study for nearby communities that will not be relocated. • Monitor dust levels to ensure human health is not compromised.
	Quality of crops decrease	Managing dust to ensure no decrease in quality of crops	No crops are impacted on by the emanating dust from construction activities	• Dust suppression mitigation as recommended by the air quality specialist.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Focus group with agricultural groups, to decide best way to manage impact. • Share monitoring results in proposed environmental forum.
	Dust nuisance lead to frustration and lowers perceived quality of life	Maintain or improve the ambient air quality and reduce nuisance impacts of dustfall.	Adhere to minimum dust requirements	• Dust suppression mitigation as recommended by the air quality specialist. Erect physical dust barriers. • Converse monitoring and management in environmental forum to find sustainable solutions
Influx of people looking for economic opportunity	Lack of infrastructure	• Ensure that a system which provides a platform for Interested and Affected Parties (I&APs) to raise any concerns and queries relating to the Construction and associated activities is developed and put in place. • The implementation of the communication system will facilitate maintaining clear lines of communication between I&APs and the role players.		• Consult with local government. Join Corporate Social Investment (CSI) initiatives. • Use presence in area to influence government.
Construction of ADF	Create employment opportunities			• Employees continue in current jobs. Develop transferable skills. • If any opportunities arise, local people should be given preference were possible
Change of land use from agriculture to industrial	Food security & Loss of income			• Work closely with agricultural industry. Rent available land to farmers where possible. Ensure high quality soil rehabilitation.
Alignment of Road D1390	Potential economic impact on road users.			• Complete new road alignment before old road is closed. Adhere to requirements set by Mpumalanga Department of Public Works Roads and Transport (Refer to letter attached to Traffic Report in Appendix F11).
Demolish houses of the Triangle Community to prepare project area	Resettlement of the Triangle community.	To relocate the triangle community efficiently and without any issues.	To have limited complaints during and after relocation.	• Appoint a relocation specialist to compile relocation strategy and RAP.

5.5 Management of Soil and Land Capability

Table 5-5: Mitigation & Management Measures - Soil & Land Capability

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Clearing of footprint for access onto site, construction of laydown areas for soil stockpile and soft overburden from footprint to dam excavations (RWD) and ADF. Clearing for the erection of security fencing and clearing and construction of support infrastructure (administrative buildings, satellite workshop etc.) to the ADF.	Loss of soil utilisation potential for the project footprint	Ensure that all reasonable management measures are implemented to maintain the re-growth potential of the topsoil to be used for rehabilitation of the construction footprint.	To retain the usefulness of topsoil for the rehabilitation of the site; and No formation of erosion channels.	Removal of all utilisable soil and storage of the same. Protect from impacts of erosion, compaction and contamination. Vegetate and/or cover with rock rap.
	Loss of vegetative cover and topsoil protection - possible erosion, the permanent loss of resource downslope and the impact of sedimentary load on receiving systems (streams, rivers pan etc.)			Minimisation of footprint of impact, use of high floatation tires on all construction vehicles, removal and storage of utilisable soil and the re-vegetation and/or rock cover to all stored materials. Concurrent rehabilitation where possible. Use of vetiver grass as erosion prevention ahead of clearing where erosion is a considered risk
	Loss of soil resource and utilisation potential due to contamination by reagents and hydrocarbons spills and/or dirty water			Restriction/minimisation of movement and servicing of vehicles, spillage from haulage systems and vehicles and the bunding of all services areas.
	Loss of resource and its utilisation potential due to compaction over unprotected ground/soil.			Minimise the footprint of impact, restrict vehicle movement to areas of need, remove utilisable soil to recommended depth, stockpile and then construct facilities. Rehabilitate areas once usefulness is completed.
	Loss of soil and land capability due to reduction in nutrient status - de-nutrification and leaching due to stripping and stockpiling of resource			Strip soils with vegetative cover in tacked, stockpile utilisable soils separately from subsoils and soft overburden, restrict stockpiles and berms to less than 1,5m high for utilisable soil and 15m for the soft overburden, vegetate stores of soil and overburden and manage ingress of dirty water and erosion.

5.6 Management of Traffic

Table 5-6: Mitigation & Management Measures - Traffic

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
In the event where the clay material required for the construction of the liner is not found on site, the required material has to be hauled from external sources using some of the public roads in the vicinity of the site. Generally, for bulk earth / material transportation 10m^3 trucks are used to haul materials from borrow pits to site. An estimated 26 trips per hour can be expected.	The hauling of construction material to the development site, will result in increased traffic volumes and will impact negatively on the traffic flow, and may exacerbate the risk of vehicular accidents, especially at night.	It must be ensured that the pre-determined number of construction vehicles and trips undertaken by the construction vehicles to and from the construction area are not exceeded.	No traffic congestion and vehicle accidents relating to the hauling of material.	• Ensure that all regulations relating to traffic management are observed and by notifying the local traffic officials of programmed construction activities; • As far as possible, attempts should be made to ensure that high construction-related road usage coincides with low traffic flow periods.
Vehicular movement on and off-site associated with the construction of the ADF	Damage to existing road surfaces	To minimise/manage extra vehicular movement on existing roads	Zero accidents or incidents	• The condition of existing access / private roads to be used shall be documented with photographs prior to construction. • Markers next to or on the road shall show the direction of travel • Where required, speed limits shall be indicated and speed control measures applied on the roads • In wet areas, the Contractor shall only use existing roads or alternative methods of construction. The Contractor shall take such areas into consideration during the tender • Any dangerous crossings shall be marked as such and where necessary, speed limits shall be enforced. • All existing private access roads used for construction purposes shall be maintained to ensure an acceptable road surface quality. • All gates shall be fitted with locks and be kept locked at all times or have controlled access
Realignment of Road D1390	Negative impact on environment	To minimise the impact on the Environmental with the realignment of road D1390		• Ensure that all applicable mitigation measures for stripping and stockpiling of topsoil are adhered to as above.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Ensure all required licencing is in place prior to construction. • The contractor's EO and ECO to ensure that the EMP are adhered to regarding all applicable aspects. • New road construction must be undertaken strictly per relevant guidelines and standards.

5.7 Management of Visual Impacts

Table 5-7: Mitigation & Management Measures - Visual

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
The proposed ADF and associated infrastructure will result in a physical change to the landscape with regards to visibility and aesthetics.	Visual Intrusion	Ensure that all reasonable management measures are implemented to reduce the significance of the impact on the aesthetic character of the area.	No complaints raised by I&APs relating specifically to the impacts to visual quality associated with the proposed project.	• Dust suppression techniques should be in place at all times during the construction, operational, the decommissioning and closure phases. • Only the footprint and a small 'construction buffer zone' around the proposed Project should be exposed. In all other areas, the natural vegetation should be retained. • It is proposed that as little vegetation as possible be removed during the construction phase. • Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the project site rehabilitation. • Plant trees at strategically identified locations to aid in camouflaging of the ADF and conveyor alignment, especially near sensitive receptors.
	Lighting	Prevent of minimise potential visual impacts emanating from the activity	To not cause light pollution or to minimise as far as possible	• Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the substation. • Light public movement areas (pathways and roads) with low level 'bollard' type lights and avoid post top lighting • Avoid high pole top security lighting along the periphery of the substation site and use only

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				lights that are activated on movement at illegal entry to the site. • Use security lighting at the periphery of the site that is activated by movement and are not permanently switched on

5.8 Management of Aquatic Ecology

Table 5-8: Mitigation & Management Measures - Aquatic Ecology

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Construction of dams, associated storm water drains and site access roads	Degradation of aquatic ecosystems (including reduced biotic integrity and impaired habitat availability in the surrounding tributaries owing to increased sedimentation, erosion and bed modification.	Limit impact on aquatic ecosystems as best possible.	Limit erosion and sedimentation from site.	• Implement an aquatic biomonitoring programme • Minimise footprint size; Stabilisation/ rehabilitation of exposed areas as soon as possible; storm water management will be incorporated to limit sediment transported to the Leeufonteinspruit • Disturbance of riparian areas along the wetland areas should be minimised. Adjacent riparian areas should be cordoned off and considered no-go areas • All wetland/riparian areas disturbed during construction should be rehabilitated immediately upon completion of construction • The position and design of stream crossings should follow existing roads as far as possible and cross streams perpendicular to the stream to minimise the footprint. • Conveyor and road crossings of wetlands should be regularly inspected for erosion, mechanical problems, leaks or spillages.
	Water quality deterioration within the surrounding tributaries owing to hydrocarbon spillages and sedimentation	Minimise sedimentation	No water quality contamination due to hydrocarbon spillages.	• Store and handle potentially polluting substances and waste in designated bunded facilities • Hydrocarbon spills must be cleaned up immediately; storm water management will be incorporated to limit contaminated water entering the Leeufonteinspruit;

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Ensure that no hydrocarbons are stored within the 1:00 year floodlines; • No chemical toilets may be placed within the 1:100 floodlines; • Ensure that all chemical toilets are securely tide down; • Stay out of 1:100 floodlines; implement water quality monitoring programme
	Complete loss of the pan and associated aquatic biota, including the identified Lesser Flamingo (*Phoenicopterus minor*)			• Wetland Consulting Services have started to develop a wetland offset strategy and identified possible target sites for this pan in question. Refer to Appendix F14 for this report

5.9 Management of Surface and Storm Water

Table 5-9: Mitigation & Management Measures – Surface and Storm Water

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Clearing of vegetation	Erosion	Minimise Erosion as a result of bare surfaces	Limit sediment downstream to as low as possible	• Minimise footprint size by phasing; vegetation clearing only where necessary and preferably during dry season; stabilisation/ rehabilitation of exposed areas as soon as possible • Install all water and storm water infrastructure strictly according to approved detail design drawings and best practice standards and guidelines.
	Loss of Streams and altered flows			• Site H is only 0.51 % of the B20F and B20E quaternary catchments; a storm water management plan that will direct clean water around the site to the Leeufonteinspruit will be put in place
	Increased sediment transport into water resources			• Vegetation clearing only where necessary; Stabilisation/ rehabilitation of exposed areas as soon as possible; storm water management will

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				be incorporated to limit sediment transported to the Leeufonteinspruit
	Water quality deterioration in adjacent water resources because of spill from mechanical equipment			• Store and handle potentially polluting substances and waste in designated bunded facilities; immediately; storm water management will be incorporated to limit contaminated water entering the Leeufonteinspruit; stay out of 1:100 floodlines; implement water quality monitoring programme
Construction of dams and associated storm water drains	Erosion with increased sediment transport into water resources	Minimise Erosion as a result of bare surfaces	Limit sediment downstream to as low as possible	• Minimise footprint size; Stabilisation/ rehabilitation of exposed areas as soon as possible; storm water management will be incorporated to limit sediment transported to the Leeufonteinspruit • Should water be required from a water service provider, a written agreement shall be reached between the Contractor and the stakeholder/s involved.
	Water quality deterioration in adjacent water resources because of spill from mechanical equipment	Minimise and mitigate spillages	No chemical or hydrocarbon spills within the 1:100 year floodline	• Store and handle potentially polluting substances and waste in designated bunded facilities; immediately; storm water management will be incorporated to limit contaminated water entering the Leeufonteinspruit; stay out of 1:100 floodlines; implement wat • Should the Contractor be required to use water from a natural source, the Contractor shall supply a method statement to that effect and obtain the required permits. No construction shall take place in the wetland, streams and other river courses without the necessary water license from the Department of Water Affairs. Strict control shall be maintained and the ECO shall regularly inspect the abstraction point and methods used.
Construction of site access road	Erosion with increased sediment transport into water resources			• Minimise footprint size; Stabilisation/ rehabilitation of exposed areas as soon as possible; storm water management will be incorporated to limit sediment transported to the Leeufonteinspruit

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Where practically possible, the major earthworks should be undertaken during the dry season (roughly from April to August) to limit erosion due to rainfall runoff. • Install sediment barriers and/or low berms along the downslope edge of cleared areas to trap sediments on site. Design of sediment barriers should be such that expected flow velocities will not damage the barriers or impair their function. Regular cleaning and maintenance of the barriers should be undertaken.
	Water quality deterioration in adjacent water resources because spills from mechanical equipment			• Store and handle potentially polluting substances and waste in designated bunded facilities; • spills cleaned up immediately; storm water management will be incorporated to limit contaminated water entering the Leeufonteinspruit; stay out of 1:100 floodlines; implement water quality monitoring programme • No washing of machinery or equipment within wetlands areas adjacent to the development sites should be allowed.

5.10 Management of Groundwater

Table 5-10: Mitigation & Management Measures - Groundwater

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Clearing of vegetation and Construction of infrastructure	Groundwater Quality	Minimise the impact on groundwater quality as much as possible	Groundwater monitoring and liner testing.	• Test liner conductivity after completion to ensure liner integrity. The Installation, testing and sampling of groundwater monitoring boreholes to accommodate the final ADF layout. • Ensure liner integrity is 100% to limit any possible seepage from ADF. • Installation and sampling of monitoring boreholes to obtain background groundwater quality prior to construction of ADF. • Contamination of the site from spills from mechanical equipment may occur and impact the groundwater. • Measure Groundwater levels and annual rainfall
	Groundwater Recharge			
	Groundwater Flow			

5.11 Management of Terrestrial Ecology

Table 5-11: Mitigation & Management Measures - Terrestrial Ecology

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Clearing of vegetation and earth works	Habitat loss and degradation	Minimise degradation to existing habitat within and around the development footprint	Comply to and implement mitigation measures	• Employees and contractors should be made aware of the presence of, and rules regarding fauna through suitable induction training and on-site signage. • Vegetation clearing should be restricted to the proposed development footprint only, with no clearing permitted outside of these areas; • Areas to be cleared should be clearly demarcated to prevent unnecessary clearing outside of these sites; • Removed topsoil should be stockpiled and used to rehabilitate disturbed areas; and • A suitable rehabilitation programme should be developed and implemented in all disturbed areas not under infrastructure. The programme should include active revegetation using locally indigenous flora species. • In the event that Red Data/protected flora are identified within the construction footprint and require relocation, rescue permits must be obtained from the provincial or relevant authority, and some suitable ex-situ, and/or in-situ conservation plan developed. The conservation plan must be approved and overseen by the ECO.
	Establishment and spread of alien invasive species	Minimise and eradicate alien invasive species	No alien invasive species on site or stockpiles	• An alien invasive species control programme must be developed and implemented. It is recommended that the programme include: • A combined approach using both chemical and mechanical control methods; • Periodic follow-up treatments informed by regular monitoring; and • Monitoring in disturbed areas, as well as adjacent undisturbed areas

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Clearing of vegetation and earth works & increased vehicle and machinery activity on-site	Mortality and disturbance of general fauna	Educate employees on fauna management	Minimise fauna encounters and manage those that cannot be averted.	• An ECO should be on-site during vegetation clearing to monitor for and manage any wildlife-human interactions; • Construction sites should be fenced off to prevent fauna gaining access to construction and operational areas; • A low speed limit should be enforced on site to reduce wildlife collisions; • The destruction, harvesting, handling, poisoning and killing of on-site fauna and flora must be strictly prohibited; • Employees and contractors should be made aware of the presence of, and rules regarding fauna through suitable induction training and on-site signage; • General noise abatement equipment should be fitted to machinery and vehicles; • Noisy activities should be limited/restricted during the summer months, as this is when most birds are breeding; and • Noise shields, including earth berms, should be erected around sites of noise origin •
Clearing of vegetation and earth works	Loss and disturbance of fauna of conservation importance (e.g. Greater Flamingo)			• No management measures will mitigate the loss of the pan.
	Loss and disturbance of flora of conservation importance			• Prior to construction, all areas designated for vegetation clearing should be clearly marked; • Rescue/destruction permits must be obtained from the provincial or relevant authority before vegetation clearing commences; and • Under the correct permit, herbaceous plants of conservation concern should be rescued and relocated to adjacent undisturbed areas. The ECO or suitable ecologist must oversee the rescue and relocation operation

5.12 Management of Wetlands

Table 5-12: Mitigation & Management Measures - Wetlands

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Site clearing & preparation	Loss of wetland habitat & functionality			• Development of a wetland mitigation/offset strategy to compensate for residual impacts and wetland loss. • Design of infrastructure areas should be optimised to minimise the size of the development footprint. • All wetland habitats adjacent to but outside of the direct disturbance footprints should be fenced off using a standard 5 strand cattle fence. The purpose of the fence is to clearly demarcate sensitive areas and prevent accidental vehicle access to these areas while not posing a hazard to the movement of small mammals. Where possible, the fenced off area should include the wetlands as well as a 50m buffer zone around the wetlands. Alternatively, the authorised development footprints should be fenced off. • All construction staff should be educated on the sensitivity of wetland areas and should be made aware of all wetland areas in close proximity to the construction sites. • Locate all temporary stockpiles, constructor's camps, laydown areas, ablution facilities etc. a minimum of 50m from any delineated wetland area. • Develop and implement a construction stormwater management plan prior to the commencement of site clearing activities. • All disturbed areas outside the direct development footprints should be rehabilitated and re-vegetated as soon as possible. Refer to the guidelines in report
	Increased sedimentation and erosion in wetlands			• Construction stormwater management plan must be developed and implemented prior to commencement of large scale vegetation clearing.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Phase vegetation clearing activities and minimise duration that areas remain cleared. • Focus vegetation clearing activities during the dry season. • Erosion within the construction site must be minimised through the following: • Limiting the area of disturbance and vegetation clearing to as small an area as possible; • Where possible, undertaking construction during the dry season; • Phasing vegetation clearing activities and limiting the time that any one area of bare soil is exposed to erosion; • Control of stormwater flowing onto and through the site. Where required, stormwater from upslope should be diverted around the construction site; • Prompt stabilisation and re-vegetation of soils after disturbance and construction activities in an area are complete; and • Protection of slopes. Where steeper slopes occur, these should be stabilised using geotextiles or any other suitable product designed for the purpose. • Sediment transport off the site must be minimised through the following: • Establishing perimeter sediment controls. This can be achieved through the installation of sediment fences along downslope verges of the construction site. Where channelled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used; • Discharge of stormwater from the construction site into adjacent grassland rather than directly into wetland habitat. Discharged flows must be slow and diffuse; and • Regular inspection and maintenance of sediment controls

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
	Water quality deterioration in wetlands			• Refer to sedimentation and turbidity control measures above. • No washing of equipment or machinery in wetlands of the area. • No runoff to be introduced directly into wetland areas. • Potential contaminants to be stored and used on bunded/protected areas. • Spill clean-up procedures and spill clean-up material to be present on site at all times.
Servitude clearing & construction	Disturbance and degradation of wetland habitat			• Method statements should be developed for each of the crossings. Such method statements should be commented on by a suitable wetland specialist. • The extent of disturbance should be limited by limiting all construction activities to the servitude as far as practically possible. • Servitudes for clearing of vegetation should be fenced or demarcated prior to the commencement of vegetation clearing or earthmoving activities. • No materials should be stockpiled within the wetland areas along the routes and driving within the wetland areas should be kept to an absolute minimum. Clearly defined access routes should be used. • As far as possible, the existing roads and farm tracks should be used to provide access during construction as this will reduce the extent of the disturbed area along the routes. • In the case of the pipeline, which will likely be buried, it is important that the natural landscape profile be restored after construction to prevent the formation of preferential flow paths through the wetland. • Post construction all alien invasive vegetation should be removed from the servitudes. This will also require long-term follow up to ensure establishment of natural vegetation in all disturbed areas.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Ideally construction activities within wetlands should take place in winter (during the dry season).
	Increased risk of erosion in wetlands			• Minimise the construction footprints within the wetland areas. Clearly demarcate the required construction servitude and maintain all activities within the demarcated area. • Make use of existing roads and tracks as far as possible to access the construction sites. • Install erosion prevention measures and sediment traps/barriers prior to the onset of construction activities. • Maintain surface flow connectivity in wetlands during the construction phase by temporarily diverting streams around the construction area. Given that all affected wetlands are characterised by mostly subsurface seepage, this might not be necessary. • Key to crossing structures should be the maintenance of flow connectivity across the crossings. • Regular culverts should also be installed to accommodate surface flow and ensure flow connectivity across the full width of the crossing. • Locate all stockpiles, laydown areas and temporary construction infrastructure at least 50m from the edge of delineated wetlands. • In the case of the pipeline crossings, it is important that the pipeline does not form a preferential flow path in the subsurface. Where the pipeline runs down a slope, it is therefore recommended to place trench breakers at regular intervals to prevent this.
	Sediment transport into wetlands			• Install erosion prevention measures and sediment barriers prior to the commencement of construction activities. • Minimise the construction footprint within the wetland area. Clearly demarcate the required construction servitude and maintain all activities within the demarcated area.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Make use of existing roads and tracks as far as possible to access construction areas. • Limit cleared areas to as small an area as possible at any one time, and to as short a time span as possible. • Undertake construction during the dry season as far as possible. • Re-vegetate and rehabilitate areas as soon as possible after completion of construction. • Locate all stockpiles, laydown areas and temporary construction infrastructure at least 50m from the edge of delineated wetlands.
	Water quality deterioration			• Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are placed no closer than 50m from a wetland or water course. • In order to reduce the potential impacts associated with the introduction of contaminants dissolved or suspended in the runoff from construction sites, where practically possible, no runoff should be introduced into wetlands directly. Introduction into dryland areas is preferred as the vegetation and soils provide an opportunity to limit the movement of contaminants and the environment is conducive for natural degradation. • Potential contaminants used and stored on site should be stored and prepared on bunded surfaces to contain spills and leaks. Sufficient spill clean-up material must be kept on site at all times to deal with minor spills. Larger spills should be reported to the Environmental Officer and the relevant authorities immediately.
	Habitat fragmentation			• Position linear infrastructure as close as possible to the security fence around the ADF.
	Establishment and spread of alien species			• An alien vegetation management plan should be compiled by an ecologist during the construction/operational phase of the ADF and

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				should be kept in place for several years following closure (minimum of five years). All species of alien invasive vegetation should be controlled and removed from site. No spread of alien vegetation into any wetlands or adjacent properties should be allowed.

6 OPERATIONAL PHASE: ENVIRONMENTAL MANAGEMENT AND MITIGATION

6.1 Management of Air Quality

Table 6-1: Mitigation & Management Measures - Air Quality

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Disposal of ash	Non-compliance with annual PM10 standards at sensitive receptors	Implement management and mitigation measures to ensure compliance against license conditions.	Comply with all license conditions	• Water sprays at exposed areas - ash and topsoil. • Revegetation as soon as possible. • Continue with monitoring programme and address the impact as identified.
	Impact area where non-compliance with daily PM10 standards was simulated			
	Non-compliance with annual PM2.5 standards at sensitive receptors			
	Impact area where dustfall rates exceed 600 mg/m2/day			

6.2 Heritage Resource Management

Table 6-2: Mitigation & Management Measures - Heritage Resources

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Daily activities	Destruction of heritage resources due to daily activities	Ensure No-Go heritage areas are safe from day to day activities	No destruction or removal of Heritage Resources	- As part of induction, make employees aware that no heritage artefacts may be removed from site; - Ensure that any No-Go areas are properly fenced.

6.3 Management of Noise Pollution

Table 6-3: Mitigation & Management Measures - Noise

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Disposal of Ash	Exceedance of IFC guidelines at closest noise sensitive receptors	To ensure all equipment are within working specifications	Not exceeding the legal requirements for noise pollution and address complaints effectively.	• All equipment must be regularly maintained and inspected and repaired if not within requirements; • Develop mechanism to monitor noise levels, record and respond to complaints; High noise generating activities be limited to day-time hours - 07:00 and 22:00;
	Change in noise levels of 3dBA at closest noise sensitive receptors			

6.4 Management of Social Environment

Table 6-4: Mitigation & Management Measures - Social Environment

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Operation of Kendal 30 year ADF	Health impacts, especially chronic health issues for community members in a 1km radius and employees.	Monitoring and managing of dust with reference to health, crops and water quality.	Legal compliance w.r.t license conditions.	• Establish environmental forum. Erect physical dust barriers. Implement recommendations of air quality study. • Conduct human health study for nearby communities that have not been relocated. Monitor dust levels to ensure human health is not compromised.
	Quality of crops decrease.			• Dust suppression mitigation as recommended by the air quality specialist. Implement management measures suggested by focus group with agricultural groups, air quality and soil specialist. • Share monitoring results in proposed environmental forum.
	Potential impact on water resources.			• Monitor water quality. • Assess potential risk to communities and other water users. Include provision to these parties in emergency planning.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Remediate polluted sources as soon as possible.
	Maintain employment opportunities.	To try and accommodate as much as possible employees with associated skill transfers.		• Employees continue in current jobs. Develop transferable skills. • If any opportunities arise, local people should be given preference of employment where possible.
	Increase in capacity to create electricity and ensuring security of supply.	Sustaining electrical supply	Minimise power outages from the Kendal Station.	• Ensure that project proceed in the interest of social and economic development without compromising rights of surrounding communities.

6.5 Management of Soil and Land Capability

Table 6-5: Mitigation & Management Measures - Soil & Land Capability

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Primarily storage and management of soil resource during the operation of the ADF for the life of the project.	Continued loss of soil resource and utilisation potential over infrastructural sites and operational areas	Protection and management of soil to be used for the closure and rehabilitation phase.	Protect, manage and rehabilitate soil as best possible to minimise the financial aspect of closure.	Restrict area of impact to as small an area as practical and manage stockpiles for erosion by wind and water.
	Loss of resource due to unprotected overland flow of water (suspended solids) and erosion of soil due to wind - potential off site dust issues			Manage stockpiles and berms. Control vegetative cover, or water/spray the stockpiles and ingress of dirty water. Maintain stormwater control system and erosion due to unprotected soil cover.
	Continued loss of soil utilisation due to contamination from spillage of waste, reagents and hydrocarbons from vehicles and			On-going management and control of vehicle maintenance, movements and cover to loads of raw materials. Spillage from haulage ways and vehicles to be cleaned regularly and placed back into the processing system.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
	mechanised infrastructure and from storage facilities (soil stockpiles).			
	Loss of soil utilisation potential due to operation of conveyers and site machinery, stormwater controls (pumps etc.) and the loss of nutrient stores and organic carbon from unprotected stockpiles and in-situ contamination on sites.			Maintenance of cover (vegetative or rock) to stockpiles and berm storage piles, cultivation and replacement of stormwater and erosion control features and restriction of ingress of dirty water.

6.6 Management of Visual Impacts

Table 6-6: Mitigation & Management Measures - Visual

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Visual Impact	Visual Impact during Operation	Minimise the visual impact during the operational phase	Rehabilitating and shaping the ash dump as to minimise the visual impact.	• If at all possible the ash dump should be shaped in such a way that it blends with the contours of the surrounding landscape. • The side slopes should be designed in such a way that they are articulated to form natural shaded areas.
	Lighting		No on-site lighting to cause abnormal light pollution for the area.	• Install light fixtures that provide precisely directed illumination to reduce light “spillage” beyond the immediate surrounds of the substation. • Light public movement areas (pathways and roads) with low level ‘bollard’ type lights and avoid post top lighting • Avoid high pole top security lighting along the periphery of the substation site and use only

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				lights that are activated on movement at illegal entry to the site. • Use security lighting at the periphery of the site that is activated by movement and are not permanently switched on

6.7 Management of Aquatic Ecology

Table 6-7: Mitigation & Management Measures – Aquatic Ecology

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Operation of the ADF	Water quality impacts to surrounding tributaries (sedimentation, chemical contamination)	Minimise the impact on local Aquatic Ecology.	Complying to license conditions and EMP requirements.	• Implement an aquatic biomonitoring programme for the surrounding water resources • Store and handle potentially polluting substances and waste in designated bunded facilities; • Spills cleaned up immediately; storm water management will be incorporated to limit contaminated water entering the Leeufonteinspruit; stay out of 1:100 floodlines; implement water quality monitoring programme • Maintaining the stormwater management plan
	Erosion and increased sediment transport into the surrounding tributaries and bed modification			
	Loss of streams, aquatic habitats, bed modification coupled with the loss of aquatic biota			
	Change to natural flow regime			

6.8 Management of Surface and Storm Water

Table 6-8: Mitigation & Management Measures – Surface and Storm Water

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Operation of ADF	Water quality impacts (sedimentation and chemical contamination)			Maintenance of the storm water management system and compliance to GN704 to keep clean and dirty water separated; implement water quality monitoring programme; Store and handle potentially polluting substances and waste in designated bunded facilities;
	Water quality impacts from overflows from contaminated dams			Adequate design and operation of the dams in compliance to GN704 to maintain freeboard of 0.8m for each dam and prevent overflows (1:50).
Clearing of vegetation over the period 2030 - 2052	Erosion and increased sediment transport into water resources			Site H is only 0.54 % of the B20F and B20E quaternary catchments; a storm water management plan that will direct clean water around the site to the Leeufonteinspruit will be put in place and upgraded as the phases proceed
	Loss of streams and altered flows			Vegetation clearing only where necessary; Stabilisation/ rehabilitation of exposed areas as soon as possible; storm water management will be incorporated to limit sediment transported to the Leeufonteinspruit
	Water quality deterioration in adjacent water resources because of spills from mechanical equipment			Store and handle potentially polluting substances and waste in designated bunded facilities; spills cleaned up immediately; storm water management will be incorporated to limit contaminated water entering the Leeufonteinspruit; stay out of 1:100 floodlines; implement water quality monitoring programme
	Erosion with increased sediment transport into water resources			Stabilisation/ rehabilitation of exposed areas as soon as possible; storm water management will be incorporated to limit sediment transported to the Leeufonteinspruit
	Water quality deterioration in adjacent water resources			Store and handle potentially polluting substances and waste in designated bunded facilities; spills cleaned up immediately; storm water management will be incorporated to limit

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
	because of spills from mechanical equipment			contaminated water entering the Leeufonteinspruit; stay out of 1:100 floodlines; implement water quality monitoring programme
	Emptying of dam and disposal of contaminated sediment leading to water quality impacts			The removal and disposal of the sediment will be done in a manner such that the contaminated sediments will be disposed of to the ADF.

6.9 Management of Groundwater

Table 6-9: Mitigation & Management Measures - Groundwater

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Stockpile Management	Groundwater Quality - potential seepage quality from the ADF	Implement management and mitigation measures to ensure compliance against license conditions.	Comply with all license conditions	• Test liner conductivity after completion to ensure liner integrity. The Installation, testing and sampling of groundwater monitoring boreholes to accommodate the final ADF layout. • Leachate quality assessments • The potential seepage quality from the ADF should be monitored through the quarterly monitoring of the water quality in the PCD. • Monitoring of groundwater quality • Measure Groundwater levels and annual rainfall
Stockpile Management	Groundwater Recharge			
Stockpile Management	Groundwater Flow			

6.10 Management of Terrestrial Ecology

Table 6-10: Mitigation & Management Measures – Terrestrial Ecology

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Clearing of vegetation and earth works	Establishment and spread of alien invasive species	Minimising spread and occurrence of alien vegetation on site	No alien vegetation on site.	Continue to implement alien invasive species control, including regular follow-up and monitoring across the entire project site

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Vehicle and machinery activity on-site. Trapping of fauna in infrastructure.	Mortality and disturbance of general fauna	Limit fauna fatalities on site	As few as possible faunal fatalities on site.	• Operational areas should be fenced off to prevent fauna gaining access; • Awareness to all staff via toolbox talks and induction; • A low speed limit should be enforced on site to reduce wildlife-collisions • The destruction, harvesting, handling, poisoning and killing of on-site fauna and flora must be strictly prohibited; • Employees and contractors should be made aware of the presence of, and rules regarding fauna through suitable induction training and on-site signage; and • General noise abatement equipment should be fitted to machinery and vehicles.

6.11 Management of Wetlands

Table 6-11: Mitigation & Management Measures – Wetlands

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
Ongoing construction of ADF phases	Loss of wetland habitat & functionality	Minimise and manage the loss of wetland habitat and functionality.	Successful implementation of wetland mitigation and offset strategy.	• Development of a wetland mitigation/offset strategy to compensate for residual impacts and wetland loss. • Design of infrastructure areas should be optimised to minimise the size of the development footprint. • All wetland habitats adjacent to but outside of the direct disturbance footprints should be fenced off using a standard 5 strand cattle fence. The purpose of the fence is to clearly demarcate sensitive areas and prevent accidental vehicle access to these areas while not posing a hazard to the movement of small mammals. Where possible, the fenced off area should include the wetlands as well as a 50m buffer zone around the wetlands.

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				Alternatively, the authorised development footprints should be fenced off. • All construction staff should be educated on the sensitivity of wetland areas and should be made aware of all wetland areas in close proximity to the construction sites. • Locate all temporary stockpiles, constructor's camps, laydown areas, ablution facilities etc. a minimum of 50m from any delineated wetland area. • Develop and implement a construction stormwater management plan prior to the commencement of site clearing activities. • All disturbed areas outside the direct development footprints should be rehabilitated and re-vegetated as soon as possible. Refer to the guidelines in report
	Increased sedimentation and erosion in wetlands	Minimise and manage sedimentation and erosion in and around wetland areas	Implementing and managing a proper stormwater management plan, with water quality sampling.	• Construction stormwater management plan must be developed and implemented prior to commencement of large scale vegetation clearing. • Phase vegetation clearing activities and minimise duration that areas remain cleared. • Focus vegetation clearing activities during the dry season. • Erosion within the construction site must be minimised through the following: • Limiting the area of disturbance and vegetation clearing to as small an area as possible; • Where possible, undertaking construction during the dry season; • Phasing vegetation clearing activities and limiting the time that any one area of bare soil is exposed to erosion; • Control of stormwater flowing onto and through the site. Where required, stormwater from upslope should be diverted around the construction site;

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• Prompt stabilisation and re-vegetation of soils after disturbance and construction activities in an area are complete; and • Protection of slopes. Where steeper slopes occur, these should be stabilised using geotextiles or any other suitable product designed for the purpose. • Sediment transport off the site must be minimised through the following: • Establishing perimeter sediment controls. This maybe be achieved through the installation of sediment fences along downslope verges of the construction site. Where channelled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used; • Discharge of stormwater from the construction site into adjacent grassland rather than directly into wetland habitat. Discharged flows must be slow and diffuse; and • o Regular inspection and maintenance of sediment controls
	Water quality deterioration in wetlands	Manage the runoff and water quality on site.	Comply to water use license conditions and quality discharge limits.	• Refer to sedimentation and turbidity control measures above. • No washing of equipment or machinery in wetlands of the area. • No runoff to be introduced directly into wetland areas. • Potential contaminants to be stored and used on bunded/protected areas. • Spill clean-up procedures and spill clean-up material to be present on site at all times.
	Water quality deterioration due to seepage out of ADF			• ADF to be suitably lined. • Seepage collection system to be installed as part of liner. • Dirty water to be captured and stored on site. Reused within dirty water area. • Clean and dirty storm water need to be separated;

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				• No contaminated water should be allowed to enter the clean storm water system; • No dirty water may be released into the wetlands. All dirty water should be contained and treated on site, or used for dust suppression within dirty water areas. Should contaminated water enter the wetlands due to spillages or other unforeseen circumstances a wetland/water quality expert should be consulted regarding implementation of suitable mitigation and/or rehabilitation measures; and • Required PCDs should be designed to be in compliance with the applicable legislation requirements as well as accepted best management practices; • To prevent seepage and leakage out of PCDs, these facilities should be lined with a suitable engineered liner; • An emergency response plan for handling large spills or leaks due to infrastructure failure must be compiled and put in place, with regular practice drills to ensure its effectiveness; • A water quality and bio-monitoring plan should be compiled and implemented (if not already in place) to monitor for any deterioration in water quality in the adjacent wetland systems; and • Regular maintenance and inspections of PCDs should be undertaken to ensure operation of the dams as per design specifications. A log book of inspections and maintenance activities must be kept.
	Water quality deterioration due to ash dust deposited in wetlands	Effective dust suppression.	No water quality deterioration due to windblown dust.	• Dust suppression measures must be put in place for both the ADF and the conveyor transporting ash to the ADF. The measures recommended by the air quality specialist must be fully implemented in this regard. A water quality and bio-monitoring plan should

Environmental Aspect	Impact	Objective	Target	Management & Mitigation Measures
				be compiled and implemented (if not already in place) to monitor for any deterioration in water quality in the adjacent wetland systems.
Linear infrastructure - Operation	Disturbance and degradation of wetland habitat	Minimise and manage the loss of wetland habitat and functionality.	Successful implementation of wetland mitigation and offset strategy.	• All wetlands along the infrastructure servitudes should be clearly demarcated as sensitive habitats and staff/contractors made aware of the location and sensitivity of these habitats. No temporary laydown or stockpiling of material required for maintenance activities may take place in wetland areas. • All vehicular and machinery movement along the servitude must be restricted to defined service road. No off-road driving should be allowed. • If necessary to prevent wetland disturbance, the servitude should be fenced off with a 5 strand cattle fence to prevent vehicles and staff accessing wetlands outside the servitude area. A 5 strand cattle fence is preferred to a razor wire security fence as it allows for free movement of small mammals and reptiles under the fence. If electrification of the fence is required, the lowest electrical fence strand should be positioned to still allow for free movement of small mammals and reptiles under the fence without causing fatalities of these species.
	Erosion and sedimentation due to storm water discharges from road	Minimise and manage sedimentation and erosion in and around wetland areas	Implementing and managing a proper stormwater management plan, with water quality sampling.	Regular inspections and maintenance of all wetland crossings and stormwater management infrastructure should be undertaken and any damage repaired and flow obstructions cleared to ensure optimal functioning.

7 ROLES AND RESPONSIBILITIES

The effectiveness of the implementation of the EMP rests on the each of the role players taking onus of their respective tasks / responsibilities. It is therefore fundamental that each of the key stakeholders involved in the implementation of the EMP have a clear understanding of their respective roles. Although the onus of ensuring that all project activities associated with the proposed project comply with mitigation, environmental management and EA conditions rest with the holder of the EA, various parties will play a role in the implementation of this EMP. Taking the aforementioned into account, this section of the EMP is intended to clearly define the responsibilities for management actions contained in this document and to explain arrangements for coordination among the role players involved in the implementation of the proposed project lifecycle.

7.1 Project Proponent

The project proponent (holder of the EA) namely Eskom Holdings SOC Ltd, is required to ensure that all conditions provided in the EA, as well as any other reasonable condition that the CA considers necessary for the protection of the environment, are met. In keeping with the requirements of Section 28 of the NEMA as amended, the holder of the EA is also required to take all reasonable measures and to implement mitigation / management measures to prevent adverse environmental consequences, associated with the implementation of the project activities, from happening.

The project proponent is responsible for ensuring that the mitigation measures provided in this EMPr are implemented and that the mitigation measures are clearly understood by all relevant parties. Where the implementation of Construction and / or Operational activities associated with the proposed project are contracted out (e.g. to Contractors and / or Sub-contractors), the legal responsibility associated with non-compliance still rests with the Project Proponent (unless otherwise agreed upon by the Competent Authority).

Additional responsibilities of the Project Proponent also include the following:

- Ensure compliance with the EA Conditions by any person acting on their behalf, including but not limited to, an agent, sub-contractor, employee or any person rendering a service to the holder of the EA;
- Notify the DEA, ECO any other relevant authority, in writing, within 48 hours thereof if any condition of the EA is not adhered to;
- Ensure that a copy of the EA is kept on site at all times. The EA must be provided to an authorised official of the DEA who may request to see it and must be made available for inspection to any employee or agent of the holder of the EA who works or undertakes work within the development footprint;
- Notify the DEA, of any changes of the ownership and / or project developer. It must be explained to the new owner / developer that the conditions provided in the EA are legally binding and must be adhered to;

- Notify the DEA of any change of the contact details including the name of the responsible person, the physical or postal address and / or telephonic details and provide the Department with the new details; and
- Allow Departmental Officials access to the development site for the purpose of assessing and / or monitoring compliance with the EA Conditions.

7.2 Engineer

The Project Proponent will appoint an Engineer who will function to ensure that all construction activities are carried out in accordance with the approved detail design. In addition, the role and responsibility of the Engineer will include:

- Providing assistance to the ECO in the monitoring and execution of the Contractors or Sub-contractors' Method Statements;
- Review and approve the Method Statements developed by the Contractor;
- Maintaining a photographic record of the construction activities;
- Verifying that the EMPr have been included in the contract documents. In the event the EMPr is not included in the tender documents, it shall be issued officially to the Contractor once approved;
- Ensuring that Environmental Compliance Matters are addressed during all Site Meetings;
- Provide technical guidance and assistance to onsite teams regarding the implementation and compliance with the EMPr;
- Consults and co-operates with the ECO concerning environmental matters;
- Designate or appoint a staff member to review weekly site inspections undertaken by the Contractor to determine whether construction activities are carried out as per the detailed design and management measures provided in the EMPr and Method Statements; and
- Provide inputs, as and when required, to the monthly Environmental Compliance Report prepared by the ECO.

7.3 Project Manager

The Project Manager, appointed by Eskom will function to coordinate and manage the Construction and Operational Phases of the proposed project. Separate Project Managers for the Construction Phase and Operation Phase may be appointed. Any project activity, which may result in adverse environmental consequences and for which mitigation and management measures are not provided in this EMPr must be approved by the Project Manager. The Project Manager must instruct the Contractor / Sub-contractor to cease any construction activity which is in contravention of this EMPr and the EA.

7.3.1 Eskom Environmental Officer

The appointed Eskom SOC Limited EO will be required to, in conjunction with the Construction Supervisor; undertake regular inspections of the Contractor's site as well as the installation works in order to check for compliance with the EMPr in terms of the specifications outlined therein. Inspections shall take place at least once a week and copies of the monitoring checklist contained in the file. The EO will also be responsible for managing all environmental aspects on behalf of the PM and the Developer.

7.4 Contractor and Sub-contractor/s

Where specific EMPr responsibilities are assigned to Contractors or Sub-contractors, these must be clearly stipulated and included in the contract documentation. Any construction activities or actions of onsite personnel which results in environmental damage, non-compliance with the EA and EMPr, must be reported to the project proponent by the Contractor. The roles and responsibilities of the Contractor will also include the following:

- To prepare Method Statements which sets out the manner in which the management actions contained in the EMPr will be implemented;
- Ensure that all sub-contractors and onsite personnel understand and are familiar with the management measures provided in the EMPr;
- Ensure that all mitigation and management measures relating to construction activities are implemented;
- Report any non-compliance with the EMPr and / or EA Conditions to the project proponent and ECO;
- Rehabilitate the construction footprint as well as any sensitive environment damage resulting from negligence on the part of the Contractor, to the satisfaction of the ECO; and
- All personnel shall be required to familiarise themselves with the content of this EMPr.

7.5 ECO

The ECO will be appointed by the project proponent for the duration of the Construction. The ECO must be appointed prior to the commencement of any site preparation, land clearing or construction activities. The ECO's primary role will be to monitor compliance with the conditions provided in the EA and the implementation of the EMPr, and to report the compliance / non-compliance to the Competent Authority. The appointed ECO must meet the following requirements:

- Have an appropriate Environmental Management / Science qualification / degree
- Appropriate training and experience in the implementation of environmental management specifications; and
- Have no vested interest in the proposed project.

The responsibilities of the ECO will include the following:

- Review and approval of Method Statements prepared by the Contractor for activities on the construction site;
- Conduct monthly site inspections / audits and record compliance / non-compliance with the management and mitigation measures provided in the EMPr and EA Conditions observed during the inspection;
- Based on the observations made during monthly site inspections issue site instructions to the contractor for any corrective actions which may be required;
- Document the findings of the site inspection / audits;
- Monthly Environmental Compliance Audit Reports should be submitted to both Eskom and the CA. The Environmental Compliance Report should provide an overview of any trends in non-compliance recorded;
- Develop and maintain an I&APs Complaints Register in which all complaints are recorded, as well as remedial action taken and the response provided to the I&APs;
- Verify that the management and mitigation measures provided in the EMPr as well as the EA Conditions have been communicated to, and are understood by all personnel on site including the Contractors and Sub-contractors;
- Report incidents which have lead / may lead to substantial danger to the surrounding communities /public or significant environmental damage, to the CA. Any remediation or corrective measures which have been / proposed to be implemented to prevent danger to the surrounding communities /public or significant environmental damage from occurring must also be reported to the CA;
- Ensure that a copy of the approved revised EMPr and EA is kept onsite and is accessible to all personnel on site; and
- Provide Environmental Awareness Training to all personnel on site, Contractor and Sub-contractor. Documented proof of the Environmental Awareness Training as well as the content of the training must be kept onsite and should be made available to the Competent Authority upon request. All visitors to the site (including project team members which are not based onsite), must undergo Environmental Induction before being permitted to the construction and associated area. The Environmental Induction should be structured so as to provide a condensed version of the comprehensive Environmental Awareness Training that will be provided to the workforce / onsite staff.

7.6 Contractor's SHE Officer

The name and letter of appointment of the Contractors SHE Officer must be given to the ECO and the terms of reference for the work to be undertaken must be detailed including time on site, roles and responsibility, interaction with the Contractor and environmental offices, etc.

8 ENVIRONMENTAL AWARENESS PLAN

In keeping with Regulation 33(j) of the NEMA EIA Regulations 2010 (Government Notice R.543) this part of the EMPr provides an account of the approach that will be adopted for Environmental Awareness Plan during the Construction Phase of the proposed project. The Environmental Awareness Plan is intended to describe the method that will be adopted by Eskom to inform any person acting on their behalf, including an agent, sub-contractor, employee or any person rendering a service, of any environmental risk which may result from the implementation of the project activities and the way risks must be managed to avoid adverse environmental consequences. Providing Environmental Awareness Training is fundamental for ensuring that the onsite personnel understand how they can play a role in achieving the objectives specified in the EMPr.

The Environmental Officer, in conjunction with the employer, should develop an environmental awareness plan to address the following:

- Training needs of site and project personnel;
- Training material to be used;
- Language of training;
- General environmental awareness i.e. posters, toolbox talks etc.;
- Include site-specific findings as per the EIA;
- Health and Safety aspects;
- HIV/Aids Awareness;
- Environmental Reports; and
- Environmental Terminology.

Once the awareness plan and training material are available, the entire workforce and project management team should undergo an environmental awareness training course. Environmental awareness training is critical for the workforce to understand how they can play a role in achieving the objectives specified in the EMP. All visitors to the site (including project team members which are not based onsite), must undergo Environmental Induction before being permitted to the construction and associated area. The Environmental Induction should be structured so as to provide a condensed version of the comprehensive Environmental Awareness Training that will be provided to the workforce / onsite staff.

9 ENVIRONMENTAL COMPLIANCE MONITORING

9.1 Method Statements

- A Method Statement (MS) must be compiled for every activity undertaken by the Contractor which poses a risk to the environment (natural, biophysical and social), and includes the following:
- The MS should be submitted at least 7 working days prior to the commencement of work to the ECO;
- A MS describes the scope of the intended work in a step by step description to ensure that the ECO understands the Contractors intentions. This will enable them to assist in devising any mitigation measures which would minimise environmental impact during these tasks;
- The ECO may require changes to a MS if it does not comply with the specification or if, in the reasonable opinion of the ECO, the proposal may result in, or carries a greater than reasonable risk of damage to the environment in excess of that permitted by the EMPr or any legislation;
- The Contractor shall carry out the activities in accordance with the approved MS;
- Approved MS shall be readily available on the site and shall be communicated to all relevant personnel;
- Approval of the MS shall not absolve the Contractor from any of his obligations or responsibilities in terms of the contract;
- No claim for delay or additional cost incurred by the Contractor shall be entertained due to inadequacy of a MS;
- For each instance where it is requested that the Contractor submit a MS to the satisfaction of the ECO, the format should clearly indicate as a minimum the following:
    - Responsible person (name and ID number) and an alternative (name and ID number);
    - The applicable requirements provided in all legislation and policies which have a bearing on the proposed activities;
    - Training Requirements;
    - Timing of activities as per the Project / Construction Schedule;
    - Materials, plant and equipment to be used;
    - Proposed construction procedure, including the order in which the activities making up the procedure will be carried out, designed to implement the relevant environmental specifications;
    - The system to be implemented to ensure compliance with the above;
    - PPE required;
    - A detailed description of the process of work, methods and materials;
    - Emergency Procedures;
    - Response in the case of a non-compliance; and
    - Other information deemed necessary by the ECO.

- All Method Statements must be signed by the Engineer; and
- Work may not commence until the method statement has been approved by the ECO. All method statements will form part of the EMPr documentation and are subject to all terms and conditions contained within the EMPr main document.

The following Method Statements, as a minimum, shall be prepared by the Contractor for approval:

- Site layout. The graphical representation with detailed notes of the location, layout and method of establishment of the construction camp must be provided and must including the following:
  - All Contractor's buildings, and/or offices;
  - Lay down areas;
  - Vehicle and plant storage areas, including wash areas;
  - Workshops, if required and approved by ECO;
  - Fuel storage and dispensing areas, if required and approved by ECO;
  - Cement/concrete batching areas, if required and approved by ECO (including the methods employed for the mixing of concrete and particularly the containment of runoff water from such areas and the method of transportation of concrete);
  - Other infrastructure required for the running of the project.
- Access Routes. Details, including a drawing, showing where and how the access points and routes will be located and managed must be provided in a Method Statement. Final locations of planned new access roads will be subject to successful negotiations with landowners. Details of fences and gates affected or used during the construction activities, including a drawing showing the location of fences and access gates must be provided.
- Pollution control. Expected solid waste types, quantities, methods and frequency of collection and disposal as well as location of disposal sites must be identified and stated in a Method Statement. The Method Statement shall further include methods of minimising, controlling, collecting and disposing of contaminated water, and details of any hazardous substances/materials to be used, together with the transport, storage, handling and disposal procedures for the substances.
- Safety considerations. The Contractor shall provide details identifying what safety precautions will be implemented to ensure the safety of all staff, and the general public at large, on site during the life of the project. This will include protective clothing requirements for all types of construction activities on site, including protection against dust, noise, falling objects, work associated with electricity and work at heights.
- Emergency procedures. The Contractor shall provide details regarding all relevant emergency procedures that will be implemented for fire control and accidental leaks and spillages of hazardous substances (including fuel and oil). The Contractor shall further include details of risk reduction measures to be implemented including firefighting equipment, fire prevention procedures and spill kits.
- Waste management control. The Contractor shall provide details regarding how solid and liquid waste generated on the construction site and site camp will be collected, stored, transported and

disposed of. Details of any service provider(s) appointed to manage this task must also be provided.

- Storm water and erosion control. The Contractor shall provide details of how storm water emanating within or adjacent to the construction site may impact on construction activities. Details on how the Contractor will deal with storm water runoff and potential erosion within the construction footprint and servitude must be provided. Details of any service provider(s) appointed to manage this task must also be provided.

9.2 Compliance Auditing and Reporting

The independent ECO will be responsible for compliance monitoring, auditing and reporting throughout the life of the proposed development. The required compliance monitoring for the Kendal 30-year ash project should include the following:

The ECO and EO shall be responsible for the day-to-day management and implementation of the EMPr. They should ensure that day-to-day activities are captured in a site diary and a photographic record is kept as evidence.

The EO shall be responsible to report any non-conformities to the ECO within 24 hours of the incident and an investigation report within 5 days. Bi-weekly reports to the ECO should be submitted and should include all activities and aspects of the last two weeks.

The EO and ECO shall schedule compliance audits at least once a month to check full compliance to the EMPr and the audit report to be made available to the Department and management.

9.3 Implementation of Corrective Measures

Checking and corrective action forms part of the environmental management function and is aimed at ensuring that the necessary environmental management activities are being implemented and that the desired outcomes are achieved. When non-conformities do occur that have a negative impact on the environment, these should be rectified by the implementation of corrective actions issued by the ECO and Project Manager within a reasonable or agreed period of time. All corrective actions need to be documented and the outcome photographed and included in the next report.

9.4 Documentation and Record Keeping

All records related to the implementation of this EMPr (e.g. method statements, audit inspection protocols, incident reports, etc.) must be filed together by the ECO in a safe place where it can be easily retrieved. These records should be kept for two years, following the completion of the Construction Phase and should, at any time, be available for scrutiny by relevant authorities. It is also recommended that photographs be taken of the site prior to, during and immediately after construction/ installation, as a visual reference. These photographs should be stored with other records related to this EMPr.

9.5 Monitoring

9.5.1 Air Quality

Source Monitoring

Visual identification of dust plumes from the ADF will be an important initial indicator of ineffective mitigation measures. Response to minimise particulate emissions during these periods should be as rapid as possible. To avoid these conditions, the following activities are recommended.

- Monitoring local weather forecasts for windy and/or dry conditions – for example during late winter, spring, and early summer. Contingency systems should be in place to respond with additional dust suppression during these periods.
- Regular checks of the dust suppression equipment, for example the water spray systems and efficient repairs where necessary.
- Regular visual inspection of revegetated areas for complete vegetation cover. Where un-vegetated patches open, water sprays should be used to minimise particulate emissions until the topsoil can be replaced and reseeded.

Ambient Air Quality Monitoring

To ensure that mitigation is effective it is recommended that a dustfall monitoring network is established and is operational in the appropriate vicinity of the ADF. The location of the dust buckets was informed by the location of sensitive receptors together with simulated impact areas of non-compliance with NAAQS due to the proposed project operations. Locations for a dust bucket network are proposed in Figure 5 1. In addition, PM10 sampling is recommended at sensitive receptors to the north and east- southeast of the ADF.

The Air Quality Basic Assessment for the Kendal Continuous ADF (Bird & von Gruenewaldt, 2014) included a screening exercise of simulated ambient concentration of metals, where the findings were that the risk of increased life-time cancer risk because of exposure to arsenic, nickel and chromium was low or very low and well within health effect screening levels. However, concerns have been raised with regards to the metal content of the particulate emissions (Section 6.1 in Bird & von Gruenewaldt, 2014). It is therefore, also recommended that short-term filter-based PM10 monitoring campaigns be run annually, at communities to the north and downwind of the proposed ADF so that ambient metal concentrations can be determined and tracked over time.

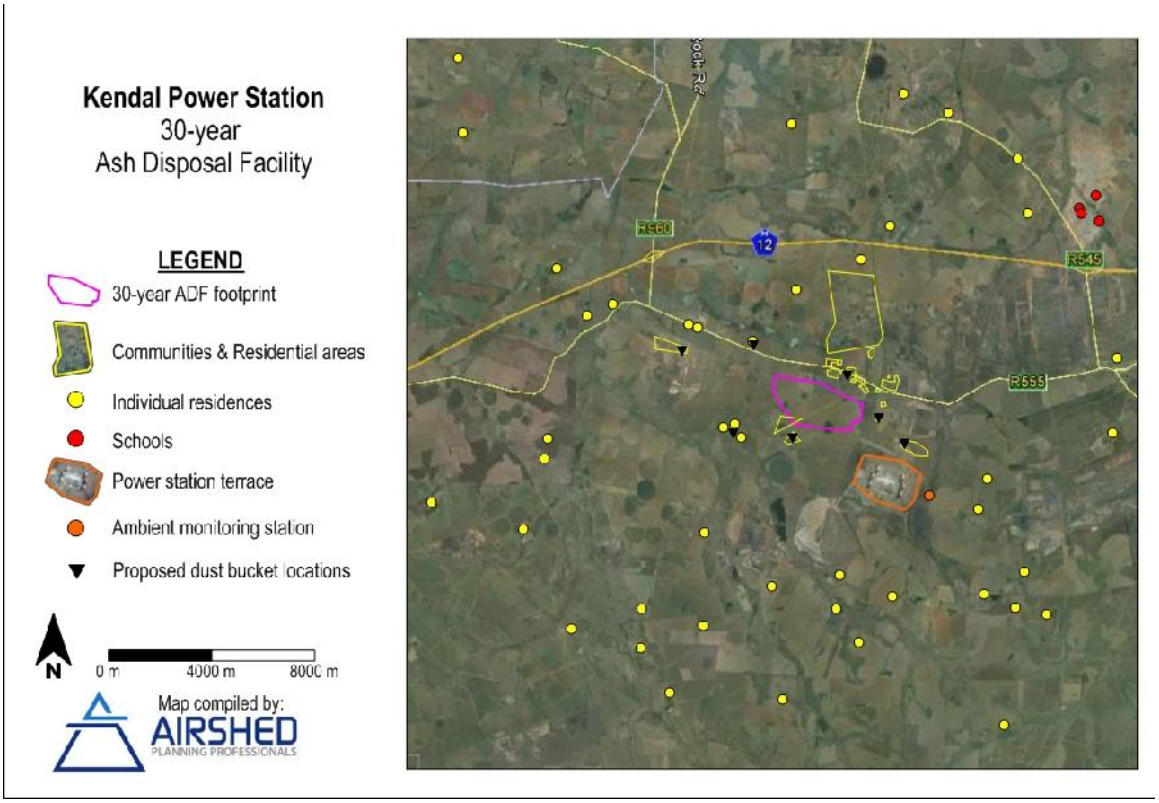

Figure 9-1: Proposed dust bucket locations

Record-Keeping, Environmental Reporting and Community Liaison

Periodic Inspections and Audits

The NDCR requires that monitoring reports be submitted to the local air quality officer when exceedances of the dustfall standards occur.

Liaison Strategy for Communication with I&APs

Public concern regarding particulate emissions and subsequent impact on ambient air quality was raised during the assessment of impact of the Kendal Continuous ADF. It was suggested that a collaborative Environmental Management forum be established, including representatives from the mining houses as well as Kendal and Kusile Power stations. This forum would be an appropriate forum for communication with I&APs potentially affected by ash disposal activities. This recommendation applies to the continuation of ash disposal on the proposed Site H ADF.

9.5.2 Aquatic

An aquatic biomonitoring programme should be implemented and maintained for the Wilge River and adjoining tributaries during construction and operation. The monitoring programme should include the following indices monitored on a quarterly basis during the wet and dry season:

- In situ water quality;

- Habitat availability using the IHAS;
- Aquatic macroinvertebrates; and
- Ichthyofauna.

9.5.3 Noise

Short term 'spot' sampling may be conducted at residences closest to the Project. The analyser should comply with Type 1 sound level meter requirements and measurements should be conducted in accordance with procedures specified by the IFC. It is recommended that samples, at least 24-hours in duration be taken annually and as a minimum, include the following parameters:

- LAeq
- LA90
- Unweighted octave band sound pressure levels (LZeq)

In the interpretation and reporting of sampled environmental noise levels, use should be made of a trained specialist.

9.5.4 Social

The proposed Kendal 30-year ADF site is situated in a complex social environment. There are a number of communities residing within a 1km radius of the proposed project. The close proximity of these communities is a matter of concern, especially from a health perspective. One of the communities reside on the proposed site, and although the property where they live belong to Eskom, some of them do have right of life on the property, having lived there in excess of 40 years. This community will have to be relocated. There are mines, industries and agricultural activities taking place in the area which all contribute to the potential health impacts on communities. Most of the impacts experienced in the area can only be mitigated if all the different role players, including the municipality work together. In order to protect the vulnerable communities in the area, the following key recommendations are made

- Establish an environmental forum to monitor cumulative impacts and share resources to address existing impacts.

9.5.5 Land Capability

Nutrient requirements reported in this document are based on the monitoring and sampling of the soils at the time of the baseline survey. These values will definitely alter during the storage stage and will need to be re-evaluated before being used during rehabilitation. Ongoing evaluation of the nutrient status of the growth medium will be needed throughout the life of the project and into the rehabilitation and closure phases.

During the rehabilitation exercise, preliminary soil quality monitoring should be carried out to accurately determine the fertiliser and pH requirements that will be needed. Additional soil sampling should also be carried out annually after rehabilitation has been completed and until the levels of

nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth.

Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.

Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.

- pH (H_2O);
- Phosphorus (Bray I);
- Electrical conductivity;
- Calcium mg/kg;
- Cation exchange capacity;
- Sodium mg/kg;
- Magnesium mg/kg;
- Potassium mg/kg;
- Zinc mg/kg;
- Clay, sand and Silt; and
- Organic matter content (C %).

9.5.6 Surface water

Surface water monitoring must be undertaken at the sites set out in **Table 9-1** below.

Table 9-1: Proposed surface water quality monitoring points

Monitoring points	Location	
	Latitude (S)	Longitude (E)
CSW02	-26.06045	28.86524
CSW03	-26.02776	28.87286
SCH02	-26.08263	28.93350
SCH01	-26.088470	28.941030

It is recommended that sampling be undertaken on a monthly basis, starting at least 6 months prior to construction start-up for the parameters listed below:

- pH;

- Conductivity (mS/m);
- Total Dissolved Solids (TDS)(mg/L);
- Alkalinity as CaCO3 (mg/L);
- Ammonia as N (mg/L);
- Nitrate (NO3) as N (mg/L)
- Sulphate (SO4)(mg/L)
- Arsenic (As (µg/L);
- Aluminium (Al) (µg/L);
- Cadmium (Cd)(mg/L);
- Calcium (Ca)(mg/L);
- Chloride (Cl)(mg/L);
- Fluoride (F)(mg/L);
- Iron (Fe)(µg/L);
- Lead (Pb)(µg/L);
- Magnesium (Mg) (mg/L);
- Manganese (Mn) (mg/L);
- Mercury (Hg)(µg/L);
- Potassium (K)(mg/L);
- Sodium (Na)(mg/L); and
- Zinc (Zn) (µg/L).

In light of the fact that certain heavy metals such as cadmium, arsenic, mercury, lead, manganese and zinc are thought to have endocrine disrupting properties at very low concentrations and the users downstream include cattle consuming water from the resource, it is important that these are monitored and that sensitive laboratory techniques, such as ICP-MS, are used.

9.5.7 Terrestrial

An alien invasive species control programme must be developed and implemented. It is recommended that the programme include:

- A combined approach using both chemical and mechanical control methods;
- Periodic follow-up treatments informed by regular monitoring; and
- Monitoring in disturbed areas, as well as adjacent undisturbed areas.

9.5.8 Groundwater

- Once-off geochemical assessment of further ash samples, tests to include Acid Base Accounting, XRD analysis, leach test for waste classification and roll bottle test (1:4 liquid –to-solid ratio).
- The potential seepage quality from the ADF should be monitored through the monthly monitoring of the water quality in the PCD.
- Testing of liner conductivity during installation is recommended to ensure liner integrity.
- Installation and testing of groundwater monitoring boreholes to accommodate the final ADF layout. A summary of the proposed monitoring boreholes is listed in Table 9-2 and the approximate position of the proposed boreholes is shown in (Figure 9-2). It must be noted that the exact positions of each monitoring borehole needs to be determined by site-specific geophysical investigations.

Table 9-2: Proposed monitoring boreholes, approximate locations and schedule

BH	Target	Latitude	Longitude	Implementation
ADF-BH06	PCD No.2	-26.085742	28.948576	Year 0 to 5
ADF-BH07	ADF and PCD No.1	-26.064929	28.96072	Year 0 to 5
ADF-BH08	ADF and PCD No. 4	-26.055735	28.940947	Year 10 to 15
ADF-BH09	ADF and PCD No. 7	-26.054675	28.93075	Year 20 to 27
ADF-BH10	ADF (Dyke)	-26.062588	28.926917	Year 10 to 15
ADF-BH11	ADF and PCD No. 6	-26.075066	28.931323	Year 15 to 20
KMBH-05	ADF	-26.07580	28.94569	Maintain (Pan BH)

The monitoring boreholes should be installed prior to construction phase to determine background water qualities and form part of Eskom monitoring programme.

- Quarterly monitoring of groundwater levels and quality;
- Purged groundwater sampling;
- The analytical suite for groundwater samples should include determinants as listed in Table 9-3.

Table 9-3: Proposed Analytical Suite

Variable	Units
pH	pH Units
Electrical Conductivity	mS/m
Total Dissolved Solids(TDS)	mg/l
Total Alkalinity	mg/l
Major cations (Na, K, Mg, Ca)	mg/l
Major anions (Cl, F, SO_4)	mg/l

Variable	Units
Nitrate(NO_3 as N)	mg/l
Nitrite(NO_2 as N)	mg/l
Chemical Oxygen demand(COD)	mg/l
Orthophosphate	mg/l
Turbidity((as N.T.U)	mg/l
Trace elements by ICP-OES scan including Fe, Mn, Al, Cu, B,Pb,Zn,Hg, Cd and As	mg/l
Total Chromium (as Cr)	mg/l
Cyanides (as CN)	mg/l
Silica (as SIO_2)	mg/l
Free and saline Ammonia NH3 (as N)	mg/l
E.coli	In cfu/100ml

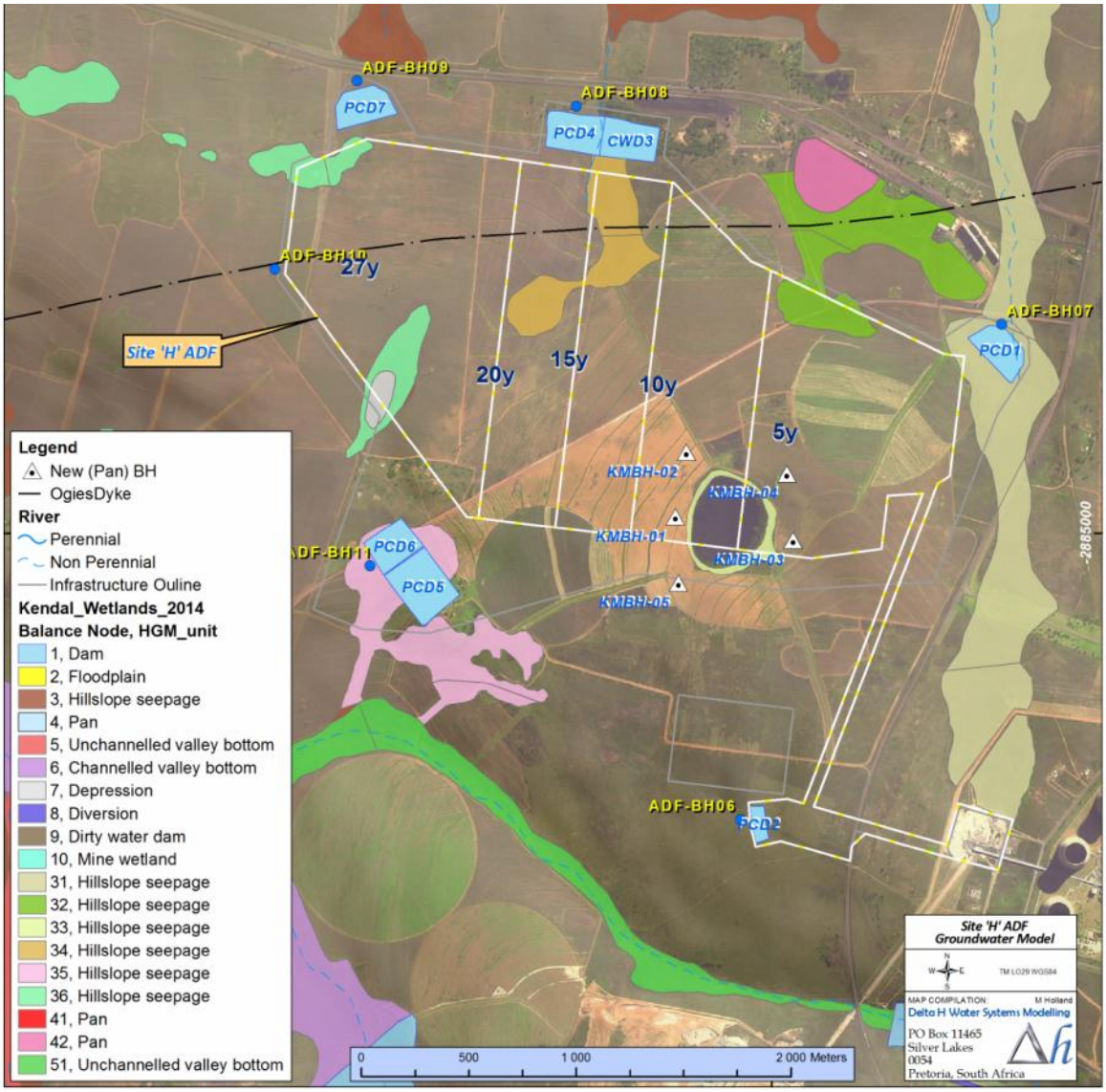

Figure 9-2: Proposed monitoring borehole locality for the proposed ADF