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REPORT ON

FINAL ENVIRONMENTAL IMPACT REPORT

For Kendal Power Station - 30 Year Ash Disposal Facility

Report No: 004

Submitted to:

Eskom Holdings SOC Limited
P O Box 1091
Johannesburg
2000

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October 2016 12935

THE FINAL ENVIRONMENTAL IMPACT REPORT (FEIR)

The FEIR has been submitted to the Competent Authority, the Department of Environmental Affairs (DEA), and is available in electronic format on the Zitholele website: http://www.zitholele.co.za/ea-wml-for-30yr-ash-disposal-facility-at-kendal-power-station

In accordance to Section 56(6) of the 2010 EIA Regulations, a registered Interested and Affected Party (I&AP) may submit comments on the FEIR, but these should be submitted to the Competent Authority, the DEA. A copy of your comments should be provided to the Environmental Assessment Practitioner (EAP).

The DEA representative for this project is Masina Litsoane (MLitsoane@environment.gov.za). The EAP can be copied at the following address: publicprocess@zitholele.co.za

This FEIR shows all the changes and amendments from the Draft Environmental Impact Assessment Report (DEIR) which was made available for public review. These changes are reflected in this report as follows:

- Additions in the text are reflected as underlined text; and
- Deletions are reflected as text that has been ~~struck through~~.

EXECUTIVE SUMMARY

The proposed Kendal 30-year Ash Disposal Facility (ADF) project is located north east of the Kendal Power Station (KPS), approximately 40km south of Witbank in the Mpumalanga Province. The proposed site falls within the Emalahleni Local Municipality and the Nkangala District Municipality on the farms Heuvelfontein 215 IR and Schoongezicht 218 IR.

The 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 ï approximately 27 years. The proposed ADF 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.

A distance of 362 metres has been achieved between the existing AFGRI 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.

Because the Kendal 30-year ADF project was initiated and registered with the Department of Environmental Affairs (DEA) in 2012/2013, the Environmental Impact Assessment (EIA) is being done in accordance with the (then active) EIA Regulations of 2010 under the National Environmental Management Act (Act 107 of 1998), as amended ñNEMAò This set of regulations (GN R 543 ï 545) have subsequently been repealed by the EIA Regulations of 2014 (GN R 982 ï 985). The project triggers activities listed in the EIA Regulations Listing Notice 1 (GN R544) and Listing Notice 2 (GN R 545), therefore requiring Environmental Authorisation before it may be implemented.

The project also triggers waste activities and Waste Management Licence is required under the National Environmental Management Waste Act (Act 59 of 2008), as amended ï ñNEM:WAò The List of Waste Management Activities (GN R 718 of 2007) has been repealed by the List of Waste Management Activities of 2013 (GN 921). Because the Kendal 30-year ADF project includes both NEMA and NEM:WA activities, an integrated application process is being followed for an Environmental Authorisation and Waste Management Licence.

During the Scoping- and current EIA Phase for the proposed project, all provisions relating to Public Participation included in Regulation 54 of the NEMA EIA Regulations R.543 (2010) were adhered to. The Public Participation Process (PPP) was also guided by the Environmental Management Principles which relate to the involvement of Interested and Affected Parties (I&APs) as well as various Public Participation Guidelines. Questions and comments that were received from I&APs to date have been captured in a Comments and Response Report (CRR) which was

made available for public review as an appendix to the Draft Environmental Impact Report (DEIR). Below is a list of some of the main comments received:

- Aspects of mining, mineral and prospecting rights
- Relocation of infrastructure (Transnet pipeline, D1390 road and Eskom Power Lines)
- Relocation of communities and dust impacts
- Loss of productive agricultural land and existing farming practices
- Impacts to the surface and groundwater resources
- Issues relating to existing social circumstances in the area, such as:
  - No electricity
  - No / limited water supply
  - Poor sanitation conditions
  - Possible job creation
  - Impact on livestock

To select a preferred site, a site identification and assessment process was followed. In May 2013 a site identification study was conducted which scored and ranked a number of site alternatives for further investigation. Following this, specialist studies were commissioned on the four top-scoring site alternatives. The detailed investigations revealed that three of the four sites comprised large areas earmarked for future mining. These sites were then eliminated as feasible alternatives. The full suite of baseline specialist studies was nevertheless finalised on all four site alternatives. Site H was revealed as the preferred site.

Specialist studies were undertaken to assess and document the receiving environment (or baseline). The results of their studies are documented in detail in the FEIR. The following are some of the high-level finds from their studies:

- Air Quality: The project falls within the Highveld Priority Area (HPA) as well as the Emalahleni Hot Spot. The poor ambient air quality in the Emalahleni Hot Spot is a result of emissions from power generation, metallurgical manufacturing processes, open-cast coal mining and residential fuel burning.
- Aquatics: The Leeufontein Spruit and another un-named tributary, drain in a north westerly direction from the site towards and into the Wilge River. The Wilge River has been classified as a Class II river, which is defined as a river which is moderately used and the overall condition of that resource is moderately altered from its pre-development condition.
- Ecology (Terrestrial): The site is located in the Eastern Highveld Grassland vegetation type on the border with the Rand Highveld Grassland in the grassland biome. A small section of Site H is categorised as Critical Biodiversity Area according to the Mpumalanga Biodiversity Sector Plan. Site H is predominantly used for agriculture (maize cultivation).

- Groundwater: The average recharge for Site H is indicated as ranging between 50mm to 75mm per annum. The aquifer is classified as a minor aquifer system. The aquifer type is indicated as intergranular and fractured. The average borehole yield in the area is indicated as ranging between 0.5l/s and 2.0l/s. Groundwater vulnerability is indicated as low to medium.

- Heritage: On Site H there are eight heritage sites, consisting of seven cemeteries and one homestead dating back to the early 1900ôs. In total, there are approximately 149 graves.

- Noise: The noise levels measured at sites around the ADF were comparable and correspond to typical noise levels prevalent in rural and suburban districts and rural and urban districts.

- Soils and Land-use: Site H contains deep, well drained soils. The land use is that of (large portions) of land irrigated by means of centre pivots. The soil forms that were mapped are were: Clovelly (Cv), Hutton (Hu), Glencoe (Gc), Dresden (Dr) and Glenrosa (Gs), so well as the more hydromorphic Forms, namely Avalon (Av), Westleigh (We) and Pinedene (Pn).

- Social: The communities surrounding Site H were identified and include: Eskom Triangle Community; Kayalethu Village; Olympic Community; Makhosi community and van Biljon residence.

- Surface Water: The site is located in the Upper Olifants Catchment which falls within the Olifants Water Management Area (WMA 02), specifically in the B20E and B20F quaternary catchments. The chemical water quality within the study area is generally good. However, some sample points indicate high levels of sulphate (SO4), aluminium (Al), magnesium (Mg) and ammonia (NH4).

- Traffic: The site is traversed by Road D1390 and bound by D686. D1390 is a gravel road running north south linking local mines onto the D686 which subsequently intersects with the N12 National Road which is to the north.

- Visual: The visual character of the study site is largely cultivated land or natural grasslands with the KPS dominating the scene. The main residential components are the scattered farmsteads, Kendal Agricultural holdings and the town Kendal and Ogies. The farming activities and the residential components combination with the power infrastructure and mining structures and activities create a mixed pastoral / industrial landscape character theme.

- Wetlands: Approximately 86.5 ha of wetland habitat were delineated within the proposed footprint of Site H, making up 16.3 % of the development footprint. This includes a large pan (11.6 ha) located mostly within the site and is used for water storage and abstraction for irrigation.

The results of the impact assessment showed that the most significant impacts on the receiving environment are on:

- Wetlands and the associated loss of potential habitat for the Lesser Flamingo (*Phoenicopterus minor)* and other waterfowl*.* In this regard, it should be noted that the proponent, Eskom, have initiated a wetland offset study to mitigate this impact. Please refer to Appendix F14 for the wetland offset study at its current level of detail. It should be noted that this study is still being finalised and will be completed, with the guidance of Department of Water and Sanitation (DWS) and South African National Biodiversity Institute (SANBI), outside of the EIA process.

- Socially, the relocation of the Eskom Triangle Community will have a significant impact. The Triangle community consist of 12 families (approximately 68 people) that occupy 14 units on a piece of land that is owned by Eskom. According to the residents, some of them have been living there for 60 years and have living rights on the property. In order to respond appropriately to this impact, Eskom intends to initial a resettlement process if and when Environmental Authorisation is received. Once the Resettlement Policy Framework (RPF) is finalised and communicated to the affected community, Eskomôs resettlement specialist must develop a Resettlement Action Plan (RAP) that fully details the operational process of enacting the resettlement.

- The impact of particulate emissions from the ADF on ambient concentrations will be dependent on the specific location of the 80 ha operational area. This area will migrate across the final footprint area as disposal of ash occurs. Eskom is committed to effectively implementing the mitigation measures proposed by the Air Quality Specialist in Appendix F1. The specialist recommends that the sidewalls of the ADF be vegetated by means of the application of a top-soil layer and seeding with appropriate grass seeds. The vegetation cover should be such to ensure at least 80% control efficiency. The top surface area should only have 80 ha of ash material exposed at any time. The un-active surface should be stabilised with topsoil and seeded with appropriate indigenous grass seed mix as soon as possible. Exposed topsoil surfaces (before vegetation has established) must be watered regularly to eliminate additional windblown dust from these surfaces. Water spraying system should be implemented on the surface of the ADF covering the outer perimeter of the facility and the active 80 ha area, spraying water when winds exceed 4 m/s.

- The loss of the utilisation of the soil resource will negatively impact the land use practice of commercial cultivation of cereal crops being undertaken on the dryland soils at present. These activities are perceived to be of great economic benefit to the local economy and land owners and contribute to the ecosystem services. One of the ways in which this impact can be minimised is by phasing the project in over several years.

The implementation of the proposed mitigation measures will reduce the significance of the anticipated environmental impacts. Mitigation measures which have been proposed in the various specialist studies that were undertaken for the proposed project have also been included. The findings of the Impact Assessment showed that the proposed Kendal 30-year ADF Project will not lead to unacceptable environmental costs.

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ABBREVIATIONS

ADF ..... Ash Disposal Facility
ASPT .....Average Score per Taxa
CA .....Competent Authority
CBA .....Critical Biodiversity Area
BPEO.....Best Practicable Environmental Option
CES ..... Cation Exchange Capacity
CO_2.....Carbon Dioxide
CRR.....Comments and Response Report
DAFF .....Department of Agriculture Forestry and Fisheries
dBA..... Decibels
DEA ..... Department of Environmental Affairs
DEIR ..... Draft Environmental Assessment Report
DM .....District Municipality
DEA ..... Department of Environmental Affairs
DEMP .....Draft Environmental Management Programme
DMR ..... Department of Mineral Resources
DO .....Dissolved Oxygen
DO% .....Percentage Dissolved Oxygen
DSR ..... Draft Scoping Report
DWS .....Department of Water and Sanitation
EAP ..... Environmental Assessment Practitioner
EAPASA .....Environmental Assessment Practitioners of South Africa
ECA ..... Environment Conservation Act
ECO.....Environmental Control Officer
E-Dump .....Emergency Dump
EIA.....Environmental Impact Assessment
EIR..... Environmental Impact Report
EIS.....Ecological Importance and Sensitivity
EMPr.....Environmental Management Programme
ESS ..... Earth Science Solutions (Pty) Ltd
FAII .....Fish Assemblage Integrity Index
FEIR .....Final Environmental Impact Report
FSR ..... Final Scoping Report
GCLé . Geosystemic Clay Liner
GIS .....Geographical Information Systems
GNR.....Government Notice Regulation
GPS.....Global Positioning System
GSM .....Gravel Sand and Mud
HDI .....Historically Disadvantaged Individuals
HNP ..... Herstigte Nasionale Party
HPA ..... Highveld Priority Area
I&APs.....Interested and Affected Parties
IEA..... Integrated Environmental Authorisation
IEM ..... Integrated Environmental Management
IEP..... Integrated Energy Plan
IFC.....International Finance Corporation
IHAS ..... Integrated Habitat Assessment System
ISEP ..... Integrated Strategic Electricity Planning
IUCN..... International Union for Conservation of Nature
IWULA ..... Integrated Water Use Licence Application
kV ..... Kilo Volts
KPS ..... Kendal Power Station
LM ..... Local Municipality
MBSP ..... Mpumalanga Biodiversity Sector Plan

MAP ..... Mean Annual Precipitation
MU ..... Management Unit
MVA ..... Mega Volt Ampere
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
NERSA ..... National Energy Regulator of South Africa
NIRP ..... National Integrated Resource Plan
NWMS ..... National Waste Management Strategy
PCD ..... Pollution Control Dam
PES ..... Present Ecological State
PGS ..... Professional Grave Solutions (Pty) Ltd
PPP ..... Public Participation Process
QV ..... Quality Value
RAP ..... Resettlement Action Plan
RMD é é é é é é é é é é Relative Abundance of Monovalent and Divalent Cations
RPF ..... Resettlement Policy Framework
RQO ..... Resource Quality Objectives
S&EIR ..... Scoping and Environmental Impact Assessment Report
SACNASP ..... South African Council for Natural Scientific Professionals
SANBI ..... South African National Biodiversity Institute
SASS5 ..... South African Scoring System Version 5
SEA ..... Strategic Environmental Assessment
SIA ..... Social Impact Assessment
SIC ..... Stones in Current
SO_2 ..... Sulphur Dioxide
SOER ..... State of the Environment Reporting
SR ..... Scoping Report
TDS ..... Total Dissolved Salts
TOPS ..... Threatened or Protected
ToR ..... Terms of Reference
TWQR ..... Target Water Quality Range
WCS ..... Wetland Consulting Services (Pty) Ltd
WMA ..... Water Management Area
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 (Eskom, 2016).

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 (LM) and the Nkangala District Municipality (DM) 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. Subsequent to 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. As a result 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 ï 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.

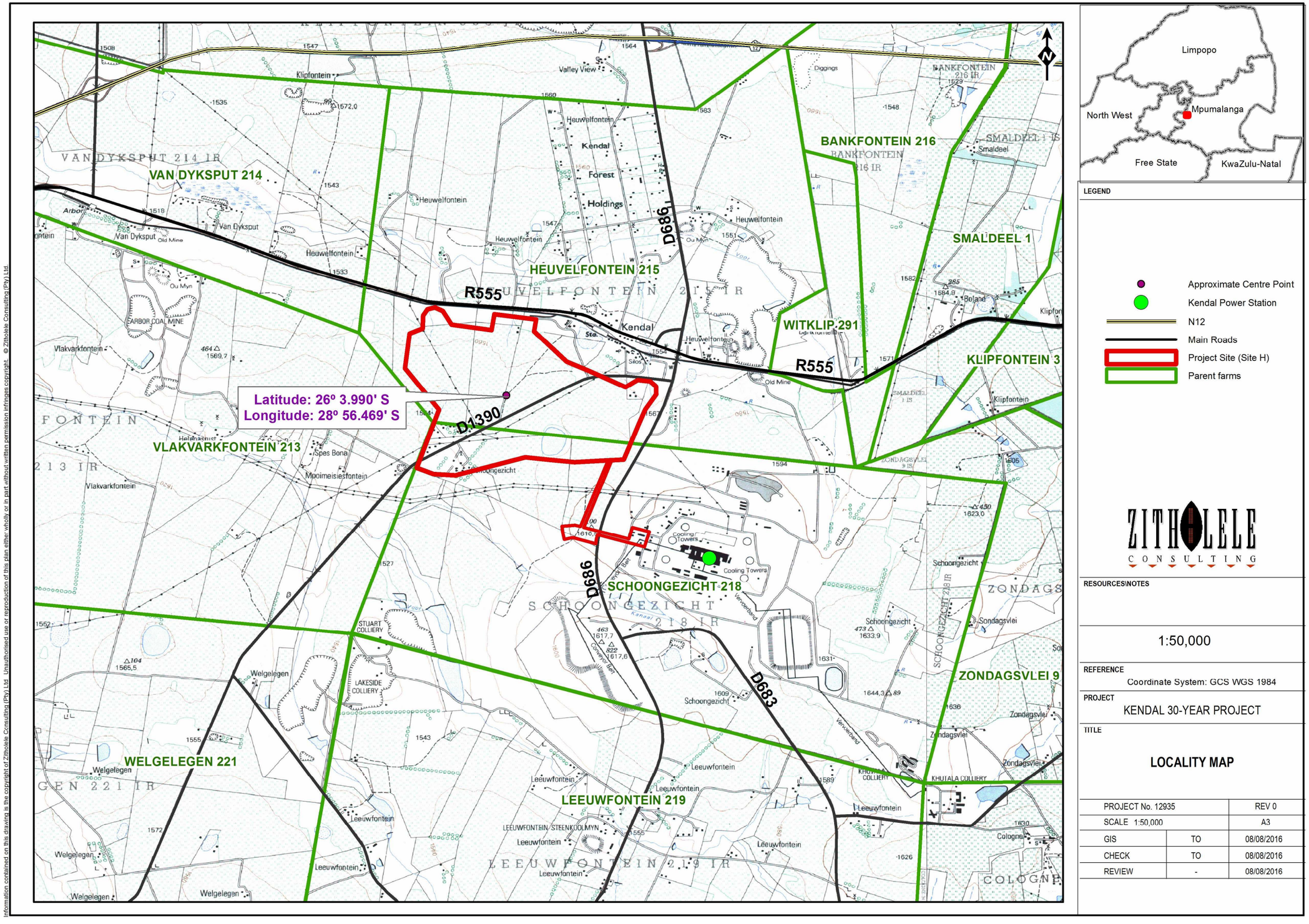

Figure 1-1: Project Locality Map

ZITHOLELE CONSULTING

Zitholele Consulting (Pty) Ltd, hereafter referred to as ñZitholeleò has been appointed by Eskom Holdings SOC Ltd, hereafter referred to as ñEskomò to carry out the following Environmental Authorisation 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 will be completed in accordance with the EIA Regulations of the time ï the 2010 EIA Regulations (GNR 543 ï 543). This set of regulations (GN R 543 ï 545) have subsequently been repealed by the EIA Regulations of 2014 (GN R 982 ï 985). Appendix B of this FEIR contains the original as well as updated Integrated Application Form for the Kendal 30-year Project. An updated application form under the latest legislation is included as per communication from the DEA, because three additional listed activities is being added.

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 Masterôs Degree in Environmental

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

Management from the North West University. Tania manages many large scale environmental authorisation projects and specialises in water use licences

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

Name and Surname	Tania Oosthuizen
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Dr Mathys Vosloo is a well-qualified and technically proficient environmental and natural scientist with more than 12 yearsôenvironmental 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)

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2 ENVIRONMENTAL IMPACT ASSESSMENT ROADMAP

As stated in Chapter 1, this EIA is being undertaken in accordance with the 2010 EIA Regulations (GN543). Table 2-1 below provides a roadmap of where the requirements of GN543 is addressed in this FEIR.

Table 2-1: Environmental Impact Report Document Roadmap

GN 543 No.		Description	Relevant EIR Part
31(2)(a)		Details of -	
	(i)	The EAP who compiled the report; and	Chapter 1: Details of the EAP
	(ii)	The expertise of the EAP to carry out an environmental impact assessment;	
31(2)(b)		A detailed description of the proposed activity;	Chapter 3: Project Description
			Table 4-1: Description of Listed Activities
31(2)(c)		A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is -	Chapter 1.1: Project Background Figure 1-1: Locality Map and Figure 3-4: General Arrangement
	(i)	A linear activity, a description of the route of the activity; or	
	(ii)	An ocean-based activity, the coordinates where the activity is to be undertaken;	Not Applicable
31(2)(d)		A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Chapter 7: Description of receiving environment
31(2)(e)		Details of the public participation process conducted in terms of sub-regulation (1), including -	Chapter 5: Public Participation Process
	(i)	Steps undertaken in accordance with the plan of study;	Chapter 5.1: Public Participation during the Scoping Phase
			Chapter 5.2: Public Participation during the EIA Phase
	(ii)	A list of persons, organisations and organs of state that were registered as interested and affected parties;	Appendix C8: I&APs Database
	(iii)	A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and	Appendix:C7 Comments and Response Report
	(iv)	Copies of any representations and comments received from registered Interested and Affected Parties (I&APs);	Appendix C5 and C6: Correspondence and Minutes of Meetings
31(2)(f)		A description of the need and desirability of the proposed activity;	Chapter 10: Need & Desirability of project

GN 543 No.		Description	Relevant EIR Part
31(2)(g)		A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;	Chapter 6: Comparative Assessment of Alternatives
31(2)(h)		An indication of the methodology used in determining the significance of potential environmental impacts;	Chapter 9: Environmental Impact Assessment
31(2)(i)		A description and comparative assessment of all alternatives identified during the environmental impact assessment process;	Chapter 6: Comparative Assessment of Alternatives
31(2)(j)		A summary of the findings and recommendations of any specialist report or report on a specialised process;	Chapter 7: Receiving Environment
31(2)(k)		A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;	Chapter 9: Environmental Impact Assessment
31(2)(l)		An assessment of each identified potentially significant impact, including -	Chapter 9: Environmental Impact Assessment
	(i)	Cumulative impacts;	
	(ii)	The nature of the impact;	
	(iii)	The extent and duration of the impact;	
	(iv)	The probability of the impact occurring;	
	(v)	The degree to which the impact can be reversed;	
	(vi)	The degree to which the impact may cause irreplaceable loss of resources; and	
	(vii)	The degree to which the impact can be mitigated.	
31(2)(m)		A description of any assumptions, uncertainties and gaps in knowledge;	Chapter 8: Knowledge gaps and Limitations
31(2)(n)		A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 11: Environmental Impact Statement
31(2)(o)		An environmental impact statement which contains -	Chapter 11: Environmental Impact Statement
	(i)	A summary of the key findings of the environmental impact assessment; and	
	(ii)	A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	
31(2)(p)		A draft EMPr containing the aspects contemplated in Regulation 33;	Appendix G: EMPr
31(2)(q)		Copies of any specialist reports and reports on specialised processes complying with Regulation 32;	Appendix F: Specialist Studies Reports
31(2)(r)		Any specific information that may be required by the competent authority; and	All
31(2)(s)		Any other matters required in terms of sections 24(4)(a) and 24(4)(b) of the Act.	Not Applicable

3 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 ï 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.

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

3.2 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.

3.3 Barrier system

A waste classification was carried out on the ash and it was classified as a Type 3 waste ï low hazard waste (Appendix E). This type of waste requires disposal on a landfill with a Class C barrier system. Refer to Figure 3-1 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 3-2 for the proposed Class C barrier system.

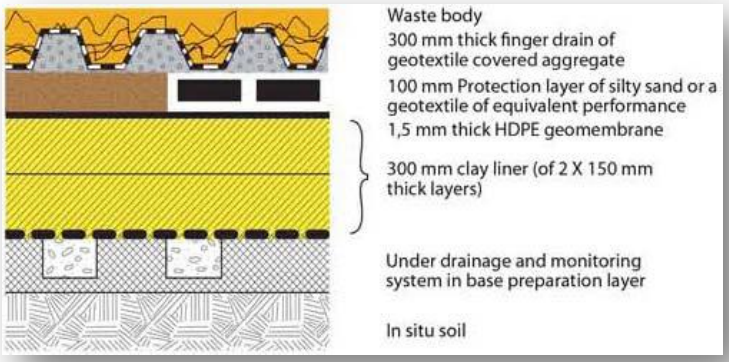


Figure 3-1: Typical Class C Landfill Barrier System

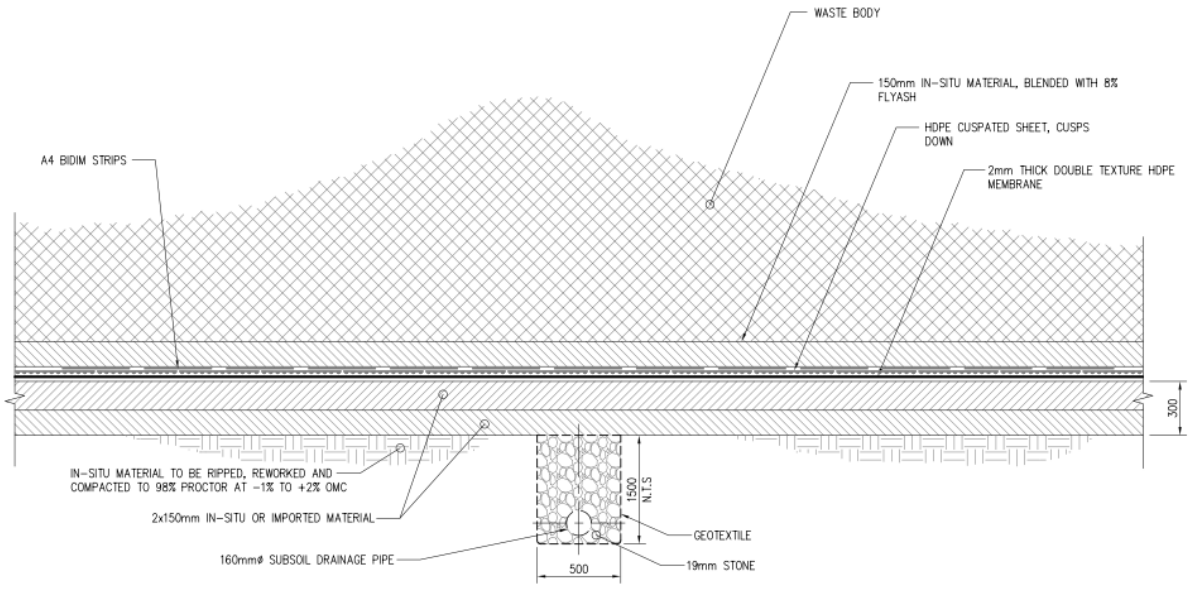


Figure 3-2: Proposed Class C Barrier System

3.3.1 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 manufacturerôs specifications where applicable.

3.3.2 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.

3.4 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 3-3 for an illustration.

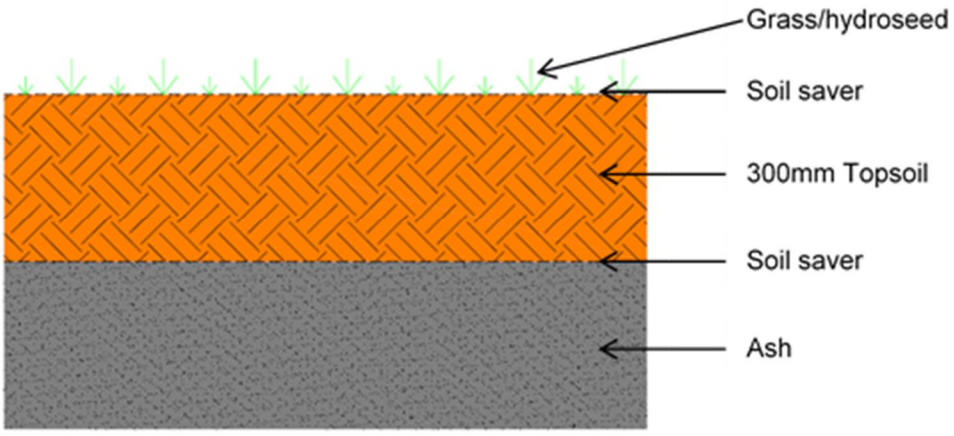


Figure 3-3: Section through rehabilitated ADF

3.5 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 daysôash 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 3-4 for a General Arrangement of the proposed project.

3.6 Project Phases

Table 3-1 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.

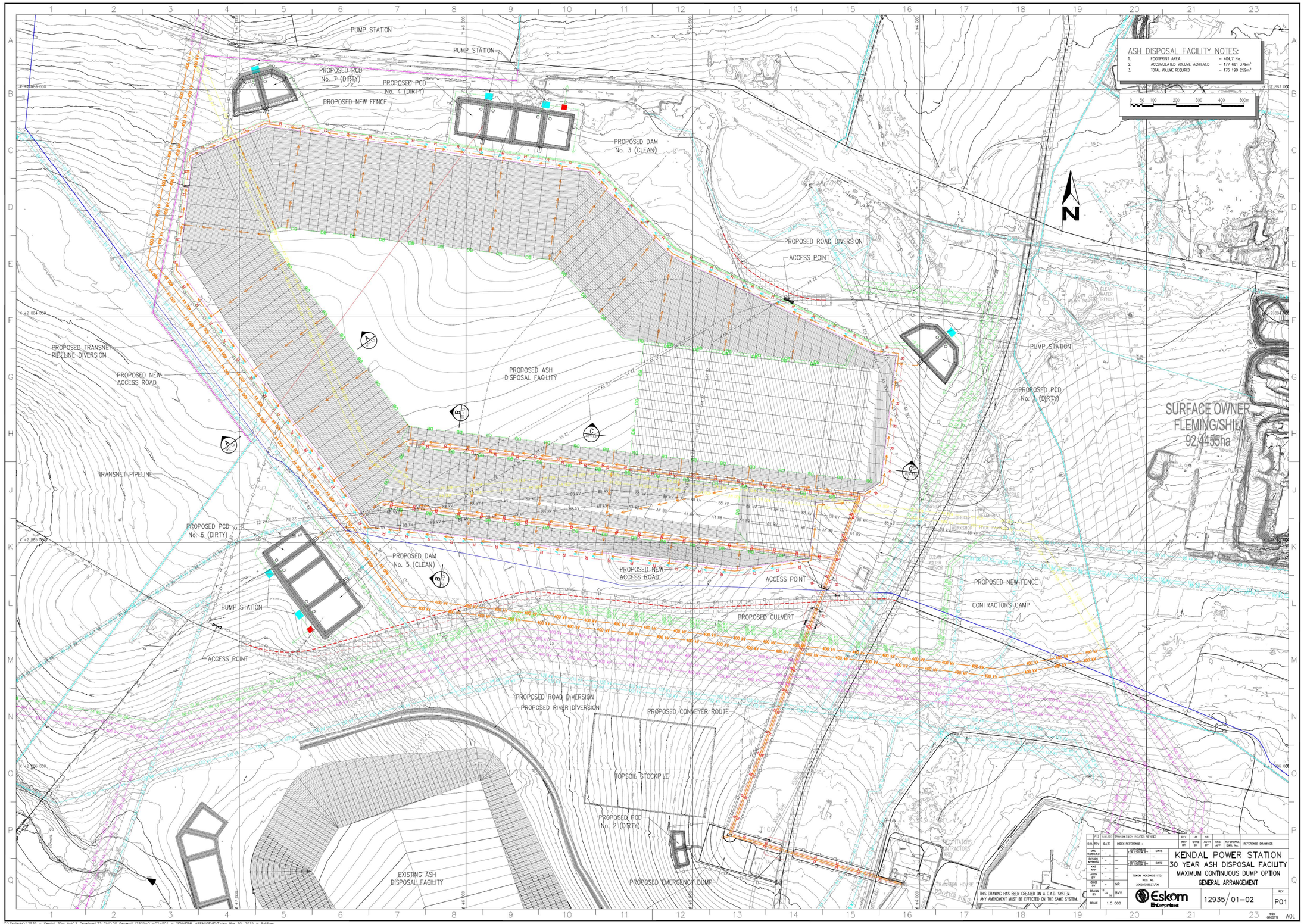


Figure 3-4: General Arrangement

Table 3-1: 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

4 ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

This part of the EIR is intended to provide a detailed account of all environmental legislation which may have bearing on the proposed project. Particular attention will be paid to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The NEMA[2] (1998) is regarded as South Africaôs Environmental Management Framework Act. An overview of sector specific environmental Acts which govern specific elements or project activities and the relevance on the proposed project will also be provided. In order to ensure that Environmental Management Best Practice Principles are adhered to, all guidelines which are relevant to the proposed project activities have also been taken into consideration during the preparation of this EIR. Determining the applicability of all environmental management legislation is also fundamental in ensuring that all required Environmental Authorisations are applied for and facilitating compliance with the applicable provisions of these Acts.

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

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

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

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

The National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended is the primary statute which gives effect to Section 24 of the Constitution. The Environmental Right contained in Section 24 of the Constitution also places responsibility on the EAP, Applicant and Competent Authority to ensure that this right is not infringed upon. The Sector Guidelines for Environmental Impact Assessment (2010) (Government Notice 654[3]) describe

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

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

These responsibilities include:

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

4.3 2010 EIA Regulations

Because the Kendal 30-year project was initiated and registered with the DEA in 2013, the EIA process is being completed in accordance with the (then active) EIA Regulations of 2010. This set of regulations (GN R 543 ï 545) have subsequently been repealed by the EIA Regulations of 2014 (GN R 982 ï 985).

Appendix B of the DEIR contained the original as well as updated Integrated Application Form for the Kendal 30-year Project. As there has not been any changes to the listed activities since submitting the DEIR, the application form is not re-submitted with this FEIR.

The Kendal 30-year project includes activities which trigger activities listed in the EIA Regulations Listing Notice 1 (GN R544) and Listing Notice 2 (GN R 545), therefore requiring Environmental Authorisation before they may be implemented. The proposed activities prompt a full Scoping and Environmental Impact Reporting Process. Each of the project activities as well as the corresponding listed activity is provided in Table 4-1.

Table 4-1: Description of Listed Activities

Note: Lines shaded in orange have been added to the original list of activities (Appendix B)

No.	Listing Notice	Listed Activity		Project Activity	Description
1.	Listing Notice 1 (GN R 544)	10	The construction of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	Re-alignment of power lines	Several power lines occur on the site and will have to be re-aligned. The following power lines require diversion: Å11 kV Distribution Power Line Å22 kV Distribution Power Line ÅTwo 88 kV Distribution Power Lines ÅTwo 132 kV Distribution Power Lines ÅTwo 400 kV Transmission Power Lines
2.	Listing Notice 1 (GN R 544)	12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 m^3 or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010;	Pollution Control Dams and Clean Water Dams	Seven new dams are being proposed, some of which will exceed 50 000 m^3 in capacity.

No.	Listing Notice	Listed Activity		Project Activity	Description
3.	Listing Notice 1 (GN R 544)	11	The construction of: (ii) channels; (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (x) buildings exceeding 50 m^2 in size; or (xi) infrastructure or structures covering 50 m^2 or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	ADF Project	The preferred Site (Site H) is located over several wetlands. The project will include different types of storm water management infrastructure (channels, dams etc.) and will also exceed 50 m^2).
4.	Listing Notice 1 (GN R 544)	18	The infilling or depositing of any material of more than 5 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shell grit, pebbles or rock of more than 5 cubic meters from: (i) a watercourse;	Working in and around wetlands	The construction activities required for the ADF Liner will inherently entail excavations within, and the removal / moving soil from the wetland. The volume of soil that will be removed by the excavations may exceed 5 m^3.
5.	Listing Notice 1 (GN R 544)	22	The construction of a road, outside urban areas; (ii) where no reserve exists where the road is wider than 8 metres	Deviation of D1390 and Access Road	The D1390 will be re-aligned. Also, an access road will be constructed around the ADF.
6.	Listing Notice 1 (GN R 544)	26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	ADF Project	At this point, no protected species have been found that require removal. However, should any such species be discovered during later phases the NEM:BA process should be followed to apply for their removal.

No.	Listing Notice	Listed Activity		Project Activity	Description
7.	Listing Notice 1 (GN R 544)	29	The expansion of facilities for the generation of electricity where: (i) the electricity output will be increased by 10 megawatts or more, excluding where such expansion takes place on the original development footprint; or (ii) regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more	ADF Project	The Kendal 30-year project can be considered as an extension of the existing KPS ï to prolong its lifespan. The new ADF will exceed 1 ha in size.
8.	Listing Notice 2 (GN R 545)	5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No.59 of 2008) in which case that Act will apply.	ADF Project	The project requires a WUL from the DWS for various water use activities,
9.	Listing Notice 2 (GN R 545)	6	The construction of facilities or infrastructure for the bulk transportation of dangerous goods ï (ii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.	ADF Project	The dry ash generated by the combustion of coal in the electricity generation process will be disposed of at the ADF.
10.	Listing Notice 2 (GN R 545)	8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.	Re-alignment of power lines	Several power lines occur on the site and will have to be re-aligned. The following power lines require diversion: Å11 kV Distribution Power Line Å22 kV Distribution Power Line ÅTwo 88 kV Distribution Power Lines ÅTwo 132 kV Distribution Power Lines ÅTwo 400 kV Transmission Power Lines

No.	Listing Notice	Listed Activity		Project Activity	Description
11.	Listing Notice 2 (GN R 545)	15[4]	Physical alteration of undeveloped vacant or derelict land for residential retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more.	ADF Project	The preferred site is located on active farm-land, but it may be considered ñundevelopedò The ADF project will exceed 20 ha in area.

[4] It should be noted that activity 15 under GN R 545 have been delisted in the 2014 EIA Regulations

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

All Waste Management Activities are regulated by the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) as amended and the regulations thereunder. Owing to the nature and composition of the ash that is generated by the combustion of coal, it is considered to be hazardous waste and as such also falls within the ambit of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA). A number of the project activities associated with the proposed Kendal 30 year ADF project are regarded as Waste Management Activities. As such these activities are governed by the NEM:WA (2008) and must conform to the provisions of the Act.

In order to regulate waste management activities and to ensure that they do not adversely impact on human health and the environment, the NEM:WA (2008) introduced the licensing of waste management activities. All waste management activities which are listed in GN R 921 (2013) in terms of the NEM:WA (2008) requires licensing from the Competent Authority before these activities may proceed.

The Kendal 30-year project was initiated and registered with the DEA before the 2013 Waste Regulations (GN 921) came into effect. Therefore, the previous waste Regulations (GN R 718) is being applied for as stipulated in Table 4-2 below.

Table 4-2: Description of applicable Waste Management Activities listed in Government Notice 718 (2009)

Category	Waste Management Activity		Project Activity	Description
Category B	9	The disposal of any quantity of hazardous waste to land.	ADF	The dry ash generated by the combustion of coal in the electricity generation process will be disposed of at the Kendal 30year ADF. owing to the nature and composition of the ash that is generated by the combustion of coal, it is considered to be hazardous waste.
Category B	11	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	ADF	The existing ADF will be expanded to into the north westerly direction. The expansion of the dry ash dump is required to provide sufficient capacity for the remaining life of the KPS.

Because this project includes both NEMA and NEM:WA activities, an integrated application process is being followed for an environmental authorisation and waste management licence.

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

The activities associated with the proposed Kendal 30-year ADF project trigger a number Water Uses that are defined in Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA)

(refer to Table 4-3). Accordingly, these Water Uses may not be undertaken without being granted a Water Use License from the DWA. In accordance with Sections 40 and 41 of the NWA (1998), a Water Use License Application Process will be carried out. The resultant documents from the WULA process will include completed WULA forms as well as a Technical Report. These documents will be submitted to DWS for review and decision making. Although a joint PPP is followed for the WULA within the EIA Phase, these two processes constitute separate applications and submissions are made to the respective Competent Authorities.

Table 4-3: Description of Water Uses

Water Use	Description
Section 21 (a)	Taking of water from a water resource.
Section 21 (b)	Storing of water.
Section 21 (c)	Impeding or diverting the flow of water in a water course.
Section 21 (i)	Altering the bed, banks, course, or characteristics of a watercourse. This includes altering the course of a watercourse (previously referred to as a river diversion).
Section 21 (e)	Engaging in a controlled activity: S37(1)(a) irrigation of any land with waste, or water containing waste generated through any industrial activity or by a water work.
Section 21 (g)	Disposing of waste in a manner which may impact on a water resource.

4.6 Additional Environmental Legislative Requirements

A number of additional legislation and guidelines may have a bearing on the proposed Kendal 30-year ADF project. Although authorisation in terms of these various acts may not necessarily be mandatory the requirements of these acts have been considered.

Table 4-4: List of additional applicable Environmental Legislation

Act	Applicable Section	Relevance to project
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Section 34: Structures	Structures which are older than 60 years may not be demolished without a permit issued by the relevant provincial Heritage Resources Authority. No structures older than 60 years were recorded in the Heritage Impact Study.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Section 35: Archaeology, palaeontology and meteorites	The findings of the Heritage Impact Study indicated that the possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site could not be ruled out. It is likely that the fossils may be present on the site and the probability of finding fossils during the excavation phase are high. Any archaeological or paleontological objects that are found on the site, must be reported to the provincial Heritage Resources Authority.

Act	Applicable Section	Relevance to project
		The discovered archaeological or paleontological objects may not be removed from its original position and damaged, destroyed or altered prior to a permit being issued by the heritage resources authority.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Section 36: Burial grounds and graves	Any graves that are discovered may not be destroyed, damaged, altered, exhumed or removed from its original position without a permit issued by SAHRA or a provincial heritage resources authority.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Section 38(1)(c): Heritage Resource Management	As the proposed development area may exceed 5000 m^2, with the submission of the Heritage Impact Assessment to SAHRA, the responsible heritage resources authority has been notified of the project and provided with information relating to the project. Authorisation to proceed with the development is required from SAHRA.
Hazardous Substance Act, 1973 (Act No. 15 of 1973)	-	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	• Section 53(1) • Section 53(2) • National list or ecosystems that are threatened and in need of protection (Government Notice 1002, published in Government Gazette 34809, 09 December 2011)	The development footprint falls within the Eastern Highveld Grassland which is classified (at a regional scale) as Endangered, Within Mpumalanga this vegetation type has an ecological status of Endangered-high. In accordance with Section 53(1) and 53(2) of the NEMBA (2004), any development that Involves loss of natural habitat in a listed ecosystem require Environmental Authorisation before such developments may proceed.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)	National Ambient Air Quality Standards, Government Notice 1210, Government Gazette 32816, 24 December 2009	The Air Quality standards published in Government Notice 1210 must be adhered to.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	Section 6	Provisions included in the act regarding the implementation of control measures for alien and invasive plant species must be adhered to.
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)	Section 8	General duties of employers to their employees.
	Section 9	General duties of employers and self-employed persons to person other than their employees.
Emalahleni Local Municipality Integrated Development Plan	-	The Integrated Development Planning is regarded as a tool for municipal planning and

Act	Applicable Section	Relevance to project
Final Draft 2014/2015		budgeting to enable municipalities to deliberate on developmental issues identified by communities. The IDP ppoints the Kendal Powers Station out as a significant contributor to the economy of Ogies and Phola and receives its coal from the adjacent Khuthala mine.
Emalahleni Local Municipality By-laws	By-laws	One of the Key Performance Indicators included in the Integrated Development Plan (2014/2015) includes the compilation and review of the following by-laws by June 2014: • Electricity, Rates Tariffs, Water. • Credit Control. • Street trading. • Management & Control of Informal. • Settlements & Land invasion. • Waste Management. • Recreational Resort. • Outdoor Advertising. • Nature Conservation. • Air Quality Management. Although the following by-laws have been drafted, these are not applicable to the proposed project: • Credit Control by-law • Electricity by-law.

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

- National Environmental Management Act, 1998 (Act 107 of 1998) Implementation Guidelines Sector Guidelines for Environmental Impact Assessment Regulations Government Notice 654 of 2010, published in Government Gazette 3333, dated 29 June 2010.
- National Environmental Management Act, 1998 (Act 107 of 1998) Publication of Need and Desirability Guideline in terms of the Environmental Impact Assessment Regulations, 2010, Government Notice 792 of 2012, Government Gazette 35746, dated 05 October 2012.
- Department of Water Affairs & Forestry, 1998. Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste.
- DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria
- Department of Environmental Affairs, 2011. A user-friendly guide to the National Environmental Management: Waste Act, 2008. South Africa. Pretoria.

- DEAT (2004) Criteria for determining Alternatives in EIA, Integrated Environmental Management, Information Series 11, Department of Environmental Affairs and Tourism (DEAT), Pretoria

5 PUBLIC PARTICIPATION PROCESS

The objectives of public participation in an EIA are to provide Interested and Affected Parties (I&APs)ôaccess to sufficient information in an objective manner so as to:

- During Scoping:
  - Assist I&APs to identify issues of concern, and providing suggestions for enhanced benefits and alternatives;
  - Contribute their local knowledge and experience; and
  - Verify that their issues have been considered and to help define the scope of the technical studies to be undertaken during the Impact Assessment.
- During Impact Assessment:
  - Verify that their issues have been considered either by the EAP and EIA Specialist Studies; and
  - Comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation is to ensure transparency throughout the process and to promote informed decision making.

5.1 Public Participation during Scoping Phase

Identification of Stakeholders

The identification of key stakeholders was done in collaboration with Eskom, the local municipalities and other organisations in the area. Having undertaken work previously in the area, Zitholele already had a stakeholder database that was used as a departure point for this project. The identification of stakeholders is on-going and is refined throughout the process. As the ñon-the-groundò understanding of affected stakeholders improves through interaction with various stakeholders in the area the database is updated.

The stakeholdersô details are captured in an electronic database management software programme (Maximizer) that automatically categorises every mailing to stakeholders, including the manual capturing of faxes and postal communication to those stakeholders without an e-mail address, thus providing an on-going record of communications - an important requirement by the authorities for public participation. In addition, comments and contributions received from stakeholders are recorded, linking each comment to the name of the person who made it.

According to the NEMA EIA Regulations, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and have been updated with the details of involved I&APs throughout the process. Please refer to Appendix C8.

Initiation of public participation

The opportunity to participate in the EIA was announced between 23 and 30 November 2012 as follows:

- Advertisements were placed in the following newspapers. Please refer to Appendix C1:

Table 5-1: Advertisements placed during the announcement phase

Newspaper	Date
Streeknuus	30 November 2012
Witbank News	30 November 2012
The Echo	30 November 2012
Springs Advertiser	29 November 2012
Citizen	28 November 2012
Beeld	28 November 2012

- Registered mail and e-mails to potentially affected identified stakeholders ï these include adjacent and surrounding landowners. A notification letter, map of the site, description of the proposed site and a comment sheet. Please refer to Appendix C2.

- A Background Information Document (BID) containing details of the proposed project, including a map of the project area, a registration / comment sheet and a letter of invitation to stakeholders to become involved was distributed via mail and email to all potential interested and affected stakeholders. Please refer Appendix C3.

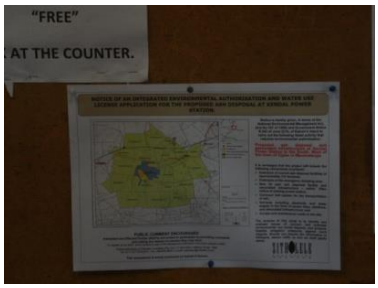
Figure 5-1: BID documents placed on site

- Site notice boards were positioned at prominent localities on 23 November 2012 on all roads surrounding the site area. These notice boards were placed at conspicuous places and at various public places (Figure 5-2). See Appendix C2 which provides a detailed register of where the site notices were placed (photos included) and a map indicating the placement of the notices.

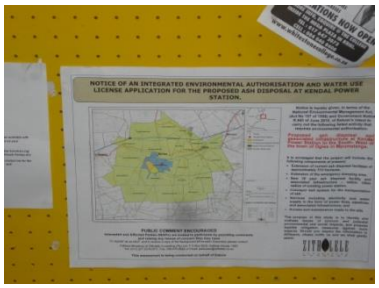
KPS Ash Plant

Road Outside Leeufontein

Ogies Public Library



Emalahleni Library



Kriel Public Library

Corner Groen & Sprinkbok Avenues, Kriel

Figure 5-2: Site notice boards were put up in the study area

- Stakeholders were also invited to visit the Zitholele/Eskom websites where all documents for public review are available ï http://www.zitholele.co.za/, www.eskom.co.za/eia.

Notification of land-owners

During the announcement phase of the Kendal 30 Year ADF EIA land owners within a 10 km radius that could possibly be affected by the project were notified, based on contact details obtained from the deeds registry. Personalised emails and letters, to those land owners without email addresses, were sent to land owners. Please refer to Appendix C5.

Comments and Responses Report

The issues raised in the announcement phase and DSR comment period was captured in a Comments and Responses Report (CRR). The CRR was be updated to include additional I&AP contributions that may be received throughout the EIA process. The following versions of the CRR has been compiled (every version was an update of the previous version):

- Version 1 appended to the DSR;
- Version 2 appended to the FSR;
- Version 3 appended to the DEIR; and
- Version 4 appended to the FEIR.

Please refer to Appendix C7 for the CRR.

Draft scoping report (DSR) - Obtaining comment and contributions

The DSR was made available for public review from **Thursday, 6 June 2013** to **Thursday, 18 July 2013**. The availability of the DSR for public review was announced in the following manner:

- Advertisements were placed in the following newspapers. Please refer to Table 5-2:

Table 5-2: Advertisements placed during the Scoping Phase

Newspaper	Date
Streeknuus	5 June 2013
Witbank News	5 June 2013
The Echo	6 June 2013
Springs Advertiser	5 June 2013
Citizen	5 June 2013
Beeld	5 June 2013

- Registered mail and e-mails to potentially affected stakeholders on the I&AP database ï these include adjacent and surrounding landowners. A notification letter, map of the site, description of the proposed site and a comment sheet. Please refer to Appendix C5.

The following opportunities were available during the Scoping Phase for comment and contribution by registered I&APs:

- Completing and returning the registration/comment sheets on which space was provided for comment:
- Providing comments telephonically, by email or per letter to the public participation office; and
- Attending public meeting that has been widely advertised (see table below) and raise comments there.

Table 5-3: Public meetings held during DSR review period

INTEREST GROUP	DATE	TIME	VENUE AND ADDRESS
Phola Community	Thursday, 20 June 2013	16:00	Phola Community Hall in Phola.
Public	Thursday, 4 July 2013	18:00	NG Church Hall, Ogies

The above mentioned meetings were held separately but contained and addressed the same information. The reason was to accommodate the needs, perceptions and availability of the different interest groups.

- Three separate Focus Group Meetings were held with I&APs:

  Focus Group Meeting 1:

Attendees: Ngankala District Municipality (DM) and eMalahleni Local Municipality (LM) officials

Date: Thursday, 20 June 2013

Time: 09:00 ï 11:00

Place: Ngankala DM offices

Focus Group Meeting 2:

Attendees: Representatives from potentially affected Mining Houses, NGOs and other interest groups

Date: Thursday, 20 June 2013

Time: 12:00 ï 14:00

Place: Ngankala DM offices

Focus Group Meeting 3:

Attendees: Landowners and potentially affected Mining Houses

Date: Thursday, 4 July 2013

Time: 14:00 ï 16:00

Place: NG Church Hall, Ogies

Issues relevant to the project will be considered and where necessary will be carried forward into the Impact Assessment phase.

This DSR was made available and distributed for comment as follows:

- Placed in public venues within the vicinity of the project area (these are listed in Table 5-4 below);
- Published on the Eskom and Zitholele websites;
- Mailed to I&APs who requested a copy of the report; and
- Copies were made available at the stakeholder meetings.

I&APs could comment on the report in various ways, such as completing the comment sheet accompanying the report, and submitting individual comments in writing or by e-mail.

Table 5-4: List of public places where DSR was available

Contact Location	Contact
Printed Copies	
Phola Public Library	013 645 0094
Ogies Public Library, 61 Main Street, Ogies	013 643 1150
Delmas Public Library	013 665 2425
Emalahleni Public Library ï 19 OR Thambo Street	013 653 3116
Kungwini Public Library	013 932 6305
KPS ï Security Reception	013 647 6002

Contact	Location	Contact
Electronic Copies		
Emmy Molepo	www.eskom.co.za/eia Kendal 30-year ash	011 800 4211
Patiswa Mnqokoyi	www.zitholele.co.za	011 207 2077
Patiswa Mnqokoyi	CD available on request via email from Zitholele Consulting.	Phone 011 207 2074 or send email request to patiswam@zitholel.co.za

Final Scoping Report (FSR)

Using the comments received from stakeholders the FSR was updated and finalised. All comments received were added to the CRR and attached to the FSR as Appendix C7.

The FSR was updated with additional issues raised by I&APs. The FSR was submitted to the Competent Authority (CA) DEA in August 2013 and to those I&APs who specifically requested a copy. All registered I&APs were informed of the submission of the FSR.

The DEA sent a letter dated September 2013 that accepts the FSR.

5.2 Public Participation during Impact Assessment Phase

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the DEIR and Environmental Management Programme (EMPr) is made available to the public for review and comments. I&APs was requested to comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The FEIR (this report) includes the CRR (Version 4), which lists comments/concerns/issues raised and recommendations made with an indication of where the issue is dealt with in the technical evaluations (main Report, Specialist Study Reports or draft EMPr), and the relevant findings. Stakeholders was notified of the availability of the DEIR and Draft EMPr for review and comments and was afforded an opportunity to engage with the project team at the public meetings held during the review period of the DEIR.

The public participation process undertaken ~~and to be undertaken~~ during the impact phase is outlined below.

EIA Newsletter

In August 2014, an EIA Newsletter was distributed to registered I&APs (e-mail, fax or post, depending on their preference of communication). The purpose of the EIA Newsletter aimed to provide registered I&APs with an update with regards to the EIA process, including environmental and technical tasks, and the public consultation still to be undertaken.

Important to note is that in the EIA Newsletter the four (4) developable sites, from the original nine (9) sites that formed part of the scoping phase, were listed. Also the reinstatement of site H was referred to in the EIA Newsletter. An updated locality map and a comment form was included in this communication. Please refer to Appendix C4).

The EIA Newsletter was also uploaded on Zitholeleôs website and the link was included in the EIA Newsletter.

Consultation with Key Stakeholders

From the start of the impact phase several focus group and/or one-on-one meetings were held with various key stakeholders. Please refer to Appendix C6 for copies of the minutes.

Table 5-5 below provides the list of the groups that formal presentations had been made to regarding the proposed project and minutes of these meetings were drafted. The information received at these meetings was of great value to the project team and it assisted the technical team with the preliminary design of the ADF as well as any possible realignment associated with the establishment of the proposed ADF on the preferred site.

The presentation done at the Eskom Triangle Community and Khayalethu Village was done in English and translated into Zulu by one of the team members present. After each topic presented in English, the information was then translated into Zulu. Several social issues were brought to the fore during the meetings which mainly falls outside this proposed projectôs scope of work. However, the Social Specialist who attended these meetings took cognisance of these.

At the meetings held with the Eskom Triangle Community and Khayalethu Villages, it was requested that monthly updates regarding the proposed project be provided to them. The method on providing the requested information was agreed to be via SMS. Two community representatives (Mr Dumisani Motha, Khayalethu Village and Mr Eric Mboneni, Eskom Triangle Village) were identified by the communities to receive these monthly updates. The two representatives will provide the community with the updated information. The monthly SMSs are included in Appendix C5.

Table 5-5: List of Local Communities, Mining Houses and Landowners Consulted

Community / Mining House / Landowner	Meeting Date
BHP Billiton (Khutula & Klipspruit Collieries)	28 August 2013
Shanduka Coal	10 September 2013
Ntshovelo Mining	13 September 2013
Wescoal Mining	4 November 2013
Anglo Coal, Anglo Central Services, Emalahleni	12 November 2013
Mbuyelo Coal, Rirhandzu Colliery, Mpumalanga	21 January 2014
Zibulo Colliery	03 February 2014
Kusile Mining, Eyethu Coal Head Office, Pretoria	24 February 2014
Eyethu Coal	21 August 2014
AFGRI, Centurion	06 October 2014
Mr H Prinsloo (Landowner: Farms Schoongezicht & Heuvelfontein)	13 October 2014
Eskom Triangle Community	29 November 2014
Khayalethu Village	

Ferret Coal	12 February 2015
Transnet Freight Rail Properties	02 March 2015
Transnet Pipelines	12 March 2015
Mr H Prinsloo (Landowner: Farms Schoongezicht & Heuvelfontein)	23 June 2016
Mr Thys Marais (Representative of Truter Farms)	23 June 2016

Site visits were undertaken by the public participation team within a 1km buffer from the EIA preferred Site Alternative H. The team met with individual community members and/or their representatives. Most of the discussions were conducted in Zulu as this was identified, and confirmed during the site visit, as the preferred local spoken amongst the community members. The communities / residents visited are listed in Table 8 below.

Table 5-6: List of Communities/Residents/Landowners Consultation during site visit

Community	Site Visit Date(s)
Wescoal Mining	06 January 2015
Makhosi Community	
Olympic Community	
Mr Harry van Biljon	
Mrs Louise Engelbrecht	
Kendal Policing Community Forum (KCPF)	15 January 2015
Councillors (Wards 28 and 30), Emalahleni Local Municipality	
Co-Operative Governance Traditional Affairs	

Consultation with Authorities

Various meetings with the DWA and DEA have been held during the project. Proof of this is attached in Appendix C9. The meetings held were as follows:

- 30 May 2013: DWS pre-application meeting;
- 14 August 2014: DWS site selection meeting;
- 29 January 2015: DWS Bronkhorstspruit meeting regarding drilling on Site H;
- 29 May 2015: DEA interim feedback meeting;
- 16 April 2015: DWS engineering meeting to present design; and
- 31 May 2016: DWS feedback on specialist studies.

The site visit reports, capturing the purpose, findings and comments during these site visits are attached as Appendix C6.

To add value to the public participation process and to ensure that as many I&APs in the vicinity of the EIA preferred ADF site (Site H) is informed, an EIA process notices were displayed on the general notice board at Kendal Village (opposite KPS in February 2015. Please refer to Appendix C4).

Project Status Notification

A Project Status Notification letter (dated 27 August 2015) were distributed to all registered I&APs on the project database and the purpose of this letter was to inform the I&APs that the project is still active but that it is being delayed because the team was awaiting a water use licence to undertake drilling work near the Site H Pan. This letter also served to close the gap between the EIA Newsletter (distributed in August 2014) and the envisaged date of the release of the DEIR i.e. March 2016.

Attached to this letter was an updated site layout map showing the size of the study area of approximately 404 ha in size. The map also indicates the proposed deviation of the D1390 road. Please refer to Appendix C4.

Issues Raised and addressed in Impact Phase

A well-defined Public Participation Process (PPP) is a process where the comments/concerns/issues and/or recommendations made by I&APs are considered and, where applicable, are addressed by the environmental specialist team. The following key issues were identified during the consultation process and attended to in this phase:

Table 5-7: Key Issues Raised and Addressed

Comment	Response in the DEIR & FEIR
Impact on mining, mineral and prospecting rights have been raised by the potentially affected Mining Houses around the KPS.	Various meetings were held with Mining Houses and correspondence with the DMR. Alternative sites associated with mining right applications were discarded during the impact phase. Refer to Chapter 7 of the FEIR, Appendix C6 (Minutes) and Appendix C7 (CRR)
Possible impact on Transnet servitudes.	Transnet Pipelines infrastructure will be rerouted at an additional cost to the project. Refer to Section 3.2 of the FEIR, Appendix C6 (Minutes) and Appendix C7 (CRR).
Impact on surrounding community members.	Dust is a cumulative impact as it is not only the ADF's possible impact, but also that of mining in the area and transport of coal on gravel roads. Refer to Chapter 7 of the FEIR, Appendix F1 (Air Quality Specialist Report) and Appendix C7 (CRR)
Productive agricultural land and existing farming practices	Refer to Chapter 7 of the FEIR, Appendix F7 (Agricultural / Soil Specialist Report) Appendix C6 (Minutes) and Appendix C7 (CRR)
Impacts to the surface water features such as the Wilge River, and groundwater resources, which is utilised by landowners in the area.	Refer to Chapter 7 of the FEIR, Appendix F9 (Surface Water Specialist Report) Appendix C6 (Minutes) and Appendix C7 (CRR)
Social issues raised by community representatives: • No electricity • No / limited water supply	The concerns raised regarding lack of electricity, water supply and sanitation are social issues related to issues the communities have with the Municipality. The project team informed the communities that these concerns can unfortunately

Comment	Response in the DEIR & FEIR
• Poor sanitation conditions • Possible job creation • Impact on livestock	not be addressed through the EIA process, but that it will be forwarded to the Social Specialist for their information and to the relevant Councillors. Regarding job creation / opportunities, it is anticipated that there will be no, or very limited job opportunities as Eskom will appoint a contractor to develop the new ADF and utilising their existing staff to maintain the new ADF. It is not envisaged that there will be a huge negative impact on livestock as most of the surrounding properties are commercial graze farming. Refer to Chapter 8 of the FEIR, Appendix F8 (Social Specialist Report) and Appendix C7 (CRR)
The relocation of the Triangle Community	Refer to Chapter 7 of the FEIR, Appendix F8 (Social Specialist Report) Appendix C6 (Minutes) and Appendix C7 (CRR)

Draft Environmental Impact Report

Using the comments received from stakeholders raised during the scoping phase, submitted on the EIA Newsletter and Project Status Notification letter, the DEIR was updated and finalised. All comments received were added to the CRR and attached to the DEIR as Appendix C7.

The DEIR and Draft EMPr will be made available for public review and comment from **Wednesday, 24 August 2016** to **Monday, 10 October 2016**. A group of I&APs were given until the 24th of October 2016 to submit their comments, as the notification email did not go out successfully to this group at the start of the review period. All I&APs registered on the projectõs database was notified of the availability of the DEIR and Draft EMPr. The availability of the DEIR, as well as the details of the public meetings, was advertised in the same newspapers as being used throughout the EIA process. The proof of these advertisements is included in the Public Participation Appendices that will form part of the FEIR.

The registered I&APs attention was once again drawn to the fact that this is an Integrated Environmental Authorisation which includes Environmental Authorisation process for the:

- Environmental Impact Assessment Application;
- Waste Management License Application; and
- Water Use License Application.

and that comments and inputs are requested, and important, on all three (3) these applications.

The DEIR and Draft EMPr was made available at the following public places. The documents were also available in electronic format on Zitholeleõs website.

Table 5-8: List of public places where DEIR and Draft EMPr was available for review

Printed Copies	
Venue	**Contact Details**
Phola Public Library, Qwabe Street, Phola Location	Tel: 013 645 0094
Ogies Public Library, 61 Main Street, Ogies	Tel: 013 643 1027
Emalahleni Public Library 28 Hofmeyer Street, Emalahleni	Tel: 013 690 6231
Kusile Power Station Office, Wilge Village	Tel: 013 699 7004
ELECTRONIC COPIES	
Zitholele Consulting Website	http://www.zitholele.co.za/ea-wml-for-30yr-ash-disposal-facility-at-kendal-power-station
~~Tricia Njapha~~ Tania Oosthuizen	Available on CD per written request from: E-mail: publicprocess@zitholele.co.za Tel.: 011 207 2060

Advertisements were placed in the newspapers listed in Table 5-2: Refer to Appendix C1

Table 5-9: Advertisements placed during the EIA Phase

Newspaper	Date
Streeknuus	26 August 2016
Witbank News	26 August 2016
The Echo	26 August 2016
Springs Advertiser	25 August 2016
Citizen	25 August 2016
Beeld	25 August 2016

Invitation to Public Meetings

All registered I&APs, including the key stakeholders such as the commenting authorities/organs of state, was invited to attend any one of the three public meetings scheduled to take place as follows:

Table 5-10: Public Meeting information

Date	Time	Venue
Wednesday, 21 September 2016	9:00 ï 11:00	Kopanong Hall, Kendal (opposite KPS)
	12:00 ï 14:00	
	16:00 ï 18:00	

The invitations were extended as per registration on the project database i.e. those with e-mail addresses received their invitation per e-mail, those without an e-mail address were notified per sms. ~~but with a fax number, will receive their invitation per fax, and those without an e-mail address or fax number will receive their invitation by post~~.

The above-mentioned meetings were held separately but contained and addressed the same information. The reason for having separate meetings was to accommodate more people with different availability during the day. ~~the needs, perceptions and availability of the different interest groups~~. The Executive Summary was translated into Zulu and was made available on the day of the public meetings.

The availability of the DEIR for public review as well as the details of the public meetings were combined in the advertisements placed (Table 5-10) in and the notifications sent.

The proof of these advertisements are included in Appendix C1 of this FEIR.

Minutes of Meetings

The minutes of the public meetings ~~to be~~ held during the review period of the DEIR, is included in Appendix C6 in the FEIR ~~after it has been distributed to the attendees for verification~~. The minutes were delivered in hard copy to the communities on Tuesday, 18 October 2016.

Comments and Responses Report

All comments received during the review period of the DEIR and those raised at the public meetings has been updated in the Comments and Responses Report version 4, and ~~will be~~ included in Appendix C7 of the FEIR submission.

Final Environmental Impact Report

Once the FEIR and Final EMPr are submitted to the DEA, a letter will be sent to I&APs registered on the projectôs database, indicating that the reports have been submitted for decision-making. The notification will also indicate where the documents are available for review and comment, to who their comments need to be submitted to and will outline the next steps in the EIA process. ~~Proof of this notification will be included in Appendix C4 the FEIR.~~

Announcement of Environmental Authorisation

Once the DEA issues a decision, Zitholele Consulting, on behalf of Eskom Holdings SOC Ltd, will, in writing and within 12 (twelve) days of the date of the decision (as per NEMA, EIA Regulations, 2010 10(2) requirements), notify registered I&APs of the decision. ~~A copy of the notification letter (and appendices) will be included in Appendix C4 of the FEIR~~. The DEAôs reasoning, as set out in the Environmental Authorisation, will be summarised in the notification letter as well as in the advertisement. The DEAôs letter and the Environmental Authorisation (EA) will be attached to the notice and electronic copies will be uploaded on Zitholele Consultingôs website. The website link will be provided in the notification letter as well as the advertisement.

Any additional requirements set out by the DEA in the EA will be included in both the I&AP notification letter and the advertisement. The opportunity for I&APs to lodge an appeal against the DEAôs decision will be explained in the I&AP notification letter and the advertisement. A copy of the appeal process will be attached as an Appendix to the I&AP notification letter and the

advertisement will provide Zitholele Consulting's website link where an electronic copy of the appeal process can be obtained.

In addition to the notification letter to the registered I&APs and in compliance with Regulation 10(2)(d), Zitholele Consulting, on behalf of Eskom Holdings SOC Ltd, must, within 12 days of the date of the decision, place a notice in the same newspaper(s) used in the PP Process which are the:

- Streeknuus
- Witbank News
- The Echo
- Springs Advertiser
- Citizen
- Beeld

~~Proof of placements of the advertisement will be included as Appendix C1 of the FEIR~~.

All possible means will be taken to place the EA advertisements within the timeframes stipulated in the Environmental Impact Assessment Regulations, 2010. However, it needs to be noted that four (4) of the above-mentioned newspapers are local / community newspapers and depending on the date the authorisation is received by the DEA and/or Client, there is a risk that the EA might not be placed in one or more of these local / community newspapers because of their deadline dates for submission of approved material.

6 ALTERNATIVES ASSESSMENT

The optimal goal in establishment of a waste disposal facility and associated infrastructure (such as conveyors, pipelines and return water dams) is to effectively minimise the negative environmental and social impact while ensuring safety, reliability, and cost savings for the facility.

A structured approach was utilised to ensure that the approach for consideration of alternatives is defensible. Initially, the project team determined the need and motivation for the proposed project (NEMA, 1998). Once the need was established, potential solutions that can fulfil that need were identified; at this point no alternative solutions had been excluded. When dealing with waste related projects, this discussion typically is structured around the waste hierarchy (National Management Waste Strategy [NMWS], 2011) as shown in Figure 6-1.

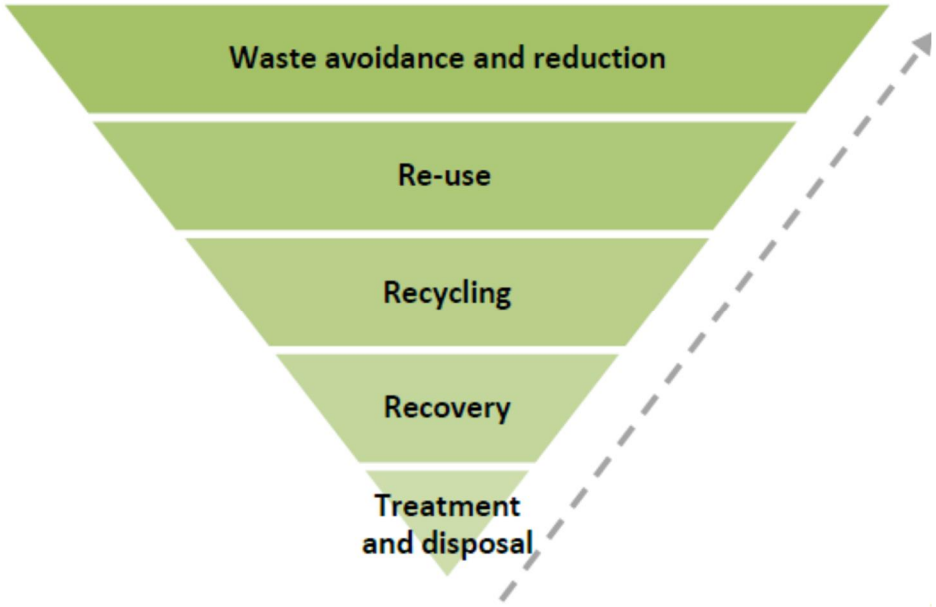


Figure 6-1: Waste management hierarchy (NMWS, 2011)

The essence of the approach is to group waste management measures across the entire value chain in a series of steps, which are applied in a descending order of priority. The foundation of the hierarchy, and the first choice of measures in the management of waste, is waste avoidance and reduction. Where waste cannot be avoided, it should be re-used, recycled, treated, recovered, or treated (NMWS, 2011). Waste should only be disposed of as a last resort. Remediation on the other hand is part of the rehabilitation process and is on-going until the decommissioning of the power station.

6.1 Alternative Waste Management Solutions

Based on the information available at the time of site identification, the following alternative solutions to the ash waste stream exist:

- Avoidance and Minimisation:
  - None. KPS has been in operation since 1993, therefore the generation of the ash waste stream is unavoidable.

- Recovery / Recycling / Re-use:
  - Use of ash in construction activities i.e. as aggregate in road construction, or as a cement extender;
  - Other applications include cosmetics, toothpaste, kitchen counter tops, floor and ceiling tiles.
- Treatment
  - No feasible alternatives are currently available to treat the ash waste.
- Disposal
  - Disposal to a suitably designed ADF.
- Remediation
  - Concurrent rehabilitation and capping of the new facility at the end of life.

Due to the large volumes of ash that will be generated it has been concluded that a dry ADF will be required, even with the implementation of all the other alternatives.

6.2 Alternatives specific to the ADF

6.2.1 Introduction

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

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

Further, in terms of NEMA and the EIA Regulations, feasible and reasonable alternatives have to be considered within the Environmental Impact Assessment, including the ñNo Goô option. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors. Feasible and reasonable alternatives identified are discussed in more detail below.

6.2.2 Desktop comparative assessment of site alternatives

Site Identification and Screening

A detailed site screening and identification process was undertaken in May 2013 to identify the most feasible site areas within a maximum radius of 10 km around KPS. This report is attached in Appendix D and was based on desktop information.

A four phased approach was used to attain the most feasible sites within the study area. This included:

1. Identification of the study area;
2. Defining the developable areas;
3. Undertaking an environmental, social and technical site screening exercise; and
4. Rating and ranking of the identified site areas according to the identified site sensitivities (Overlay analysis).

Identification of the study area

The study area was determined by identifying all farm and erf portions potentially affected within a 7 km radius from the KPS. A maximum distance of 10 km was investigated after realisation that the constraints in the study area of 7 km may not provide a feasible number of potential sites (Figure 6-2).

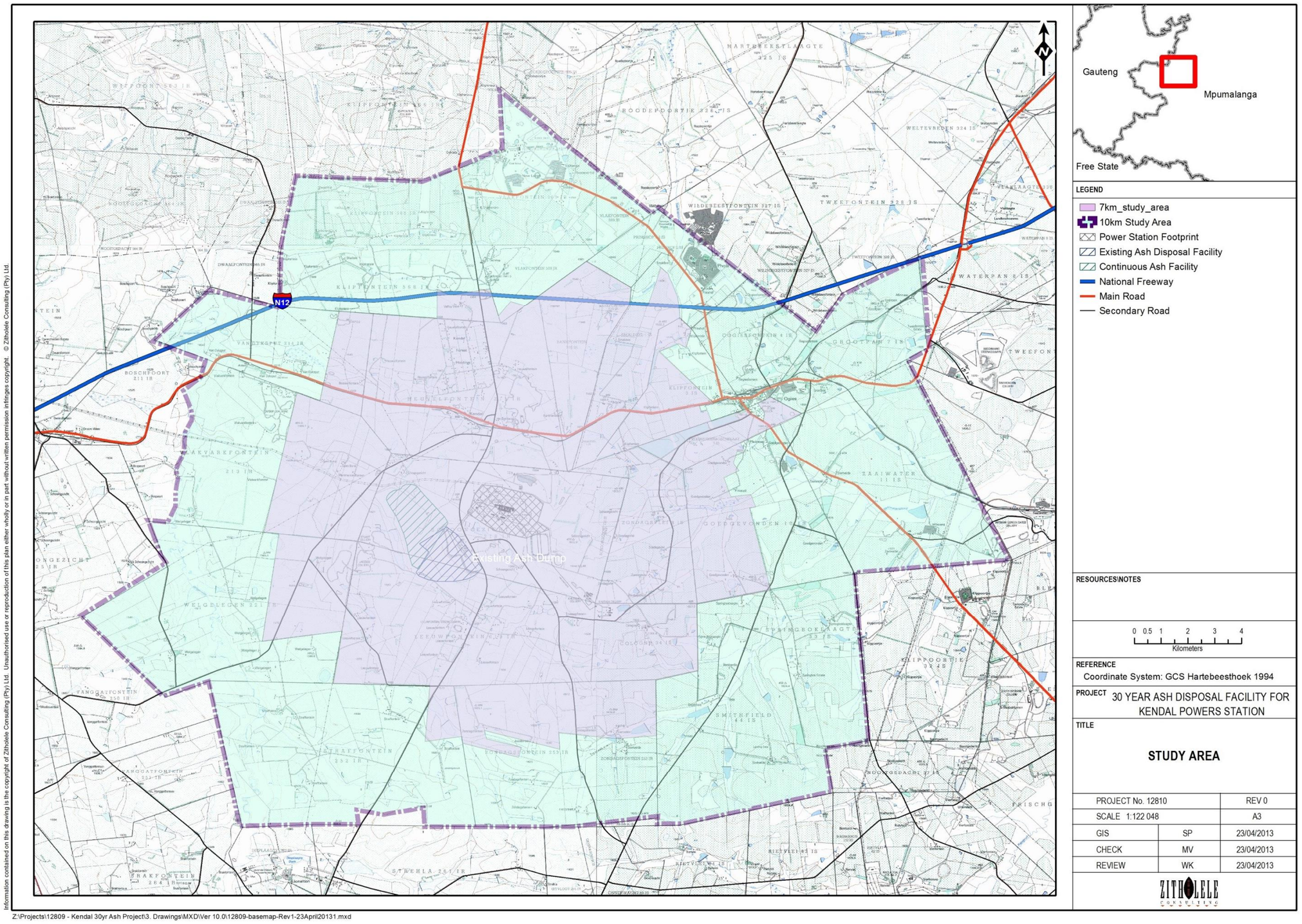
Defining the developable area (Negative mapping)

The next step in the process was to define the developable areas. This was done by using negative mapping in such a way as to exclude all areas within the study area that conflict with the proposed development. A draft list of ñLimiting Factorsò was drawn up and is shown in Table 6-1 below.

The preliminary desktop assessment of the study site from existing high-level environmental, social and cultural GIS layers, and Google Earth Imagery and 1:50000 topographical maps indicated that the following features were not detected within the study area:

- Cemeteries;
- Churches;
- Military Facilities;
- Known Archaeological sites;
- Monuments, and heritage and culturally significant areas; and
- Protected Areas and Parks.

The following No-Go areas where no ash may be placed were identified from the outset of the exercise:



Z:\Projects\12809 - Kendal 30yr Ash Project\3. Drawings\MXD\Ver 10.0\12809-basemap-Rev1-23April20131.mxd

Figure 6-2: Study area for the Kendal 30-year ADF

- New Largo footprint, including a 100 m buffer;
- N12 National Road, including a 100 m buffer;
- Rail reserve across the study area, including a 50 m buffer;
- Wilge River, including a 500 m buffer; and
- High density residential areas ï Wilge settlement, Phola settlement, Ogies and New Largo settlement, including a 100 m buffer.

After exclusion of the No-Go areas above, the remaining area was subjected to a negative mapping exercise. The objective of the negative mapping exercise was to identify important features (environmental, social and technical) in the landscape that should not be impacted by the proposed disposal facility. The GIS layers containing these features are shown in Table 6-1.

In the first instance the feature footprint and substantial buffer for each feature were excluded from the developable area layer in the negative mapping exercise. The buffer width was informed either by legislation, for example the 500 m buffers around wetlands and rivers as stipulated by the National Water Act or existing guidelines and documentation for example pertaining to servitude widths for roads and transmission lines, or dictated by best practice and experience of the environmental assessment practitioner.

The philosophy applied to the first iteration was thus that if sufficient areas of suitable sizes could be identified, most of the sensitivities and important features in the landscape would already have been avoided. On the other hand, if no areas could be identified, then the buffers of selected features would be reduced and potential areas again investigated. With each iteration the buffers around the landscape feature would be reduced until an assigned minimum value for each feature is reached. For some features such as minor roads and transmission lines, it was assumed that these could be relocated if no other alternatives existed, however for rivers and wetlands it was assumed that they cannot be relocated. Four iterations were investigated before sufficient number and size developable areas were identified.

The following iterations of the negative mapping took place:

- Iteration 1 ï Buffers as per Table 6-1, no suitable areas were identified;
- Iteration 2 ï Farmsteads, schools, powerline and roads buffers removed, no suitable areas identified;
- Iteration 3 ï Built buffers reduced to 100 m, 1 potential site, 1 combination site (2 smaller areas) were identified; and
- Iteration 4 ï Wetland and river buffers reduced to 100 m, several potential areas.

Table 6-1: Areas of avoidance. Red items indicate the identified No-Go areas.

Natural Environment				
Layer	**Iteration 1**	**Iteration 2**	**Iteration 3**	**Iteration 4**
Wilge River	***500 m buffer***			
Rivers / Streams	500 m	500 m	500 m	100 m
Wetlands / Dams	500 m	500 m	500 m	100 m
Red Data Species	100 m	100 m	100 m	100 m
Protected areas and parks	None in study area			
Social Environment				
High density residential areas	***500 m buffer***			
Farmsteads	1 km	☒	☒	☒
Schools	1 km	☒	☒	☒
Cemeteries, Churches, Monuments, and heritage and culturally significant areas	Not identified in study area from high level scan			
Built Environment / Engineering Requirements				
New Largo footprint	***100 m buffer***			
Open Pits	100 m	100 m	☒	☒
Undermined Areas	100 m	100 m	☒	☒
Richards Bay Rail	***50 m buffer***			
Other Railway Lines	50 m	50 m	☒	☒
N12 National Road	***100 m buffer***			
Tarred Roads	100 m	☒	☒	☒
Farm Roads	100 m	☒	☒	☒
Overhead Power lines	Servitude	☒	☒	☒
Gas Pipeline	Servitude	☒	☒	☒
Water Pipeline	Servitude	☒	☒	☒
Conveyor Belt	50 m	☒	☒	☒

In order to determine the potential footprint requirements of a potential ash disposal site, the following technical specifications were assumed:

- Ash production would continue in the range of 576 223 m^3 per month;
- Total ash produced over the life of the ADF would be in the order of 256 million m^3;
- The maximum design life of the facility would be 37 years; and
- The facility side slopes should be 1:5.

Using the technical specifications above, a minimum and maximum facility footprint scenario was developed by the technical team. Assuming a facility height of 50 m, which has proven feasible at other dry ash disposal facilities in the region, the maximum footprint scenario would require a facility footprint of approximately 770 ha. For the minimum footprint scenario, a maximum height of 100 m would require a facility footprint of approximately 520 ha. The viability of the minimum

footprint scenario is however dependant of the underlying geotechnical conditions in the study area. In both these scenarios the calculated facility footprints did include 15 % additional area to allow for topography variability, and additional 50 ha to house return water dams, roads, conveyor alignment, site camp, etc.

The negative mapping exercise identified nine potential developable areas within the study area as shown in Figure 6-3. Site area A was fatally flawed at this stage due to the insufficient size of the area.

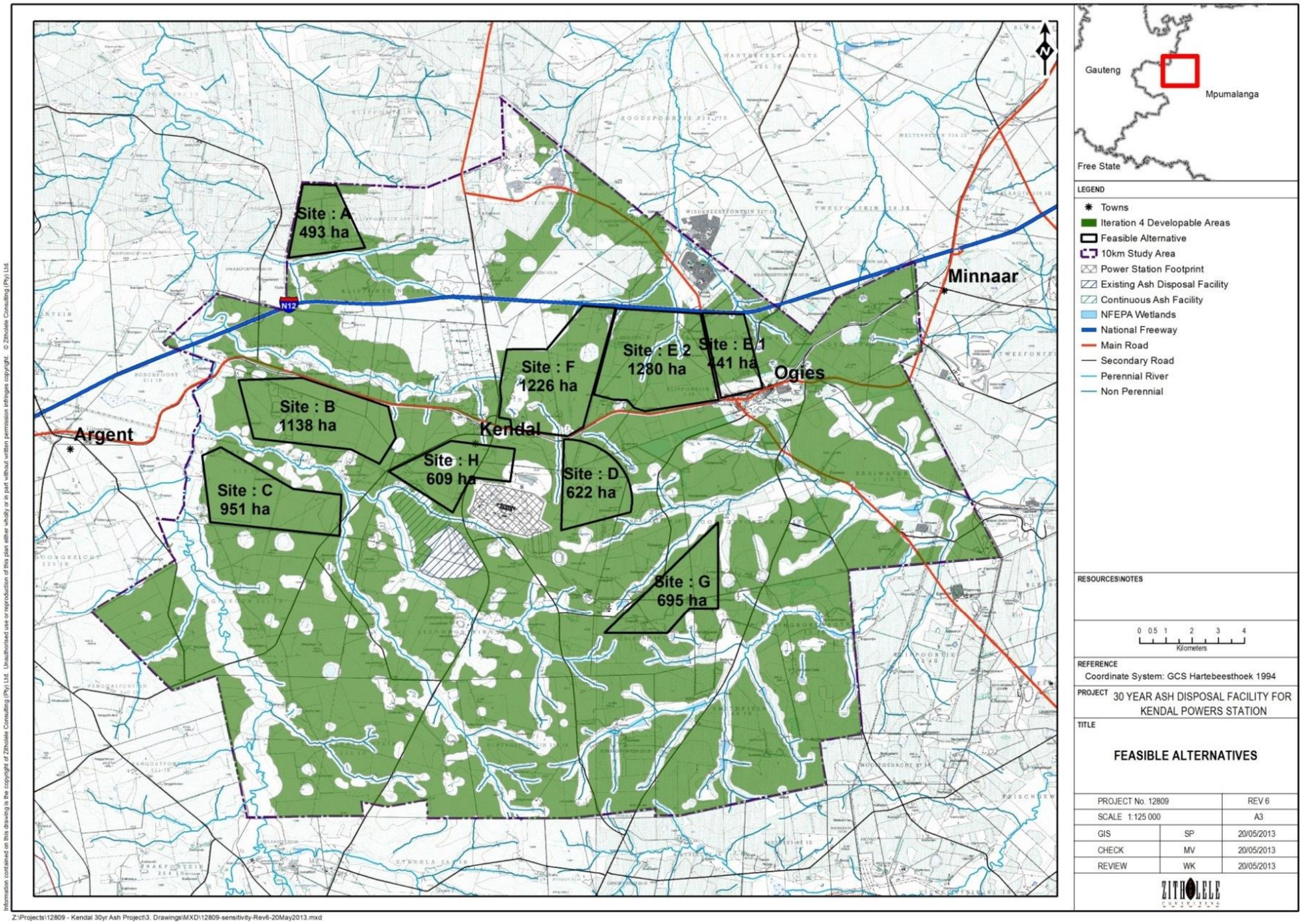


Figure 6-3: Potential feasible sites identified during the site identification process

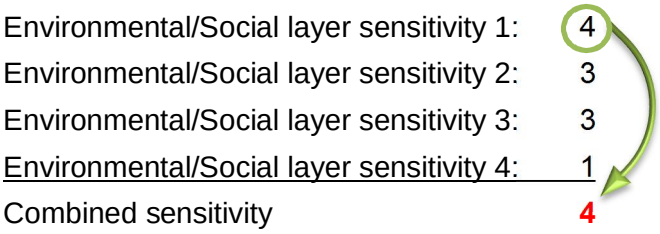
Environmental, Social and Technical Sensitivity Analysis

Each of the developable areas identified were rated according to their environmental and social sensitivity, and their technical / geotechnical suitability. Several environmental and social layers were used to calculate the environmental and social sensitivity of the proposed developable areas. These layers can be viewed in the full site identification report included in Appendix D. The sensitivity of the features in each layer was rated according to a rating scale ranging from 1 to a maximum of 5. The rating scale is provided in Table 6-2 below.

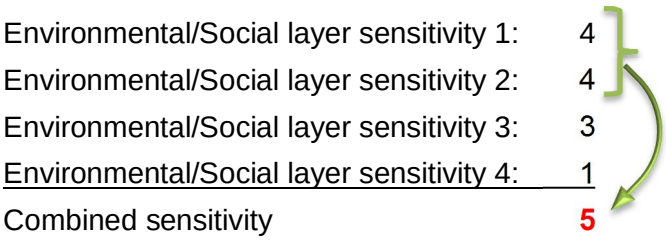
Table 6-2: Sensitivity rating scale used for rating of the site elements

Rating	Description
1	Very Low sensitivity
2	Low sensitivity
3	Moderate sensitivity
4	High sensitivity
5	Very High sensitivity

In the next step of the sensitivity analysis, the rated layers were overlaid on top of one another in a Geographical Information System package (ArcGIS 10.1). Where several components overlaid the same geographical area, the highest sensitivity rating of all of these layers was assigned to the particular area (or polygon). In instances where the highest rating was shared between 2 or more layers, the overall sensitivity rating of the area (or polygon) was taken to the next level to ensure that the individual sensitivities in each layer translated into a cumulative higher sensitivity. This is described in a simplified manner below.



However, with 2 or more sensitivity layers with the same rating the combined rating is as follow:



The result of the sensitivity analysis includes a separate sensitivity layer for the environmental and social components. The environmental and social sensitivity layer was subsequently ñclippedò with the developable areas layers to exclude all the No-Go areas identified at the start of the exercise.

Overlay analysis

During the overlay analysis the sensitivities within the identified areas was considered. The environmental and social sensitivity layers were ñclippedò with the identified areas and the highest sensitivity per site element was determined for each site element.

The ratings per site element were summarised in a table format where the un-weighted score represented the sum of all the sensitivity ratings and the weighted scores represented the sum of all the sensitivity ratings after a weighting per element had been factored into each rating.

Based on the combined ratings for the environmental, social and technical elements, and further discussion with the specialist and Eskom technical teams the following site areas were identified (in order of feasibility) as the most feasible site alternatives to be investigated further during the impact assessment phase:

1. Site area C;
2. Site area F;
3. Site area D; and
4. Site area B.

6.2.3 Field verification and focussed public participation findings

Following the site identification (desktop) study of May 2013, specialist studies were commissioned on the three preferred sites (Sites B, C and F). Field verification and further focussed consultation subsequently identified that Site D is 70% undermined and therefore this site was eliminated from further investigation.

Additional findings from specialist studies and site investigation concluded that large sections of Sites B, C and F were being mined or earmarked for future mining. The information gathered on the mining rights status and prospects on the sites was concluded in January 2014 and represented in Table 6-3 to Table 6-5 and Figure 6-4. At that stage, Site H had not yet been re-introduced.

In an attempt to gain a better understanding of the mining situation in the area, Zitholele undertook extensive consultation with the relevant mining houses and held meetings with all of those mining houses affected between 2013 ï 2015 as explained in more detail in Chapter 5 of this DEIR. It became apparent that the mining situation was very dynamic / fluid with the situation changing every couple of months.

The full suite of specialist studies (baseline) was nevertheless completed on Sites B, C and F.

Table 6-3: Mining Information available for Area B as on January 2014

Farm Name	Portion(s)	Mining House	Mine Name	Status	Source of Information
Vlakvarkfontein 213	3, 5 & 13	Ntshovelo Mining	Vlakvarkfontein Colliery	Mining Right on portions 3 & 5. Mining Right application for portion 13	Meeting with Theuns Botha (Mine Manager)
Vlakvarkfontein 213	2, 12 & 16	WesCoal	Intibane Colliery	Mining Right and active mining (aerial photo) on portions 2 & 12	Meeting with Martin Bartle (Managing Director)

Table 6-4: Mining Information available for Area C as on January 2014

Farm Name	Portion(s)	Mining House	Mine Name	Status	Source of Information
Vlakvarkfontein 213	7, 8	Anglo Coal	Zibulo Colliery	Mining Right on portions 7 & 8. No active mining.	Initially communicated by DMR. Confirmed by Leanard Durrow (Survey Manager)
Vlakvarkfontein 213	4, 14 & 15	Mbuyelo Goup	Rirhandzu Colliery	Mining Right. Active Mining.	Hydrogeological Report
Vlakvarkfontein 213	12	WesCoal	Intibane Colliery	Mining Right on portion 12. No active mining.	Meeting with Martin Bartle (Managing Director). No active mining observed on portion 12 based on aerial photo (flown in Sep 2013).

Table 6-5: Mining Information available for Area F as on January 2014

Farm Name	Portion(s)	Mining House	Mine Name	Status	Source of Information
Bankfontein 216	7, 10 & 11	Anglo Coal	New Largo Colliery	Future extension of New Largo	Meeting with Leanard Durrow (Survey Manager)
Heuvelfontein 215	96 & 97	WesCoal	Khanyisa Colliery	Mining Right. Active and previous Mining.	Hydrogeological Report
Bankfontein 216	17	BECSA	Klipspruit Colliery	Mining Right on portion 17. Active and previous Mining.	Meeting with Johan Muller and Derick Korff No active mining observed on portion 12 based on aerial photo (flown in Sept 2013).
Witklip 291	0	JustCoal	Kendal Colliery	Mining Right on portion 0	Rough map received from Anglo Coal.

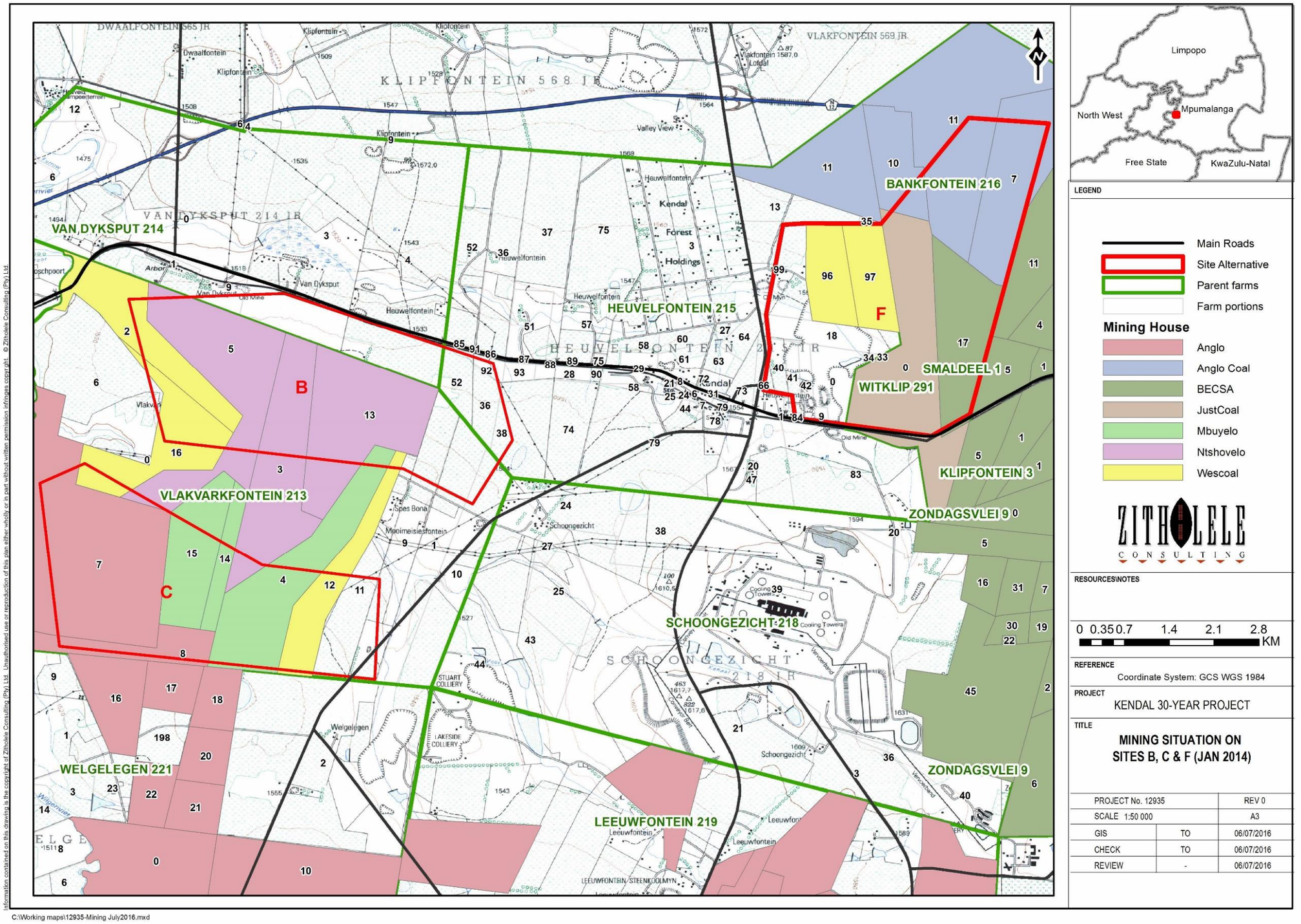


Figure 6-4: Mining Areas per Colliery Name as on January 2014

Re-introduction of Site H

Based on the mining information obtained through the field work and focussed public participation study, the need to include another site alternative, which is not earmarked for future mining was apparent.

Site H, which was identified as one of the top nine sites in the Site Identification and Screening study of May 2013 was re-introduced to the project at that stage. Site H, is located largely on Eskom owned land, as is shown in Figure 6-5. Site H was also the alternative closest to the KPS.

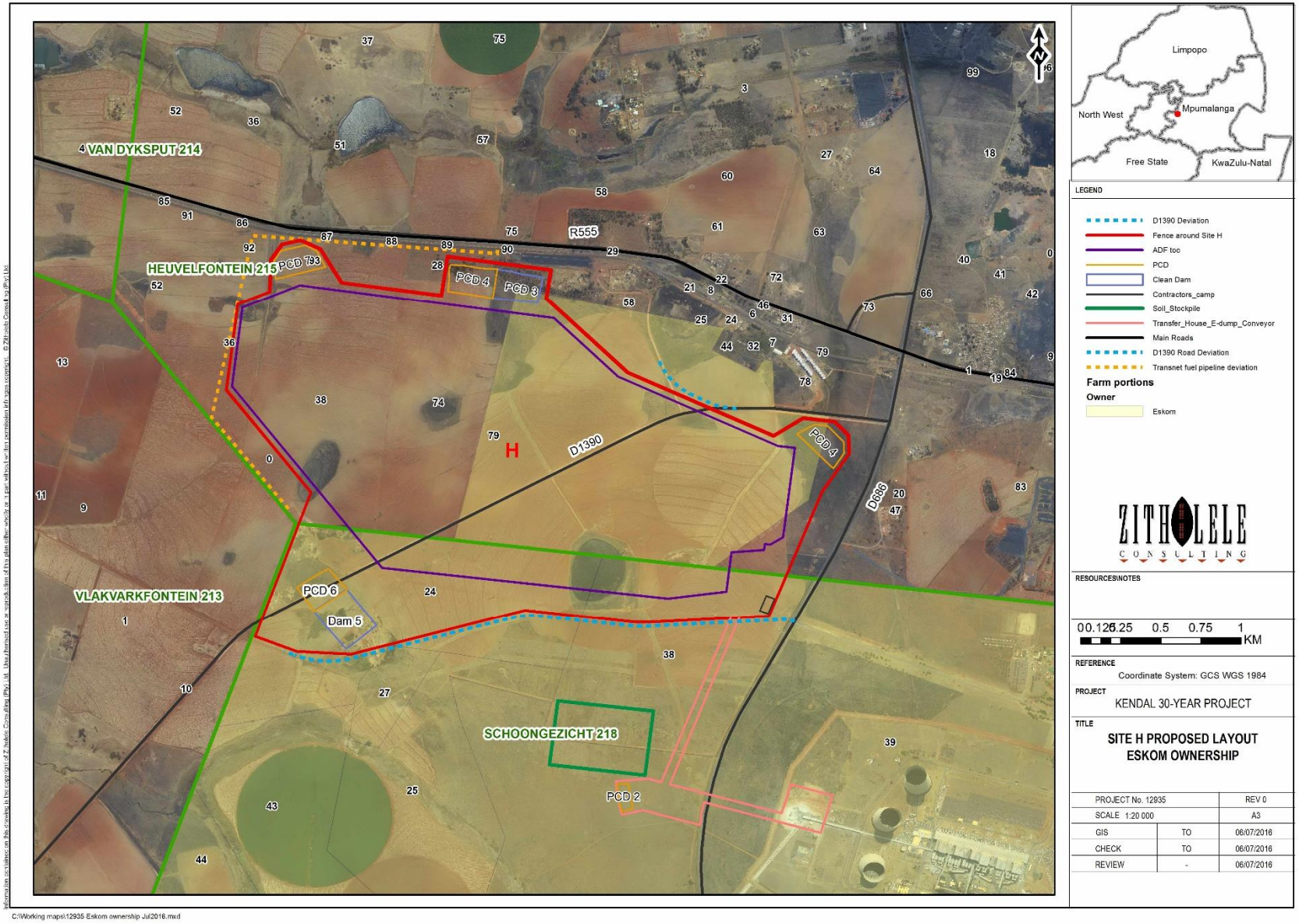


Figure 6-5: Eskom ownership of Site H

6.2.4 Design Alternatives

Optimisation of Kendal Continuous Project

The existing ADF for KPS will be extended to as part of the Kendal Continuous ADF Project. This facility will be extended and will be able to receive ash until end of 2031[5] and thereafter a new site will be required in order to receive ash up to the end of 2058.

The Kendal Continuous project was optimised in order to operate for as long as possible, thereby making the lifespan and size of the Kendal 30-year facility as small as possible.

Design interventions that were included in the Kendal Continuous project includes a stream diversion to allow the Continuous facility to extend further north than it would have without the diversion.

Footprint optimisation and multi-stacking

A further design alternative includes the optimisation of the 30-year ADF footprint through detailed and innovative conceptual engineering of the ADF. The geotechnical findings have proven to be favourable for the ADF height to be increased to 75 m. The existing and Continuous ADF is approximately 63 m high.

Single facility vs. Multiple facilities

A single facility is more desirable because it ultimately reduces the footprint requirement for the entire waste stream. In addition, it is more cost effective. However, multiple facilities were considered in the event that a single facility of sufficient size could not be found.

Minimum standards

The design requirements for the ADF were that of GN 634, 635 and 636 ñWaste Regulationsò promulgated in August 2013 under the National Environmental Management: Waste Act (Act 58 of 2008).

6.2.5 The "No Go" Project Alternative

The No Project or ñNo-Goò alternative proposes that the power station dispose of ash only until the full capacity of the KPSôs existing disposal facility is reached and that no second facility be commissioned to receive the ash produced by the KPS to end of the extended station life of 2058. This means that the station would have to stop generating electricity, and ash, since ash is waste generated from electricity generation.

[5] The exact years are dependent on the quality of coal that will be burned. Should the power station receive poorer quality coal, more ash will be produced at the Kendal Continuous Facility meaning that the Kendal 30 year ADF might be required sooner.

Should the ñNo-Goòalternative be the preferred alternative, Eskom will have to shut-down and stop production of electricity by 2031 at the KPS. The environmental and social impacts will be assessed and compared to the aforementioned alternatives.

6.3 Sustainability Assessment

The Sustainability Assessment was undertaken by Prime Africa. Refer to Appendix F10 for the full report.

The DEA issued an acceptance letter to the FSR for the Kendal 30-year ADF project on 11 September 2013 requesting that the EIR should include information on the following:

- Environmental costs vs benefits of the disposal facilities activity; and
- Economic viability of the facility to the surrounding area and how the local community will benefit.

This section provides an integrated assessment of the financial, economic, ecological and social costs and benefits of Site H as the preferred site for the Kendal 30-yr ADF.

The benefits are demonstrated at the hand of the electricity crisis in South Africa.

The financial and economic costs follow the best international practices and methodology described in section 2.4 of Appendix F10 and measures the financial NPV (FNPV) and socio-economic NPV (SNPV) respectively. The ecological and social costs are measured through the ecosystem services effects on human well-being.

Financial costs ï Impact on Eskom

The financial costs are those costs incurred by Eskom, during the construction and operations of the ADF.

The financial costs were derived from the conceptual design specifications and estimates provided by the Engineers on the project. The total cost over the life of the facility is R2 185 million. The major cost components are:

- The capital costs associated with construction and especially the liner (44.7%);
- ADF capping costs (17.9%);
- Operational costs (8.1%); and
- General earthworks (8.0%).

To provide context, this cost represents a ratio of 7.2% of the planned capex of the Eskom Group for 2014/15. It also contributes 0.12% to electricity price escalation.

6.3.1 Combined Assessment

Benefits - Impact on Energy Security

In the case under study, the direct benefit of developing Site H at Kendal as the 30-year ADF is that it enables the KPS to continue operations.

The financial benefit of this will be that Eskom will continue to sell electricity.

The economic benefit of the ADF is to provide power generation capacity to the South African power generation grid. This has significant national benefit in a Cost Benefit Analysis (CBA).

The National Energy Regulator of South Africa (NERSA) has recently approved, for Eskom, a Cost of Unserved Energy (COUE) model, which estimates the economic impact of power outages. Although this COUE-model is based on unplanned power outages, recent experience in South Africa has shown that there is often little scope for planning load shedding and therefore the COUE model is applicable in this case.

The COUE model estimates the cost of not delivering power to the grid to include a direct and a total impact on the economy. The direct impact is R21.63/kWh and the total impact is R77.30/kWh. The social COUE, i.e. the impact on household convenience and vulnerability is R4.13/kWh. Table 6-6 provides an assessment of these benefits as it relates to Kendal. The assumption is that Kendalôs power production is dependent on the Site H ADF. The direct economic benefit is R691 billion per year, the total benefit is R2,470 billion per year and the household (social) benefit is R132 billion per year.

Table 6-6: Economic impact of unserved energy can be used as an indicator of the benefits provided to the economy of operating the KPS

	R/kWh	Impact for Kendal (R billion per year)
Direct COUE	21.63	691
Total COUE	77.3	2,470
Social COUE	4.12	132

These benefits come at financial and economic costs, which are analysed in the sections below.

No Impact on Mining

Site H will not sterilise any coal mining activities and will incur no additional costs as a result of this.

Economic cost - Impact on Agriculture

The issue of food (in) security is of great importance to the Department of Agriculture, Forestry and Fisheries (DAFF) and has been at the forefront of government policy planning since 2011. With the

added impacts of the 2015/16 drought adding to food price inflation, any loss of agricultural land would require mitigation of sorts.

The footprint of the Kendal 30 year ADF is approximately of 404,7 ha of which the majority of the area is dry land agriculture. According to the Agricultural Potential Assessment conducted by ESS (Appendix F7), there is good evidence (present land use) to believe that an economically successful agricultural development is viable for a significant proportion (79.19%) of the study area, with better than average (national average for the crop climate) yields being returned from the moderate and good (50.04%) agricultural potential sites (ESS, 2016). In order to calculate the value of the agricultural area lost and in the absence of an agricultural study, we made a few assumptions when calculating the agricultural potential of the impacted area:

1. Assumed productivity of dryland maize in the area is approximately 4 tons/ha/annum, while maize under irrigation is approximately 10 tons/ha/annum.
2. The average white maize price for 2014/2015 was R2 596/ton (South African Grain Information Service, 2016).
3. Therefore, the total loss of potential income for the impacted area is approximately R3 901 951/year

Table 6-7. Approximate loss of the potential agricultural value of the Kendal 30 year ADF footprint

	Area (ha)	Assumed Productivity T/ha	Average White Maize price 2014-2015 R/ton	Yearly Income	Total Lost/Annum
Total Footprint	404,7				
Area dryland	272,5	4	R2 596	R2 829 262	
Area Pivot	80,83	10	R2 596	R2 098 066	
Percentage of Site H considered economically viable (ESS, 2016)					**79,19%**
Value of loss of agricultural potential/annum					**R3 901 951**

However, where land will be purchased, the value of the agricultural production will be internalised in the land value and it is assumed that the agricultural impact will be negligible as it is likely that the returns to land will be reinvested again in agriculture.

Social Cost ï Socio-Economic Nexus

The Social Impact Assessment (SIA) (Appendix F8) identified several potential issues with the development of the Kendal 30 year ADF, of which the most serious was the resettlement of the Triangle Community, which reside within the footprint of the ADF. Appropriate land and services will have to be provided to this community well before the commencement of construction.

Determination of the associated costs is difficult to identify without a full resettlement plan that would be done in consultation with the affected community.

For the purposes of this report, we estimated that it would cost approximately R500 000/household for successful resettlement. According to the SIA report there are 14 households to be resettled which would require an approximate budget of R7 000 000. This does not include the relocation of cemeteries.

Social Cost ï Socio-Ecological Nexus

- Value of Wetland Ecosystem Services

The wetland ecosystem services impact value of Site H is high. A wetland ecosystem services valuation was performed using data from South African National Biodiversity Institute's (SANBI's) Working for Wetlands programme and data from the Olifants WMA Water Resources Classification Study (2012). The benefits of these ecosystem services accrue indirectly in the Olifants WMA, through water regulation, water purification and habitat services. Based on the values from these studies it is calculated that the value of the ecosystem services delivered by the wetlands at Site H are approximately R6 million/annum. This is the value of ecosystem services lost to downstream users within the catchment. As these values are based on other studies, they are merely indicative of cost and an Ecosystem Services Assessment would need to be conducted in order to determine a more accurate value.

Table 6-8. Value of wetland in the Olifants WMA and within the footprint of the 30 Year ADF

	Ecosystem Service	Value R
Provisioning	Resource-poor farmers	1 169 000 000
	Resource rent to agriculture	332 000 000
	Sub-total	1 501 000 000
Regulating	Water flow regulation	2 733 000 000
	Water purification / waste assimilation	876 000 000
	Flood attenuation	23 000 000
	Carbon sequestration	11 000 000
	Sub-total	R3 643 000 000
Grand Total		R5 144 000 000
Total wetlands in the Olifants WMA (ha)		126 128
R/ha/annum		R40 783
Area impacted by proposed ADF (ha)		149,3
VALUE OF WETLANDS IMPACTED BY THE ADF		R6 089 046

- Wetland Offset

The SANBI has developed guidelines for wetland offsets, which can be considered once all other avenues within the mitigation hierarchy have been exhausted. According to the SANBI Wetland Offset Guideline, wetland offsets are measurable conservation outcomes resulting from actions

designed to compensate for significant residual adverse impacts on wetlands (including all impacts on water resources, including hydrological and ecological processes and function, and wetland biodiversity including ecosystems, habitats and species).

The broad wetland offset policy goals proposed by the SANBI offset guidelines are as follows:

- **Formally protecting** wetland systems in a good condition so as to contribute to **meeting national conservation targets** for the representation and persistence of different wetland and wetland vegetation types;
- **No net loss in the overall wetland functional area** by providing gains in wetland area and / or condition equal to or greater than the losses due residual impacts;
- **Providing appropriate and adequate compensation for residual impacts on key ecosystem services;** and
- **Adequately compensating** for residual impacts on **threatened or otherwise important (e.g. wetland-dependent) species** through appropriate offset activities that support and improve the survival and persistence of these species.

Wetland Consulting Services (WCS) developed a Wetland Offset Study (Appendix F14) where the required offset targets were calculated and offset target areas were identified.

Understanding the costs of the wetland offset is difficult as there are several unknowns at this stage. The Offset Guidelines provide various options for reaching the required offset targets including land tenure and level of rehabilitation. After discussions with Eskom staff, it is assumed that no land purchase would occur and the wetland targets would be secured through stewardship agreement.

Based on a 1:1 ratio, or a like for like principle, we estimated the cost of rehabilitating the 149 ha of wetland that would be directly and directly impacted by the ADF. Based on estimated cost of approximately R28 000/ha for rehabilitation, it would cost approximately **R4 200 000** to rehabilitate the wetlands for the wetland offset.

Combined assessment

The combined assessment makes a strong case for extensive wetland mitigation. Table 6-9 below presents a sensitivity analysis of Site H financial and socio-economic costs using a net present cost (NPC[6]) assessment. The Financial NPC analysis refers to the project costs discounted at a specific rate of the 30-year project life cycle. The Socio-economic NPC analysis refers to the

[6] The total Net Present Cost of a project is a summation of all costs: capital investment, non-fuel operation and maintenance costs, replacement costs, energy costs (fuel cost plus any associated costs), any other costs such as legal fees, etc.

project costs as well the loss of agricultural potential and loss of ecosystem services discounted at a specific rate of the 30-year project life cycle. Three discount rates are tested i.e. 4, 6 and 8%.

The socio-economic NPC with mitigation compares is significantly lower that the socio-economic NPC without mitigation indicating that wetland mitigation need to be pursued. The difference (externality) between the financial NPC with mitigation and the socio-economic NPC with mitigation is that of the loss in food production, for which no mitigation is planned.

Table 6-9. Sensitivity analysis of financial net present cost (NPC) and socio-economic net present cost (SNPC) for Site H over a 30-year life cycle

Discount rate	Financial without Mitigation (NPC) (R'million)	Socio-economic without Mitigation (SNPC) (R'million)	Financial with Mitigation (NPC) (R'million)	Socio-economic with Mitigation (SNPC) (R'million)
4%	1,625	1,787	1,629	1,633
6%	1,313	1,441	1,316	1,320
8%	1,086	1,191	1,090	1,093

6.3.2 Conclusion

The purpose of the sustainability assessment is to guide DEA in making an informed decision on the integrated environmental, economic and social impacts and consequences that Site H may incur to society, and how this may be mitigated. The economic, environmental and social considerations are summarised below.

Economic Considerations

The economic case for the selection of Site H, as a preferred option, is strong as Sites B, C and F are covered by mining rights and are earmarked for current and future mining activities. If these sites had been feasible alternatives, they would have been multiple times more expensive than Site H: Site B is 6.27 times more expensive, Site C is 6.18 times more expensive and site F is 8.243 times more expensive.

As a result, Sites B, C and F are not defensible from a financial point of view. These sites, if they were to go ahead would put vast additional pressure on Eskom capital expenditure programme, by increasing capital expenditure by ratios of 59.9%, 56.2% and 72.1% respectively.

Sites B, C and F are also not defensible from an economic point of view. They would increase electricity tariffs by 0.76%, 0.74% and 0.88% respectively, much higher than the 0.12% of Site H.

Environmental and Social Considerations

However, the selection of Site H comes with considerable environmental and social consequences. Environmentally, the biggest concern is the loss of the wetlands and in particular the loss of the pan. Other concerns relate mainly to the aquatic and surface water environments, but these can be mitigated though construction and operational best practices.

Socially, the loss of the wetland ecosystem services delivered to downstream users is a concern as well as the loss of the agricultural land and the resettlement of the impacted Triangle Community.

Mitigation Considerations

From the analysis it is clear that considerable effort needs to be placed in mitigating the environmental and social attributes that will be lost. It is the opinion of the authors that in particular the following two mitigation programmes need to be developed further:

- **The resettlement of the triangle Community**: Resettlement can causes significant social impacts. Being displaced and/or resettled can be a very traumatic experience for people, disrupting their sense of place, their livelihoods, their social networks and community connectedness. Resettlement is a major cause of human rights risks for companies. Taking these risks into consideration, Eskom is urged to develop a Resettlement Plan for the impacted community once the environmental authorisation is received. While costs have been estimated in this report, a more detailed assessment needs to be completed.
- **Wetland Offset Strategy**: The loss of ecosystem services and the loss of the pan will have a pronounced impact on the quaternary catchment and possibly even further within the catchment. While a Wetland Offset Plan has been developed, further information needs to be clarified i.e. land tenure of the offset, suitable target areas and rehabilitation planning for the offset.

7 RECEIVING ENVIRONMENT

7.1 Air Quality

Information pertaining the air quality environment associated with the study area was sourced from the Air Quality Impact Assessment carried out by Airshed Planning Professionals dated July 2016. The full report is available in Appendix F1.

7.1.1 Air Quality Sensitive Receptors

The National Ambient Air Quality Standards (NAAQS) are based on human exposure to specific criteria pollutants and as such, possible sensitive receptors were identified where the public is likely to be unwittingly exposed. NAAQS are enforceable outside of power station and ADF boundaries and therefore a number of sensitive receptors have been identified (Figure 7-1). These sensitive receptors are small residential communities (yellow polygons in Figure 7-1) and individual residences and farmsteads in the vicinity of the proposed ADF.

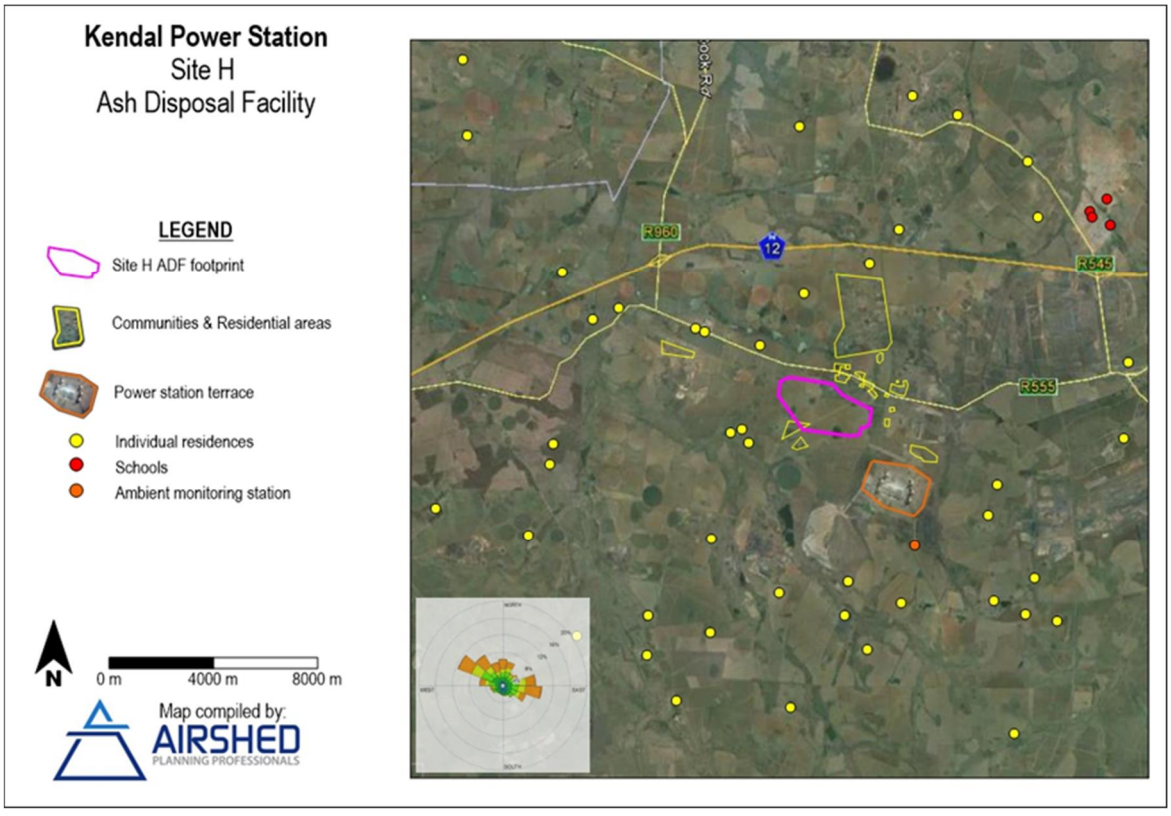


Figure 7-1: Sensitive receptors around the proposed Site H Kendal ADF

The closest residences to the proposed ADF could be affected on any particular day depending on wind speed and wind direction although, on an annual basis, residences to the south-east of the proposed site are likely to be impacted on more days per year than other residences. The simulated ground-level concentrations of PM_{10} and $PM_{2.5}$ are compared against relevant NAAQS and dustfall rates compared with the South African National Dust Control Regulation(s) (NDCR(s)) acceptable dustfall rates, at these sensitive receptors.

7.1.2 Summary of Meteorological Conditions

The meteorological characteristics of a site govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. Meteorological data for the Kendal ADF project was available from the Eskom-operated Kendal 2 ambient air quality monitoring station. Eskom provided data for the period 1 January 2009 to 31 December 2012- a period of almost four years, a period in compliance with the Regulations Regarding Air Dispersion Modelling (Government Gazette No. 37804, vol. 589; 11 July 2014). The following sections summarise the meteorological conditions at the site over this period.

Surface Wind Field

The dominant wind direction (Figure 7-2), during the period January 2009 to October 2012, is west-north-west with a frequency of occurrence approaching 12%. Easterly sector winds are the next dominant with a frequency of 10%. Winds from the southern and south-western sectors occur relatively infrequently (<4% of the total period). Calm conditions (wind speeds <1 m/s) occur 6.66% of the time. A frequent north-westerly flow dominates day-time conditions with >12% frequency of occurrence. At night, an increase in easterly flow is observed (~11% frequency).

During summer months, winds from the east become slightly more frequent (Figure 7-3). There is an increase in the frequency of calm periods (i.e. wind speeds <1 m/s) during the autumn (6.64%) and with an increase in the westerly flow during winter months (5.85%). During spring-time, winds from the north-westerly sector dominate, frequently in the range of 5.0 to 10.0 m/s, with calm conditions only 2.18% of the time.

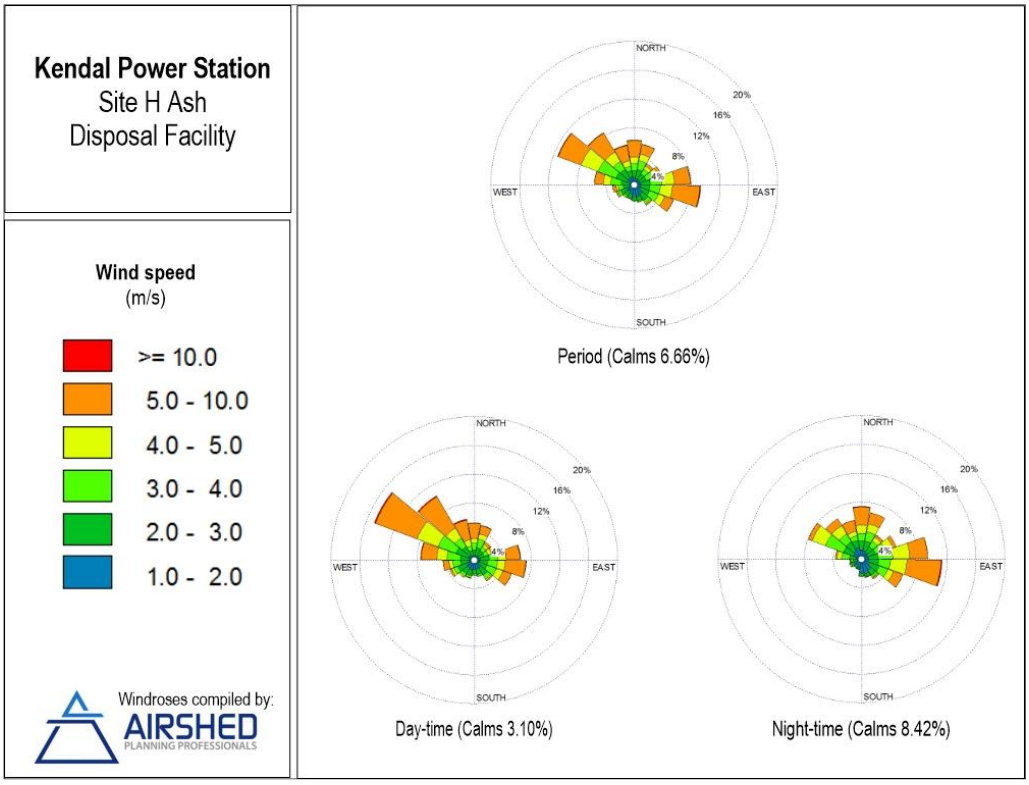


Figure 7-2: Period, day-time and night-time wind roses for Kendal monitoring station (January 2009 – October 2012)

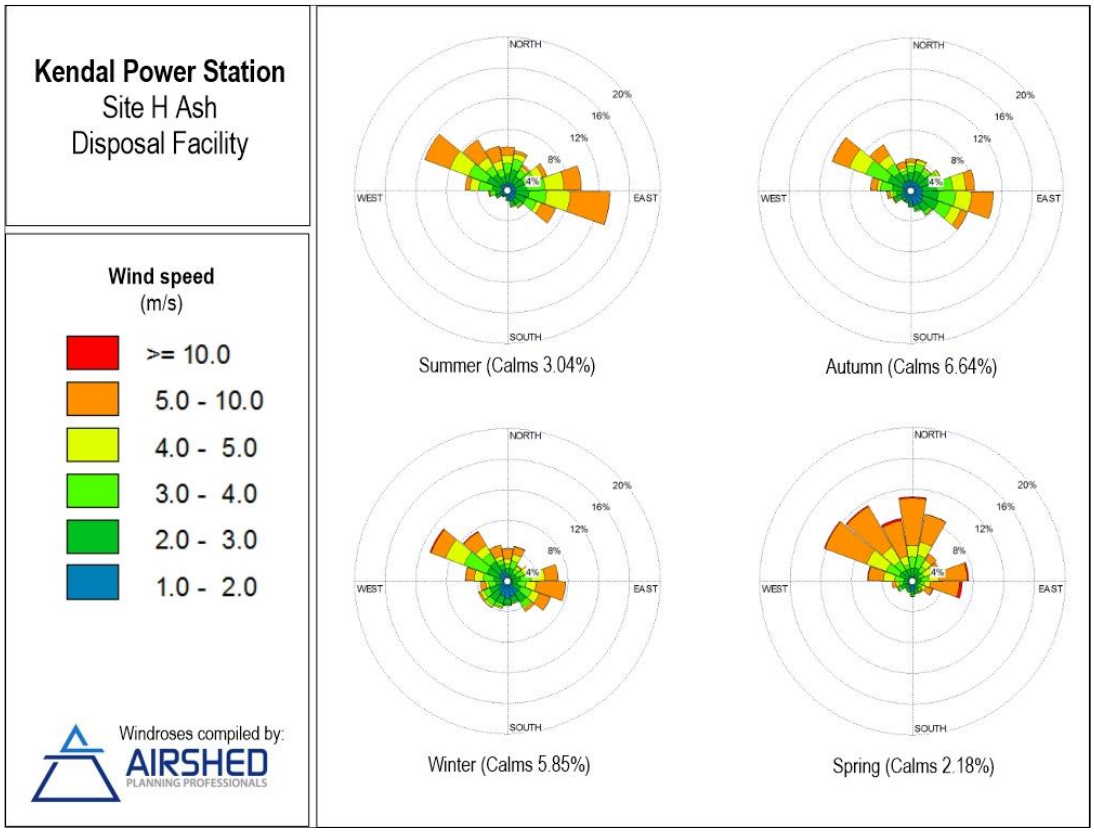


Figure 7-3: Seasonal wind roses for Kendal monitoring station (January 2009 – October 2012)

Surface Temperature

Air temperature provides an indication of the extent of insolation, and will therefore influence the rate of development and dissipation of the mixing layer, and therefore pollutant dispersion. The monthly temperature range for the area is given in Figure 7-4. Average daily maximum, minimum and mean temperatures for the site are given as 26.5°C, 9.6°C and 16.2°C, respectively, based on the measured data at Eskomôs KPS for the period January 2009 ï October 2012. Average daily maximum temperatures range from 31.5°C in December to 19.9°C in June, with daily minima ranging from 14.5°C in December to 2.1°C in July (Figure 7-4).

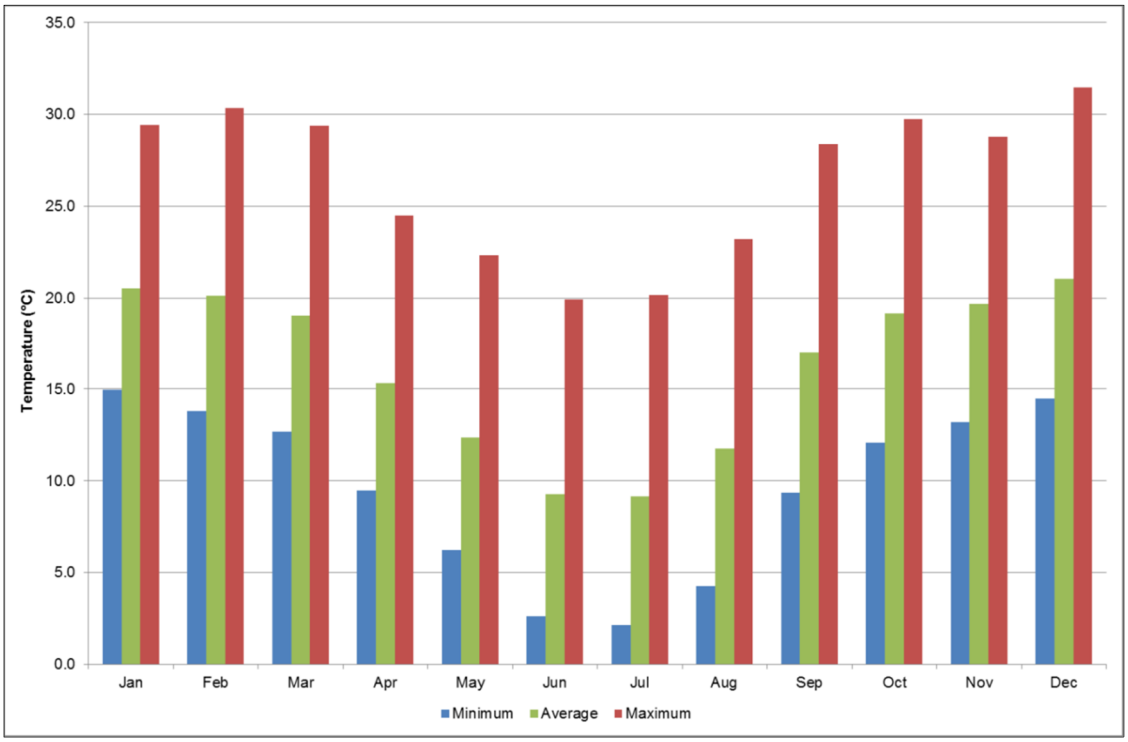


Figure 7-4: Minimum, maximum and average monthly temperatures near KPS during the period January 2009 – October 2012

Precipitation and Evaporation

Rainfall represents an effective removal mechanism of atmospheric pollutants and is therefore frequently considered during air pollution studies. Precipitation records for Kendal were not available; long-term precipitation records for Middleburg and Bethal are presented below in the absence of these records. Long-term total annual rainfall figures for various stations within the Emalahleni region is in the range of 730 mm to 750 mm (Table 7-1). Rain falls mainly in summer from October to April, with the peak for the region being in January. Long-term monthly average evaporation across the Mpumalanga province is presented in Figure 7-5. The annual range varies between 1 537 and 2 335 mm. Maximum evaporation is expected in December and January, while the minimum is expected in June. Variation within months is lowest in winter months (June, July and August).

Table 7-1: Long-term mean monthly rainfall figures (mm) for various stations within the Emalahleni region.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Middelburg (1904 ï 1950)	132	103	88	42	19	7	9	8	22	63	124	118	735
Bethal (1904 ï 1984)	134	94	78	46	19	7	8	10	25	78	128	120	747

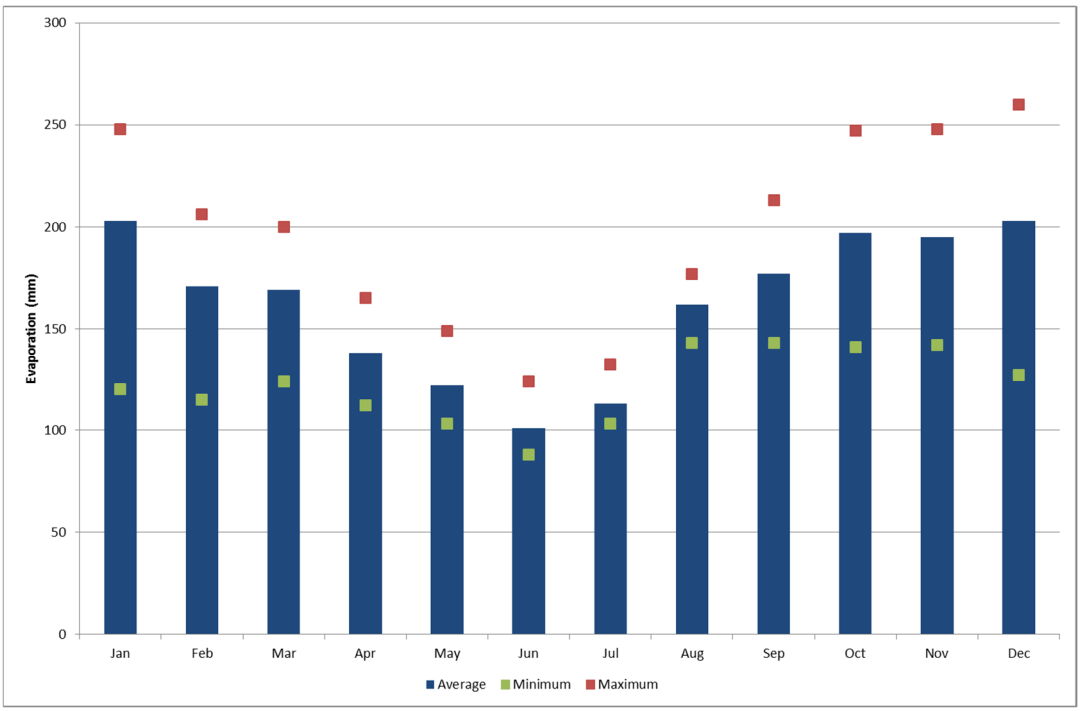


Figure 7-5: Long-term monthly average evaporation (mm) across Mpumalanga

7.1.3 Status Quo Ambient Air Quality

Highveld Priority Area

The Highveld Airshed Priority Area (HPA) was declared the second national air quality priority area (after the Vaal Triangle Airshed Priority Area) by the Minister of Environmental Affairs at the end of 2007 (HPA, 2011). This required that an Air Quality Management Plan for the area be developed. The plan includes the establishment of emissions reduction strategies and intervention programmes based on the findings of a baseline characterisation of the area. The implication of this is that all contributing sources in the area will be assessed to determine the emission reduction targets to be achieved over the following few years. The Kendal ADF, current and the proposed footprint, fall within the HPA. Therefore, the particulate emissions from the facility will contribute to the air quality of the HPA. The ADF is located in the vicinity of the Emalahleni Hot Spot (HPA, 2011) and the ambient air quality, with particular reference to particulates, is outlined below.

The poor ambient air quality in the Emalahleni Hot Spot is a result of emissions from power generation, metallurgical manufacturing processes, open-cast coal mining and residential fuel burning; where industrial processes dominate the source contribution (HPA, 2011). Dispersion modelling simulations, reported in the HPA Air Quality Management Plan show exceedances of the daily PM10 limit for more than 12 days across the Emalahleni Hot Spot (HPA, 2011). Monitored daily PM10 (Figure 7-6) and PM2.5 (Figure 7-7) concentrations within the Hot Spot, at Witbank show regular exceedances of the daily limit, between 2009 and 2014. The HPA Air Quality Management Plan (HPA, 2011) reported exceedance of the annual limit, for 2008 / 2009, at one of the two monitoring stations in Witbank with an annual averages ~83 µg.m^{-3} for Witbank 2.

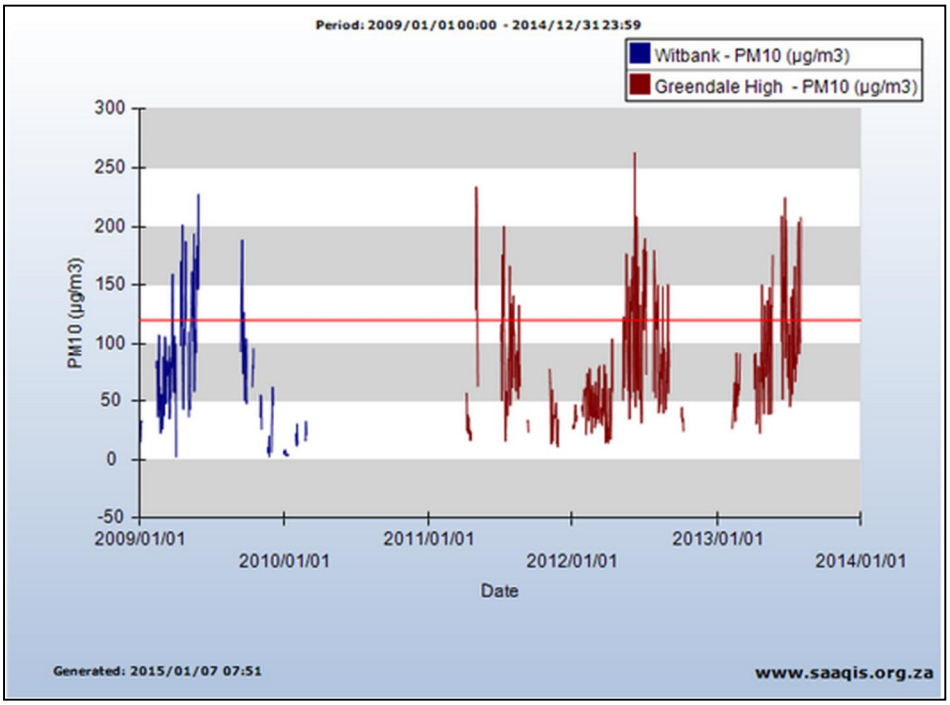


Figure 7-6: Daily PM10 concentrations monitored at two stations in the Emalahleni Hot Spot between 2009 and 2014 (from www.saaqis.org.za). The horizontal red line indicates the daily limit concentration applicable during the period (120 µg.m-3).

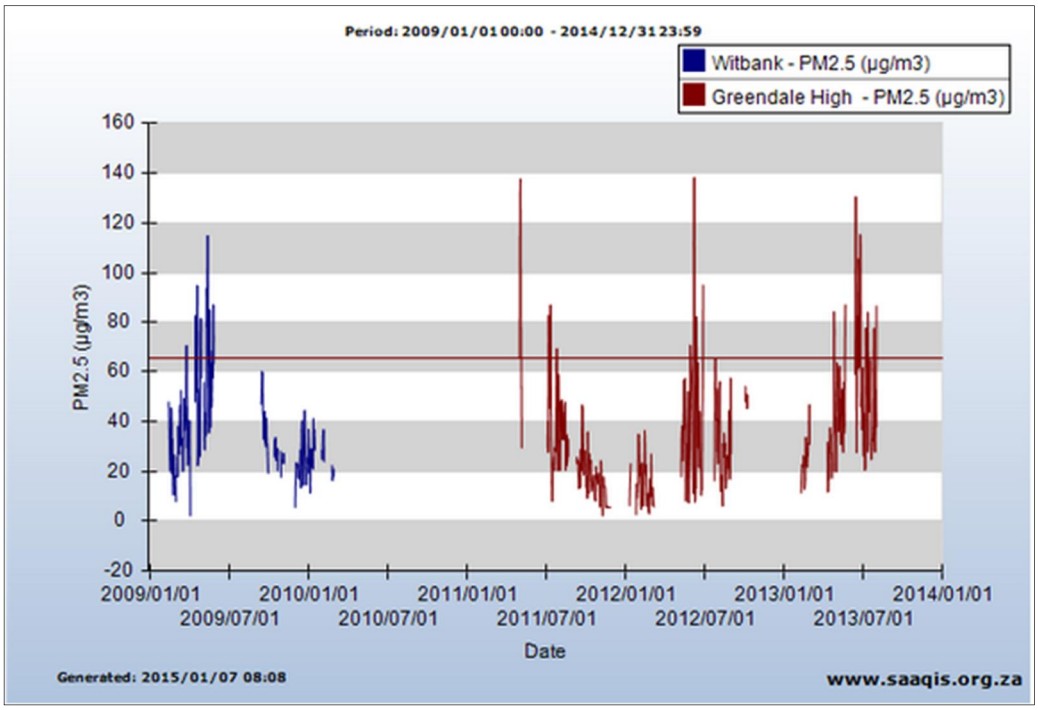


Figure 7-7: Daily PM2.5 concentrations monitored at two stations in Emalahleni Hot Spot between 2009 and 2015 (from www.saaqis.org.za). The horizontal red line indicates the daily limit concentration applicable during the period (65 µg.m-3).

Ambient Air Quality within the KPS Vicinity

Eskom manages an ambient air quality station near Kendal to assess impacts on air quality from the KPS and other pollution sources ï for example mining, agriculture and domestic fuel burning - in the area. The monitoring station is located ~1.5 km south-south-east of the power station and is

equipped for continuous monitoring of ambient concentrations of fine particulate matter (PM_{10}), among other pollutants.

The daily average PM_{10} concentrations for the period 1 September 2012 to 31 August 2013 are presented in Figure 7-8. The NAAQS daily PM_{10} standard allows for four exceedances of the daily concentration limit. At the Kendal 2 monitoring station, 14 daily exceedances were recorded between 1 September 2012 and 31 August 2013 when compared to the NAAQ limit concentration (120 µg/m^3). Compared with the NAAQ limit applicable in 2015 (75 µg/m^3), 99 daily exceedances were recorded in the same period. More recent PM_{10} data recorded at this station was not available. Ambient data for the period corresponding to the meteorological data was not available.

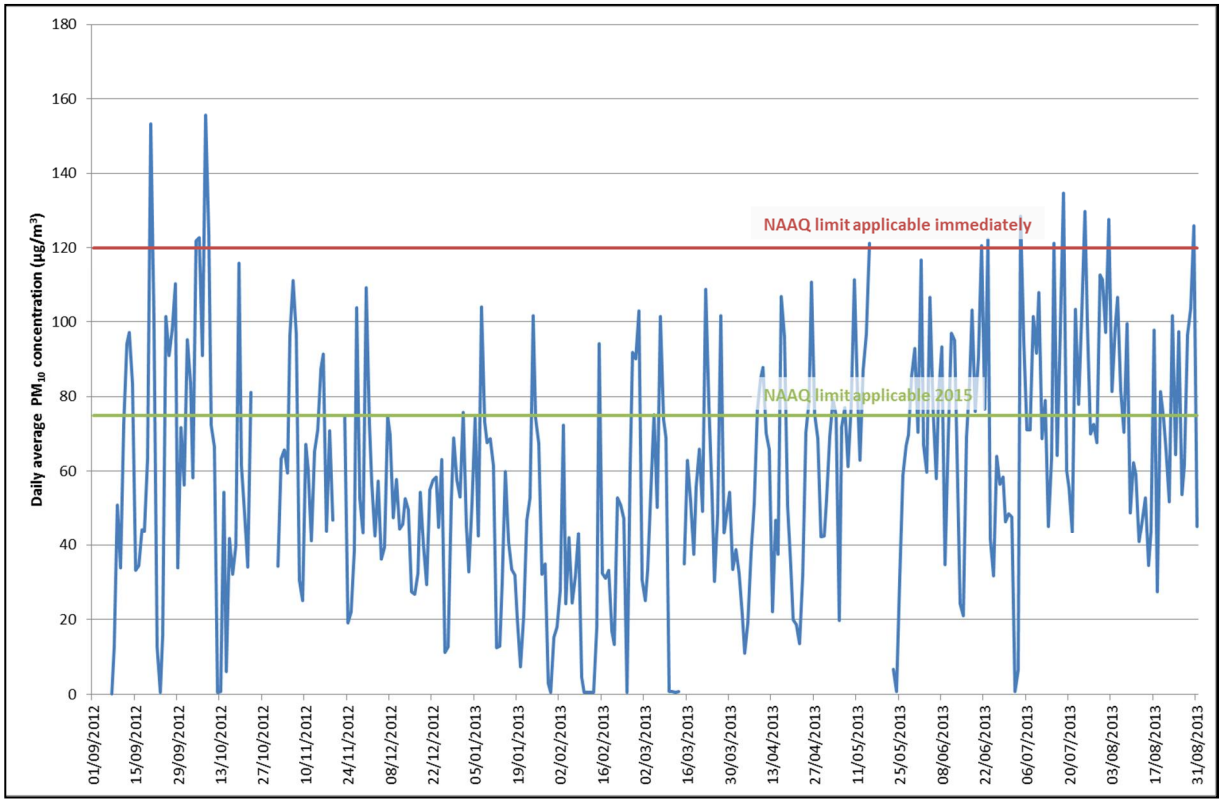


Figure 7-8: Daily average PM10 ground level concentrations (µg/m3) at the Eskom Kendal 2 monitoring station (for the period September 2012 to August 2013)

7.2 Aquatics

Information pertaining the aquatic environment associated with the study area was sourced from the ñAquatic Impact Assessment for the Kendal 30 Year ADF Projectò study dated July 2016 that was carried out by Golder Associates. Refer to Appendix F2 for the full report.

7.2.1 Study Area

The main drainage feature of the Kendal study area is the Wilge River which flows northwards to the west of the KPS and proposed ash dump facilities. The Leeufontein and another un-named tributary, drain in a north westerly direction from the ash disposal facilities towards and into the Wilge River.

The topography of the region is a gently undulating to moderately undulating landscape of the Highveld plateau. Some small scattered wetlands and pans occur in the area, rocky outcrops and ridges also form part of significant landscape features in the wider area. The altitude ranges between 1 260 ï 1 620 m above mean sea level.

The soils in the region form a typical Highveld plinthic catena with shallow soils on the crests of slopes, deeper sandy apedal soils on the slopes and soils with some plinthic clay layers in the foot slopes. In the valleys the clays accumulate and in some cases harden into ferricrete (hardpan/ouklip).

7.2.2 Sampling Points

A total of 18 sites were monitored within the watercourses associated with the Kendal 30-year project. The sites have been selected to represent the receiving environment associated with the proposed development, as well as potential impacts on the larger Wilge River.

The GPS co-ordinates of sampling sites are listed in Table 7-2. A map of the study area showing the location of aquatic sampling sites is presented in Figure 7-9. Photographs of sampling sites are presented in Appendix F2.

These sampling points are representative of all the shortlisted sites and not all have a bearing on Site H. However, as Figure 7-9 shows, Site H is located almost centrally in the regional study area.

Table 7-2: Locations of aquatic monitoring sites

Site	River	Latitude	Longitude	Farm Portion	Dry Season Survey (Aug/Sep' 13)	Wet Season Survey (May' 16)
K_WIL1	Wilge River	-26.141800°	28.877233°	Welgelegen 221	ã	X
K_WIL2	Wilge River	-26.098717°	28.858500°	Welgelegen 221	ã	X
K_TRI11	Unnamed tributary of the Wilge River	-26.102062°	28.851163°	Schoongezicht	ã	X
K_TRI1	Unnamed tributary of the Wilge River	-26.082733°	28.835883°	Bospoort	ã	X
K_WIL3	Wilge River	-26.078100°	28.859133°	Bospoort	ã	X
K_TRI2	Unnamed tributary of the Leeufontein	-26.092133°	28.914250°	Vlakvarkfontein 213	ã	X
K_TRI3	Leeufontein	-26.084691°	28.920815°	Vlakvarkfontein 213	ã	ã
K_TRI4	Leeufontein	-26.078735°	28.911531°	Mooimeisiefontein	ã	ã
K_TRI10	Leeufontein	-26.064916°	28.870633°	Vlakvarkfontein 213	ã	X
K_WIL4	Wilge River	-26.04485	28.86745	Vlakvarkfontein 213	ã	X
K_TRI8	Unnamed tributary of a secondary tributary of the	-26.059560°	28.960769°	Heuvelfontein 215	ã	X

Site	River	Latitude	Longitude	Farm Portion	Dry Season Survey (Aug/Sep' 13)	Wet Season Survey (May' 16)
	Wilge River					
K_TRI9	Unnamed tributary of the Wilge River	-26.049550°	28.942083°	Heuvelfontein 215	ã	ã
K-TRI13	Unnamed tributary of the Wilge River	-26.03770	28.88959	Van Dyksput 214	ã	ã
K_WIL5	Wilge River	-26.014727°	28.868792°	Dwaalfontein 565	ã	X
K_TRI7	Unnamed tributary of the Saalboomspruit	-26.019494°	28.984667°	Bankfontein 216	ã	X
K_TRI6	Unnamed tributary of the Saalboomspruit	-26.019626°	29.027276°	Trichardtsfontein 1	ã	X
K_TRI6A	Saalboomspruit	-26.018410°	29.011140°	Bankfontein 216	ã	X
K_TRI5	Saalboomspruit	-26.005487°	29.025831°	Phinshop 2	ã	X
K_PAN1	Pan	-26.07671	28.94663	Heuvelfontein 215 Schoongezicht 218 Vlakvarkfontein 213	ã	ã

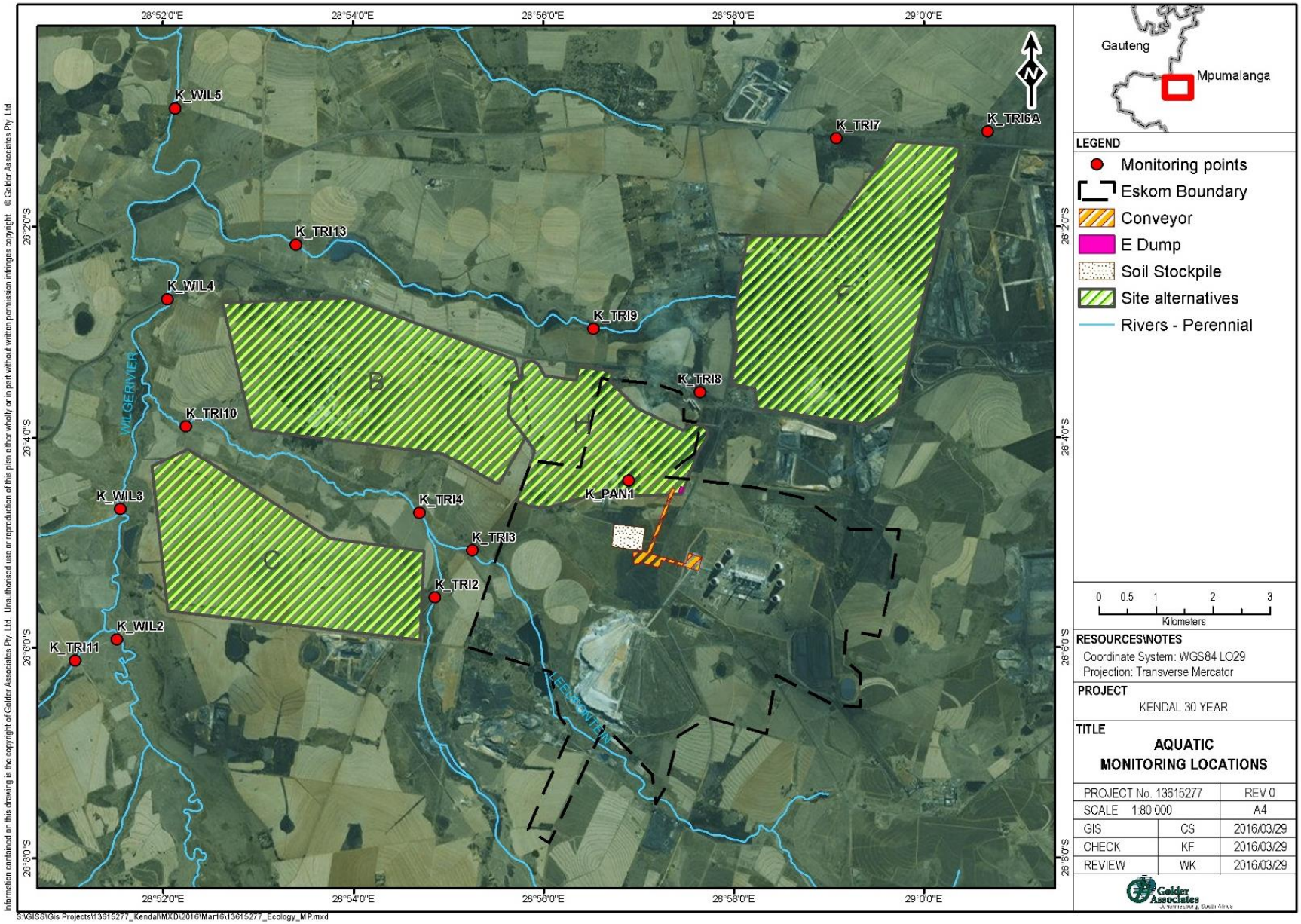


Figure 7-9: Map of aquatic monitoring sites as well as site alternatives and associated conveyor corridor

7.2.3 Flow Conditions

A dry season survey was undertaken in August / September 2013 and a wet season survey in May 2016. At the time of the dry season survey, flow conditions within the project area were considered to be normal for a dry season survey. During the wet season survey, flow conditions within the project area did not reflect typical wet season conditions however, this is owing to the limited rainfall of the drought currently being experienced in South Africa. The flow conditions recoded per site and photos thereof is recorded in Appendix F2.

7.2.4 *In situ* water quality

In situ water quality measurements were recorded using field instruments and the results presented in Table 7-3. This information is important in terms of the interpretation of biological results because of the direct influence water quality has on aquatic life forms. Although these measurements only provide a ñsnapshotò, they can provide valuable insight into the characteristics of a specific sample site at the time of the survey. The Target Water Quality Range (TWQR) as provided by DWAF (1996) is shown for the *in situ* parameters measured.

The section following Table 7-3 has been shortened to include only a write-up of the Pan water quality over time. Refer to Appendix F2 for the full description of all monitoring points.

Table 7-3: *In situ* water quality results recorded during the August/September 2013 and May 2016 survey

Site	pH		EC (mS/m)		TDS (mg/ℓ)		DO (mg/ℓ)		DO Saturation (%)		Temp (˚C)		Clarity (cm)	
	Sep'13	May'16	Sep'13	May'16	Sep'13	May'16	Sep'13	May'16	Sep'13	May'16	Sep'13	May'16	Sep'13	May'16
TWQR	6.5 – 9.0		<154		<1 000		>5.00		80 – 120		5 – 30			
K_WIL1	8.8	-	48	-	312.0	-	4.1	-	78.6	-	20.4	-	70.0	-
K_WIL2	9.1	-	54	-	351.0	-	5.3	-	103.5	-	21.1	-	52.0	-
K_TRI11	9.0	-	26	-	169.0	-	5.0	-	86.0	-	15.0	-	>3	-
K_TRI1	8.8	-	44	-	286.0	-	3.7	-	65.0	-	17.7	-	10	-
K_WIL3	8.5	-	51	-	331.5	-	2.5	-	49.6	-	22.0	-	25.0	-
K_TRI3	8.4	8.6	132	112	858.0	728.0	5.5	10.7	95.5	113.7	15.6	21.2	>28	>22
K_TRI4	8.4	8.3	73	104	474.5	676.0	4.3	10.3	83.2	112.1	21.0	21.6	35	>20
K_TRI10	8.4	-	76	-	494.0	-	4.2	-	86.5	-	23.3	-	>22	-
K_WIL4	8.9	-	92	-	598.0	-	6.3	-	95.9	-	9.9	-	>45	-
K_TRI8	8.5	-	112	-	728.0	-	1.9	-	34.0	-	16.7	-	10	-
K_TRI9	8.4	#	92	#	598.0	#	3.7	#	59.0	#	12.2	#	3	#
K_TRI13	8.4	8.6	42	37	273.0	240.5	5.8	10.8	79.7	113.1	5.8	17.6	>10	>6
K_WIL5	9.0	-	30	-	195.0	-	5.6	-	112.0	-	22.5	-	>50	-
K_TRI6	8.1	-	81	-	526.5	-	1.0	-	17.0	-	14.4	-	3	-
K_TRI6A	8.4	-	18	-	117.0	-	3.5	-	64.5	-	18.7	-	40	-
K_TRI5	8.5	-	94	-	611.0	-	5.8	-	116.9	-	22.7	-	>70	-

(Red highlighted text indicate exceedances of the guideline values detailed in the report; [1]EC - Electrical Conductivity; [2]TDS - Total Dissolved Solids; [3]DO - Dissolved Oxygen; mS/m – milliSiemens per metre; mg/l – milligrams per litre; % Sat – percentage saturation.

Clarity figures that display a ">" indicates the maximum depth of the river where the secchi disk could still be seen, and thus an accurate clarity measurement could not be recorded as the water was either too shallow or clear. #Dry

pH

The pH within the pan, located in the centre of the proposed Site H, has mostly been alkaline and beyond the guideline values (Figure 7-11). This is primarily attributed to the site being an endorheic (inward draining) pan. Figure 7-11 represent historical pH analysis results of the Site H pan.

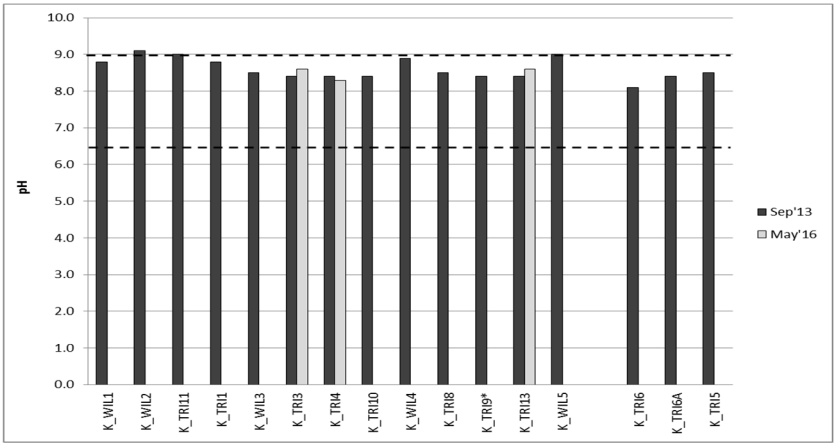


Figure 7-10: pH values observed in August/September 2013 and selected points in May 2016 (dashed lines indicate guideline values, *dry during the May 2016 survey)

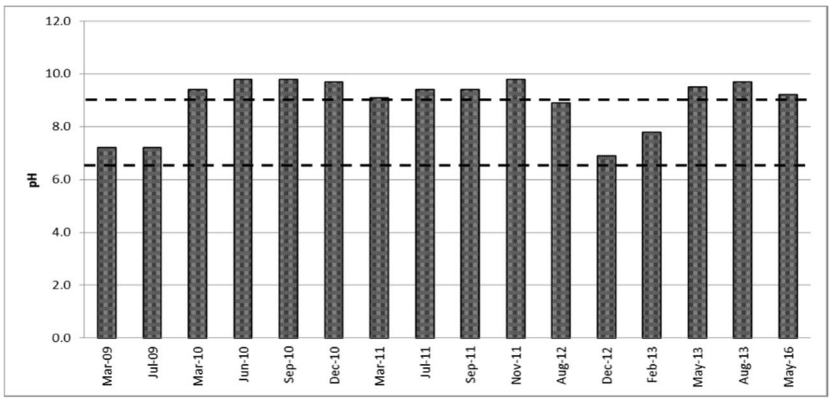


Figure 7-11: Historical pH values observed at site K_PAN1 from March 2009 to August 2013 and May 2016 (dashed lines indicate guideline values)

Total Dissolved Salts

The TDS concentrations within the Site H pan have increased temporally (Figure 7-13). The elevated TDS concentration measured at this site is typical of an endorheic (inwards draining) body of water, where salts accumulate over time. However, the high TDS concentration recorded in August 2013, and which were also elevated during the follow-up survey in May 2016, was of a concern. Figure 7-13 represent historical pH analysis results of the Site H pan.

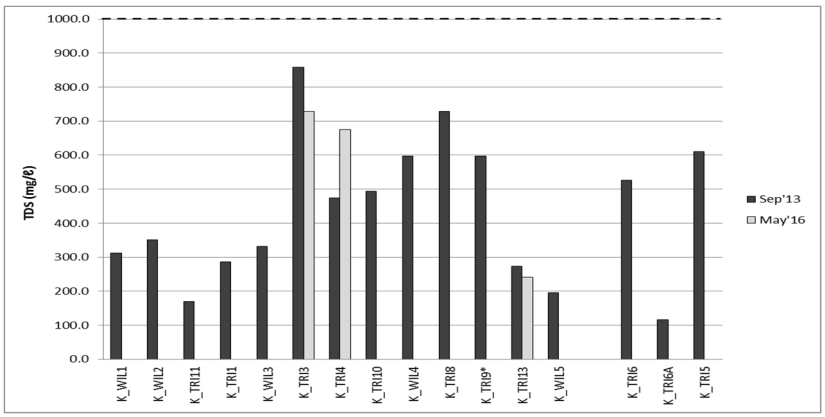


Figure 7-12: Total Dissolved Salts concentrations measured in August/September 2013 and selected points in May 2016 (dashed lines indicate guideline values, * dry during the May 2016 survey)

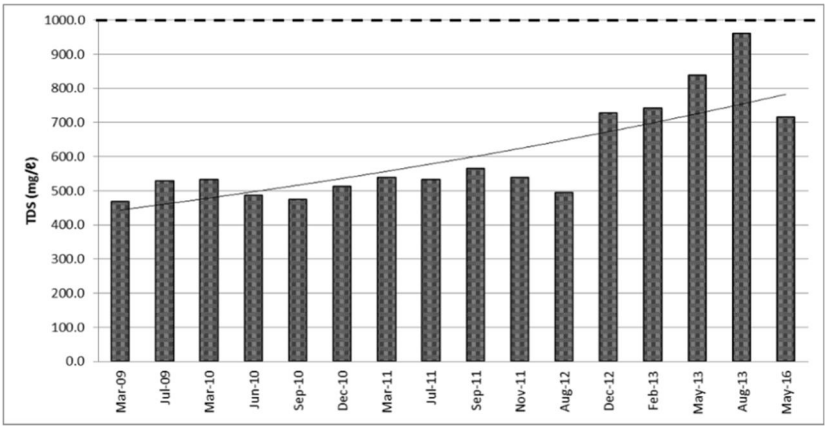


Figure 7-13: Historical TDS values observed at site K_PAN1 from March 2009 to August 2013 and May 2016 illustrating an exponential trend line (dashed lines indicate guideline values)

Dissolved Oxygen

The Dissolved Oxygen (DO) concentration within the Site H pan site has mostly exceeded the guideline value of 5 mg/ă and thus did not pose a risk to the aquatic biota during the August/September 2013 survey (Figure 7-15). During this latest survey in May 2016, supersaturated conditions were recorded in the pan recorded, symptomatic of the other sites during the current survey.

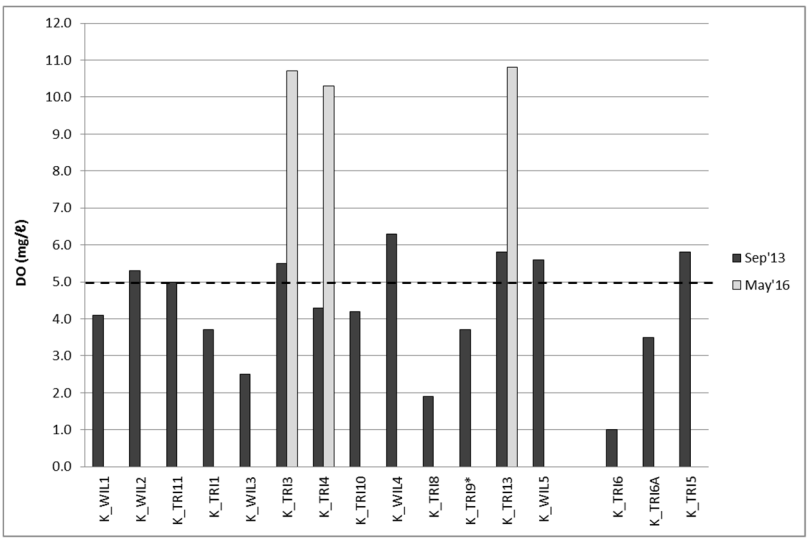


Figure 7-14: Dissolved Oxygen concentrations measured during the August/September 2013 survey and selected points in May 2016 (dashed lines indicate guideline values, * dry during the May 2016 survey)

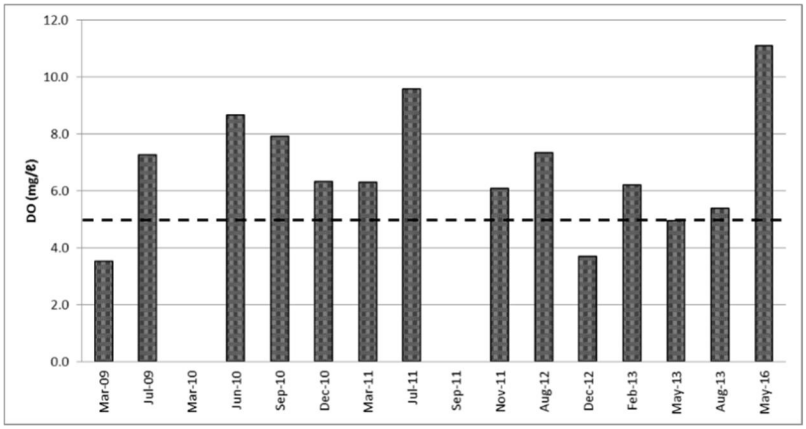


Figure 7-15: Historical DO concentrations observed at site K_PAN1 from March 2009 to August 2013 and May 2016 (dashed lines indicate guideline values)

Percentage Oxygen Saturation (DO%)

During the August/September 2013 survey, the percentage situation fell below the guideline value at several sites along the tributaries, as well as the two upper monitoring points on the Wilge River (Table 7-3 and Figure 7-16). The percentages recorded in the Leeufontein were within the guideline range, which consequently improved the saturation levels at site K_WIL4 (Figure 7-16). The percentage saturation at sites K_TRI8 and K_TRI6 were below the lethal limits (40%).

This may have been attributed to the algal blooms observed at those sites at the time of the survey, a sign of eutrophication, coupled with low flow conditions and a large amount of decaying organic matter on the stream beds. During the latest survey (May 2016) the percentage saturation was adequate and between the guideline values. Site K_TRI13 had improved from three years ago where the percentage saturation was recorded below the guideline values (Figure 7-16).

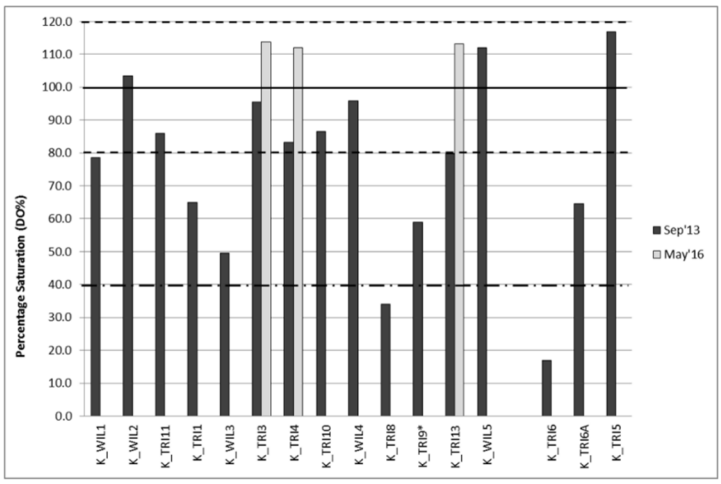


Figure 7-16: Percentage saturation (DO%) recorded during the August/September 2013 survey and selected points in May 2016 (dashed lines indicates target values, solid line indicates saturation and dot-dash line indicates lethal limit, *site dry during the May 2016 survey)

Water Temperature

The water temperatures measured during the August / September 2013 and May 2016 surveys were considered to be normal for these systems at that time of the year and were not expected to have had a limiting effect on aquatic biota (Table 7-3 and Figure 7-17). Furthermore, the variability across the sites is primarily attributed to water depth and exposed surfaces. The temperature within the pan site is ideal for a typical endorheic pan (Figure 7-18).

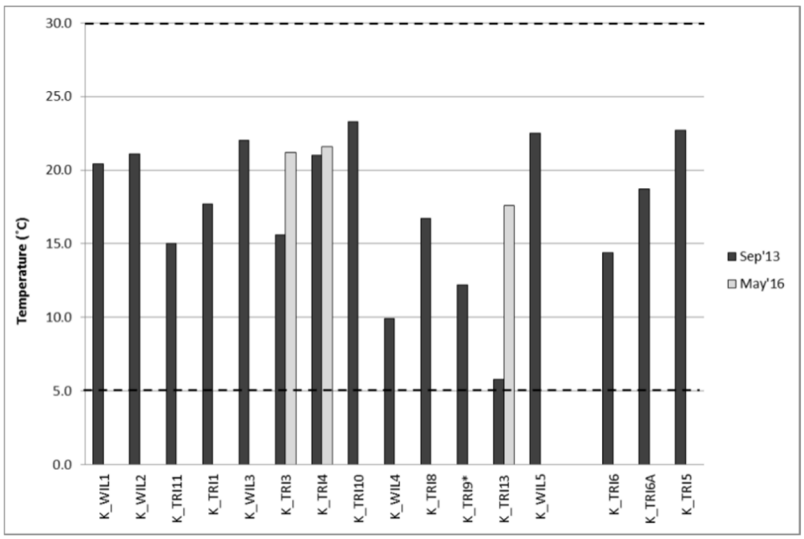


Figure 7-17: Water temperatures recorded during the August/September 2013 survey and selected points in May 2016 (dashed lines indicate guideline values, * dry during the May 2016 survey)

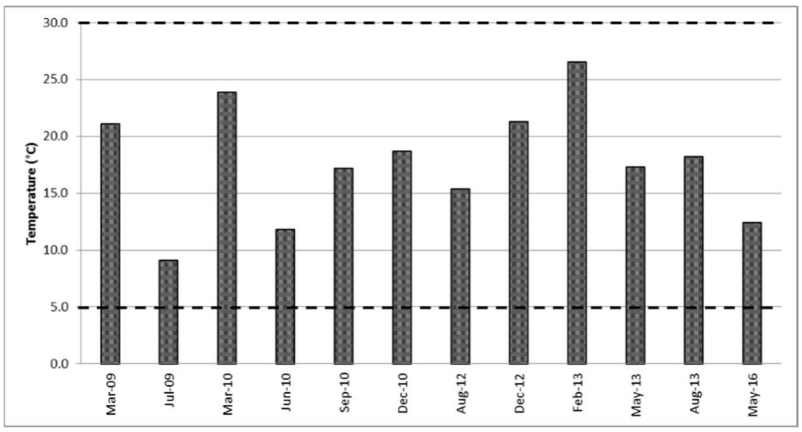


Figure 7-18: Historical temperature concentrations observed at site K_PAN1 from March 2009 to August 2013 and May 2016 (dashed lines indicate guideline values)

Turbidity

During both surveys, water levels at the majority of sites were comparatively low, resulting in shallow water that was low in turbidity (Figure 7-19). The low turbidity was attributed to a lack of run-off during the dry season in August/September 2013, coupled with limited flow deposition transferring sediment downstream. Turbidity levels at sites K_TRI1, K_TRI8, K_TRI9 and K_TRI6 were low during that survey (Figure 7-19). This was attributed to the sites being typical wetland sites which had been silted up, although water quality was recorded from a small remaining muddy puddle in the middle of the channel. Nonetheless, in comparison, turbidity during the wet season was typically high, with cumulative impacts within the catchment contributing to elevated suspensoids. Historically, the turbidity levels within the pan are generally low (Figure 7-20). This is primarily due to the pan being relatively shallow. Furthermore, there are limited disturbance at the pan, with the exception of a farmerôs pipeline which occasionally pumps water into the pan.

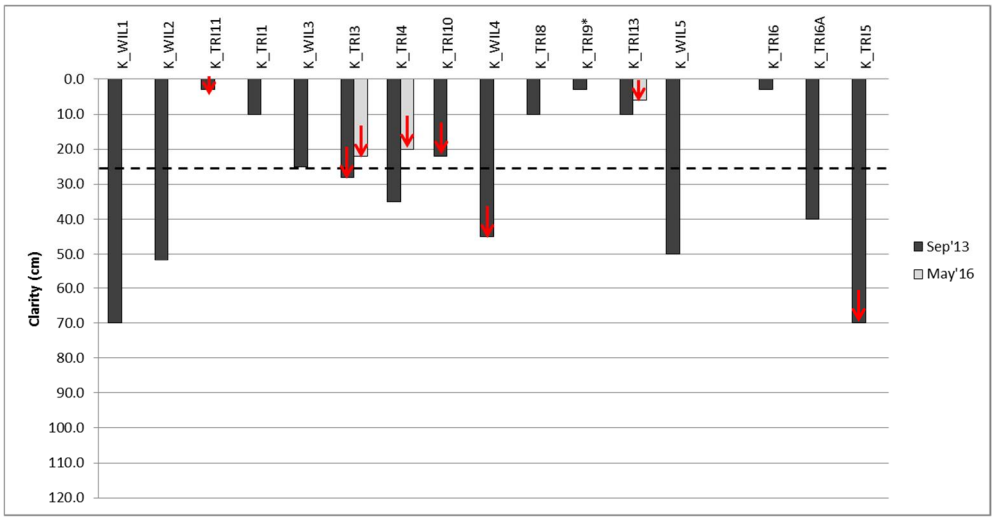


Figure 7-19: Secchi Disk depths recorded during the August/September 2013 survey and selected points in May 2016 as an indication of clarity (dashed line indicates low turbidity, arrows indicate 'more than' values, *site dry during the May 201 survey)

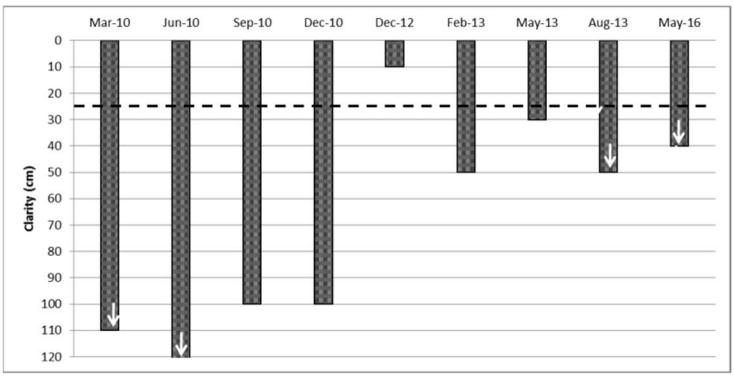


Figure 7-20: Historical secchi Disk Depths recorded at site K_PAN1 from March 2009 to August 2013 (dashed line indicates low turbidity; arrows indicate 'more than' values)

7.2.5 Habitat Assessment

Resource Utilization and Site Specific Impacts

Whilst on site, surrounding impacts and utilisation of resources were noted. As the study area falls within an economic hub for agricultural activities, there are a range of anthropogenic impacts on the tributaries within the study area. Impacts noted along the rivers are associated with agricultural, mining and power generation activities. Overgrazing and trampling by cattle was evident in the vicinity of the project area. The overgrazing of the ground cover results in higher runoff velocities that transport particulates and result in erosion, increased turbidity and sedimentation.

A further concern is the level of nutrient input into the river systems due to the high level of agricultural activities within the project area. High levels of nutrient inputs are contributing to algal blooms at various sites, a clear sign of eutrophic conditions. Refer to Appendix F2 for photos of the cattle activities, algal blooms and waste problems in the larger study area.

General Habitat Characterization

In addition to taking note of site specific impacts, habitat characteristics were documented, as species composition is largely driven by the habitat quality & availability. The substrate of a river is defined by the biological and inorganic materials making up the river bed. The inorganics include a range of sizes, from fine silts/sands, through gravels and pebbles to boulders and bedrocks. The biological materials are dominated by leaf litter, aquatic plants and wooded debris. The velocity of the water, determined by gradient erodes and deposits the different materials to form a heterogenic substrate or habitat.

Substrate heterogeneity is an important factor in determining both abundance and diversity of biota, with more stable substrate showing higher diversity and abundances. As particle size increase, so does physical complexity, so clay or sandy substrates would be considered poor due to their instability, whereas cobbles and rocks would be more stable. A mixed substrate would obviously be the best with a variety of habitats and microflow patterns available for different biota. Table 7-4 provides a summary of the habitats types present at each site that would contribute to the findings in the subsequent sections. It must be noted that habitat types vary seasonally and thus this table illustrates those for both surveys.

Table 7-4: Habitat descriptions

Characteristics	K_WIL1	K_WIL2	K_TRI11	K_TRI1	K_WIL3	K_TRI2	K_TRI3	K_TRI4	K_TRI10
Width (m)	>20	>20		1	>20		2	>10	>2-5
Depth (m)	2	2		1	½		½	2	½
Flow characteristics	Low	Low		Low	Low		Low	Low	Low
GSM	ã	ã		ã	ã		ã	ã	ã
Vegetation	ã	ã		ã	ã		ã	ã	ã
Stones	x	ã		x	x		ã	ã	ã
Riparian vegetation	Indigenous shrubs, grasses, and *Salix spp.*	Indigenous shrubs and grasses	*Wetland conditions*	Indigenous shrubs, grasses and *Phragmites spp*.	Indigenous shrub, grasses and small trees	*Dry*	Indigenous shrubs and grasses	Indigenous grasses and *Phragmites* spp.	Indigenous shrubs and grasses
In-stream vegetation	*Phragmites spp*. stands	None		*Phragmites spp*. stands and aquatic shrubs	None		None	*Phragmites spp*. stands	None
Algae present	ã	ã		ã	ã		ã	ã	ã
Cattle movement	x	ã		ã	ã		ã	ã	ã

Characteristics	K_WIL4	K_TRI8	K_TRI9	K_TRI13	K_WIL5	K_TRI7	K_TRI6	K_TRI6A	K_TRI5
Width (m)	>10			1	>10			>2-5	>2-5
Depth (m)	½			½	1			1	1
Flow characteristics	Low to moderate			Low	Low			Low	Low
GSM	ã			ã	ã			ã	ã
Vegetation	ã			ã	ã			ã	ã
Stones	ã			ã	ã			x	x
Riparian vegetation	Indigenous shrubs, grasses and trees	*Dry*	*Wetland conditions*	Indigenous shrubs, grasses and trees	Indigenous shrubs, grasses, and *Salix spp.*	*Wetland conditions*	*Wetland conditions*	Indigenous shrubs and grasses	Indigenous shrubs, grasses and *Populus spp.*
In-stream vegetation	*None*			None	*None*			None	*Phragmites spp*. stands and freshwater lilies
Algae present	ã			ã	ã			ã	ã
Cattle movement	ã			ã	ã			x	x

The width and depths are approximations

Integrated Habitat Assessment System (IHAS)

The IHAS was developed for use in conjunction with the SASS5 protocol. The IHAS index considers sampling habitat and stream characteristics. The August/September 2013 IHAS results are provided in Table 7-5. It must be noted that neither, aquatic macroinvertebrate sampling or the IHAS was conducted for the pan site.

Based on the IHAS results obtained in August/September 2013, habitat availability ranged from **Adequate** to **Poor**. Table 7-5 shows the scores calculated in obtaining the final IHAS scores as well as a bar graph of the normalised percentage contribution per biotope. This allows one to breakdown the IHAS score into what biotopes were the most and least prominent as well as look between sites at what contribution the biotopes added to the final score. Results illustrate that vegetation (VEG) and gravel, sand and mud (GSM) were strong drivers for higher IHAS scores within the Kendal ADF project area (Table 7-5). Stream bed composition is one of the most important physical factors controlling the structure of a freshwater invertebrate community. Physical stream condition and other habitats/general biotopes are also important factors to consider. The **Poor** habitat availability observed during this survey was largely attributed to the absence of the SIC habitats, the presence of incised banks and the homogenous habitats at the sampling points (Table 7-5). It was further attributed to the low flow conditions at the time of the survey and winter die-back of vegetation.

The habitat availability has remained poor at the sites visited during the May 2016 survey, as a result of the drivers mentioned above (Table 7-6).

Table 7-5: Integrated Habitat Assessment System Evaluation for the August/September 2013 survey

Site	Sampling Habitat				IHAS	
	Stones-in-Current	Vegetation	Other Habitat / General	Physical Stream Condition	Score	Description
K_WIL1	0	11	7	16	34	Poor
K_WIL2	0	10	17	12	39	Poor
K_TRI11	SASS5 N/A					
K_TRI1	0	13	4	14	31	Poor
K_WIL3	0	9	6	13	28	Poor
K_TRI3	12	12	8	17	49	Poor
K_TRI4	6	12	12	15	45	Poor
K_TRI10	10	13	12	23	58	Adequate
K_WIL4	13	12	13	23	61	Adequate
K_TRI8	SASS5 N/A					
K_TRI9	SASS5 N/A					
K_TRI13	7	14	9	20	50	Poor
K_WIL5	0	13	15	13	41	Poor
K_TRI6	SASS5 N/A					
K_TRI6A	0	13	7	17	37	Poor
K_TRI5	0	13	10	16	39	Poor

Table 7-6: Integrated Habitat Assessment System Evaluation for the May 2016 survey

Site	Sampling Habitat				IHAS	
	Stones-in-Current	Vegetation	Other Habitat / General	Physical Stream Condition	Score	Description
K_WIL1	Not assessed for site alternative H					
K_WIL2	Not assessed for site alternative H					
K_TRI11	Not assessed for site alternative H					
K_TRI1	Not assessed for site alternative H					
K_WIL3	Not assessed for site alternative H					
K_TRI3	0	8	8	12	28	Poor
K_TRI4	9	8	11	17	45	Poor
K_TRI10	Not assessed for site alternative H					
K_WIL4	Not assessed for site alternative H					
K_TRI8	Not assessed for site alternative H					
K_TRI9	Dry					
K_TRI13	0	5	9	5	19	Poor
K_WIL5	Not assessed for site alternative H					
K_TRI6	Not assessed for site alternative H					
K_TRI6A	Not assessed for site alternative H					
K_TRI5	Not assessed for site alternative H					

Bar graphs within cells indicate the normalized percentage contribution per biotope

n/a SASS5 not applicable due to site being dry or lack of flow

7.2.6 Aquatic Macroinvertebrates

During the dry season survey in 2013, a total of 41 aquatic macroinvertebrate taxa were recorded in the sample area (7 to 24 taxa per site) (Table 7-7). The SASS5 scores ranged from 25 at site K_TRI1 to 129 at site K_WIL5 (Table 7-7). The Average Score per Taxa (ASPT) values ranged from 3.6 at site K_TRI1 to 5.9 at sites K_WIL4 (Table 7-7). The ASPT scores provide an indication of the average tolerance/ intolerance of the aquatic macroinvertebrate community at each site. In this case ASPT scores indicated that the macroinvertebrate communities at most of the sites are composed primarily of tolerant (1 - 5) taxa. However, ASPT scores are considered to be unreliable when the total number of taxa at a site is low and should be interpreted with caution.

Further explanations are provided below. The number of taxa, SASS5 scores and ASPT scores were variable in the tributaries, with the lowest number of taxa and SASS5 scores observed at site K_TRI1 during both the 2013 survey (Figure 7-24 and Figure 7-25). The habitat at this site was poor with eroded banks and limited flow conditions. Typically, sensitive taxa populate the SIC biotope and as this site lacked this biotope/habitat, these taxa were absent resulting in a lower number of taxa and SASS5 scores. The number of taxa and SASS5 scores within the Wilge River increased in a downstream direction, with the exception of site K_WIL3 where the lowest aquatic macroinvertebrate diversity and abundance was recorded within this river reach (Figure 7-24 and Figure 7-25). This was attributed to the limiting water quality (low DO and DO%) coupled with low flow conditions. The ASPT scores fluctuated spatially during this survey with no real trend identified (Figure 7-25).

During the 2016 survey, the total number of aquatic macroinvertebrates recorded were 17 at the selected monitoring sites. The ASPT values recorded all were below 5.0, indicative of tolerant taxa

(Figure 7-24 and Figure 7-25 and Table 7-7). This was expected owing to the poor habitat availability and lack of flow at the time of the survey.

Table 7-7: SASS5 scores recorded during the August/September 2013 and May 2016 survey

Site	Total number of taxa		SASS Score		ASPT	
	Sep'13	May'16	Sep'13	May'16	Sep'13	May'16
K_WIL1	15	-	76	-	5.1	-
K_WIL2	21	-	116	-	5.5	-
K_TRI11	N/a			-		
K_TRI1	7	-	25	-	3.6	-
K_WIL3	11	-	43	-	4.0	-
K_TRI3	18	7	91	28	5.1	4.0
K_TRI4	14	3	77	11	5.5	3.7
K_TRI10	18	-	87	-	4.8	-
K_WIL4	19	-	112	-	5.9	-
K_TRI8	Dry			-		
K_TRI9	N/A			Dry		
K_TRI13	22	15	113	55	5.1	3.7
K_WIL5	24	-	129	-	5.4	-
K_TRI6	N/A			-		
K_TRI6A	20	-	80	-	4.0	-
K_TRI5	19	-	87	-	4.6	-
N/A: Not sampled because of wetland conditions, IHAS tool not suitable						

As habitat availability affects the structure of a freshwater invertebrate community, there was value in assessing the ASPT of each biotope sampled in isolation. In this way one could avoid bias in the results at sites with different habitat types. Some taxa, such as *Plecoptera* (Stoneflies) and *Trichoptera* (Caddisflies), are associated with SIC, while other taxa such as some *Odonata* (Dragonflies) and *Hemiptera* (Bugs) are associated with VEG. This is important to note as different taxa have been assigned different tolerance scores, which are based on their susceptibility or resistance to pollution and perturbations. As a result, the biotope and ASPT scores are presented below in Figure 7-21.

The VEG and GSM biotopes were the most abundant biotopes sampled at all the sites during both surveys (Figure 7-22 and Figure 7-23). Although when the SIC biotope was sampled (during the 2013 survey only), the ASPT scores increased, particularly along the Wilge River (Figure 7-21). This can be attributed to more sensitive taxa being recorded in the SIC biotope, such as Heptageniidae (quality value (QV) score: 13) and Leptophlebiidae (QV score: 9) which prefer SIC habitats and flow conditions (Figure 7-21).

During the 2013 survey, the ASPT scores in the Wilge River ranged from 4.0 at site K_WIL3 to 5.9 at site K_WIL4. The low ASPT score recorded at site K_WIL3 in the Wilge River may be attributed to poor water quality namely low DO and DO% (Figure 7-14 and Figure 7-16). The GSM biotope recorded an average ASPT score of <5.0, thus this biotope primarily comprised high abundances of highly tolerant taxa such as Oligochaeta (QV score: 1), Chironomidae (QV score: 2), Simulidae (QV score: 5) and Corixidae (QV score: 3). Tolerant species with low quality value scores are

typically associated with the GSM, and as the availability of this specific habitat decreases, so does the likelihood of recording these species.

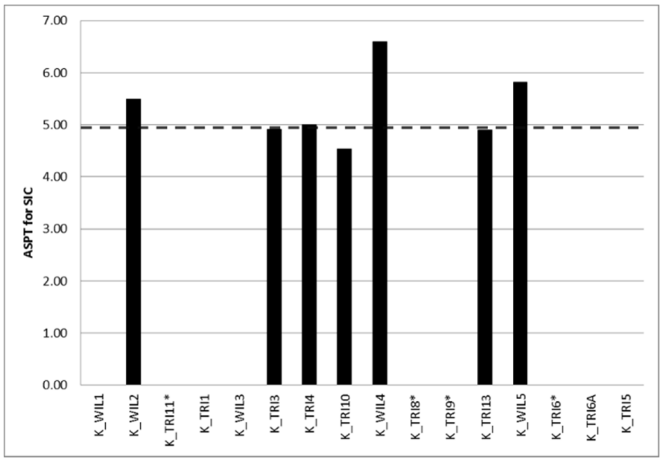


Figure 7-21: ASPT score for the SIC biotope, August/September 2013 (dark bars indicate the Wilge River, dashed line indicates the reference point between biotope graphs, * represents sites that were not SASS5 applicable). No SIC were available to sample during the wet season survey (May 2016)

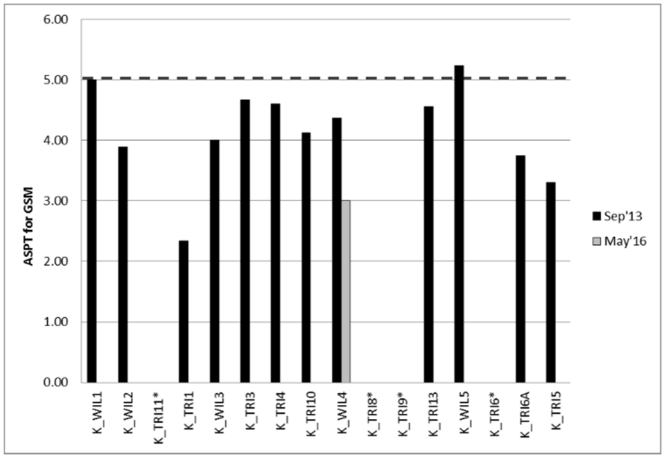


Figure 7-22: ASPT score for the GSM biotope, August/September 2013 and May 2016 (dark bars indicate the Wilge River, dashed line indicates the reference point between biotope graphs, * represents sites that were not SASS5 applicable)

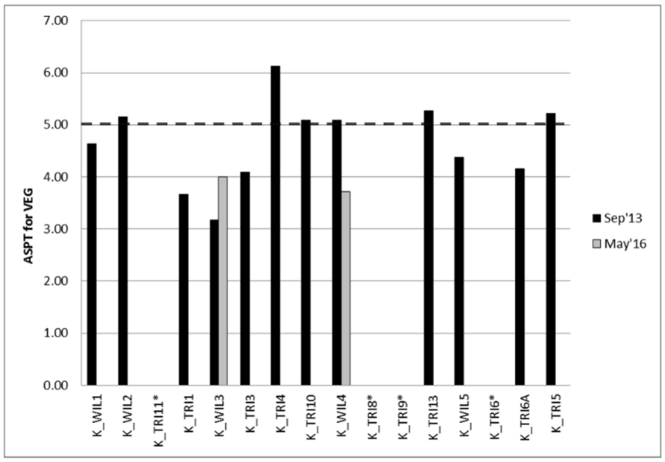


Figure 7-23: ASPT score for the VEG biotope, August/September 2013 and May 2016 (dark bars indicate the Wilge River, dashed line indicates the reference point between biotope graphs, * represents sites that were not SASS5 applicable)

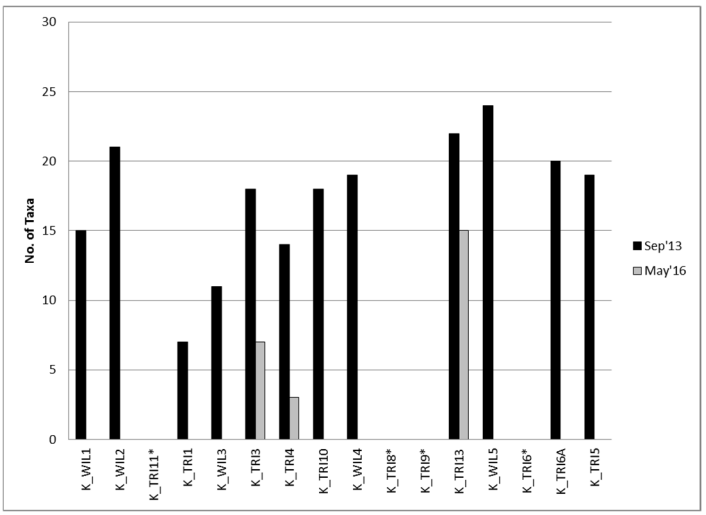


Figure 7-24: Total number of Taxa recorded in the tributaries during the August/September 2013 and May 2016 surveys (dark bars indicate the Wilge River, * represents sites that were not SASS5 applicable)

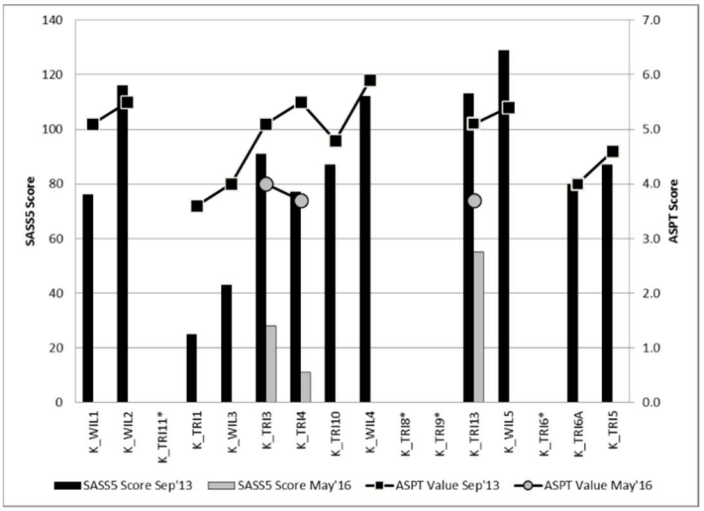


Figure 7-25: SASS5 scores and ASPT score recorded in the tributaries during the August/September 2013 and May 2016 surveys (dark bars indicate the Wilge River, * represents sites that were not SASS5 applicable)

Biotic Integrity based on SASS5 Results

The Present Ecological State (PES) classes and descriptions of each of the classes are presented in Table 7-8. Based on the August/September 2013 results, biotic integrity ranged from unmodified (PES Class A) to seriously modified (PES Class E) (Table 7-8). The low aquatic macroinvertebrate diversity, abundance and ASPT scores recorded at sites K_TRI1 and K_WIL3 contributed to the seriously modified state. Furthermore, this may be attributed to the sites being prevalent to agricultural activities. Following the May 2016 survey, owing to the poor aquatic macroinvertrate diversity recorded (primarily due to the poor habitat availability and lack of flow variations), the biotic integrity was seriously modified (Table 7-8).

Table 7-8: PES classes based on SASS5 results obtained during the August/September 2013 and May 2016 survey

Site	Reach	PES	
		Aug/Sep'13	May'16
K_WIL1	Upper reaches of the Wilge River	B	-
K_WIL2	Upper reaches of the Wilge River	B	-
K_TRI11	Western tributary of the upper Wilge River	*SASS5 N/A*	-
K_TRI1	Western tributary of the upper Wilge River	E	-
K_WIL3	Upper reaches of the Wilge River	E	-
K_TRI3	Eastern tributary of the upper Wilge River	B	E
K_TRI4	Eastern tributary of the upper Wilge River	B	E
K_TRI10	Eastern tributary of the upper Wilge River	B	-
K_WIL4	Upper reaches of the Wilge River	A	-
K_TRI8	Eastern tributary of the upper Wilge River	*SASS5 N/A*	-
K_TRI9	Eastern tributary of the upper Wilge River	*SASS5 N/A*	*Dry*
K_TRI13	Eastern tributary of upper Wilge River	B	E
K_WIL5	Upper reaches of the Wilge River	A	-
K_TRI6	Southern tributary of the Saalboomspruit	*SASS5 N/A*	-
K_TRI6A	Unknown tributary	C	-
K_TRI5	Southern tributary of the Saalboomspruit	B	-

7.2.7 Ichthyofauna

Observed Fish Species List

During the dry season survey in 2013, 5 of the 8 expected indigenous fish species were recorded in the project area (Table 7-9). In addition, two exotic species *Cyprinus carpio* and *Gambusia affinis* were recorded in the lower reaches of the Leeufontein and also at sites K_WIL4 and K_WIL5 in the Wilge River (Table 7-9, Figure 7-26 and Figure 7-27). The highest combined fish abundance (n = 70) was recorded at site K_WIL4, which comprised four indigenous and one exotic fish species (Table 7-9). The low fish diversity and abundance at some sites was attributed to limited habitat.

Chiloglanis pretoriae, an indigenous fish species expected in the Wilge River in the project area was not recorded during the August/September 2013 survey. This sensitive and small rheophilic species is a good indicator of good water quality, fast flowing water (roughly >0.3 m/sec) and ócleanô substrates (interstitial areas between rocks/cobbles) (pers. comm. Kleynhans, 2012). This species has previously been recorded in the Wilge River in the project area. It is believed that the *C. pretoriae* fish population in the Wilge River represents one of the few remaining populations in the upper Olifants River catchment. It is still present in the upper Olifants and the Wilge (B2), especially the lower sections (and in the Bronkhorstspruit below the Bronkhorstspruit Dam). However, they do not generally occur in the Olifants Highveld streams, but rather the Eastern Bankenveld streams.

During the wet season survey conducted in 2016, 2 of the 8 expected indigenous fish species were recorded (Table 7-10) and no exotic species. Fish were only recorded at site K_TRI13 (Table 7-10), with one site being dry and the other 2 sites recorded no fish at the time of the survey.

Table 7-9: Fish species recorded in the Kendal ADF project area during the August/September 2013 survey

Site	*Barbus anoplus*	*Cyprinus carpio*	*Clarias gariepinus*	*Gambusia affinis*	*Labeobarbus polylepis*	*Pseudocrenilabrus philander*	*Tilapia sparrmanii*		Diversity	Abundance
K_WIL1	4					1	1		**3**	**6**
K_WIL2	4					19	2		**3**	**25**
K_TRI11	*Fish N/A*									
K_TRI1	4								**1**	**4**
K_WIL3	17	1				31	4		**4**	**53**
K_TRI3	47								**1**	**47**
K_TRI4	20			5					**2**	**25**
K_TRI10	15			1		2			**3**	**18**
K_WIL4	47			9	1	11	2		**5**	**70**
K_TRI8	*Fish N/A*									
K_TRI9	*Fish N/A*									
K_TRI13	22					1	2		**3**	**25**
K_WIL5			1	6		17	18		**4**	**42**
K_TRI6	*Fish N/A*									
K_TRI6A									**0**	**0**
K_TRI5	10					1	1		**3**	**12**
Total Individuals	**190**	**1**	**1**	**21**	**1**	**83**	**30**			

Introduced species are highlighted in red

 # Site not sampled

Table 7-10: Fish species recorded in the Kendal ADF project area during the May 2016 survey

Site	*Pseudocrenilabrus philander*	*Tilapia sparrmanii*		Diversity	Abundance
K_TRI3				**0**	**0**
K_TRI4				**0**	**0**
K_TRI13	2	4		**2**	**6**
Total Individuals	**2**	**4**			

Figure 7-26: *Gambusia affininis*, exotic fish species recorded at sites K_TRI4, K_TRI10, K_WIL4 and K_WIL5

Figure 7-27: *Cyprinus carpio*, exotic fish species recorded at site K_WIL3

Presence of Red Data Species

Based on the International Union for Conservation of Nature (IUCN) Red List no rare, threatened or endangered fish species are expected to occur in the project area and none were recorded during the August/September 2013 survey (IUCN, 2013).

Fish Health Assessment

A large number of the individuals sampled during the August/September 2013 survey, showed signs of abnormalities and heavy parasite loads, a sign of increased physiological stress. The prevalence was considerably higher in *Pseudocrenilabrus philander* which showed the highest infection rates. During the May 2016 survey, no individuals recorded any external extremities however the sample size was extremely small to conclude.

Fish Assemblage Integrity Index (FAII)

The interpretation of the FAII scores follows a descriptive procedure into which the FAII score is allocated into a particular class (Table 7-11). The PES classes for each of the sites are presented in Table 7-11. Based on the FAII results, the biotic integrity during the 2013 survey ranged from *Largely* to *Critically Modified* (PES Class D to F) (Table 7-11). Six of the monitoring sites were critically modified.

The poor biotitic integrity recorded in the project area at the time of this survey may have been attributed to poor water quality, limited habitat availability and low flow conditions. During the 2016 survey, the biotic integrity did not improve at the selected sites monitored (Table 7-11).

Table 7-11: PES Classes recorded during the two surveys

Site	River Reach	Relative FAII Score	Class Rating	Description	Relative FAII Score	Class Rating	Description
		Aug/Sep'13			May'16		
K_WIL1	Upper reaches of the Wilge River	16	F	Critically Modified	-		
K_WIL2	Upper reaches of the Wilge River	16	F	Critically Modified	-		
K_TRI11	Western tributary of the upper Wilge River	N/A			-		
K_TRI1	Western tributary of the upper Wilge River	27	E	Seriously Modified	-		
K_WIL3	Upper reaches of the Wilge River	21	E	Seriously Modified	-		
K_TRI3	Eastern tributary of the upper Wilge River	16	F	Critically Modified	0	F	Critically Modified
K_TRI4	Eastern tributary of the upper Wilge River	16	F	Critically Modified	0	F	Critically Modified
K_TRI10	Eastern tributary of the upper Wilge River	19	F	Critically Modified	-		
K_WIL4	Upper reaches of the Wilge River	34	E	Seriously Modified	-		
K_TRI8	Eastern tributary of the upper Wilge River	N/A			-		
K_TRI9	Eastern tributary of the upper Wilge River	N/A			Dry		
K_TRI13	Eastern tributary of upper Wilge River	36	E	Seriously Modified	27	E	Seriously Modified
K_WIL5	Upper reaches of the Wilge River	23	E	Seriously Modified	-		
K_TRI6	Southern tributary of the Saalboomspruit	N/A			-		
K_TRI6A	Unknown tributary	0	F	Critically Modified	-		
K_TRI5	Southern tributary of the Saalboomspruit	49	D	Largely Modified	-		

7.3 Ecology (Terrestrial)

Information pertaining the terrestrial ecology of the study area was sourced from the ñTerrestrial Ecosystems Assessment for the proposed Kendal 30 Year Ash Dump Projectò study dated June 2016 that was carried out by Golder Associates. Refer to Appendix F3 for the full report.

The study area (Site H) is located in the Eastern Highveld Grassland vegetation type on the border with the Rand Highveld Grassland in the grassland biome (Figure 7-28). The associated characteristics of the grassland biome and Rand Highveld Grasslands and Eastern Highveld Grasslands are discussed in detail in Appendix F3.

Both Grasslands types are classified at a regional scale as **Endangered**. Within Mpumalanga the Eastern Highveld Grassland is classified as Endangered-high and the Rand Highveld Grassland (majority of Site H) as Endangered-Low.

7.3.1 Mpumalanga Biodiversity Sector Plan

According to the Mpumalanga Biodiversity Sector Plan (MBSP) (2013) the study area consists of four of the province's biodiversity categories. These are listed and summarised in Table 7-12 and their distribution shown in Figure 7-29.

Table 7-12: Categories of the Mpumalanga Biodiversity Sector Plan (2013)

Category	Description and Motivation
Modified	*Modified areas are those that have undergone a significant and often irreparable degree of transformation that has led to a near-complete loss of biodiversity and ecological functioning. Common agents of modification include mining, arable agriculture and infrastructure development.*
Modified – Old lands	*This sub-category of Modified relates to areas that have been altered by cultivation and other activities within the last 80 years and subsequently abandoned. The biodiversity and ecological functioning in such areas is compromised but may still play a role in the provision of ecosystem services.*
Other natural areas	*These are areas that have not been selected to meet biodiversity conservation targets, yet they are likely to provide habitat for flora and fauna species and a range of ecosystem services.*
Critical Biodiversity Area (CBA) - Optimal	*CBA – Optimal are areas selected to optimally meet biodiversity targets. Although these areas have a lower irreplaceability value than the CBA – Irreplaceable category, collectively they reflect the smallest area required to meet biodiversity conservation targets.*

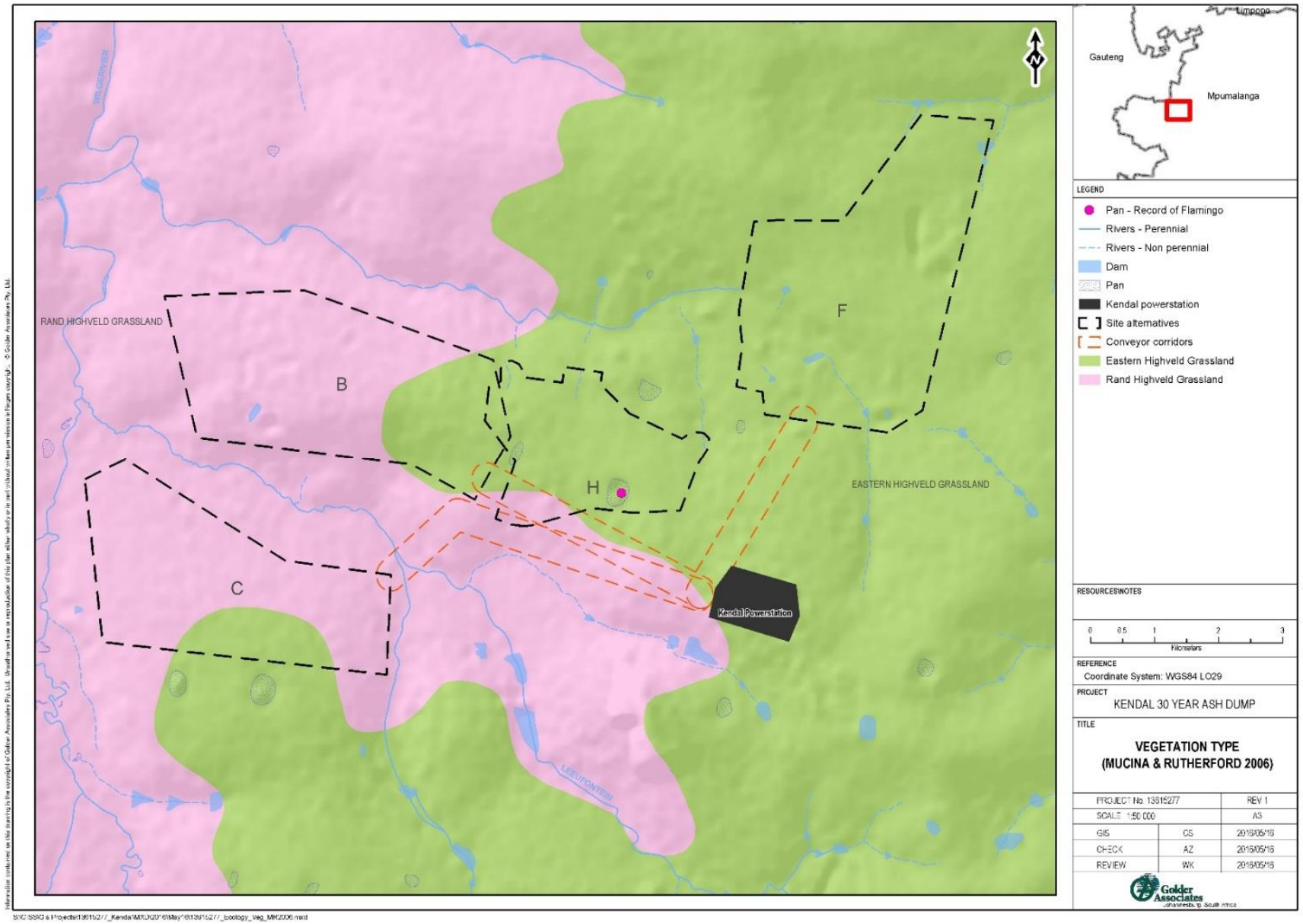


Figure 7-28: Locality of study area in relation to the regional vegetation types

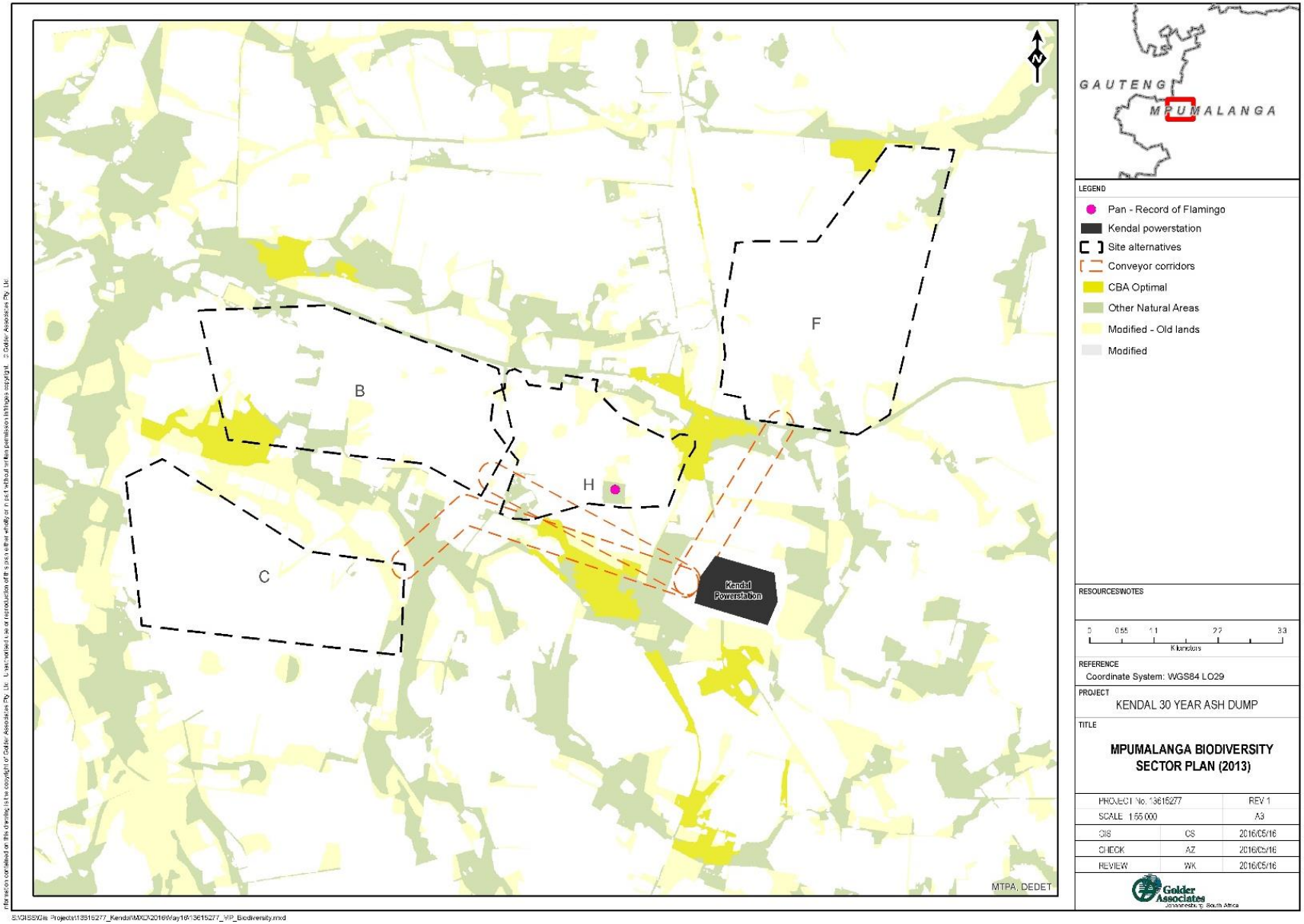


Figure 7-29: Study area in relation to the Mpumalanga Biodiversity Sector Plan (2013)

7.3.2 Flora Assessment

Landscape matrix

The larger study areas landscape matrix is highly variable, with prominent land-uses comprising, *inter alia*, agriculture, livestock grazing, coal mining, and activities related to the KPS. The landscape is also traversed by railway tracks, numerous arterial and access roads, and is bordered to the north by the N12 Highway. Consequently, the immediate landscape is fragmented and much of the surface area is either completely transformed or highly disturbed.

Patches of semi-natural and natural grassland do occur and are generally associated with drainage features or rocky hillsides. As habitat refuges and movement corridors, these natural areas are critically important in sustaining indigenous fauna and flora populations and landscape-scale ecological processes. In a local context, the Leeufontein stream, which flows on an east-west bearing between Sites B and C, and the Wilge River which flows on a south-north bearing to the west of Sites B and C, and a number of natural pans and artificial dams scattered around the broader study area, are of ecological importance.

Study area characteristics

Six vegetation communities or land units were identified within the proposed ADF and conveyor corridors footprints. These were recognised based on physiognomy, moisture regime, slope, species composition and disturbance characteristics:

1. Transformed land;
2. Cultivated land (current and former);
3. Exotic woodlot;
4. Eragrostis pasture;
5. Dry mixed grassland, includes *Hyparrhenia* dominated form; and
6. Moist grass and sedge community.

Large sections of the study area have been completely transformed or severely degraded by coal mining, and rural and peri-urban developments. These sites have collectively been categorised as Transformed land, and were noted but subject to no further investigation.

Table 7-13: Approximate area of the vegetation communities at site alternatives in the study area

Vegetation Community	Approximate area (ha)			
	Site B	Site C	Site F	Site H
Transformed land	*309*	*230*	*933*	*12*
Cultivated land (current and former)	*534*	*664*	*182*	*509*
Exotic woodlots	*11*	*0.7*	*32*	*8*
Eragrostis pastures	*77*	*0*	*0*	*23*
Dry mixed grassland	*73*	*18*	*46*	*45*
Dry mixed grassland – Hyparrhenia dominated	*102*	*0*	*22*	*11*
Moist grass and sedge community	*18*	*26*	*11*	*60*

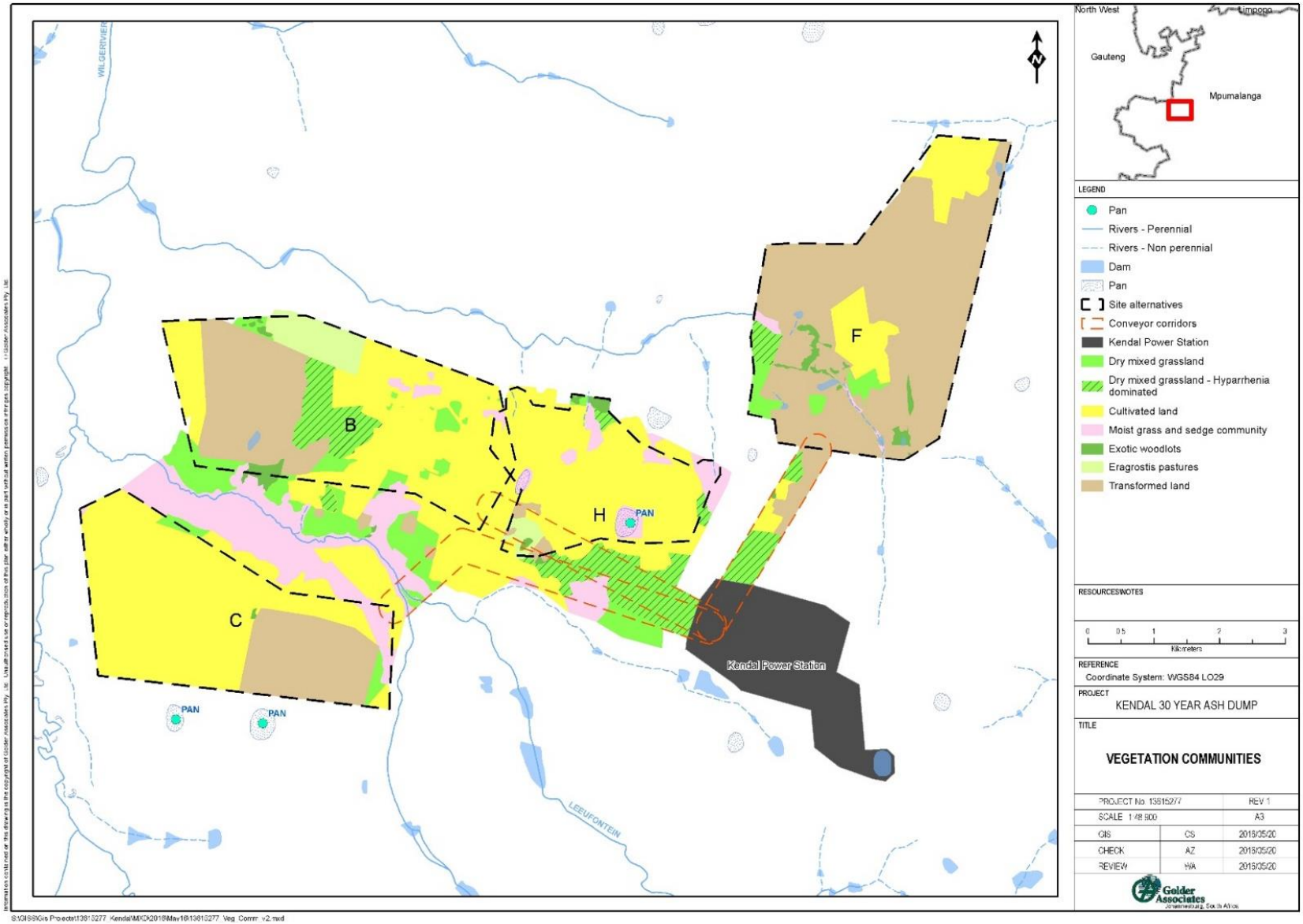


Figure 7-30: Vegetation communities associated with the site alternatives and conveyor corridors in the study area

The majority of Site B, C and H comprise cultivated land. During the dry season these were lying fallow, but were under maize or potato production during the wet season survey. Non-crop plants recorded in or on the edges of the cultivated lands include the exotic, often invasive plants such as *Argemone ochroleuca*, *Argemone* spp*., Bidens pilosa, Chenopodium* spp., *Conyza bonariensis, Cosmos bipinnata, Cyperus esculentus, Tagetes minuta* and *Verbena bonariensis* and grasses *Eleusine coracana, Melinis repens, Panicum maximum* and *Urochloa mosambicensis*.

7.3.3 Fauna Assessment

Mammals

Fourteen mammal species were recorded in the larger study area. These are the Scrub Hare (*Lepus saxatilis),* Multimammate Mouse (*Mastomys* sp.), Striped Mouse (*Rhabdomys pumilio*), Slender Mongoose (*Galerella sanguinea*), Water Mongoose (*Atilax paludonosus*), Large -spotted Genet (*Genetta tigrina*), Porcupine (*Hystrix africaeaustralis*), Serval (*Leptailurus serval*), Black-backed Jackal (*Canis mesomelas*), Cape Clawless Otter (*Aonyx capensis*), Warthog (*Phacochoerus africanus*), Bushpig (*Potamochoerus larvatus*), Steenbok (*Raphicerus campestris*) and Common Duiker (*Sylvicapra grimmia*).

Previous studies conducted in areas surrounding KPS and the nearby Kusile Power Station have recorded an additional seven mammals. These range from small rodents to medium-sized ungulates, the majority of which are fairly-common to common, with widespread distributions and are highly likely to occur in the natural habitats of the study area. Based on historic distributions, a further 47 species are known to occur in the region.

Table 7-14: Additional mammals previously recorded in the Kendal/Kusile Power Station areas

Scientific name	Common name
Crocidura hirta	Lesser Red Musk Shrew
Cynictis penicillata	Yellow Mongoose
Damaliscus dorcas phillipsi	Blesbok
Dendromys mystacalis	Chestnut Climbing Mouse
Crocidura cyanea	Reddish-grey Musk Shrew
Orycteropus afer	Aardvark
Otomys angoniensis	Angoni Vlei Rat

Red Data and protected mammals

Three mammal species recorded in the larger study area are of conservation importance; Serval (*Leptailurus serval*), Steenbok (*Raphicerus campestris*) and Cape Clawless Otter (*Aonyx capensis*). The conservation status and biology of these are briefly discussed below:

The Steenbok is a relatively common, widespread small antelope and is accordingly not considered threatened or rare. Be that as it may, it is listed as protected according to the Mpumalanga Nature Conservation Act (No. 10 of 1998) and for this reason has been included as a mammal of conservation importance;

Serval are listed as protected on the NEMBA TOPS list (2013) and near threatened according to the IUCN (2013.1). They are solitary and mainly nocturnal, preferring grassland and wetland habitats where they prey upon small mammals, birds, reptile and insects. Like many threatened fauna, habitat loss and persecution are the main threats to this species; and The Cape Clawless Otter is protected in terms of Schedule 2 of the Mpumalanga Nature Conservation Act (No. 10 of 1998) and the NEMBA TOPS list (2013). Cape Clawless Otters are found near permanent water where they feed on a mixture of fish, amphibians and crustaceans. Threats to otter include habitat loss and habitat degradation mainly in the form of pollution, increased siltation and agricultural run-off. Additionally, otters are hunted for their pelt and for medicinal purposes (IUCN Otter Specialist Group, 2012, internet). Otters frequent the stream channels and artificial dams in the study area and environs. An additional sixteen Red Data and/or protected mammal species potentially occur in the study area. These, along with a probability of occurrence, are listed in Table 7-15.

Table 7-15: Red Data and protected mammals potentially occurring in the study area

Scientific name	Common name	Status			Probability of occurrence
		IUCN (2013.1)	NEMBA TOPS List (2013)	Mpumalanga Protected Species (1998)	
Chrysospalax villosus	Rough-haired Golden Mole	Critically Endangered	-	-	Moderate
Amblysomus robustus	Robust Golden Mole	Vulnerable	Endangered	-	Moderate
Amblysomus septentrionalis	Highveld Golden Mole	Near Threatened	-	-	High
Miniopterus schreibersii	Schreibersô Long-fingered Bat	Near Threatened	-	-	Low
Dasymys incomtus	Water Rat	Near Threatened	-	-	High
Vulpes chama	Cape Fox	-	Protected	-	Low
Aonyx capensis	Cape-clawless Otter	-	Protected	Protected	Recorded
Leptailurus serval	Serval	Near Threatened	Protected		Recorded
Proteles cristatus	Aardwolf	-	-	Protected	High
Panthera pardus	Leopard	Near Threatened	Protected	Protected	Recorded
Hyaena burnea	Brown Hyaena	Near Threatened	Protected	-	Low
Mellivora capensis	Honey Badger	Near Threatened	-	Protected	Moderate
Ourebia ourebi	Oribi	-	Endangered	Protected	High
Raphicerus campestris	Steenbok	-	-	Protected	Recorded
Pelea capreolus	Grey Rhebok	-	-	Protected	High
Lutra maculicollis	Spotted-necked Otter	Near Threatened	-	Protected	High
Felis nigripes	Black-footed Cat	-	Protected	Protected	High
Atelerix frontalis	South African Hedgehog	Near Threatened	-	Protected	High
Orycteropus afer	Aardvark	-	Protected	Protected	High
Redunca fulvorufula	Mountain Reedbuck	-	-	Protected	High

Birds

Seventy-one bird species were recorded in and adjacent to the larger study area (Table 7-16). Most species were observed in the wetland and grassland habitats surrounding the proposed ADF sites. Recorded species are generally widespread in their range and are common in the grassland and wetland habitats of Mpumalanga.

Table 7-16: Birds recorded in the study area during the 2013 dry season survey (listed alphabetically by scientific name)

Scientific name	Common Name
Alcdeo cristata	Malachite Kingfisher
Alopochen aegyptiacus	Egyptian Goose
Anas erythrorhyncha	Redbilled Teal
Anas sparsa	African Black Duck
Anas undulata	Yellow-billed Duck
Anhinga rufa	Darter
Ardea melanocephala	Black-headed Heron
Ardea purpurea	Purple Heron
Asio capensis	Marsh Owl
Bostrychia hagedash	Hadeda Ibis
Bradypterus baboecala	African Sedge Warbler
Bubulcus ibis	Cattle Egret
Burhinus capensis	Spotted Thick Knee
Buteo vulpinus	Steppe Buzzard
Calandrella cinerea	Red-capped Lark
Centropus burchellii	Burchell's Coucal
Charadrius tricollaris	Three-banded Plover
Chlidonias hybridus	Whiskered Tern
Chrysococcyx caprius	Dideric Cuckoo
Columba guinea	Rock Pigeon
Corvus albus	Pied Crow
Cossypha caffra	Cape Robin
Dendrocygna viduata	White-faced Duck
Egretta garzetta	Little Egret
Elanus caeruleus	Black-shouldered Kite
Euplectes afer	Golden Bishop
Euplectes orix	Red Bishop
Euplectus progne	Long-tailed Widow
Francolinus swainsonii	Swainson's Francolin
Fulica cristata	Red-knobbed Coot
Gallinago nigripennis	African Snipe
Haliaeetus vocifer	African Fish Eagle
Himantopus himantopus	Black-winged Stilt
Hirundo albigularis	White-throated Swallow
Hirundo cucullata	Greater-striped Swallow
Hirundo rustica	European Swallow
Lamprotornis nitens	Glossy Starling
Larus cirrocephalus	Grey-headed Gull
Macronyx capensis	Orange-throated Longclaw
Milvus aegyptius	Yellow-billed Kite
Mirafra sabota	Sabota Lark

Scientific name	Common Name
Motacilla capensis	Cape Wagtail
Myrmecocich formicivora	Anteating Chat
Numida meleagris	Helmeted Guineafowl
Oena capensis	Namaqua Dove
Oenanthe pileata	Capped Wheatear
Passer melanurus	Cape Sparrow
Phalacrocarax capensis	Reed Comorant
Philomachus pugnax	Ruff
Phoenicopterus sp.	Flamingo sp.
Plectropterus gambensis	Spurwinged Goose
Plegadis falcinellus	Glossy Ibis
Ploceus velatus	Masked Weaver
Quelea quelea	Red-billed Quelea
Sagittarius serpentarius	Secretarybird
Saxicola torquata	African Stone Chat
Lanius collaris	Common Fiscal
Scopus umbretta	Hammerkop
Spreo bicolor	African Pied Starling
Streptopelia capicola	Cape Turtle Dove
Streptopelia semitorquata	Red-eyed Dove
Streptopelia senegalensis	Laughing Dove
Tachybaptus ruficollis	Little Crebe
Tadorna cana	South African Shelduck
Threskiornis aethiopicus	Sacred Ibis
Vanellus armatus	Blacksmith Lapwing
Vanellus coronatus	Crowned Lapwing
Vanellus senegallus	African Wattled Lapwing
Vidua macroura	Pin-tailed Whydah

Red Data and protected birds

Bird species of conservation importance include Secretarybirds (*Sagittarius serpentarius*), Sacred Ibis (*Threskiornis aethiopicus*) and Greater Flamingo (*Phoenicopterus ruber*). These are discussed below:

Two species of Flamingo occur in southern Africa; the Greater Flamingo and Lesser Flamingo (*Phoenicopterus minor*). Both species are listed as Near Threatened by the IUCN and are protected according to the NEMBA TOPS list and Schedule 2 of the Mpumalanga Nature Conservation Act (No. 10 of 1998). Flamingos inhabit shallow water bodies, such as pans and lakes, where they feed on *inter alia*, small fish, aquatic insects and crustaceans. Greater Flamingo have been recorded at the pan in the south-east corner of Site H (Co-ordinates: 26° 4.412 S, 28° 56.876 E) (pers comm. D. McCulloch[7] 2012/2013);

Secretary birds inhabit open grassland to lightly wooded savanna and are often found in agricultural areas. They are large raptors that prey on a variety of small mammals and reptiles. They are listed as Vulnerable by the IUCN (2013.1) and protected according to Schedule 2 of the

[7] Formerly of Wetland Consulting Services

Mpumalanga Nature Conservation Act (No. 10 of 1998). A pair of Secretary birds was observed hunting in a grassland area adjacent to Site C (Co-ordinates: 26º 4.477 S, 28º 52.966 E); and

Notwithstanding the fact that Sacred Ibis are general common and widespread, they are listed as protected according to the NEMBA TOPS list (2013). This species favours grassland and wetland habitats and was recorded at the pans adjacent to Site C.

Many of Mpumalangaôs most threatened bird species are dependent on wetlands and short, dense grasslands, as well as tall grasslands in the province. These habitats that are found to a limited extend in the proposed development footprints, but occur extensively in adjacent untransformed areas. Indeed, large pockets of the Moist grass and sedge community located between Sites C and B are dominated by *Imperata cylindrica* – a grass is the favoured nesting habitat for the vulnerable African Grass Owl (*Tyto capensis*).

An additional 15 Red Data/protected species may occur in the study area. These, along with a probability of occurrence, are listed in Table 7-17.

Table 7-17: Red Data and protected bird species potentially occurring in the study area

Scientific name	Common name	Status			Probability of occurrence
		IUCN (2013.1)	NEMBA TOPS List (2013)	Mpumalanga Protected Species (1998)	
Alcedo semitorquata	Half-collared kingfisher	Near threatened	-	Protected	Moderate
Anthropoides paradiseus	Blue crane	Vulnerable	Vulnerable	Protected	Moderate
Charadrius pallidus	Chestnut-banded plover	Near threatened	-	Protected	Moderate
Circus ranivorus	African marsh harrier	Vulnerable	-	Protected	High
Crex crex	Corn Crake	Vulnerable	-	Vulnerable	High
Eupodotis caerulescens	Blue korhaan	Near threatened	-	Protected	Moderate
Eupodotis senegalensis	White-belled korhaan	Vulnerable	-	Protected	Low
Falco biarmicus	Lanner falcon	Near threatened	-	Protected	High
Falco naumanni	Lesser Kestrel	Vulnerable	-	Protected	High
Falco peregrinus	Peregrine Falcon	Near threatened	-	Protected	Moderate
Geronticus calvus	Southern Bald Ibis	Vulnerable	Vulnerable	Protected	High
Glareola nordmanni	Black-winged Pratincole	Near threatened	-	Protected	High
Mirafra cheniana	Melodious Lark	Near threatened	-	Protected	Moderate
Phoenicopterus minor	Lesser Flamingo	Near threatened	Protected	Protected	Recorded
Phoenicopterus ruber	Greater Flamingo	Near threatened	Protected	Protected	Recorded
Sagittarius serpentarius	Secretarybird	Vulnerable	-	Protected	Recorded
Threskiornis aethiopicus	Sacred Ibis	-	Protected	-	Recorded
Tyto capensis	African Grass Owl	Vulnerable	-	Protected	High

Herpetofauna

Amphibians recorded in the study area are the Common Platanna (*Xenopus laevis*), Common River Frog (*Afrana angolensis*), Striped Stream Frog (*Strongylopus fasciatus*) and Red Toad (*Schismaderma carens*). These are all common species with widespread distributions.

In terms of reptiles, only the Variable Skink (*Mabuya varia*) was observed in the study area, yet 12 additional species of herpetofauna, as listed in Table 7-18, have previously been recorded. These include eight reptile and four amphibian species. All recorded species are common and not restricted in terms range or habitat.

Table 7-18: Herpetofauna previously recorded in and adjacent to the study area

Biological Name	Common Name
Reptiles	
Bitis arietans	Puff Adder
Dasypeltis scabra	Rhombic Egg Eater
Hemachatus heamachatus	Rinkhals
Lamprophis fuliginosus	Brown House Snake
Pelomedusa subrufa	Marsh Terrapin
Philothamnus hoplogaster	Green Water Snake
Psammophylax tritaenlatus	Striped Skaapsteker
Varanus niloticus	Water Monitor
Amphibians	
Afrana fuscigula	Cape River Frog
Bufo gutturalis	Guttural Toad
Kassina senegalensis	Bubbling Kassina
Tomopterna cryptotis	Tremolo Sand Frog

Red Data and protected herpetofauna

According to Schedule 2 of the Mpumalanga Nature Conservation Act (No. 10 of 1998), all species of reptile excluding both Monitor species (*Varanus exanthematicus* and *Varanus niloticus*) and all snakes, are listed as Protected. This notwithstanding, the Spotted Harlequin Snake (*Homoroselaps lacteus*) which may potentially occur in the study area, has been categorized by the MPTA as Near-threatened, while two other species that may also be present, the Breyerôs Long-tailed Seps (*Tetradactylus breyeri*) and the Striped Harlequin Snake *(Homoroselaps dorsalis*)*,* are listed as Vulnerable and Near Threatened, respectively (IUCN 2013.1). The probability that these species occur in the study area is considered moderate.

The Giant Bullfrog (*Pyxicephalus adspersus*) is the only listed amphibian potentially occurring in the study area. This species is listed as Near Threated (IUCN- regional status) nationally and protected at a provincial level (Mpumalanga Nature Conservation Act (1998). The probability that Giant Bullfrogs occur in the wetlands and pans surrounding the proposed ADF footprints is considered high.

Arthropoda

Ninety-five arthropod taxa have been recorded in, and/or adjacent to the study area. These are mostly common and widespread species. Refer to Appendix F3 for a list of recorded arthopods.

Red Data and protected arthropods

The Marsh Sylph (*Metisella meninx*) butterfly was recorded at several wetland locations in the study area during the wet season survey.

This species was listed as Vulnerable, but has subsequently been down-rated. Despite this, considering its preference for wetland and marsh habitats on the Highveld, Marsh Sylphs are still considered sensitive species.

Other arthropods of conservation importance that potentially occur in the study area include members of the *CTENIZIDAE* (trapdoor spiders) and *THERAPHOSIDAE* families (Baboon spiders). These spiders usually live in burrows or silk-lined retreats, none of which were observed in the study area. Be that as it may, the on-site habitat is suitable and the probability that they are present is considered moderate.

The following scorpions may occur in the area and are of conservation importance; *Opistacanthus validus* and *Opistophthalmus glabrifrons*. Although these were not recorded in the study area, the probability that they are present is also considered high.

7.4 Groundwater

Information concerning groundwater associated with the development area was taken from the study titled ñ*Kendal ADF Site 'H' Groundwater Model*ò dated July 2016. Refer to Appendix F4 for the full report.

7.4.1 Hydrological Setting

Site H is intersected by the surface water divide between quaternary catchment areas B20E and B20F with recorded mean annual precipitations (MAP) of 657.25mm/a and 666.79mm/a respectively. Drainage across catchment area B20E is affected by a tributary of the Leeuwfonteinspruit that originates on Schoongezicht 218 IR to the south of Kendal öE-Houseô (Schoongezichtspruit Drainage System). To the north across catchment area B20F drainage is affected by a number of tributaries of the Kromdraaispruit of which one originates within the siteös north-eastern corner on Portion 20 of the farm Heuwelfontein 215 IR. The total length of the drainage line bounding the southernmost portion of the site is approximately 2.9km. The Kromdraaispruit is located some 1.28km to 2.31km to the north of the site. Centrally the site also features a perennial pan that is intersected by the boundary between Heuwelfontein 215 IR and Schoongezicht 218 IR.

7.4.2 Topographical Setting

The topography slopes from an elongated high (1574mamsl - 1613mamsl in the southeast) coinciding with the water divide between quaternary catchment areas B20F and B20E towards the

tributary of the Leeuwfonteinspruit and an elevation of approximately 1539mamsl along the south-western extent of the site as well as the north towards the Kromdraaispruit and its tributaries and a minimum elevation of 1561mamsl along the north-eastern extent of the site. Centrally drainage around the perennial pan that is intersected by the boundary between Heuwelfontein 215 IR and Schoongezicht 218 IR Figure 7-31 is towards the pan and an elevation of approximately 1580mamsl. North of the water divide the average slope is in the region of 2.8% while south of the divide the average slope is approximately 4.4%.

Figure 7-31: South-Westernly view of pan (KEN30-P3)

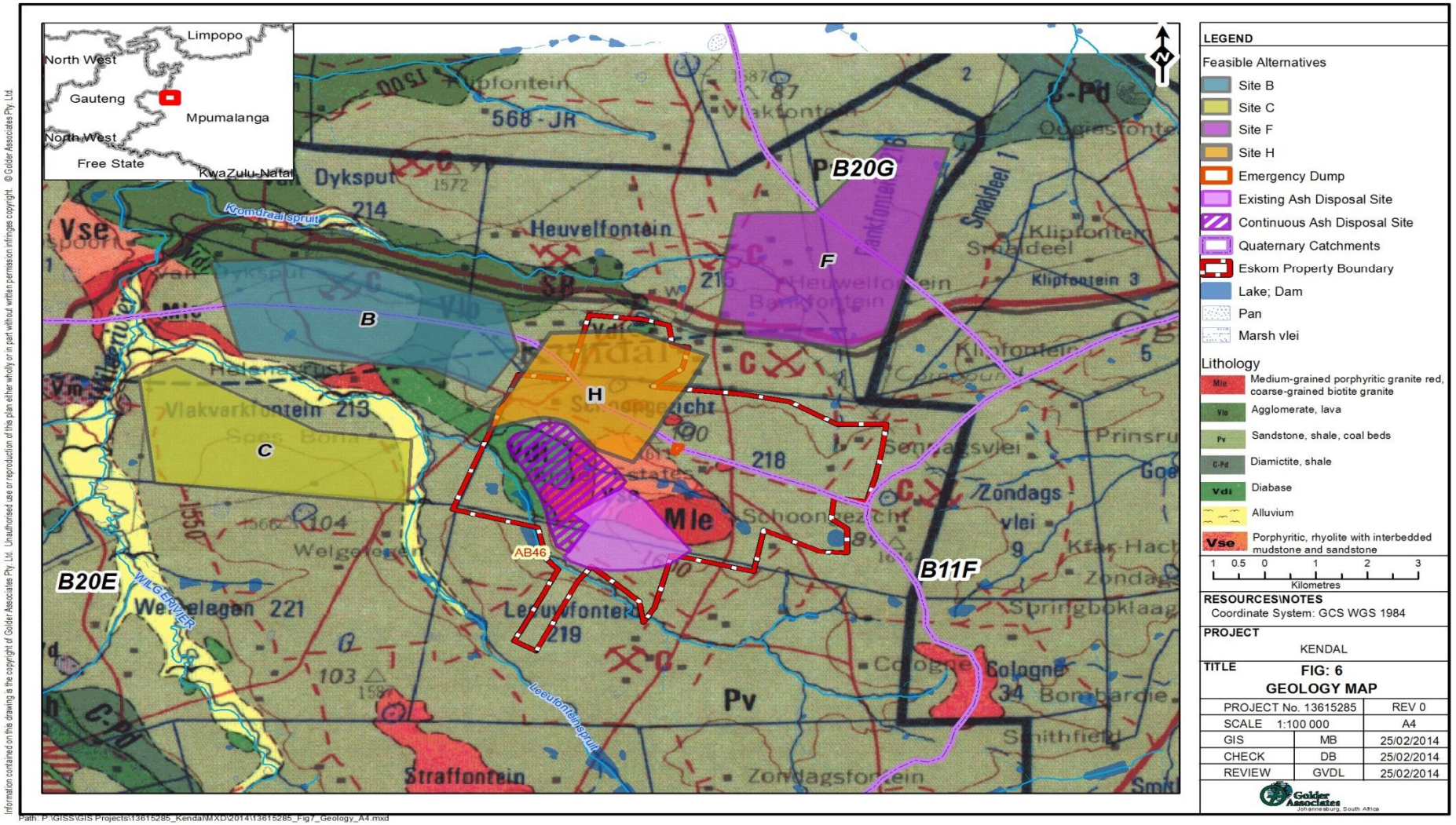


Figure 7-32: Geology Map

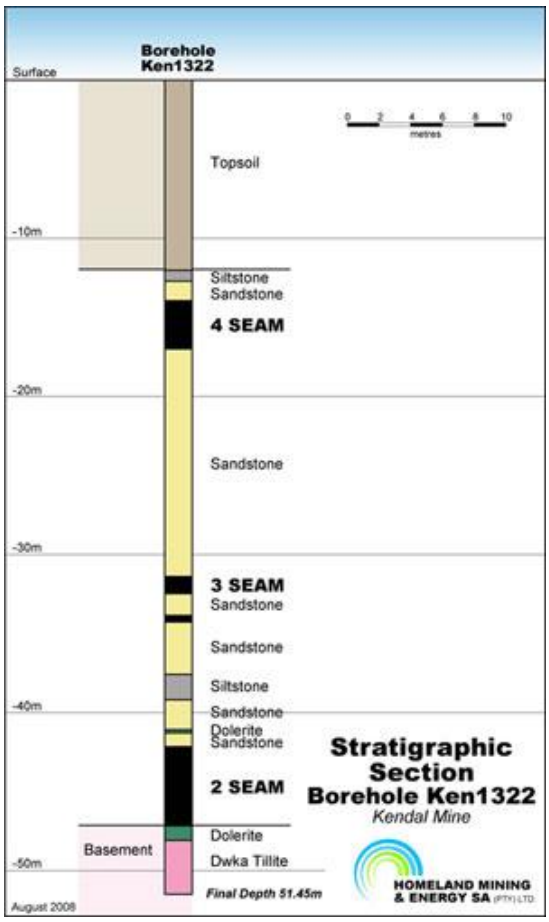


Figure 7-33: Typical Stratigraphic Section at KPS

7.4.3 Geological Setting

Based on the published 1:250 000 geology map series (2628 East Rand), the area of investigation is mainly underlain by Karoo Sequence sediments Figure 7-33. The Karoo Sequence consists of the older Dwyka formation at the base, followed by the Ecca, Beaufort and Lebombo groups. The sediments in the areas of investigation comprise of shale, carbonaceous shale, sandstone and coal of the Vryheid formation of the Ecca Group.

Basement rocks consist mainly of strata of the Selons River Formation (Vse) and the overlying Loskop Formation (Vlo - regarded as the last phase of sedimentation associated with the Transvaal sequence) hosting Nebo Granite (the main part of the Bushveld Granite) and diabase sill intrusions.

Transecting the area of investigation is the west-east striking, post deposition, Ogies dyke, which attains a thickness of approximately 15 m. Local aeromagnetic data in the vicinity of Ogies, is indicative of the Ogies dyke dipping roughly between 73 and 79 degrees to the south. The dyke is also known to feature smaller off-shoots to both the north and south. Sediments up to 20m either side of the dyke have been subjected to folding and jointing.

To the west of Quaternary Tertiaryôalluvial deposition is indicated along the Wilge River and two of its tributaries on either side of the R555.

A typical stratigraphic section at KPS is illustrated in Figure 7-33.

Site H is almost entirely underlain by sediments of the Vryheid Formation featuring two small Nebo Granite inliers on Schoongezicht 218 IR as well as a small diabase sill outcrop along the central northern boundary of the site.

The Karoo sediments can be seen to pinch out against basal outcrops of the Loskop Formation some 500m to 1.4km to the north and west as well as diabase sill, Nebo Granite and rocks of the Selons River Formation to the south. The south-western corner of the site transects a minor portion of the sill outcrop while the south-eastern corner of the site intersects a portion of the mentioned Selons River Formation.

The Ogies dyke traverses Site H

Although Site H does not feature any current or known historical coal mining activities, it is bounded in the northeast by the historic Kendal United No.4 seam underground workings. Open cast mining (including pillar extraction on the historically mined No.4 seam) at Block E by Just Coal is currently taking place.

7.4.4 Site H Hydrogeological Setting

- The average recharge for Site H is indicated as ranging between 50mm to 75mm per annum.
- The aquifer is classified as a minor aquifer system.
- The aquifer type is indicated as intergranular and fractured.
- The average borehole yield in the area is indicated as ranging between 0.5l/s and 2.0l/s.
- Groundwater vulnerability is indicated as low to medium.

7.4.5 Groundwater Quality

The chemical signatures of the major ion compositions of the water samples analysed are portrayed in an Expanded Durov diagram presented in Figure 7-34.

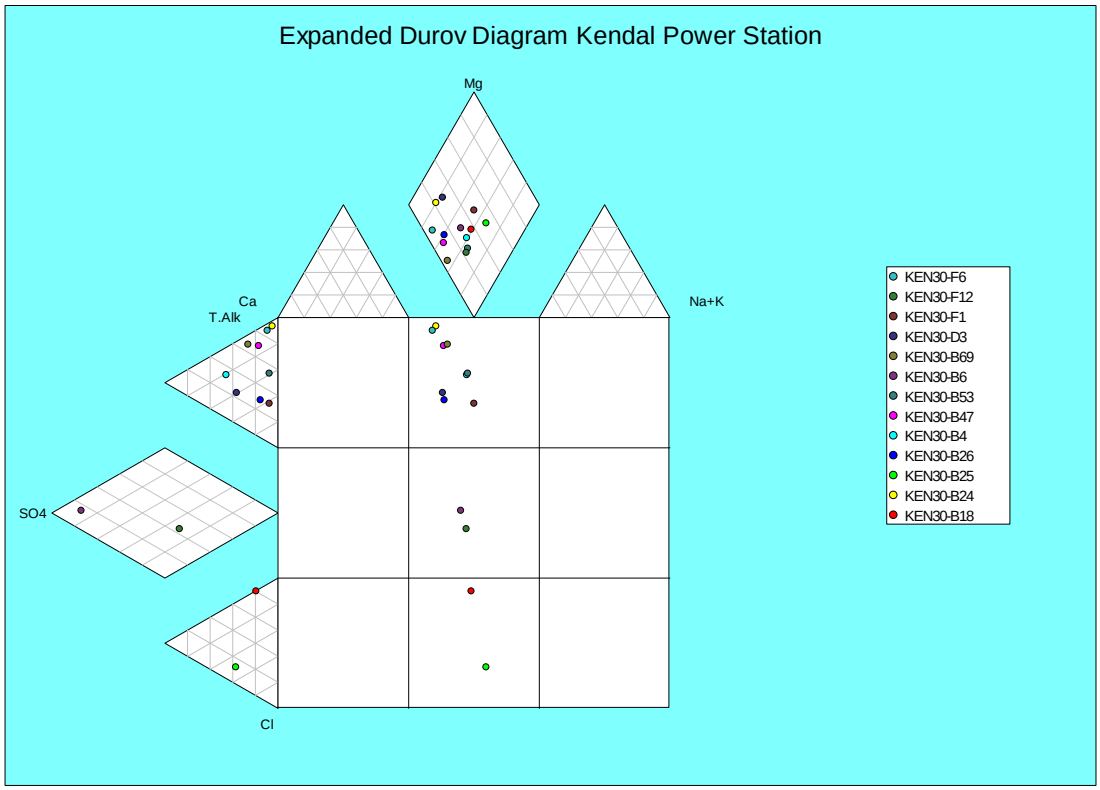


Figure 7-34: Expanded Durov Diagram of Hydrocensus Results

As can be seen in Figure 7-34, KEN30-B26 represent a calcium bicarbonate type of water (Ca) (HCO3)2, representing uncontaminated water. The plotting position of KEN30-F12, with the dominant cations and anions being Mg and SO4, is representative of water from an opencast coal mine environmentôwhile the plotting position of KEN30-B25, with the dominant cations and anions being Mg and Cl, are representative of seldom found water.

7.5 Heritage Resources

A Heritage Impact Study for the Kendal 30-year ADF Project was carried out by PGS Heritage. Refer to Appendix F5 for the full report.

The field work revealed a total of 8 newly discovered heritage sites at Site H. The sites consist of 7 cemeteries (KAD10, KAD16, KAD17, KAD18, KAD19, KAD20 and KAD21) with approximately 149 graves and a single farmstead (KAD15). Refer to Figure 7-35 below for the spatial distribution of the heritage sites and to Table 7-19 for information on each of the sites.

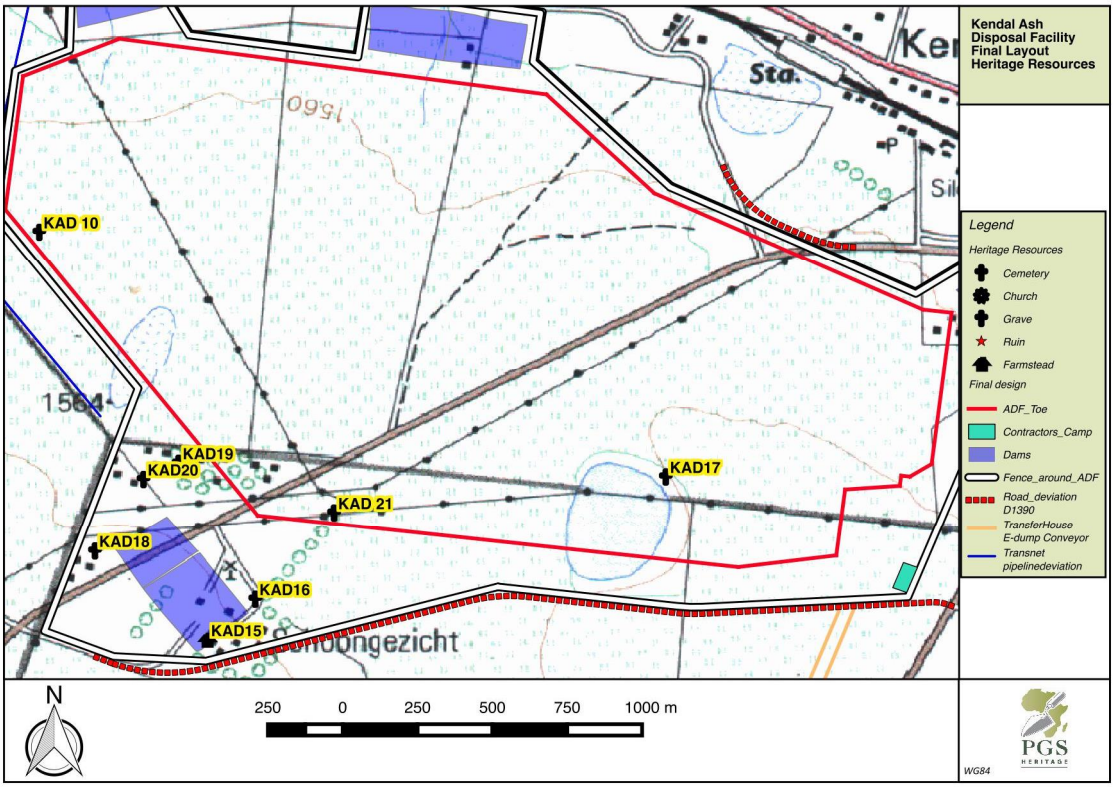


Figure 7-35 – Site H ADF layout with heritage features

Table 7-19: Summary of identified heritage sites on Site H

Heritage Site		Coordinates	Size
KAD10	Cemetery	S26.06355 E28.92852	Approximately 4m x 15m in size.
KAD15	Farmstead	S26.07719 E28.93412	Approximately 200m x 200m in size.
KAD 16	Cemetery	S26.07582 E28.93573	Approximately 5m x 8m in size.
KAD 17	Cemetery	S26.07171 E28.94945	Approximately 40m x 40m in size.
KAD18	Single grave	S26.07420 E28.93038	Approximately 2m x 2m in size.
KAD19	Single grave	S26.07126	Approximately 3m x 2m in size.

Heritage Site		Coordinates	Size
		E28.93317	
KAD20	Cluster of graves	S26.07180	Approximately 10m x 5m in size.
		E28.93200	
KAD21	Cluster of graves	S26.072916	Approximately 10m x 5m in size.
		E28.938364	

Cemetery 1 - KAD10

A small, informal cemetery with approximately six graves was identified at this location. The cemetery was situated in a ploughed field next to gravel road. The graves were placed in a line next to each other and were orientated from the east to west.

Four of the graves had informal mounds of packed rocks as dressings and two of the graves had cement headstones. The cemetery was not maintained recently. The cemetery will be directly impacted by the proposed development. The graves will have to be relocated.

Figure 7-36: Heritage Site – KAD10

Farmstead - KAD15

The site consists of an extended farmstead with numerous out buildings and two dwellings of the original Schoongezicht farm. The farmstead contains elements dating from 1900 and numerous additional structures have been added over the past 113 years to the layout of the farmstead. The structures represent a rich historical layering representing the development of farmstead over time.

The older farmhouse has recently been demolished. An older structure was situated approximately 50m to the south-west of the main farmstead. The original structure was square and

measured approximately 6m x 6m in size. A later addition was made on the western side of the original structure and it measured approximately 4m x 7m. The original structure had a pitched corrugated iron roof and the addition had a sloping corrugated iron roof.

The building had metal door- and window-frames. It did not have an electrical or water system. The building was most probably used as a storeroom on the farm but was not in use any more and not maintained. A disused water tower was situated approximately 10m from the identified storeroom. The water tower measured approximately 1.5m x 1.5m at the base and was approximately 6m high. Some building rubble was found next to the water tower. One of the farm workers, Johannes Mhlanga, said that an old house used to be at that location. The house was demolished years ago due to its derelict state.

Another old storeroom or shed was identified approximately 50m to the east of the first storeroom identified. This storeroom was situated in a line of storerooms or buildings which were used on the farm. The other structures were modern or more recent buildings and were not older than 60 years. This old storeroom was in a derelict state and was not being used any more. The structure measured approximately 12m x 18m in size. The outer walls of this structure was built with sandstone blocks and cement and measured between 40cm-50cm thick.

The inner walls were built with sandstone blocks and a mud-mixture which was used as mortar. The inner wall had a door opening with a wooden lintel. No doorframes or doors were left in the building. A few metal window frames were still left. The structure had a brick paved floor, but did not have a roof any more. From the shape of the wall at the entrance of the building it was evident that the structure had a pitched roof before it was removed. The structure was not being maintained and was overgrown with grass and other vegetation.

Cemetery 2 - KAD16

A small informal cemetery with five (5) graves was identified at this location. The graves were situated in an open stretch of field approximately 50m north-east of the main farmstead. The graves were placed in a line next to each other and were orientated from west to east. All of the graves had rectangular shaped brick- packed or brick and cement constructed frames as dressing. Two of the graves also had inscribed sandstone headstones which were placed at the western end of the graves. The two graves with headstones dated from 1912 and 1921 and belonged to the ñHattinghò family. The graves were not maintained and were overgrown with grass and other vegetation.

A large, inscribed granite monument was placed next to these graves. This monument was fenced and was placed in line with the graves. The monument was placed there by Mr. Piet Pretorius who recognised and commemorated the life of Dr. Albert Hertzog and their political struggle as HNP (Herstigte Nasionale Party) members against the political reforming trends in South Africa during the 1990ôs. The monument was placed there in 1990. No direct impact is envisaged on the graves. If all graves are to be relocated as part of a larger relocation process a full grave relocation process must be done.

Figure 7-37: Memorial of Dr Albert Hertzog

Cemetery 3 ï KAD17

A large, informal cemetery with approximately 119 graves was identified at this location. The cemetery was situated next to and on the eastern side of a natural pan. The graves were arranged in multiple lines and most were orientated from the east to west. A few graves were also orientated from south to north. Most of the graves had informal mounds of packed rocks as dressings and had cement headstones. Two of the graves had more formal granite dressings with inscribed granite headstones. The graves dated from the 1960ôs up to the 1980ôs. The cemetery was overgrown with grass and other vegetation and was not maintained recently.

The grave count on this cemetery was confirmed by Mr Andre Janse van Rensburg of Eskom. A site visit and meeting between PGS, Zitholele and Eskom representatives has confirmed the number of graves. Mr Janse van Rensburg further indicated that they have been keeping count of the number of graves in this cemetery since 2008.

Grave Site - KAD18

The grave of a small child was identified at this location. The grave was situated at the back of one of the farm workerôs houses and within the fenced stand. The grave was marked with two big rocks which were placed on top of the grave. No headstone was present. Margaret Motileni who was the mother of this child showed the grave. It was the grave of Khomotso Motileni who was born on October 28, 2008 and passed away on October 30, 2008. The grave was not maintained and was overgrown with grass and other vegetation.

Figure 7-38 – Site KAD18 (View of grave just behind the house)

Grave Site - KAD19

A single, informal grave was identified at this location. The grave was situated in an open stretch of field near a homestead of one of the farm worker families. The grave had an oval shaped mound of packed rocks as a dressing and it was orientated from west to east. It did not have a headstone. The grave was not maintained and was overgrown with grass and other vegetation. The buried person was unknown at this stage and the age of the grave was also not known.

Figure 7-39: Site KAD18 – View of grave just behind the house

Grave Site - KAD20

A cluster with three graves was identified at this location. The graves were situated in an open stretch of field near a homestead of one of the farm worker families. Two graves were placed next to each other and the third grave was placed in front of them. All of the graves were orientated from west to east. Two of the graves only had informal mounds of rock as dressings and the other grave had a rectangular shaped brick and cement built frame as dressing. An inscribed headstone was found in the grass next to the three graves. This headstone most probably belonged to the grave with the brick-built dressing. The headstone was for the grave of Gedion Mtembu who died on 11/12/1962 and was buried on 16/12/1962. The farm workers did not know these graves or whom they belonged to. The graves were not maintained recently and were overgrown with grass and other vegetation.

Figure 7-40: View of cemetery (Site KAD20)

Grave Site - KAD21

A cluster of approximately fourteen (14) graves was identified at this informal cemetery. The cemetery is heavely over grown and accurate grave count was not possible. The graves are situated in the central part of the southern section of both layout options.

7.5.1 Palaeontology

The preferred site alternative has a variety of underlying geology ranging from Vaalian aged rocks consisting of the Silverton Formations of the Pretoria Group to Permian aged rocks of the Dwyka Formation of the Karoo Supergroup and the Vryheid Formation of the Ecca Group of the Karoo Supergroup.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are; *Azaniodendron fertile, Cyclodendron leslii, Sphenophyllum*

hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Glossopteris > 20 species, Hirsutum 4 spp., Scutum 4 spp., Ottokaria 3 spp., Estcourtia sp., Arberia 4 spp., Lidgetonnia sp., Noeggerathiopsis sp. and Podocarpidites sp.

Little data have been published on these potentially fossiliferous deposits. Around the coalmines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution.Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail.

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Natal. The Karoo sediments are almost entirely lacking in body fossils but ichnofossils are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In KwaZulu-Natal a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly Corophioides) which are assigned to ichnogenus Diplocraterion.

Table 7-20: General Palaeontology associated with development area

Geological Unit	Rock Type and Age	Fossil Heritage	Vertebrate Biozone	Palaeontological Sensitivity
Vryheid Formation	Grey to black mudstone & sandstone PERMIAN	Abundant plant fossils of *Glossopteris* and other plants trace fossils	*None*	Moderate sensitivity

7.6 Noise

A Noise Impact Assessment for the Kendal 30-year ADF Project was carried out by Airshed Planning Professionals. Refer to Appendix F6 for the full report.

The current land uses in the region include coal mining, farming, power generation facilities and small residential communities. Sensitive receptors in the study area included individual residences, homesteads and residential areas (Figure 7-41). The general topography is characterised by gently rolling terrain with no steep inclines.

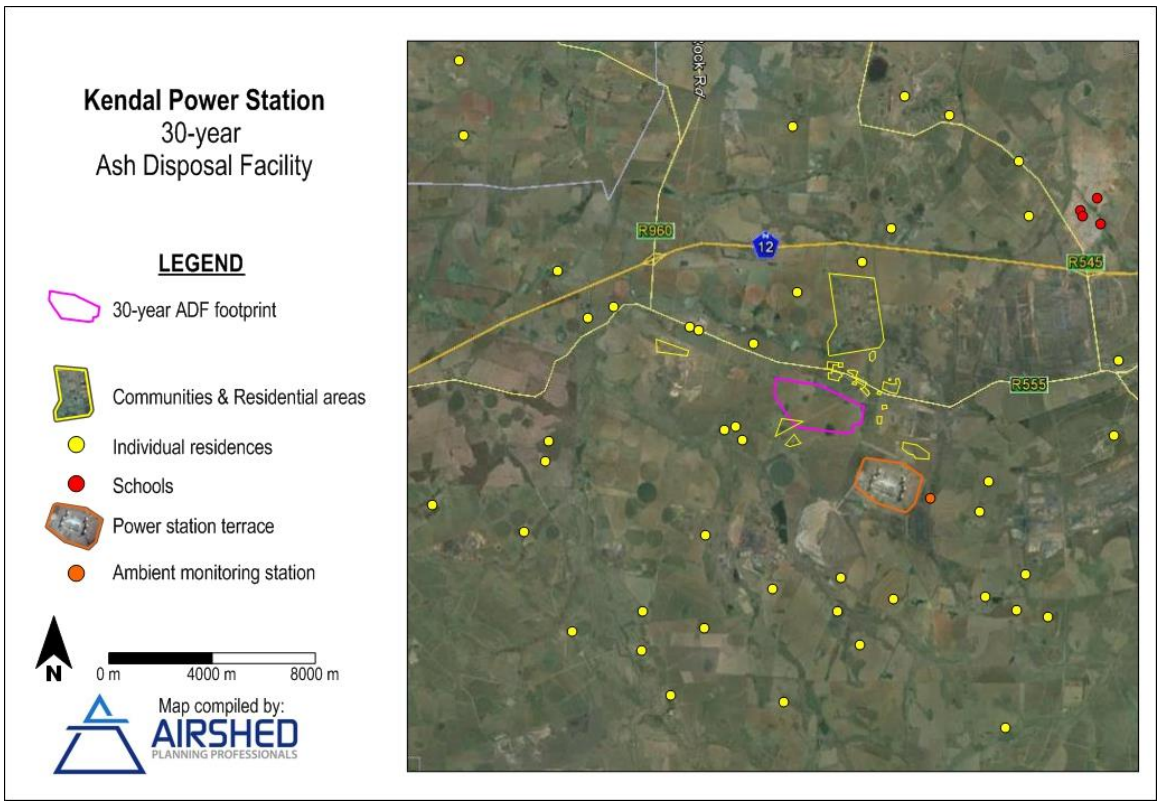


Figure 7-41: Sensitive receptors (i.e. residential areas and individual houses/farmsteads), with respect to noise impacts due to operations from the proposed Project

Previously, noise measurements were conducted in April 2013 at three representative baseline locations for the Kendal Continuous ADF Project (Figure 7-42). Noise measurements at an additional four points were conducted in September 2013 for the Kendal 30 Year ADF Project (Figure 7-42). Pictures of these locations and surround areas are presented in Appendix F6. A summary of measurement results is provided in Table 7-21.

For noise measurements conducted in September 2013, the noise levels at location KMP2 and KMP4 were comparable and correspond to typical noise levels prevalent in rural and suburban districts. The noise levels at location KMP3 were comparable and correspond to typical noise levels prevalent in rural and urban districts with noise levels at location KMP1 comparable to noise levels of industrial areas. For noise measurements conducted for the Kendal Continuous ADF Project, noise levels at location 1 and 2 were comparable and correspond to typical noise levels prevalent in rural and suburban districts. Noise levels typically found in urban districts prevailed at location 3. This is as a result of fast travelling heavy vehicles on the R555.

Time series of measured baseline noise levels are provided in Appendix F6.

Table 7-21: Summary of baseline noise level measurement results

Time of Day	Location	Start Time	Elapsed Time	L_{Aleq} (dBA)	Notes
Additional measurements undertaken for the Kendal 30 Year ADF					
Day-time	KMP1	17-Sep-13 12:22	00:30:00	70.9	Sunny, warm conditions with moderate wind. Measurements mostly affected by heavy and light vehicle traffic on the adjacent main road.

Time of Day	Location	Start Time	Elapsed Time	L_{Aleq} (dBA)	Notes
					Dogs, chickens and wind rustling through the leaves of trees contributed to measured noise levels.
	KMP2	17-Sep-13 09:17	00:30:00	43.2	Sunny, cool conditions with gusting moderate wind. Birds, insects, wind, continuous humming of distant mine vehicles and occasional air traffic contributed to measured noise levels.
	KMP3	17-Sep-13 10:21	00:30:00	44.9	Sunny, cool conditions with moderate to high winds. Noise generated by wind rustling through maize stalks on the ground, humming of farming equipment, birds and wind rustling through the leaves of trees ~100m from the measuring equipment.
	KMP4	17-Sep-13 11:16	00:30:00	46.3	Sunny with a cool moderate wind. Audible sources included: constant humming of mining equipment and mining vehicles reverse hooters.
Night-time	KMP1	20-Sep-13 00:43	00:30:00	62.6	Cold, cloudy conditions with moderate wind. Measurements mostly affected by heavy and light vehicle traffic on the adjacent main road. Mining activities, insects, birds and wind rustling through the leaves of trees contributed to measured noise levels.
	KMP2	19-Sep-13 23:19	00:30:00	43.1	Cold, partly cloudy conditions with low to moderate winds. Audible sources included constant humming of mining equipment and mining vehicle reverse hooters, insects, wind and a passing train in the distance.
	KMP3	20-Sep-13 00:05	00:24:28	44.5	Cold, partly cloudy conditions with strong wind. Wind blowing through maize stalks on the ground and constant humming of mining equipment contributed to the measures noise levels.
	KMP4	19-Sep-13 22:29	00:30:00	42.6	Cold clear conditions with low winds. Noise generated by constant humming of mining equipment and mining vehicle reverse hooters, insects, distant traffic on the N12 to the north, dogs barking in the distance, occasional calls from Jackals and a passing train.
Previous measurements undertaken for the Kendal Continuous ADF (von Reiche, 2013)					
Day-time	1	15-Apr-13 12:39	00:15:00	47.3	Sunny, warm conditions with moderate wind. Noise generated by wind rustling maize crops. Trucks, light vehicles and air traffic
	2	15-Apr-13 12:13	00:15:00	38.5	Sunny, warm conditions with slight to moderate wind. Birds, insects, farm animals and occasional air traffic contributed to measured noise levels.
	3	15-Apr-13 11:36	00:15:00	55.7	Sunny, warm conditions with moderate wind. Measurements mostly affected by heavy and light vehicle traffic on the R555 and passing dirt roads. Insects and birds also audible.
Night-time	1	14-Apr-13 21:28	00:15:00	34.3	Cold with slight breeze. Audible sources included: occasional traffic, frogs, insects and birds, constant industrial rumbling, barking dogs.
	2	14-Apr-13 21:57	00:15:00	37.7	Cold with slight breeze. Audible sources included: frogs, insects and birds, constant industrial rumbling, cattle lowing.
	3	14-Apr-13 22:35	00:15:00	65.8	Cold, wind still conditions. Audible sources included: frogs and insects, distant reverse sirens, traffic on R555.

Figure 7-42: Kendal 30 Year ADF and representative baseline noise measurement locations

7.7 Soil and Land Capability

The information relating to the Soil and Land Capability for the proposed project was taken from the study titled, ñ*Eskom Holdings SOC (Pty) Ltd Kendal 30 Year ADF Expansion Project Specialist Soils & Land Capability Studies Baseline Investigation Environmental Impact Assessment and Management Plan*ò Earth Science Solutions was commissioned to carry out the aforementioned study. Refer to Appendix F7 for the full report.

7.7.1 Land Capability

Based on a well-developed and scientifically founded baseline of information, the South African Chamber of Developments (1991) Land Capability Rating System in conjunction with the Canadian Land Inventory System has been used as the basis for the land capability study.

Using these systems, the land capability of the study area was classified into four distinctly different and recognisable classes, namely, wet land or lands with wet based soils, arable land, grazing land and wilderness or conservation land. The criteria for this classification are set out in Table 7-22.

Table 7-22: Criteria for Pre-Construction Land Capability (S.A. Chamber of Developments 1991)

Criteria for Wetland
Land with organic soils or supporting hygrophilous vegetation where soil and vegetation processes are water dependent.

Criteria for Arable Land
Land, which does not qualify as having wetland soils.
The soil is readily permeable to a depth of 750mm.
The soil has a pH value of between 4.0 and 8.4.
The soil has a low salinity and SAR
The soil has less than 10% (by volume) rocks or pedocrete fragments larger than 100mm in the upper 750mm.
Has a slope (in %) and erodibility factor (ñKò) such that their product is <2.0
Occurs under a climate of crop yields that are at least equal to the current national average for these crops.

Criteria for Grazing Land
Land, which does not qualify as having wetland soils or arable land.
Has soil, or soil-like material, permeable to roots of native plants, that is more than 250mm thick and contains less than 50% by volume of rocks or pedocrete fragments larger than 100mm.
Supports, or is capable of supporting, a stand of native or introduced grass species, or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.

Criteria for Conservation of Land
Land, which does not qualify as having wetland soils, arable land or grazing land, and as a result is regarded as requiring conservation practise/actions.

The ñland capability classificationò as described above was used to characterise and classify the soil polygons or units of land identified during the pedological survey. These combined with the geomorphological aspects (ground roughness, topography, climate etc.) of the site were then employed to rate the capability of the land in question.

The area to be disturbed by the proposed ash deposition and its surface infrastructure development comprises a range of land capability classes, with significant areas of friable and good grazing potential class soil, smaller areas or good arable potential materials and significant areas associated with the lower lying areas topographically of highly sensitive sites that returned wet based soils. The colluvial derived soils are at best considered to have a low intensity grazing land potential or wilderness status.

Arable Land

The arable potential for the majority of the soils mapped is low unless substantial quantities of fertiliser and manure are added. Some soil depths are reflective of an arable status (>750mm), however, the growth potential (nutrient status and soil water capabilities) and ability of these soils to return a cropping yield equal to or better than the national average is lacking. This is due mainly to the poor rainfall and less than optimum nutrient status of many of the soils. These variables reflect the natural conditions, and do not include any man induced additives such as fertilizers or water.

Grazing Land

The classification of grazing land is generally confined to the shallower and transitional zones that are well drained. These soils are generally darker in colour, and are not always free draining to a depth of 750mm but are capable of sustaining palatable plant species on a sustainable basis (only the subsoils at a depth of >500mm are periodically wetted). In addition, there should be no rocks or pedocrete fragments in the upper horizons of this soil group. If present it will limit the land capability to wilderness land. The majority of the study area classifies as low intensity grazing land or wilderness status.

Wilderness / Conservation Land

The shallow rocky areas and soils with a structure stronger than strong blocky (vertic etc.) are characteristically poorly rooted and support at best very low intensity grazing, or more realistically are of a Wilderness character and rating.

Wetland (Areas with wetland status soils)

Wetland areas in this document (soils and land capability) are defined in terms of the wetland delineation guidelines, which use both soil characteristics, the topography as well as floral and faunal criteria to define the domain limits (Separate Wetland Delineation has been undertaken). Only the soils are described here. These zones (wetlands) are dominated by hydromorphic soils (wet based) that often show signs of structure, and have plant life (vegetation) that is associated with seasonal wetting or permanent wetting of the soil profile (separate study).

The wetland soils are generally characterised by dark grey to black (organic carbon) in the topsoil horizons and are often high in transported clays and show variegated signs of mottling on gleyed backgrounds (pale grey colours) in the subsoils. Wetland soils occur within the zone of soil water influence. A significant but relatively small proportion of the study area classifies as having wet based soils. However, it is important to note that a significantly large area of the open pit and infrastructure development being planned encroaches on soils with a wet base.

These should not be mistaken as wetlands in terms of the delineation document, but should be highlighted as potential zones of sensitivity with the potential for highly sensitive areas associated with the prominent waterway associated with the development area. These zones are considered very important, highly sensitive and vulnerable due to their ability to contain and hold water for periods through the summers and into the dry winter seasons.

7.7.2 Soil Chemical and Physical Characteristics

Based on the previous investigations and environmental assessments undertaken for the area, and with a significant amount of baseline chemistry available for the site section process undertaken, the soil chemistry was obtained from existing studies of the soils on land in close proximity to the areas of concern. This information is available from soil studies that were executed during the mining right applications and as part of the MPRDA Process for coal mining projects adjacent to or on the land in question.

Soil Chemical Characteristics

The results are representative indications of the pre-construction conditions and are representative of the baseline conditions only. It is important to remember that the soils will change while in storage, and the results tabled here will need to be verified for particular sites as and when rehabilitation is started. On-going sampling and monitoring of the in-situ conditions will be necessary throughout the operational phase to accurately define the post operational conditions if the rehabilitation is to be successful.

The results of the laboratory analysis returned a variety of materials that range from very well sorted sandy loams with lower than average nutrient stores and moderate clay percentages (<20% - B2/1), to soils with a moderately stratified to weak blocky structure, sandy loam to clay loam texture and varying degrees of utilizable, while the nutrient stores on the colluvial derived materials, and the extremes of much higher clay and stronger structure that are noted on the wet based and wetland soils, returned lower than average nutrient concentrations and better than average water holding capabilities. In general, the pH ranges from acid at 5.8 to neutral and slightly alkaline at 7.5, a base status ranging from 5.2me% to 22.8me% [Mesotrophic (moderate leaching status) to Dystrophic (Highly leached)], and nutrient levels reflecting generally acceptable levels of calcium and magnesium, but deficiencies in the levels of potassium, phosphorous, and zinc. The organic carbon matter is reflective of the semi-arid environment.

The more structured (moderate blocky) and associated sandy and silty clay loams returned values that are indicative of the more iron rich materials and more basic lithologies that have contributed to the soils mapped. They are inherently low in potassium reserves, and returned lower levels of zinc and phosphorous. The growth potential on soils with these nutrient characteristics is at best moderate to poor and additions of nutrient and compost are necessary if commercial returns are to be achieved from these soils. They are at best moderate to good grazing lands.

Table 7-23: Analytical Results

Sample No.	CA1	CA2	CA3	CA4	CA5	CA6	CA8	EEP15	EEP19	ED1	ED2	Optimum Range
Soil Form	Cv	Av	Gc	Pn	Ka	Hu	Kd	Sd/Hu	Rg	Dr	We	
Constituents mg/kg												
pH	6.25	6	5.5	6.5	5.2	6.4	6.4	6	5.5	6.1	6.4	5.2 - 6.5
"S" Value	11.2	8.9	22.1	14.8	31	11	22	22.8	33	5.2	5.8	
Ca Ratio	59	70	66	65	62	65	49	68	62	70	65	55-75
Mg Ratio	16	24	30	32	34	22	28	34	34	28	10	18-30
K Ratio	18	4	1	1	7	4	8	4	9	0.6	12	6-10
Na Ratio	0.2	0.3	0.2	1.6	1.1	0.5	0.3	0.4	0.8	1.4	0.2	
P	111	22	8	6	17	10	15	12	20	5	82	20 -80
Zn	7.2	2	1	1.1	1.4	1.5	1.4	2	1.1	1	1.6	2-10
Sand	45	42	34	46	18	52	21	42	16	58	44	
Silt	39	36	38	46	22	30	27	26	26	34	35	
Clay	16	22	28	8	60	18	52	32	58	8	21	15 -25
Organic Carbon %	0.15	0.32	0.45	0.12	0.75	0.45	0.6	0.8	0.2	0.15	0.2	>0.75

Soil fertility

The soils mapped returned at best moderate levels of some of the essential nutrients required for plant growth with sufficient stores of calcium and magnesium. However, levels of Na, Zn, P, and K are generally lower than the optimum required. These conditions are important in better understanding the land capability ratings that are recorded, with the majority of the study area being rated as low intensity grazing land. These poor conditions for growth were further compounded by the low organic carbon (< 0.75%). There are no indications of any toxic elements that are likely to limit natural plant growth in the soils mapped within the study area

Nutrient Storage and Cation Exchange Capacity (CEC)

The potential for a soil to retain and supply nutrients can be assessed by measuring the cation exchange capacity (CEC or ñSò Values) of the soils. The inherently low organic carbon content is detrimental to the exchange mechanisms, as it is these elements which naturally provide exchange sites that serve as nutrient stores. The moderate clay contents will temper this situation somewhat with at best a moderate to low retention and supply of nutrients for plant growth.

Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically, a soil rich in humus will have a CEC of 300 me/100g (>30 me/%), while a soil low in organic matter and clay may have a CEC of 1 me/100g to 5 me/100g (<5 me/%). Generally, the CEC values for the soils mapped in the area are moderate.

Soil organic matter

The soils mapped are generally low in organic carbon. This factor coupled with the moderate to high clay contents for the majority of the soils mapped will adversely affect the erosion indices for the soils.

Soil Physical Characteristics

The majority of the soils mapped exhibit apedal to weak crumby structure, low to moderate clay content and a dystrophic leaching status. The texture comprises sandy to silty sands for the most part, with much finer silty loams and clay loams associated with the colluvial and alluvial derived materials associated with the lower slope and bottom land stream and river environs respectively.

Of significance to this study, and a feature that is moderately common across the three sites where the soils are associated with the sedimentary host rocks (albeit that it often occurs below the 1.5m auger depth on the deeper soils) is the presence of a soft plinthic or hard pan ferricrete (plinthite) layer within the soil profile. The semi-arid climate (negative water balance) combined with the geochemistry of the host rock geology are conducive to the formation of evaporites, with the development of ferruginous layers or zones within the vadose zone. The accumulation of concentrations of iron and manganese rich fluids in solution will result in the precipitation of the salts and metals due to high evaporation (negative water balance). This process results in the development of a restrictive or inhibiting layer/zone within the profile over time.

The negative water balance is evidenced by the generally low rainfall of 800mm/year or less, and the high evaporation that averages 1,350mm/year. These are the driving mechanisms behind the ouklip or hard pan ferricrete mapped. The degree of hardness of the evaporite is gradational, with soft plinthic horizons (very friable and easily dug with a spade or shovel), through hard plinthite soil (varying in particle size from sand to gravel ï but no cementation) to nodular and hard pan ferricrete or hard plinthic (cementation of iron and manganese into nodules) that are not possible to free dig or brake with a shovel. This classification is taken from - Petrological and Geochemical Classification of Laterites -Yves Tardy, Jean-Lou, Novikoff and Claude Roquid, and forms the basis for classify the hard pan ferricrete or lateritic portion of the soil horizon in terms of its workability (engineering properties) and storage sensitivities.

The soil classification system takes cognisance of ferricrete and has specific nomenclature for these occurrences (Refer to The South African Taxonomic Soil Classification ï See list of references). The variation in the consistency of the evaporite layer, its thickness and extent of influence across/under the site are all important to the concept of a restrictive horizon or barrier layer that is formed at the base of the soil profile and/or close to the soil surface.

Where this horizon develops to a nodular form or harder (Nodular, Honeycomb and Hard Pan) the movement of water within the soil profile is restrict from vertical movement and is forced to move laterally or perch within the profile. It is this accumulation of soil water and the precipitation of the metals from the metal and salt rich water that adds progressively to the ferricrete layer over time. Important to an understanding of the development of the ferricrete is the geological time and presence of the specific soil and water chemistry under which the horizon forms. This situation will be very difficult to emulate or recreate if impacted or destroyed.

Soil Erosion and Compaction

Erodibility is defined as the vulnerability or susceptibility of a soil to erosion. It is a function of both the physical characteristics of a particular soil as well as the treatment of the soil. The resistance to, or ease of erosion of a soil is expressed by an erodibility factor (ñKò), which is determined from soil texture/clay content, permeability, organic matter content and soil structure. The Soil Erodibility Nomograph was used to calculate the ñKòvalue.

With the ñKò value in hand, the index of erosion (I.O.E.) for a soil can then be determined by multiplying the ñKò value by the ñslopeò measured as a percentage. Erosion problems may be experienced when the Index of Erosion (I.O.E) is greater than 2. The majority of the soils mapped can be classified as having a moderate to high erodible erodibility index in terms of their organic carbon content and clay content, albeit that this rating is off-set and tempered to a rating of moderate or low by the undulating to flat terrain. However, the vulnerability of the ñBò horizon to erosion once the topsoil and/or vegetation is removed must not be under estimated when working with or on these soils. These horizons (B2/1) are vulnerable and rate as medium to high when exposed.

The concerns around erosion and inter alia compaction, are directly related to the disturbance of the protective vegetation cover and topsoil that will be disturbed during any construction and operational phases of the development venture. Once disturbed, the effects and actions of wind

and water are increased. Loss of soil (topsoil and subsoil) is extremely costly to any operation, and is generally only evident at closure or when rehabilitation operations are compromised. Well planned management actions during the planning, construction and operational phases will save time and money in the long run, and will have an impact on the ability to successfully ñcloseò an operation once completed.

7.8 Socio-economic environment

A Socio-Economic Study for the proposed project was carried out by Equispectives Research and Consulting Services. The primary objective of the study included the characterisation of the social environment associated with the development area as well as profiling the socio-economic baseline conditions. Taking the aforementioned into account, what is considered to be the key findings of the ñ*Kendal 30-year ADF Social Impact Assessment*ò (Equispectives, 2016) have been extracted and is provided below. Refer to Appendix F8 for the full report.

A number of stakeholders were identified, which includes Residential communities, Agriculture groups, Government, Mining groups and Parastatal organisations. Stakeholders in relation to the context of the proposed project refer to individuals and groups that are likely to impact or be impacted by the planned project. It is worth noting that ñ*the stakeholder groups for this project are also stakeholders in other developments, and there are significant cumulative impacts to consider*ò (Equispectives, 2016:37). A description of each of the aforementioned stakeholders is provided below.

7.8.1 Residential communities

Five residential communities have been identified within a 1km radius of the proposed Kendal 30-year ADF (Figure 7-43).

<u>Eskom Triangle community</u>

The Triangle community consist of 12 families (approximately 68 people) that occupy 14 units on a piece of land that is owned by Eskom. According to the residents, some of them have been living there for 60 years and have living rights on the property. The 12 families are not related to each other. They started out as farm workers, and although some people in the community work on the mines and a few work as domestic workers, the majority of the community depend on government grants and old age pensions. There are approximately 20 children of school-going age in the community and they attend school in Phola. The school bus picks them up in front of the property in the mornings. The community travels to Ogies to collect pensions, for medical care, shopping and church. There is no public transport, as the roads are too bad and the taxis refuse to travel on these roads. They do not engage in agricultural activities, since the space is limited and water availability is an issue, although some subsistence crops are planted. There are members of the community that own livestock such as cows and chickens ï the cattle graze on the property across the road.

There is no electricity or running water in the houses on the property. The community uses generators for electricity and collect water from a tap that is fed by a borehole on the property. The

water supply can be erratic at times, since the foreman that resides on the neighbouring property must switch on the pump for the borehole manually, and aspects such as safety and cable theft can influence his ability to access the pump. Some community members claim that they stay only on the property because they do not have any other options. They are currently only allowed to maintain and restore their houses, and no extensions or additional buildings may be erected. Community members stated that they have a positive relationship with their landlord. The community highlighted existing environmental impacts caused by the mining and agricultural activities in the area. These impacts include the cracking of houses, health impacts associated with dust (especially amongst the children), nuisance impacts associated with dust, noise impacts created by mining trucks, corrugation of roofs and fences and the impact of dust on their crops and animals. This community falls within the footprint of the proposed Site H.

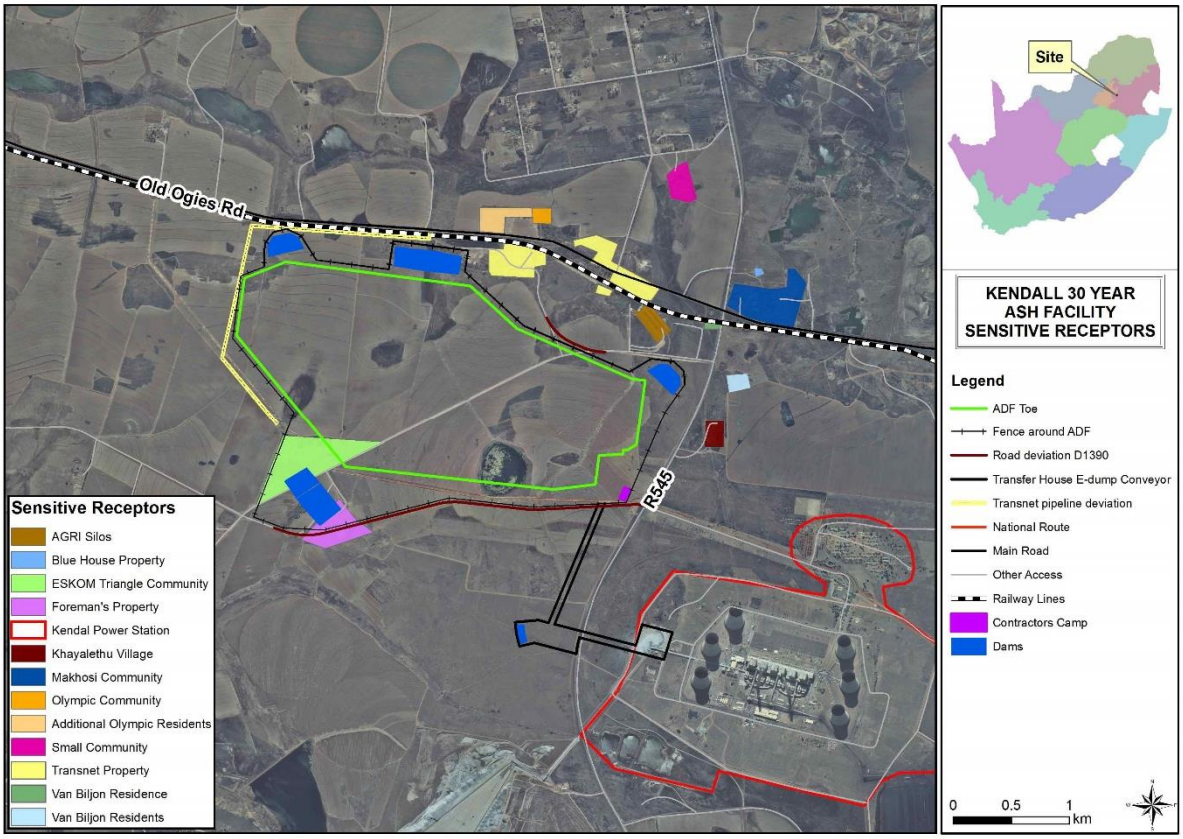


Figure 7-43: Location of closest residential communities

Khayalethu Village

Homeland Mining and Energy SA (Pty) Ltd (Homeland) relocated the people residing in Khayalethu Village in 2008. There are 15 houses in the village, each with a water tank. The village rely on the harvesting of rainwater and a borehole operated by a windmill for water. If there is no wind, they struggle with water supply. The village has access to electricity. According to the residents, Homeland has not been looking after the infrastructure, and the local municipality is also not forthcoming with the provision of services. The children that live in the village go to school in Phola, and a bus supplied by the Department of Education transports them there. There is no public transport, and residents who do not have their own transport hitchhike to go to Ogies or Witbank for medical services, church and shopping. A resident stated: ñThere are no recreational activities, so we drink for funò Some of the residents do contract work at Kusile, Balmoral or Kendal. There are a number of graves in the area, and the Kusile Mining group and the heritage impact

assessment specialist working on the Kendal 30-year ADF has approached the community about the exact location of these graves. The community claims that they experience impacts from the current Kendal ADF, such as health impacts and dust. They further claim that the dust settling on the roofs impact on the harvesting of rainwater.

At a meeting conducted on 18 May 2013 by Geovicon consultants on behalf of Kusile Mining residents were informed of a new mining development and advised that ñé they will be severely affected if they remainò and that ñé the community must consider being resettled since it will be both unsafe and unhealthy to be so close to an opencast mining operationò (Minutes of meeting held with Khayalethu Village, 13 May 2013). The community members claim that they have not heard from the consultants or Kusile Mining after this meeting. It is a matter of concern that the community that has been relocated quite recently may be relocated again, and that no restoration of livelihoods took place. Community members said that they would prefer to relocate to a municipal area where they can have title deeds for their houses and better access to services. This community is situated approximately 500m to the east of the boundary of the proposed Kendal 30-year ADF.

Olympic community

The Olympic community is situated south of the old Ogies Road (R555) and west of the R545 intersection, about 700m north from the boundary of the proposed site. It consists of approximately 60 to 80 houses, both formal and informal. Many of the residents came to the area in search for opportunities, and never moved on. There are many migrant workers from KwaZulu-Natal and elsewhere in Mpumalanga residing in this community. Representatives from the eMalahleni Local Municipality claims that many of the residents in the settlement are illegal occupiers and that there are a number of illegal immigrants and people without identification documents living there. These representatives also reported friction within the community and segregation between community groups, resulting in difficulties ñto bring them to orderò. Most of the land that is occupied by the Olympic community belongs to Transnet. The community does not have access to water, electricity and sanitation. In a focus group meeting conducted on 2 March 2015 Transnet indicated that they would not relocate the illegal occupiers from their properties, but liaise with the local municipality to do so (Refer to Appendix C7 for the CRR). The rights of people that illegally occupy the property are protected under the Prevention of Illegal Eviction and the Unlawful Occupation of Land Act (1998).

Makhosi community

The Makhosi Village consists of two parts. The first part is the ñBlue Housesò, a few houses situated a small distance from the rest of the community at the northern entrance to the community. Makhosi Village is located on the north-eastern side of the old Ogies (R555) and R545 junction, about 900m from the boundary of the proposed site. There are approximately 200 to 250 structures, both formal and informal. The legal owner of the property where the community is established could not be determined. According to a neighbour, a land claim has been submitted on behalf of himself and the Makhosi community. Access to water, electricity and sanitation is not adequate. The claims of friction within the community and segregation between community groups made by representatives of the eMalahleni local municipality also refer to this community.

The Kendal Community Police Forum is active in all the surrounding communities, and representatives of this forum engaged with the public participation team about challenges in the area. Air pollution and lack of water, electricity and sanitation are existing challenges. Regarding the proposed Kendal 30-year ADF, community members expressed concern about the distance between community members and the proposed ADF, the possibility of resettlement, grazing for their livestock, availability of jobs, project communication and the potential impact on gravesites.

Van Biljon Residence

The Van Biljon Residence is about 600m north-east of the boundary of the proposed site on the western side of the old Ogies (R555) and R545 crossing. Mr van Biljonõs father owned one of four portions of the farm Heuvelfontein. The rest of the properties where owned by the Shill family. Mr van Biljonõs father died in 1978, and Mr van Biljon claims that he is a life tenant on the property (meaning he received the right to live at or use the property during his lifetime). Mr van Biljon also claims that he submitted a land claim with the Makhosi community for the property where they are currently residing.

7.8.2 Agricultural groups

Agriculture, together with mining, is the predominant land use in the area. Commercial farmers operate in the directly affected area.

Commercial farmers

The two commercial farming enterprises that will be affected by the proposed Kendal 30 year ADF are Truter Boerderye and Torero Investments. While the land owned by these enterprises can commercially be sold to Eskom, and rented back to the owners until Eskom need to use it, the cumulative impact that the coal mines and coal fired power stations in the area have on agricultural activities must be acknowledged. As an example eight mines surround the property owned by Torero Investments. Although it is a commercial enterprise, the farmers emphasised that the impact is not merely financial, as farming is also a lifestyle choice and their homes are in the area. Despite the negative impacts experienced, the farmers believe that the soil in the area is of the most fertile in the country, and therefore they are willing to absorb some of the impacts. Existing impacts mentioned by the farmers include an influx of people leading to issues such as poaching, arson, theft and squatter camps; issues with water quality impacting on the health of animals and crops; health impacts such as sinusitis; air quality issues; and the effect of coal dust and ash on animal, crop and human health. Farming commodities include cattle, maize, soya and potatoes.

AFGRI

AFGRI is an agricultural services and processing company, with grain commodities as a core focus. The company owns 69 grain silos across South Africa, of which the Kendal silo is one. The Kendal silo is situated approximately 450m north-east of the boundary of the proposed site. All the silos are registered as food safety facilities (http://www.afgri.co.za/grain-management-brochure/) as required under the Agricultural Product Standards Act (1990). The Kendal silo employs approximately 20 people on a permanent basis, and temporary workers as needed. The farmers in

the area also frequent the silos to deliver their products. The management of the silos expressed a concern about the potential health impact the proposed Kendal 30 year ADF will have on their workers and visitors. The commodities handled by the silos include maize, wheat and soya. Although all these commodities are sensitive to ash dust, soya is more sensitive because it is oil-based. Another concern is the potential effect that the ash dust will have on the crops. Ash residue may affect the grade of the produce, and thereby affect the price. In the long run, there is a concern about the potential impact on food security.

The farmers use the D1390 gravel road to deliver their crops to the silos. The D1390 must be re-routed to accommodate the proposed Kendal 30 year ADF. AFGRI expressed a concern that a significant increase in the distance to the silos will have a negative impact on the farming community; however, the increase in distance has been calculated to be less than 500m and is therefore not significant.

7.8.3 Government

South Africa has a three-tier government consisting of national, provincial and local government. All three levels of government have legislative and executive powers in their own domain, and are responsible for a different aspect of service delivery.

Mpumalanga Provincial Government

The provincial government is responsible for housing, schools and clinics. The Mpumalanga Provincial Government is therefore the appropriate party to liaise with about the housing situation of some of the communities in the area around the proposed site for the Kendal 30 year ADF.

eMalahleni Local Municipality

Local municipalities are responsible for planning, water delivery, electricity, sanitation and refuse removal (NPC, 2012). Consultation with the communities that will potentially be impacted by the proposed project revealed that basic services such as water, electricity and sanitation are not provided in the area, and therefore the Emalahleni LM is not fulfilling their mandate. There also seem to be a lack of communication between communities and the Emalahleni LM. All South African municipalities are demarcated into wards, and a ward councillor and ten elected members lead each ward. The proposed site for the Kendal 30 year ADF falls in Ward 30 of the Emalahleni LM. Ward 28 borders Ward 30. Representatives of the EML indicated that there are existing problems in the affected communities such as community members without identity documents (which will exclude them from certain democratic processes), illegal occupation of properties, illegal immigrants, friction within the communities and segregation between some community groups. These problems make it a challenge to govern the community from the perspective of the Emalahleni LM.

Mpumalanga Provincial Department of Public Works, Roads and Transport

The Mpumalanga Provincial Department of Public Works, Roads and Transport is responsible for the D1390 road and must give permission for the road deviation in terms of the Provision of the Advertising on Roads and Ribbon Development Act (1940). Permission for the road deviation has been obtained from this department, on condition that the road remains open as a public road, the intersection meet design standards and the radius meet design standards of 80 Km/h. The department indicated that it will not be financially involved by any means in the process, but that it will assist and monitor the whole process if and when necessary. The applicant must carry all costs and risks associated with the road deviation, and if the department finds that the Kendal 30 year ADF cause significant numbers of additional trucks on the road, they may require the applicant to surface the road or part thereof.

7.8.4 Mining groups

Mining, together with agriculture is the predominant land use in the area. The area around the proposed site for the Kendal 30 year ADF has historically been exposed to mining activities, and large sections of land are under-mined.

Eyethu Coal/Kusile Mining

Eyethu Coal/Kusile Mining applied for prospecting rights on portions of Site H and Portion 20 of Schoongezicht. Prospecting revealed that Site H does not have coal resources, and Kusile Mining undertook to change their mining right application to exclude the areas required by Eskom. The Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) authorised the Heuvelfontein Colliery in September 2014. Ferret Coal, owned 51% by Kusile Mining, owns Heuvelfontein Portion 20, a piece of land that is also affected by the proposed Site H. Eyethu Coal/Kusile Mining is an important stakeholder as future neighbour and current rights holder.

Other mining groups in the area

There are a significant number of mines active in or planned for the area, including Khanyisa, Intibane, Mbuyelo (Rirhandzu Colliery), Zibulo, New Largo, Khutuka, Leeufontein, Bankfontein, Lakeside and Klipspruit amongst others. These mines share access roads and cumulatively contribute to the existing impacts experienced in the area.

7.8.5 Parastatal organisations

Parastatal organisations are state owned enterprises. The project proponent, Eskom is such an enterprise. Another enterprise that will be affected by the proposed project is Transnet.

Transnet

Transnet is part of the freight logistics chain in South Africa. It consists of five operating divisions, of which Transnet pipelines are one. Transnet pipelines will be affected by the proposed Kendal 30

year ADF, since it has a fuel pipeline that cross the site, which will have to be realigned. The pipeline cannot be taken out of operation for more than two or three days. The realignment of the fuel pipeline will have significant financial implications. Transnet also owns some of the properties adjacent to the proposed site, including properties where communities reside. Transnet indicated that they do not relocate people from their property, but engage with the municipality to provide alternative accommodation.

Eskom

Eskom generates the majority of the electricity used in South Africa and a large portion of the electricity used in Africa. Eskom is not only the project proponent, but also the owner of infrastructure that will be affected by the proposed site, such as transmission and distribution lines. Eskom will construct the proposed Kendal 30 year ADF.

7.9 Surface Water

The Surface Water Impact Assessment was undertaken by Golder Associates. Refer to Appendix F9 for the full report.

7.9.1 Description of the Catchment

The Kendal 30-year ADF project is located in the Upper Olifants Catchment which falls within the Olifants Water Management Area (WMA 02), specifically in the B20E, B20F and B20G quaternary catchments within the Wilge River sub-catchment. The preferred site (Site H) is split over quaternary catchments B20E and B20F.

The Wilge River catchment principally includes the towns of Bronkhorstspruit and Delmas as well as the Ezemvelo Game Reserve to the north. The catchments in the Olifants are further divided into Management Units (MU) and the Kendal 30-year ADF project is located within MU 22. The Wilge catchment incorporates four rivers/streams including the Grootspruit, Saalboomspruit, Bronkhorstspruit and the Wilge River. The areas of the relevant quaternary catchments are given in Table 7-24. Refer to Figure 7-44 for a spatial representation of the site alternatives in relation to the quaternary catchments.

Table 7-24: Catchment areas of B20E, B20F, Wilge River and Loskop Dam

Catchment	Area (km^2)
Quaternary B20E	620.0
Quaternary B20F	505.0
Quaternary B20G	522.0
Wilge River Catchment	4277.0
Loskop Dam	4356.0

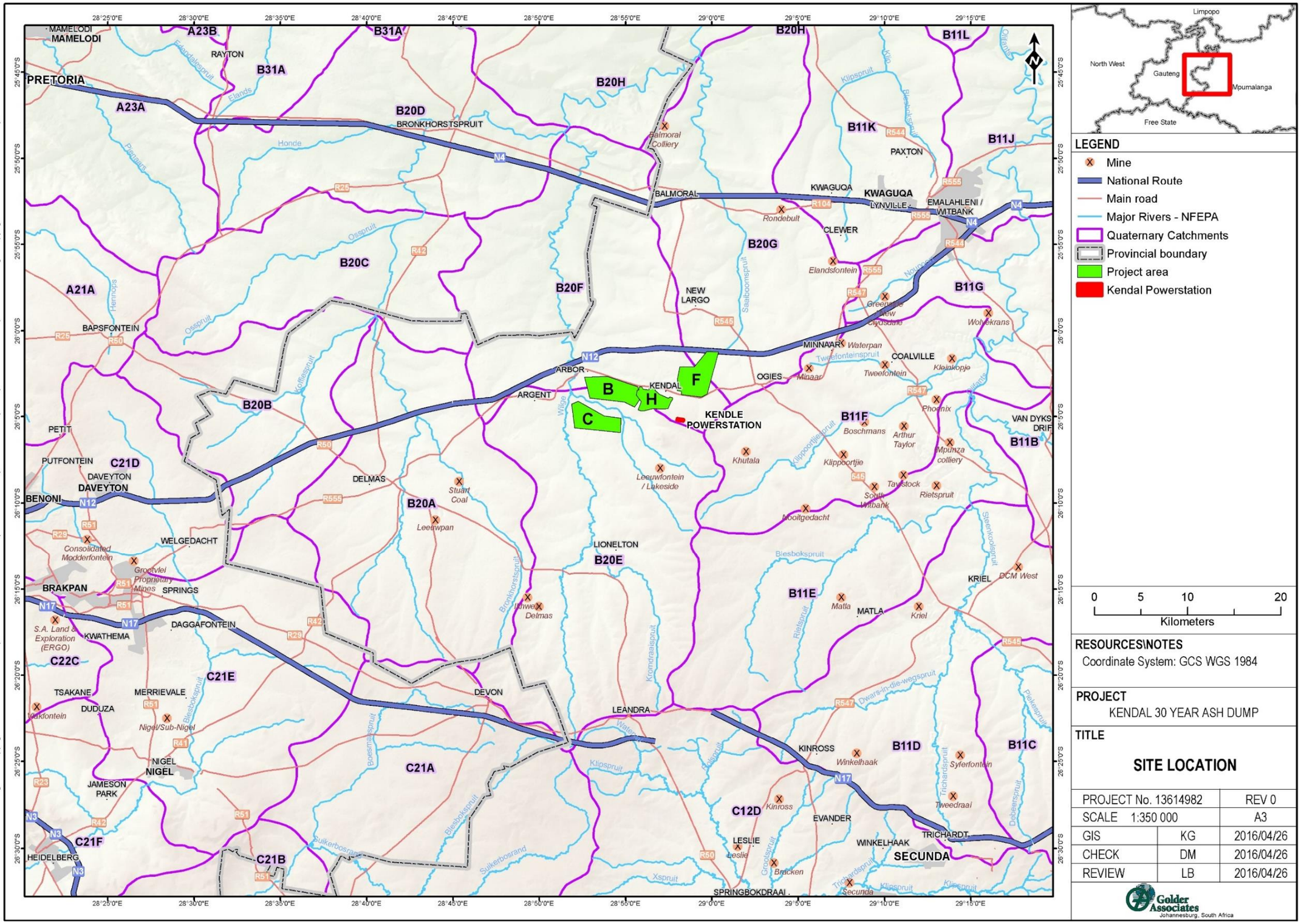


Figure 7-44: Kendal 30-year ADF Site Alternatives in relation to Quaternary Catchments

7.9.2 Classification of the resources

The DWS has completed the classification process for the significant water resources of the Olifants WMA (DWA, 2013). The Bronkhorstspruit, Saalboomspruit and Upper Wilge rivers are in a moderately modified state (category C) with less developed areas present in the catchment. Impacts within the catchment are related to urban areas, agriculture, dams and some mining. The importance of the resources is moderate especially in terms of good water quality that they contribute to the main stem Olifants River above Loskop Dam. The management class for the Wilge River has been set as a Class II with an overall ecological category of a C for the Integrated Units of Analysis (IUA). This class implies moderate usage of the water resource in future and the status quo in the river system has to be at least maintained. The recommended classes resulting from the Water Resources Classification study as well as the Resource Quality Objectives (RQO) that have been determined, are yet to be gazetted for implementation.

In this respect the level of protection provided by a Class II means that any developments in the Wilge River catchment area will have to ensure that loads discharged to the receiving environment and the impacts on the flow are small.

7.9.3 Resource Water Quality Objectives

The project falls within MU 22 (as explained in 7.9.1) The RWQOs for MU 22 as set out in Table 7-25 were used in the surface water quality assessment.

Table 7-25: Interim RWQOs for Wilge, Management Unit 22

Water quality Variables	Units	Management Unit 22
PHYSICAL		
Conductivity	mS/m	40
Dissolved Oxygen	% Sat	70
pH	-	6.5-8.4
Suspended solids	mg/ă	-
Turbidity	NTU	-
CHEMICAL, INORGANIC		
Alkalinity	mg $CaCO_3/\lambda$	120
Boron	mg/ă	0.5
Calcium	mg/ă	25
Chloride	mg/ă	20
Fluoride	mg/ă	0.5
Magnesium	mg/ă	20
Potassium	mg/ă	10
Sodium	mg/ă	20
SAR	$meql^{0.5}$	1.0
Sulphate	mg/ă	60
Total Dissolved Solids	mg/ă	280
CHEMICAL, ORGANIC		
Dissolved Organic Carbon	mg/ă	10
METALS, DISSOLVED		

Iron	mg/ă	1.0
Manganese	mg/ă	0.18
Aluminium	mg/ă	0.02
Chromium VI	mg/ă	0.05
NUTRIENTS		
Ammonia*	mg/ăas N	0.007
Nitrate	mg/ăas N	6
Phosphate	mg/ăas P	0.05
Total Phosphorus	mg/ăas P	0.25
Total Inorganic Nitrogen	mg/ăas N	2.5
MICROBIOLOGICAL		
E Coli	# per 100mă	130
Chlorophyll a	mg/ă	0.02

7.9.4 Baseline Water Quality

The surface water sampling points are illustrated in Figure 7-45. The points were chosen to assess the water quality of the Wilge River in close proximity to the existing and proposed ash disposal facilities and the tributaries within the area.

Wilge River area

The chemical water quality within the study area is generally good. However, some sample points indicate high levels of sulphate (SO_4), aluminium (Al), magnesium (Mg) and ammonia (NH_4). Sampling undertaken in 2013 and 2014 showed elevated levels, exceeding the RWQOs, at most of the points. It should be noted that while the high aluminium levels might be attributed to the geology of the area these parameters are related to mining activities. These parameters were mainly detected at the following sample points:

1. CSW01 ï On the Wilge main stem in close proximity to site C;
2. CSW02 ï On the tributary downstream of site C before flowing into Wilge River; and
3. CSW03 ï On the tributary downstream of site B before flowing into Wilge River.

Saalboomspruit

CSW13 and CSW14 are located on the Saalboomspruit that drains towards the north of site F. These sample points indicated high levels of conductivity (EC), sulphates (SO4), aluminium (Al), magnesium (Mg) and manganese (Mn). These parameters are indicators of mining activities within the area. Sampling points SCH02/KEN30-F11 and KEN30-F12 are fountains located on non-perennial streams located on the northern and southern sides of site H. Pan is the pan located on the southern border of Site H.

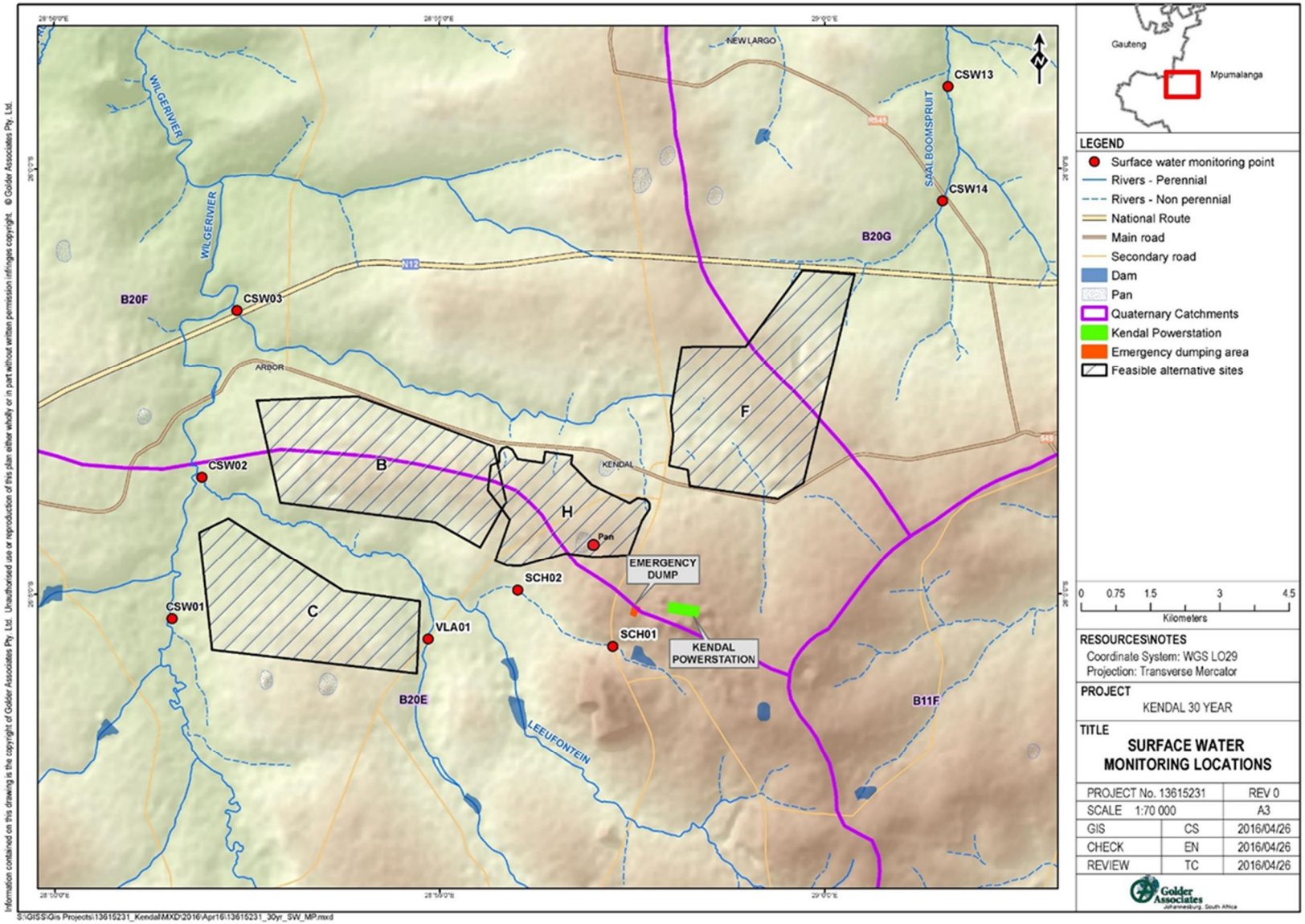


Figure 7-45: Surface Water Sampling points

7.9.5 Site H Hydrology

The preferred Site H straddles quaternary catchments B20E and B20F. The site is dominated by agricultural land and a pan located within the site. It is drained on both sides by two unnamed perennial tributaries. The tributary on the southern side confluences with the Leeufonteinspruit which flows into the Wilge River. There are two sample points (SCH01 and SCH02) on the southern non-perennial tributary however the sites have been dry when samples have been taken, and sample point CSW02 on the Leeuwfonteinspruit just before it confluences with the Wilge River. The water quality results at site CSW02 indicate elevated levels of sulphate (SO4), aluminium (Al) and magnesium (Mg) all exceeding the RWQOs. These may be as a result of impacts from upstream mining, industrial and activities. The planned conveyor route will not cross any water resources.

7.10 Traffic

The Traffic Impact Assessment was undertaken by Hatch Goba. Refer to Appendix F11 for the full report.

The Power Station and the preferred ADF Site (Site H) is shown in Figure 7-46 below. The site is traversed by Road D1390 and bound by D686. D1390 is a gravel road running north south linking local mines onto the D686 which subsequently intersects with the N12 National Road which is to the north.

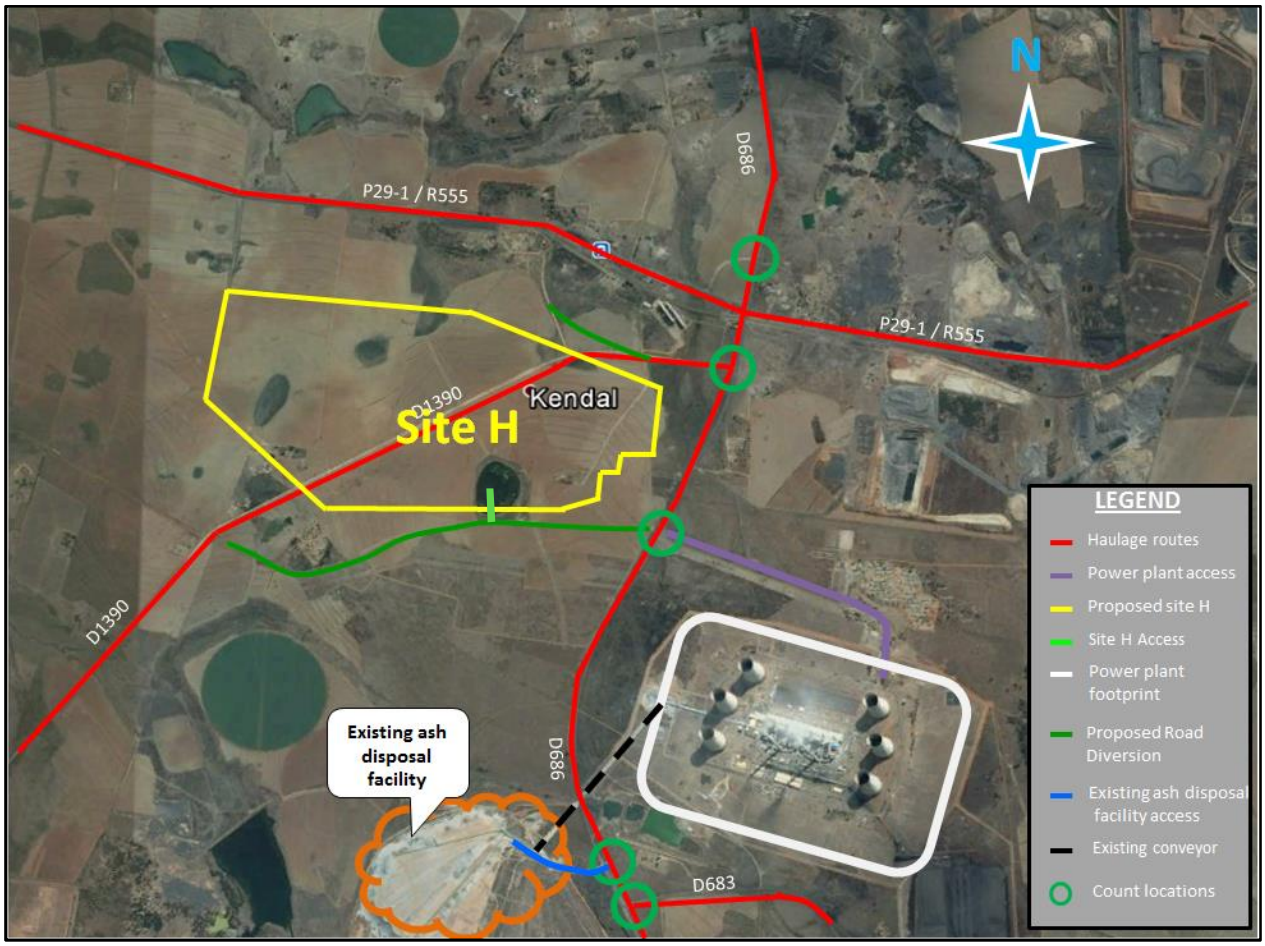


Figure 7-46: Local map layout for Preferred Site H

7.10.1 Status quo conditions

The following section summarises the present conditions related to traffic and transportation conditions around Site H.

Roads and traffic volumes in the surrounding area

Detailed 12 hour classified traffic counts were undertaken on the 15th February 2013 at the following locations relevant to Site H:

- D686 and P29-1 / R555
- D686 and D1390
- D686 and Eskom KPS Access
- D686 and existing ADF Access
- D686 and D683

The count locations are depicted in green in Figure 7-46. The major road in the vicinity of the study area is D686 and intersects with the current ADF access, south of the Power Station. The heavy vehicle traffic mainly comprises of coal trucks. The traffic count volumes are shown in Appendix F11.

Description of road infrastructure

The roads in the immediate vicinity of the site are shown in Figure 7-46 and are discussed below:

- D686: Paved Class 3

District main road traversing north south of the development with one lane in each direction carrying low volumes of traffic during critical peak hours. The road is in a fair condition due to a moderate volume of heavy vehicles currently utilising the road.

- R555 (P29-1): Paved Class 3

Provincial Class 3 main road traversing east west of the development with one lane in each direction and narrow shoulders carrying moderate volumes of traffic during critical peak hours. The road is in a fair condition due to a high proportion of heavy vehicles throughout the day.

- D1390: Gravel Class 4

District road traversing north south with one lane in each direction and carries low volumes of traffic during peak hours but a high proportion of heavy vehicles throughout the day. The road condition is poor.

The proposed Site H encroaches on a significant section of this road.

- D683: Paved Class 4

District road traversing north south with one lane in each direction and carries low volumes of traffic during peak hours but a high proportion of heavy vehicles throughout the day. The road condition is fair.

Location of employee residences

The travel patterns established from the traffic counts indicate clearly that the major source of employees or their residential areas are located in Delmas, Phola, Ogies, Emalahleni, Balmoral, Kwa-Guqa and Bronkhorstspruit.

Other transport infrastructure

The ash is transported from the power station to the existing ADF by means of overland belt conveyors. The dry ash is conditioned by the addition of water at the power station to ensure dust generation is minimised. The conveyor currently passes under Road D686 located west of the power station as shown in Figure 7-46.

In case of emergencies when the conveyors are not operational, ash is temporarily stored at the E-dump where 30-ton trucks are used to transport ash from the power station to the ADF. The trucks are covered to minimise pollution.

7.10.2 Access

The D1390 runs through the middle of Site H and the road will have to be rerouted. It is proposed that access to the facility be provided off the re-aligned D1390, at its intersection with the existing entrance to the Eskom Power Station (refer to Figure 7-46). The ADF will have three driveway accesses off the D1390, with the main access point being at the south eastern corner as indicated in Figure 7-46. No additional access or road either for construction or operational purposes, other than the D1390, is proposed. The operational traffic generated by the new proposed disposal facility will therefore only affect the surrounding road network through the intersection of the D686 and Re-aligned D1390/Entrance to Eskom roads.

7.11 Visual

The Visual Impact Assessment was undertaken by Newtown Landscape Architects. Refer to Appendix F12 for the full report.

7.11.1 The Study Area

The study area is located within the Rand Highveld Grassland and Easter Highveld Grassland. The vegetation of these Grassland types is species rich and includes and alternates between sour grassland and low shrub-land on rocky slopes. The most common genera include *Themeda, Eragrostis, Heteropogon and Elionurus spp*. Herbs can also be found in high numbers with the dominant genus being *Asteraceae*. As stated above, shrubs and trees prevail in rocky areas with *Protea caffra, Acacia caffra, Celtis africana and Rhus spp*. dominating the vegetation pallet.

The nearest town is that of Ogies, a coal mining town established in 1928 on the farm Ogiesfontein, hence the townôs name óOgiesô. The town of Ogies is located within the Cultural Heartland of Mpumalanga Province. It is also often referred to as the ñLanatusòcountry because of the endemic *Encephalartos lanatus* growing wild within the catchment of the Olifants River. Arum lilies transform the country side into a magical garden during summer months. Part of the tourism activities includes agricultural tours to working farms and industrial tours to the collieries and steel manufacturing plants. There is also a Boer War Route through the area hosting plenty of fascinating relics from that time.

7.11.2 Surrounding Land Use

Residential

The closest formal residential area is the Kendal settlement approximately 3.5km to the north of the KPS. Kendal Agricultural Holdings is located approximately 4km to the north. The town of Ogies is located approximately 11km to the north-east. Phola community is located approximately 11.4km to the north-east. Other forms of residential units include farmsteads, scattered through the whole study area.

Agriculture

The larger part of the study area consists of intensive and specialized agricultural activities and include crop production as well as livestock farming. Cultivated lands are used mostly for intensive maize crops. Livestock farming includes cattle grazing, poultry farms for egg production as well as pig farming.

Infrastructure and mining

Infrastructure within the study area includes the existing Eskom KPS with its associated infrastructure and including the existing ADF, associated power lines and substations. Mining activities include Phola Coal, approximately 5.5km to the north-east; Vlakfontein Mine, approximately 9km to the north-east; Arbor Coal Mine, approximately 5.5km to the north-west; Stuart and Lakeside Collieries adjacent to the west; Leeuwfontein Steenkool Mine, approximately 3km to the south; as well as the Khutala Colliery, approximately 5km to the south-east. Other infrastructure includes the Kendal ï Kusile as well as Transnet Pipelines and grain silos.

Transportation systems

Main roads in the area include the N12, running east-west approximately 8km north of the project site and the R555 also running east-west approximately 5km north of the project site. Various other local tarred and dirt roads traverse the study area. A railway line follows the R555 alongside to the south of the road.

7.11.3 Landscape Character

Dominant landform and land use features (e.g., hills, rolling plains, valleys and urban areas) of similar physiographic and visual characteristics, typically define landscape character types. Refer to the views in Figure 7-48 - Figure 7-50, which illustrate the nature and character of the study area. The viewpoint locations are indicated in Figure 7-47.

The study area has a gently to moderately undulating topography, typical of the Highveld plateau. Some small scattered wetlands and pans occur in the study area. Rocky outcrops and ridges also form part of the significant landscape features of the wider area. The main drainage feature within the study area is the Wilge River which drains northwards. Associated with the Wilge River is several tributaries situated to the west of the project site. Vegetation within the study area is mainly agricultural croplands with clusters of exotic shrubs and trees where the natural grassland has been disturbed.

The visual character of the study site is largely cultivated land or natural grasslands with the KPS dominating the scene. The main residential components are the scattered farmsteads, Kendal Agricultural holdings and the town Kendal and Ogies. The farming activities and the residential components combination with the power infrastructure and mining structures and activities create a mixed pastoral / industrial landscape character theme.

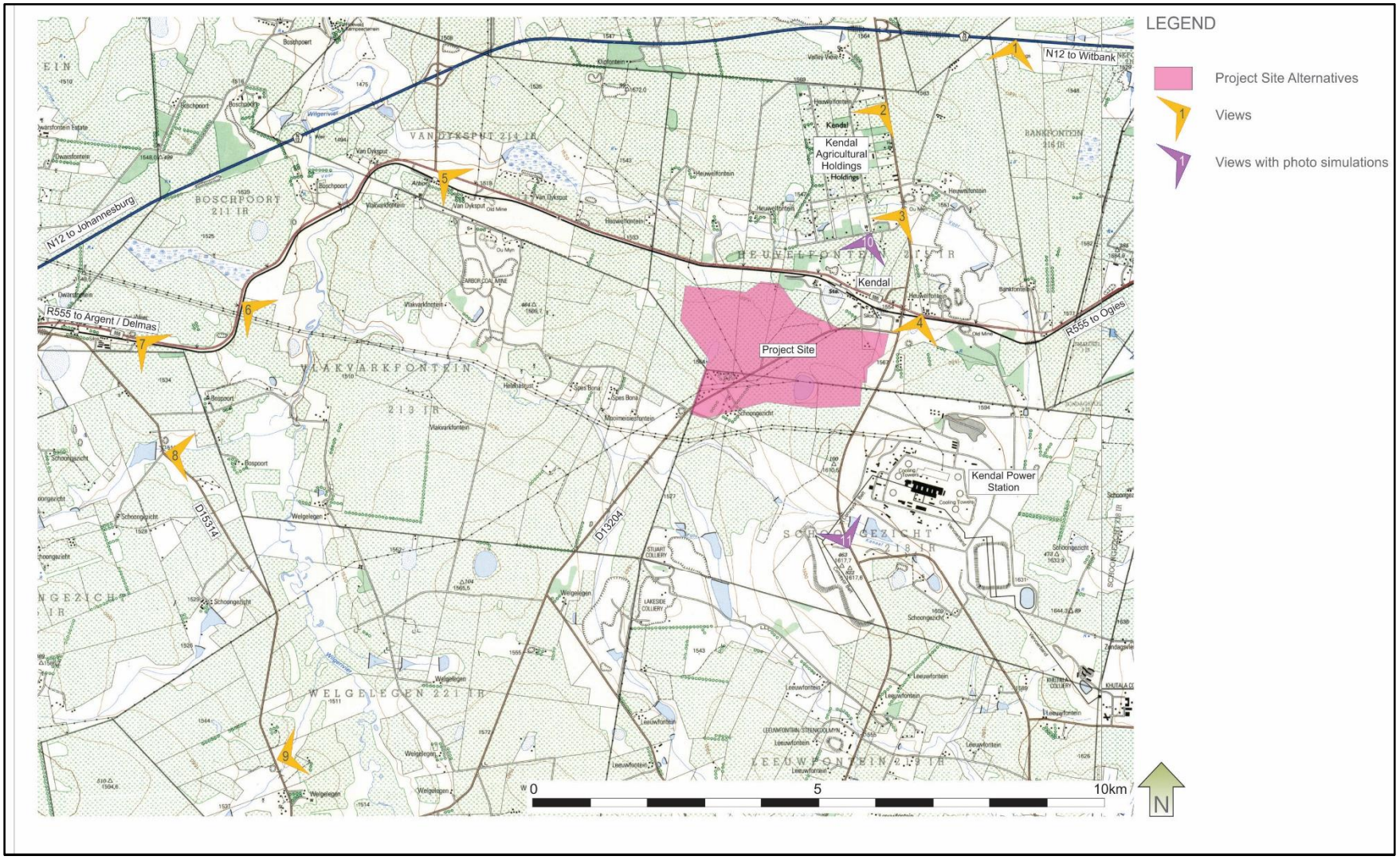


Figure 7-47: Views for the Kendal 30-year Project

View 1: along the N12, looking south across site F. Note the power station in the background and exiting mining activities to the right.

View 2: adjacent to Kendal Agricultural Holdings (KAH) from left to right: existing mining activities, Kendal power station, KAH. Site F to the left. Site B behind KAH

View 3: from left to right: existing minig activities on site F to the left, Kendal Power Station, Kendal silo's and community with some crop production in the foreground

Figure 7-48: Landscape character (1 of 3)

View 4: along the R555, looking south across site H. Note existing mining activities on the far right, Kendal Power Station in the center, typical grassland vegetation in the fore- and middle ground, railway in the foreground, Kendal silo's to the far right, and power lines in the background

View 5: along R555, looking south-east towards site B. Note railway line and existing mining activities

View 6: along the R555, looking south-east. Site B located to the left of the power line and Site C to the right of the power line

Figure 7-49: Landscape character (2 of 3)

View 7: along the R555 adjacent to Argent Railway Station, looking south-east. Note crop production, mining activities, Kendal Power Station and railway line

View 8: along D15314, looking east across site C. Note crop production and existing mining activities

View 9: along D15314, looking east towards site C. Note crop production, farmsteads, Kendal power station and existing mining activities

Figure 7-50: Landscape character (3 of 3)

7.11.4 Sensitive Viewers and Locations

Sensitive viewer locations would be those from the farmsteads and residences within the study area. Farmstead and residences were identified through a desktop study and site visits (4 April 2013 and 29 March 2015) are indicated on **Error! Reference source not found.**. Views from visitors to or travellers through the study area would also be regarded as sensitive, although only moderately sensitive.

Table 7-26: Potential Sensitivity of Visual Receptors – the Project

High Farmsteads and residences	**Moderate** visitors to & travellers through the study area	**Low** visitors & people working in mining and power supply industry
Visitors of Game Farms / Lodges and travelling along local routes, whose intention or interest may be focused on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; **Occupiers of residential properties with views affected by the development.**	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); **People travelling through or past the affected landscape in cars, on trains or other transport routes.**	**Visitors and people working in mining / prospecting activities and travelling along local mining roads** whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

Note: Items in **Bolded text** are applicable to the study area.

7.12 Wetlands

Information pertaining the wetlands associated with the study area was sourced from the ñBaseline Wetland Delineation and Assessment for the Kendal 30-Year Ash Dam Projectò study that was carried out by Wetland Consulting Services (Pty) Ltd.

7.12.1 Wetland Delineation

Approximately 86.5 ha of wetland habitat were delineated within the proposed footprint of Site H, making up 16.3 % of the development footprint. This includes a large pan (11.6 ha) located mostly within the site and is used for water storage and abstraction for irrigation. The natural wetland types recorded on site are as follows:

- Pan/depression wetland
- Hillslope seepage wetlands

No farm dams were observed within Site H.

Table 7-27: Extent (in hectares) of the wetlands recorded directly within the footprint of Site H

Wetland Type	Area (ha)	% of wetland area	% of footprint area
Pan / depression	12.6%	14.6%	2.4%
Hillslope seepage	**73.9**	**85.4%**	**13.9%**
	86.5	**100%**	**16.3%**

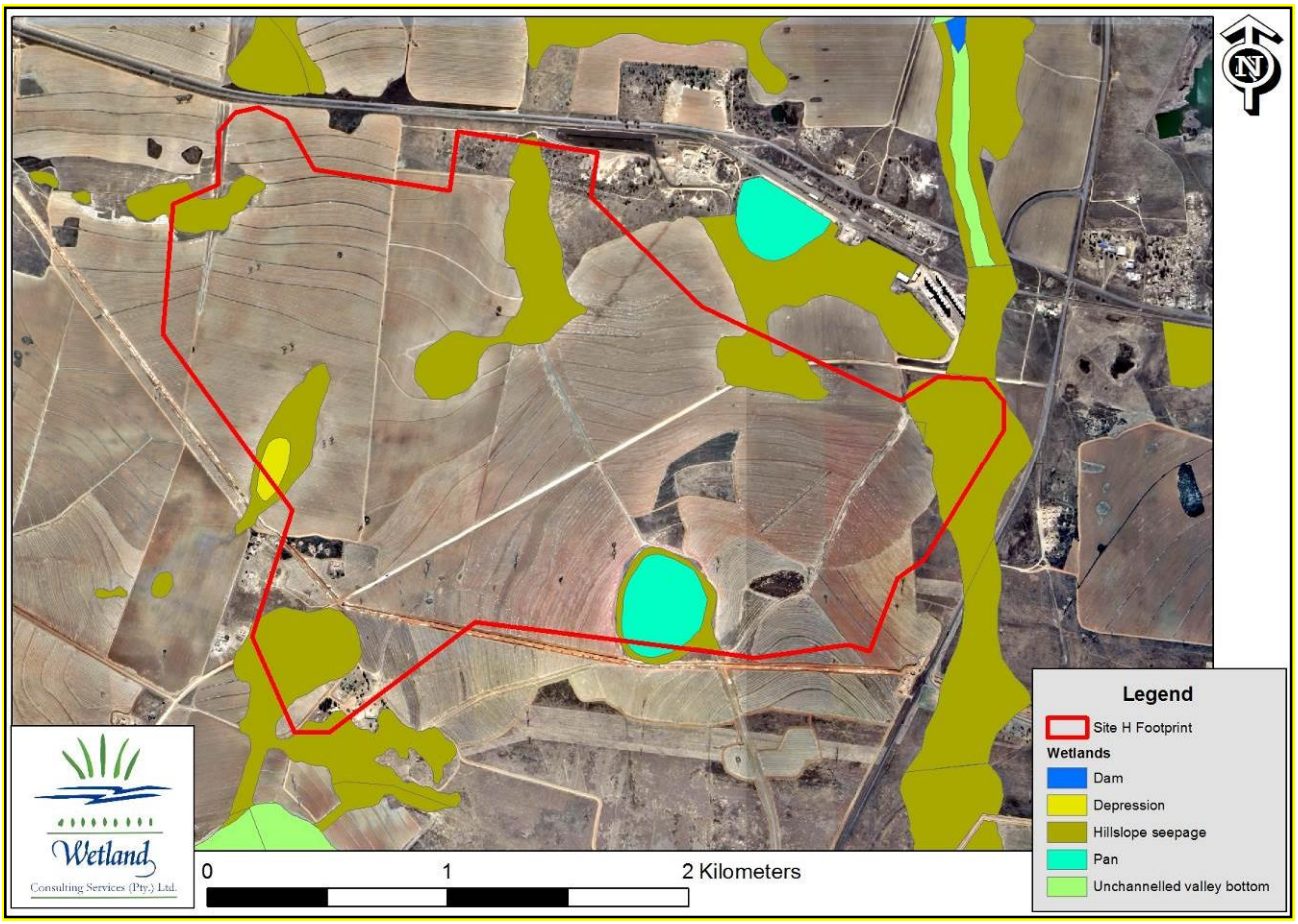


Figure 7-51: Map of the delineated wetlands within Site H

Site H is located along a watershed, being located on the boundary between quaternary catchments B20E and B20F. As a result, most of the wetlands recorded on site, with the obvious exception of the central pan, drain away from Site H either to the north or south.

All of the north draining hillslope seepage wetlands on site are located within an extensively cultivated area, with cultivation often extending into the wetland margins, resulting in habitat degradation and the presence of numerous ruderal species along the wetland verges. However, the seepage wetlands represent the only remaining natural habitat in these areas. The large hillslope seepage wetland in the north eastern corner of the site originates within the KPS fenced

off security area and drains into an unnamed tributary of the Wilge River, the same tributary that crosses Site F and drains past to the north of Site B.

The central pan was fully inundated at the time of the site visit and appears to be a permanent pan, though this is assumed to be as a result of the storage and abstraction of water from the pan. A pump house was observed on the north eastern shore of the pan, together with an excavation into the pan to allow access to deep water for abstraction pipes. The pan is known to be used for the storage of irrigation water.

Figure 7-52. Photographs of some of the wetlands recorded within Site H (clockwise from top left): view across the central pan; the large hillslope seepage wetland in the north eastern corner of Site H; depression wetland along the western boundary of Site H; and hillslope seepage wetland draining north from Site H.

7.12.2 Functional Assessment

Hillslope seepage wetlands

Hillslope seepage wetlands are mostly maintained by shallow sub-surface interflow, derived from rainwater. Rainfall infiltrates the soil profile, percolates through the soil until it reaches an impermeable layer (e.g. a plinthic horizon or the underlying sandstone), and then percolates laterally through the soil profile along the aquitard (resulting in the formation of a perched water

table). Such a perched water table occurs across large areas of the Mpumalanga Highveld, not only within hillslope seepage wetlands, but also within terrestrial areas, only at greater depth. The hillslope seepage wetlands are merely the surface expression of this perched water table in those areas where a shallow soil profile results in the perched water table leading to saturation of the profile within 50cm of the soil surface. The importance of individual seepage wetlands in temporarily storing and then discharging flows to downslope wetlands (flow regulation) varies and depends on a number of factors. Generally, seepage wetlands associated with springs and located adjacent to terrestrial areas characterised by deep, well-drained soils are more likely to play an important role in flow regulation than seepage wetlands where the wetland and catchment are characterised by shallower soils. Such seepage wetlands are likely often maintained mostly by direct rainfall and lose most of their water to evapotranspiration, and surface run-off during large storm events.

Hillslope seeps can support conditions that facilitate both sulphate and nitrate reduction as interflow emerges through the organically rich wetland soil profile, and are thus thought to contribute to water quality improvement and/or the provision of high quality water. The greatest importance of the hillslope seepage wetlands on site is thus taken to be the movement of clean water through the hillslope seepage wetlands and into the adjacent valley bottom wetlands, though the flow contribution from hillslope seepage wetlands to downslope wetlands was not quantified.

As hillslope seepage wetlands, for the most part, are dependent on the presence of an aquiclude, either a hard or soft plinthic horizon, they are not generally regarded as significant sites for groundwater recharge (Parsons, 2004). However, by retaining water in the landscape and then slowly releasing this water into adjacent valley bottom or floodplain wetlands, some hillslope seepage wetlands can contribute to stream flow augmentation, especially during the rainy season and early dry season. From an overall water yield perspective there is evidence that seepage wetlands contribute to water loss. The longer the water is retained on or near the surface the more likely it is to be lost through evapo-transpiration (McCarthy, 2000). Hillslope seepage wetlands are not generally considered to play an important role in flood attenuation, though early in the season, when still dry, the seeps have some capacity to retain water and thus reduce surface run-off. Later in the rainy season when the wetland soils are typically saturated, infiltration will decrease and surface run-off increase. Further flood attenuation can be provided by the surface roughness of the wetland vegetation; the greater the surface roughness of a wetland, the greater is the frictional resistance offered to the flow of water and the more effective the wetland will be in attenuating floods (Reppert et al., 1979). In terms of the hillslope seepage wetlands on site, the surface roughness is taken to be moderately low, given that most of the seepage wetlands are either cultivated of characterised by typical grassland vegetation, thus offering only slight resistance to flow.

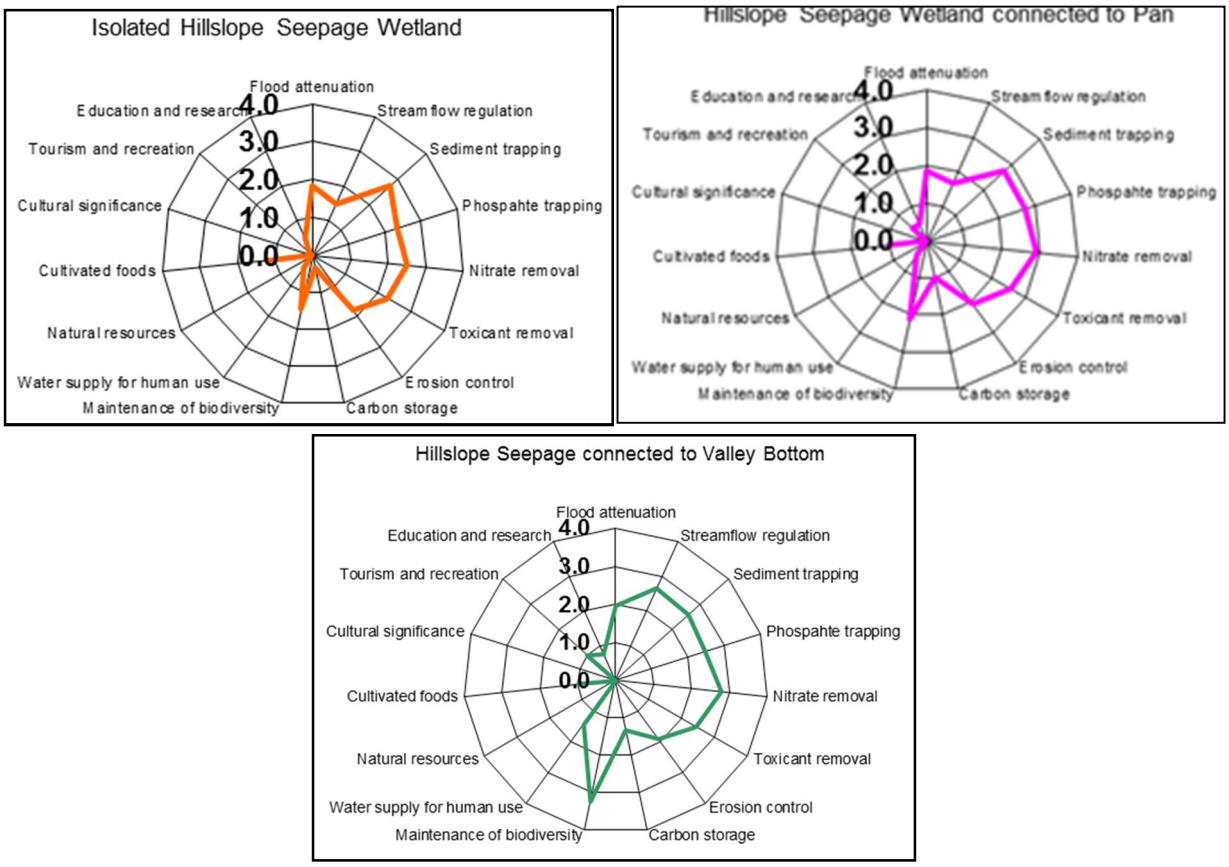


Figure 7-53: Radial plots showing the results of the WET-EcoServices assessment.

Pans / Depressions

Given the position of many pans within the landscape, which is usually isolated from any stream channels, the opportunity for pans to attenuate floods is fairly limited, though some run-off is stored in pans. In the cases where pans are linked to the drainage network via seep zones, the function of flood attenuation is somewhat elevated. Pans are also not considered important for sediment trapping, as many pans are formed through the removal of sediment by wind when the pan basins are dry. Some precipitation of minerals and de-nitrification is expected to take place within pans, which contributes to improving water quality. Some of the accumulated salts and nutrients can however be exported out of the system and deposited on the surrounding slopes by wind during dry periods.

The two pans to the south of Site C, as well as the pan within Site H, have pumping stations along their shorelines. This, together with the high water levels at the start of the rainy season suggests that water levels within the pans are supplemented and that the water is then used for irrigation (to supply the centre-pivot irrigation systems on site). The hydroperiod of these pans, as well as the water quality, is therefore likely to be substantially altered.

Nonetheless the pans, especially the eastern pan to the south of Site C, were seen to support a high number and diversity of waterbird species at the time of the wetland survey. This, the support of faunal and floral biodiversity, is generally considered one of the most important functions performed by pans. The Red Data listed Greater Flamingo was also observed feeding within the pans on site.

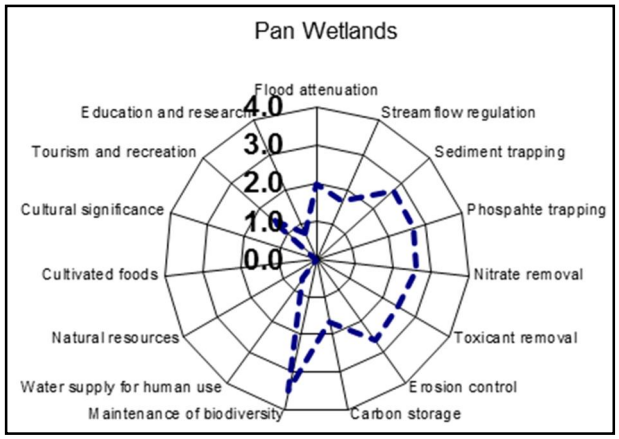


Figure 7-54. Radial plot showing the results of the WET-EcoServices assessment

Figure 7-55. Photograph of Greater Flamingos observed within the pans on site

7.12.3 Present Ecological Status

The wetlands within Site H were mostly considered largely modified (PES category D), with the hillslope seepage wetlands most significantly impacted by cultivation and associated disturbances, and the large central pan having been altered by the storage and abstraction of water from the pan. The large hillslope seepage wetland in the north east of the study area is however characterised by a large expanse of natural wetland vegetation and shows limited impacts within the central portions of the wetland. This system is thus considered to be in only a moderately modified condition (PES category C).

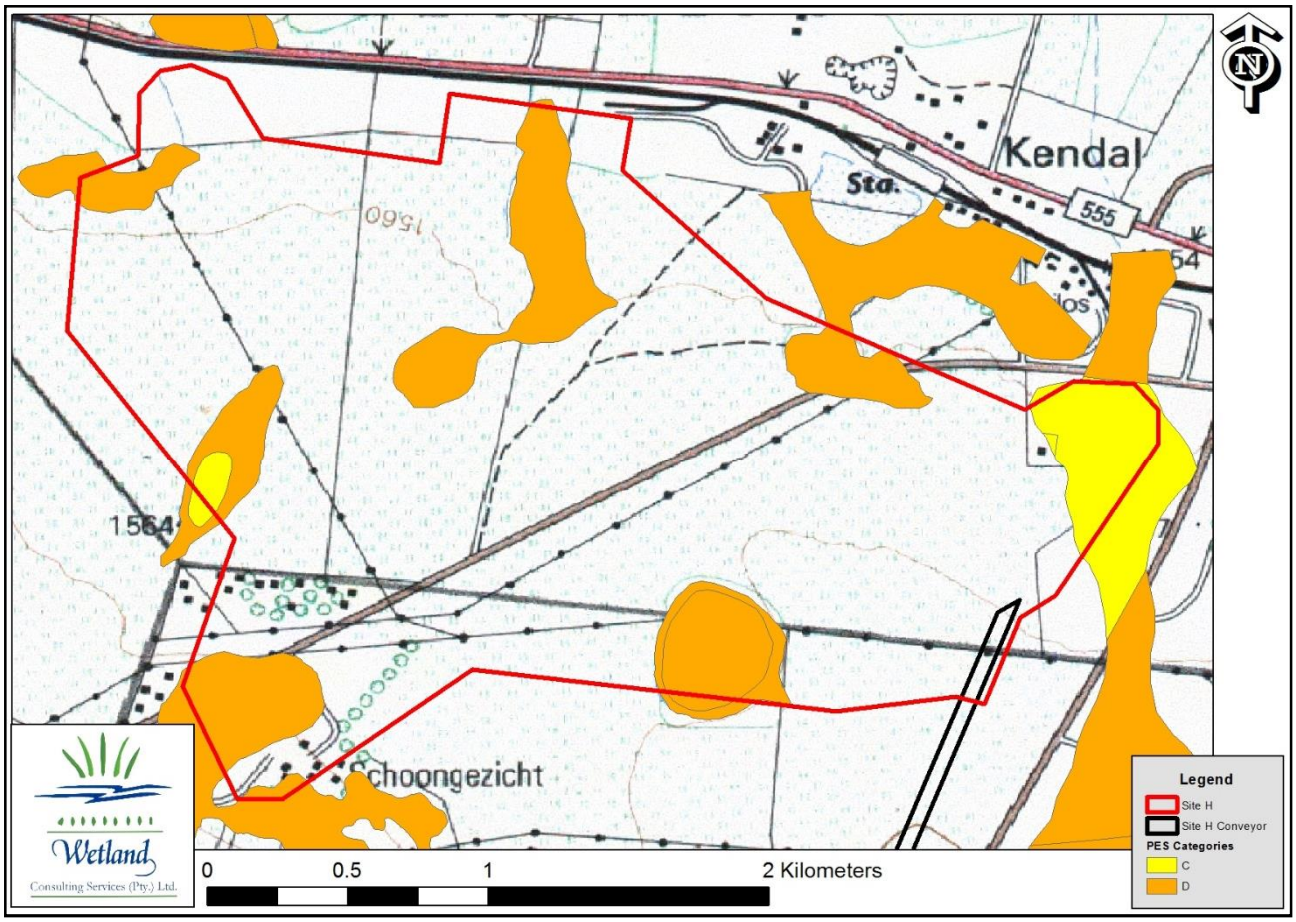


Figure 7-56: Map of PES results for Site H.

Table 7-28: Summarised PES results for Site H

Wetland Type	C	D	Total
Pan / depression	1.8	10.8	12.6
Hillslope seepage	**14.5**	**59.4**	**73.9**
TOTAL	**16.3**	**70.2**	**86.5**
% of wetland area	**18.8 %**	**81.2%**	**100%**

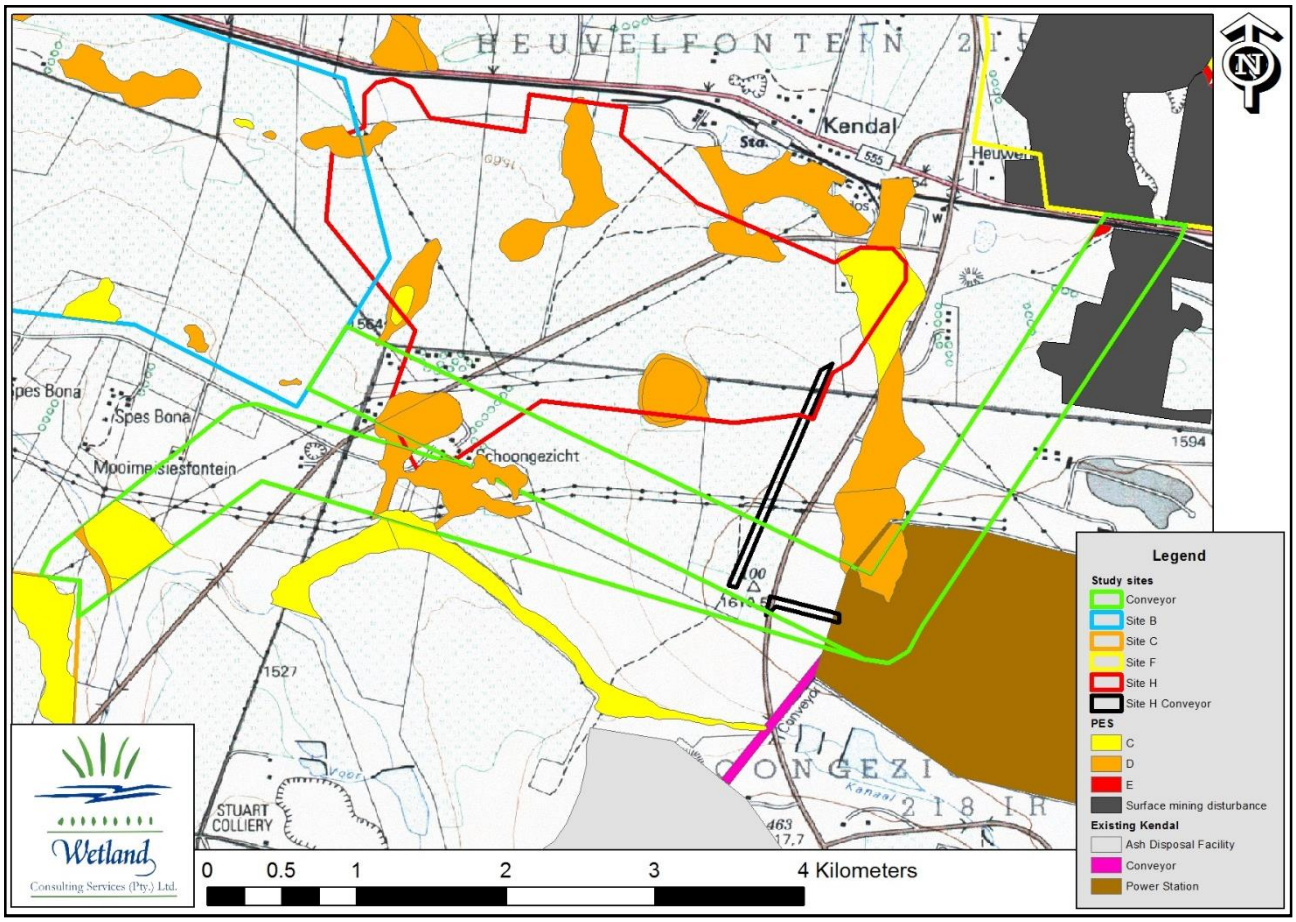


Figure 7-57. Map of PES results for the three conveyor servitudes.

7.12.4 Ecological Importance and Sensitivity (EIS)

ñEcological importanceòof a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. ñEcological sensitivityò refers to the systemôs ability to resist disturbances and its capability to recover from disturbance once it has occurred. In determining the EIS of a wetland, the following factors are considered:

- Biodiversity ï i.e. the presence of rare and endangered species, populations of unique species, species richness, diversity of habitat types, and migration/breeding and feeding sites for wetland species.
- Hydrology ï i.e. sensitivity to changes in the supporting hydrological regime and/or changes in water quality.
- Functionality ï i.e. flood storage, energy dissipation and particulate/element removal.
- Ecological Integrity ï taken from the result of the PES assessment

The wetlands within the study area all form part of the Olifants River Primary catchment which is a heavily utilised and economically important catchment. Wetlands and rivers within the Olifants River Catchment upstream of Loskop Dam have been greatly impacted upon by various activities, which include mining, power stations, water abstraction, urbanization, agriculture etc. As a result of these impacts serious water quality concerns and also water quantity concerns have been raised

within the sub-catchment. Given this situation, and the fact that wetlands can support functions such as water purification and stream flow regulation, a high importance and conservation value is placed on all wetlands and rivers within the catchment that have as yet not been seriously modified. Within this context an EIS assessment was conducted for every hydro-geomorphic wetland unit identified within the study area. Further considerations that informed the EIS assessment include:

- The location of the study area within a vegetation type (Eastern Highveld Grassland) considered to be extensively transformed and threatened, and classed as ***Vulnerable.***
- The wetland ecosystem type of the area, Mesic Highveld Grassland Group 4 wetlands, is considered to be ***Critically Endangered.***
- The location of the three sites within the Wilge River catchment and in close proximity to the Wilge River, with the Wilge River being considered a priority water resource that plays and important role in diluting the poor quality water from the Upper Olifants River catchment.
- The presence of Red Data and protected species within the wetlands on site.
- The level of degradation observed within the wetland systems on site.

It is these considerations that have informed the scoring of the systems in terms of their EIS. The results of the assessment and rankings based on our current understanding of the wetlands is illustrated in Figure 7-58 and summarised in Table 7-29.

Considering all of the wetlands delineated within the direct footprints of all of the various sites, roughly 60 % of the wetlands assessed are considered to of *Low/Marginal* EIS (EIS category D), with all of the remaining wetlands considered to be of *Moderate* importance and sensitivity (EIS category C). These generally low scores come as a direct result of the extensive transformation that has occurred within the wetland habitats as a result of agricultural and mining activities. The degradation and loss of natural vegetation within the wetlands has significantly reduced the importance of these systems in terms of biodiversity support.

Table 7-29: Summarised results of the EIS assessment

Site	Moderate	Low / Marginal	TOTAL
Site B	7.99	41.74	49.74
Site C	28.00	34.80	**62.81**
Site F	53.55	30.87	**84.42**
Site H	24.64	61.84	**86.48**
TOTAL	**114.18**	**169.25**	**283.43**

Some of the wetlands within the surrounding area are however considered to be of High EIS, most notably the Wilge River floodplain to the west of Sites B and C. This floodplain wetland is considered of High importance in terms of biodiversity support as well as hydrological functioning (e.g. flood attenuation), and is considered to be of High sensitivity in terms of changes in flow volumes and quality given the stress being placed on the system by changes in landuse and increased mining development within its catchment.

The Leeufonteinspruit draining between Sites B and C, as well as the unnamed Wilge River tributary to the north of Site B, are considered of *Moderate* importance and sensitivity.

The upper reaches of the Saalklapspruit which drain northwards away from Site F are considered to be of *Moderate* importance and sensitivity.

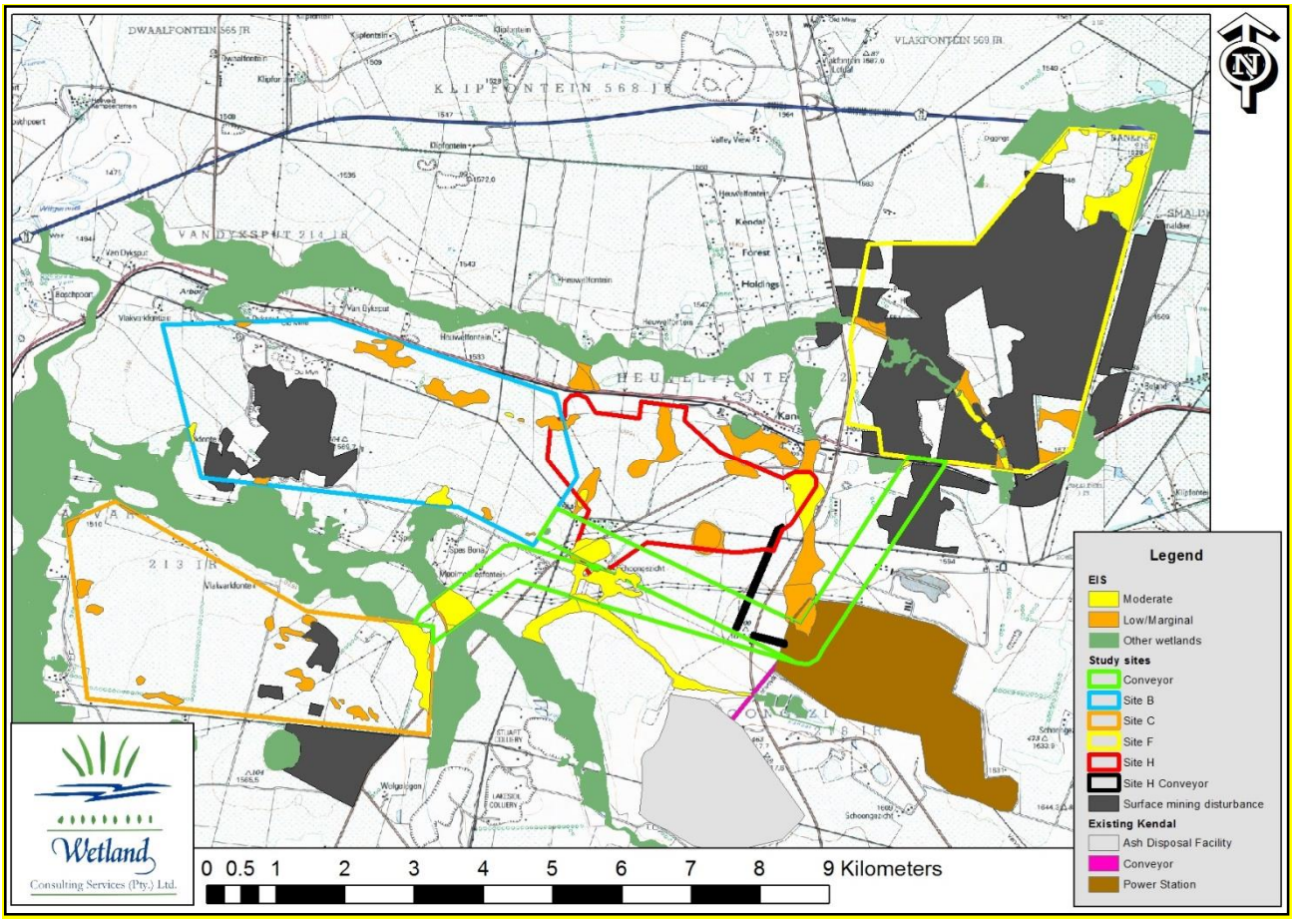


Figure 7-58. Results of the EIS assessment

8 KNOWLEGDE GAPS AND LIMITATIONS

mandatory contents of an Environmental Impact Report is stipulated in Regulation 31 of the EIA Regulations (2010) (GN R. R543). In terms of Regulation 31(2)(m) of the EIA Regulations (2010) (GN. R543) an account of any assumptions, uncertainties and gaps in knowledge that were taken into account in the preparation of the Environmental Impact Report must be provided. Although care has been taken to ensure that the contents of the Environmental Impact Report considers all aspects of the proposed project and the anticipated impacts which may result from the implementation, certain knowledge gaps and limitations have been identified.

Information used to populate the FEIR have been obtained from various sources. Certain information relating to the project description and therefore planned project activities was received from the proponent (i.e. Eskom) and formed the basis of the study. A number of specialist studies were also identified during the Scoping Phase and was carried out during the subsequent EIA Phase. The project information obtained from the proponent as well as the findings made during the Scoping Phase served to guide these specialist studies. The specialist studies also furthermore served to provide more information relating to impact of the proposed project activities on various environmental elements. Included in the findings of each of the specialist studies were certain assumptions on which the study was based as well as knowledge gaps. The subsequent sections will provide an overview of the various knowledge gaps and limitations to the studies that were identified.

8.1 Air Quality Assessment

The following Assumptions and Limitations should be considered when interpreting the findings from the air quality assessment for the Kendal 30-year ADF.

- Meteorological data was acquired from the Eskom operated monitoring station downwind of the KPS, for January 2009 to October 2012. This data was used because of the proximity of the power station to Site H. The topography of the area is relatively flat and therefore the meteorological data should be representative of the site.
- More recent ambient monitored data was not provided during assessment process. This is not considered to be a significant limitation as the operations in the area have not changed over the intervening period. The data provided is thus considered to be representative of the area.
- It is assumed that the current particle size distribution of the ash is representation of the ash that will be generated during the life-time of the proposed ADF.
- The impact assessment only considered the potential impacts from the proposed Site H ADF (although alternative locations were considered during the scoping phase of assessment). It was assumed that the current ADF and Kendal continuous ADF activities would have ceased by the time site H is operational and would be completely rehabilitated.
- It is assumed that only 80 ha will be exposed during the operational scenario. The remainder of the ADF will be revegetated or have effective mitigation measures applied.

- The dispersion model cannot compute real-time processes (including day-to-day movement of ash after deposition from the conveyor and stack and reshaping activities; or, during upset conditions when the designed disposal process is unavailable such as conveyor maintenance). The end-of-life, worst-case, area footprint for the maximum extent of the continuous ash disposal was used in the model[8].
- The selection of a modelling domain takes account of the expected impacts and it is possible that the impacts, when modelled, extend beyond the modelling domain. This occurred for the projected $PM_{2.5}$ concentrations exceeding the permissible frequency of exceedance in the unmitigated scenario; however, exceedance of the guideline outside of the modelling domain is not expected to cover a substantial area.

8.2 Wetland Delineation and Assessment Study

Field work for the wetland delineation and assessment was undertaken over several days in October 2013, and again in March 2014 (for Site H).

Adequacy of predictive methods

A number of generally accepted assessment methods were utilised within the current study for the assessment of the wetland habitats on site:

- WET-Eco-Services (Kotze *et al.*, 2009)
- WET-Health (Macfarlane *et al.*, 2009)

Although there are limitations associated with each of these methods, the methods are generally accepted and widely applied within wetland assessments in South Africa and are deemed adequate for the purpose of this study.

Adequacy of underlying assumptions

Reference conditions are unknown. This limits the confidence with which the PES category is assigned.

Uncertainties of information provided

The wetland boundaries falling within the four alternative sites were delineated in detail. Where appropriate the wetland boundaries of wetland systems outside the direct footprint of the four alternative sites were verified, which entails a lower sampling density, or mapped at a desktop level.

[8] During the time when the Air Quality modelling was undertaken, the linked project (Kendal Continuous ADF) had not yet been authorised. Some specialists therefore had to consider more than one scenario. The maximum footprint for Kendal Continuous was authorised by the authorities, therefore this assumption is correct,

While an effort was made to visit every wetland within the four alternative sites, not every wetland boundary was walked. Extensive cultivation (current and historical) along and within the wetland boundaries in some portions of the study area, which results in complete removal of wetland vegetation and disturbs the soil profile, also presented obstacles to accurate delineation of the wetland boundaries on site.

Due to ongoing mining activities on three of the alternative sites, some portions of the site could not be accessed in the field and wetlands were mapped at a desktop level only. Areas that could not be accessed are indicated in Figure 8-1 below.

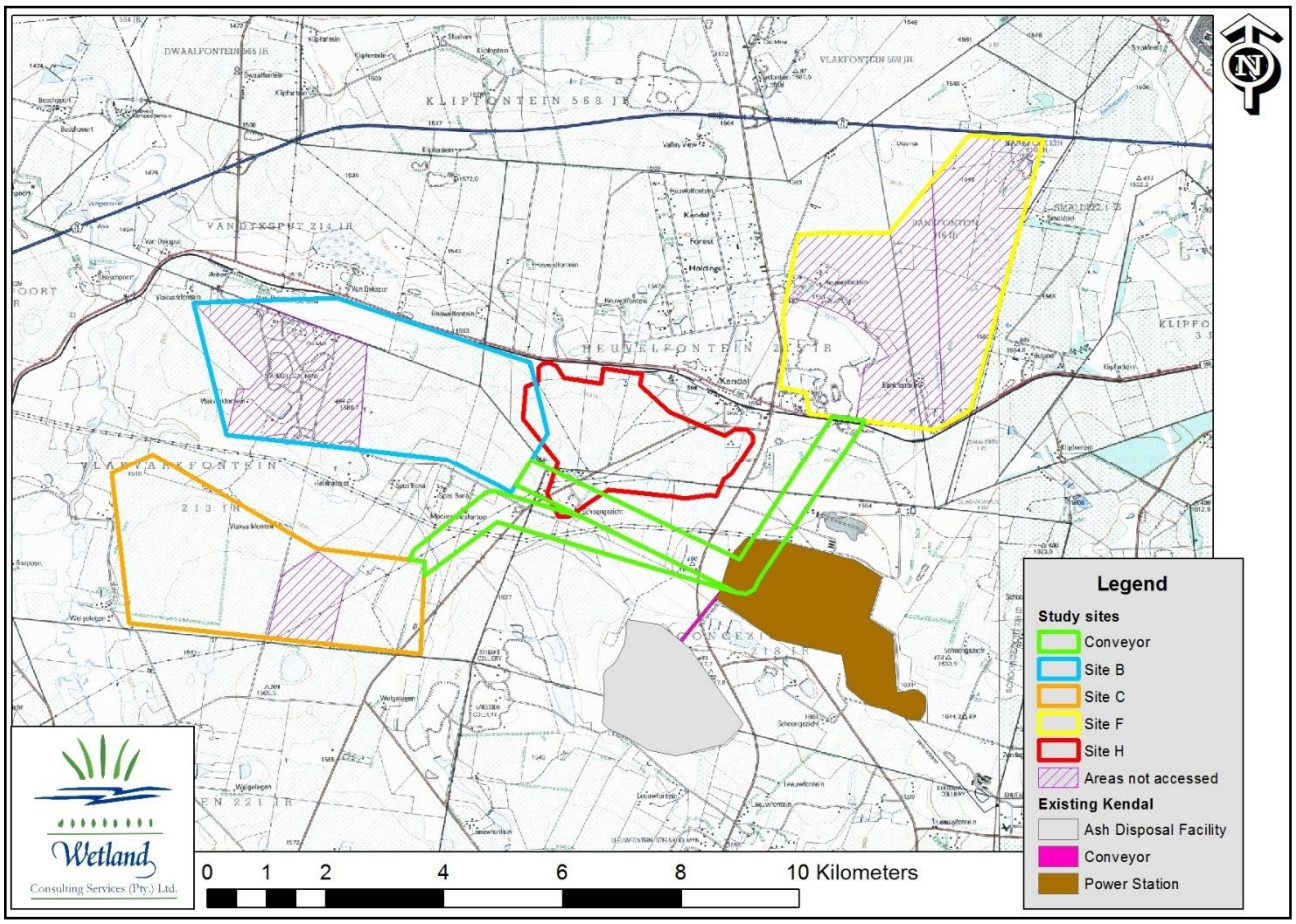


Figure 8-1: Map of the four alternative sites investigated, indicating areas that could not be accessed in the field (purple hatched areas) due to ongoing mining activities in these areas.

Due to the scale of the remote imagery used (1:10 000 orthophotos and Google Earth Imagery), as well as the accuracy of the handheld GPS unit used to delineated wetlands in the field, the delineated wetland boundaries cannot be guaranteed beyond an accuracy of about 5 m on the ground. Should greater mapping accuracy be required, the wetlands would need to be pegged in the field and surveyed using conventional survey techniques.

8.3 Groundwater Assessment

The groundwater investigation and numerical model is based on available groundwater data, including its spatial and temporal coverage to fully characterise the aquifer and the historic groundwater behaviour.

The model predictions should therefore be verified once time dependant groundwater monitoring data become available. Predicted plume migration rates for later years of the ADF development can significantly be improved by observation data from earlier years and subsequent updates of the groundwater model.

8.4 Heritage Assessment

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover.

8.5 Noise Assessment

The following limitations and assumptions should be noted:

- The study only considered sound pressure levels from the Project as additional sources of noise to measured baseline noise pressure levels.
- Source sound power levels were measured at existing operations at the existing Kendal ADF. It was assumed that similar equipment would be used for the proposed project and these sound power levels would be representative of these activities.
- Noise baseline measurements included attended ósotô samples, ~30 minutes in duration during the day and 15 minutes in duration during the night. This gives an indication of what pre-development levels are. It should be noted that these measurements therefore do not take into account variable weather conditions or community activities.

8.6 Soils and Land Capability Assessment

It has been assumed that the total area of possible disturbance was included in the area of study, that the development plan as tabled has documented and catered for all actions and activities that could potentially have an impact on the soils and land capability, and that the recommendations made and impact ratings tabled will be re-assessed if the development plan changes.

Limitations to the accuracy of the pedological mapping (as recognised within the pedological industry) are accepted at between 50% (reconnaissance mapping) and 80% (detailed mapping), while the degree of certainty for the soils physical and chemical (analytical data) results has been based on ñcompositeò samples taken from the dominant soil types mapped in the study area.

The area in question has been mapped on a comprehensive reconnaissance base, the degree and intensity of mapping and geochemical sampling being considered and measured based on the complexity of the soils noted in field during the field mapping, and the interplay of geomorphological aspects (ground roughness, slope, aspect and geology etc.).

8.7 Social Assessment

The following assumptions and limitations were relevant:

- Not every individual in the community could be interviewed therefore only key people in the community were approached for discussion. Additional information was obtained using existing data.
- The social environment constantly changes and adapts to change, and external factors outside the scope of the project can offset social changes, for example changes in local political leadership or economic conditions. It is therefore difficult to predict all impacts to a high level of accuracy, although care has been taken to identify and address the most likely impacts in the most appropriate way for the current local context within the limitations.
- Social impacts can be felt on an actual or perceptual level, and therefore it is not always straightforward to measure the impacts in a quantitative manner.
- Social impacts commence when the project enters the public domain. Some of these impacts will occur irrespective of whether the project continues or not. These impacts are difficult to mitigate and some would require immediate action to minimise the risk.
- There are different groups with different interests in the community, and what one group may experience as a positive social impact, another group may experience as a negative impact. This duality will be pointed out in the impact assessment phase of the report.
- Social impacts are not site-specific, but take place in the communities surrounding the proposed development.

8.8 Sustainability Assessment

- The inputs of the Sustainability Assessment are based on the outputs of the other specialist studies and as such no primary data is collected. A major assumption therefore, is that the data collected by the specialists is accurate and representative of the study site.
- In the social cost benefit analysis (CBA), capital and operational costs associated with the construction of the 30-year ADF are based on preliminary designs and as such escalation of costs may occur once final designs have been completed.
- A major finding of the Sustainability Assessment was the potential relocation of the Triangle Community. Costs for relocation were estimated, but in order to fully understand these costs a more detailed assessment is required.

8.9 Traffic Assessment

The following assumptions have been extracted from the Traffic Assessment:

- One heavy vehicle is equal to 3 passenger car units
- The trip generation statistics of the new ADF are the same as for the Kendal Continuous ADF study
- Ash handling: The transport of ash from the power station to the ADF will be by means of ground level conveyor systems. The dry ash is conditioned by the addition of water at the power station to ensure dust generation is minimised.

At the ADF, the conveyor discharges onto a loading cone on a concrete lined platform and then delivered onto the active cell or alternatively into a truck loading silo, from where it is loaded into a truck and driven to the nearest active cell. 30 ton trucks are used as an alternative in the case of a conveyor breakdown, to haul ash from the E-dump and the power plant to the ADF using district road D683.

On any normal day, all ash will be moved via conveyor and the only road based impact would be staff movements via private vehicles to and from the ash stack component.

- The ADF will comprise of clay material that may be found on site or can be borrowed from a source outside the site. The worst case scenario is when the required material is not found on site and therefore 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. It is assumed that excavated top soil will be stockpiled on site. Trip generation rates for this type of development are not available from the standard trip generation sources, however based on information provided by Zitholele Consulting Engineers, construction truck traffic for the liner (of clay component 300mm thick) of 26 trips/hour can be expected.
- The source of construction material is assumed to be mainly Gauteng.
- When the construction of the first 5-year phase of the new disposal facility is complete, it is assumed that all operations will be moved from the existing disposal facility to the new disposal facility thereby dictating that the operations on the new ash dump will be of the same magnitude as the existing situation. The only difference being the location of the disposal facility access ï off the realigned D1390 on the southern side of the proposed site. In other words, there will not be additional traffic generated for the operation of the continuous ash dump. The only additional traffic that will be generated will be that during the construction phase.
- The Mpumalanga Traffic Department was unable to provide any information on surrounding developments in the area and instead provided the report ñFuture Traffic Projection, Mpumalanga Province, November 2010 by ITS Pty (Ltd)ò This report states that light vehicles will grow between 0.02% and 0.03% per year. Heavy vehicle growth rates are more varied but range from -0.65% to 2.7% per year. Subsequent to this, a conservative growth rate of 2% per annum was assumed to best represent the growth in traffic in this area.

8.10 Visual Assessment

In determining the significance of the visual impact of the proposed Project, with mitigation, it is assumed that mitigation measures proposed in the report are effectively implemented and managed throughout the life of the project.

8.11 Geotechnical Assessment

The following section details recommendations made in the Geotechnical Assessment. Refer to Appendix A of Appendix E for the full Geotechnical Report.

- Detailed investigations are recommended to support construction materials evaluations, stability analyses, liner strength, engineering and liner design of the proposed development and will need to be undertaken prior to- and feed in to the detailed engineering design phase. Such investigations are expected to include:
  - A combination of drilling, probing and/or additional (deeper) test pitting and materials testing, the details and extent of which are subject to the preferred site selected and undertaken to determine the depth and properties for analysis of foundations which will impact on ADF design;
  - Further geotechnical and hydrogeological studies should be carried out to investigate the position and nature of the Ogies Dyke, and in order to provide design recommendations. This may include geophysical surveys, drilling, test pitting, trenching, as well as on-site and laboratory testing.
  - Comprehensive borrow and materials investigations may prove essential to confirm on-site resources and identify additional off-site sources required for any earthworks components, including the soil buffer anticipated to be required to protect the geomembrane liner from pozzolanic activity of the ash;
  - Investigations on areas of concern on the preferred site which have not yet been investigated in great detail owing to constraints imposed during the current investigations. Inferences have been made for areas between the investigation points using professional judgement;
  - In view of planned and currently on-going mining operations for Sites B, C and F, and the extent to which the Sites are likely to be physically transformed between now and the onset of detailed design of the ash facility, it is recommended that the extent to which the preferred site will potentially be transformed, be ascertained and detailed studies be planned accordingly.

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 Approach to Environmental Impact Assessment

9.2 Impact Assessment Methodology

The impacts have been ranked according to the methodology described below. Where possible, mitigation measures were recommended to manage impacts. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 9-1** below.

Table 9-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

Rating	Significance	Extent Scale	Temporal Scale
1	VERY LOW	Proposed site	Incidental
2	LOW	Study area	Short-term
3	MODERATE	Local	Medium-term
4	HIGH	Regional/Provincial	Long-term
5	VERY HIGH	Global/National	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

9.2.1 Significance Assessment

Significance rating (importance) of the associated impacts involves extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The

impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 9-2 below.

Table 9-2: Description of the significance rating scale

Rating		Description
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts, there is no possible mitigation or remedial action that could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts that could occur. In the case of adverse impacts, mitigation and/or remedial action is feasible but difficult, expensive and time-consuming, or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive and time-consuming, or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation and/or remedial action are both feasible and fairly easy to implement. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation and/or remedial action is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, less expensive, more effective and less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts that could occur. In the case of adverse impacts, almost no mitigation and/or remedial actions are needed, and any minor steps which might be needed are easy, inexpensive, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

9.2.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or national/global scale. The spatial assessment scale is described in more detail in Table 9-3 below.

Table 9-3: Description of the spatial rating scale

Rating		Description
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 10 km from the proposed site.
2	Study Site	The impact will affect an area not exceeding the properties directly affected.
1	Proposed site	The impact will affect an area no bigger than the ADF footprint.

9.2.3 Duration Scale

In order to describe the impact accurately, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 9-4 below.

Table 9-4: Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will persist for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will persist for the duration of the life of the facility.
4	Long term	The environmental impact identified will persist beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

9.2.4 Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in **Table 9-5** below.

Table 9-5: Description of the degree of probability of an impact occurring

Rating	Description
1	Practically impossible.
2	Unlikely.
3	Could happen.
4	Very likely.
5	Itôs going to happen/has occurred.

9.2.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard ñdegree of certaintyò scale is used as discussed in Table 9-6. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 9-6: Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70% and 90% sure of a particular fact, or of the likelihood of that impact

Rating	Description
	occurring.
Possible	Between 40% and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.
Don't know	The consultant is unable to make an assessment given available information.

9.2.6 Quantitative Description of Impacts

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

$$\text{Impact} = \frac{\text{Significance} + \text{Spatial scale} + \text{Temporal scale}}{3} * \frac{\text{Probability}}{5}$$

The impact risk is classified according to five classes as described in the Table 9-7 below.

Table 9-7: Impact Risk Classes

Rating	Impact Class	Description
0.1 ï 1.0	1	Very low.
1.1 ï 2.0	2	Low.
2.1 ï 3.0	3	Moderate.
3.1 ï 4.0	4	High.
4.1 ï 5.0	5	Very high.

9.2.7 Cumulative Impacts

It is a requirement that the impact assessments take cognisance of cumulative impacts. In fulfilment of this requirement, the impact assessment will take cognisance of any existing impact caused by the operations, any mitigation measures already in place, any additional impact on the environment through continued and proposed future activities, and the residual impact after mitigation measures.

9.3 Environment Impact Assessment

9.3.1 Air Quality

The Air Quality Impact Assessment was undertaken Airshed Planning Professionals. Refer to Appendix F1 for the full report.

Atmospheric Emissions

The main pollutant of concern associated with the proposed operations is particulate matter. Particulates are divided into different particle size categories with Total Suspended Particulates (TSP) associated with nuisance impacts (dustfall) and the finer fractions of PM_{10} and $PM_{2.5}$ linked with potential health impacts. PM_{10} is primarily associated with mechanically generated dust whereas $PM_{2.5}$ is associated with combustion sources. Gaseous pollutants (such as SO_2, NOX, CO, etc.) derive from vehicle exhausts and other combustions sources. These are, however, insignificant in relation to the particulate emissions and will not be considered in detail in this assessment.

The establishment of the ADF will result in particulate emissions (Table 9-8) during the following operations:

- land preparation during establishment and progression of the ADF;
- freshly exposed topsoil, as a step in rehabilitation of the ADF, that will be prone to wind erosion before establishment of vegetation; and,
- movement of vehicles across exposed soil or ash, will also be a source of pollution.

The subsequent sections provide a generic description of the parameters influencing dust generation from the various aspects identified.

Table 9-8: Activities and aspects identified for the construction, operational and closure phases of the proposed operations

Pollutant(S)	Aspect	Activity
Construction		
Particulates	Construction of progressing ADF Site	Clearing of Groundcover
		Levelling of area
		Wind erosion from topsoil storage piles
		Tipping of topsoil to storage pile
	Vehicle activity on-site	Vehicle and construction equipment activity during construction operations
Gases and particles	Vehicle and construction equipment activity	Tailpipe emissions from vehicles and construction equipment such as graders, scrapers and dozers
Operational phase - Continuous ash disposal		
Particulates	Wind erosion from ADF	Exposed dried out portions of the ADF
	Vehicle activity on-site	Vehicle activity at the ADF

Pollutant(S)	Aspect	Activity
Gases and particles	Vehicle activity	Tailpipe emissions from vehicle activity at the ADF
Rehabilitation		
Particulates	**Rehabilitation of ADF**	**Topsoil recovered from stockpiles**
		Tipping of topsoil onto ADF
	Wind erosion	Exposed cleared areas and exposed topsoil during rehabilitation
	Vehicle activity on unpaved roads and on-site	Truck activity at site during rehabilitation
Gases and particles	Vehicle activity	Tailpipe emissions from trucks and equipment used for rehabilitation

Construction Phase

The construction phase would normally comprise a series of different operations including land clearing, topsoil removal, road grading, material loading and hauling, stockpiling, compaction, etc. Each of these operations has a distinct duration and potential for dust generation. It is anticipated that the extent of particulate emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions.

It is not anticipated that the various construction activities will result in higher off-site impacts than the operational activities. The temporary nature of the construction activities, and the likelihood that these activities will be localised and for small areas at a time, will reduce the potential for significant off-site impacts. The Australian Environmental Protection Agency recommends a management zone of 300 m from the nearest sensitive receptor when materials handling activities occur.

Operational phase

- Dispersion Modelling Scenarios

The dispersion model setup included three emission scenarios for the 404.7 ha footprint:

- Unmitigated emissions

  This is the worst case scenario where the ADF would be left completely uncovered and dust suppression is not applied. This scenario is included to illustrate the value of applying effective particulate emission controls to the ADF.

- Operational scenario

  This scenario is based on the operational practice of an uncovered 80 ha area of ADF where active deposition occurs. The remainder of the ADF is assumed to have near zero emissions through a combination of dust suppression through wetting and revegetation.

- Mitigated operational scenario

This scenario is based on the operational practice of an uncovered 80 ha as above, and also assumes a system of water sprays to reduce particulate emissions from the operational area by 50%.

The assessment only considered the potential impacts from the proposed Site H ADF. It was assumed that the current ADF and Kendal continuous ADF activities would have ceased by the time site H is operational and would be completely rehabilitated.

- Emissions Quantification

Appendix F1 provides a detailed explanation on how the emissions were calculated that was used in the model.

- Emergency Scenario ï Road Haulage of Ash to ADF

During times when the ash disposal conveyors are non-operational, ash may need to be hauled via truck from the emergency dump (E-dump) to the ADF. Emissions will primarily be as a result of dust entrainment from the unpaved ADF access roads by the haul trucks. The distance travelled is likely to be approximately 2 km. It is anticipated that the extent of particulate emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions.

During extended periods of ash haulage, especially when coincidental with dry windy conditions, vehicle entrainment may result in higher off-site impacts than the operational activities. It is therefore recommended that provision be made for dust suppression, by means of water, on the haul roads during periods when road haulage is necessary.

Rehabilitation

It is planned that rehabilitation will occur continuously throughout the disposal of ash and will include the removal and tipping of topsoil onto the completed ADF surface areas. Dust may be generated from the dried out exposed ash surfaces before it is covered with topsoil. After vegetation is established the potential for dust generation will reduce significantly. The tipping of topsoil and vehicle entrainment on associated unpaved roads will also result in dust generation.

It is assumed that all ash disposal activities will have ceased during closure phase, when the power station has reached end of life. Because most of the rehabilitation is undertaken during the operations, the ADF should be almost completely rehabilitated by the closure phase. The potential for impacts after closure will depend on the extent of continuous rehabilitation efforts on the ADF

Modelling

Numerous air quality models are included in Appendix F1. The following sections represent the models that were generated to show the Operational and Mitigated Scenarios for PM10 and PM2.5.

- Operational Scenario - Impact on PM_{10} and $PM_{2.5}$

The ash disposal approach is to have an active, operational area of 80 ha. This scenario assumes that emissions from the remainder (non-active areas) of the ADF are controlled with water sprays and revegetation. Figure 9-1 show the area where simulated PM_{10} concentrations exceed the daily and annual NAAQS. Residential areas near the ADF, power station and along the R555 regional road will have more than four days where the PM_{10} concentrations exceed the daily limit. However, simulated annual average PM_{10} concentrations are compliant with the NAAQS across most of the modelling domain.

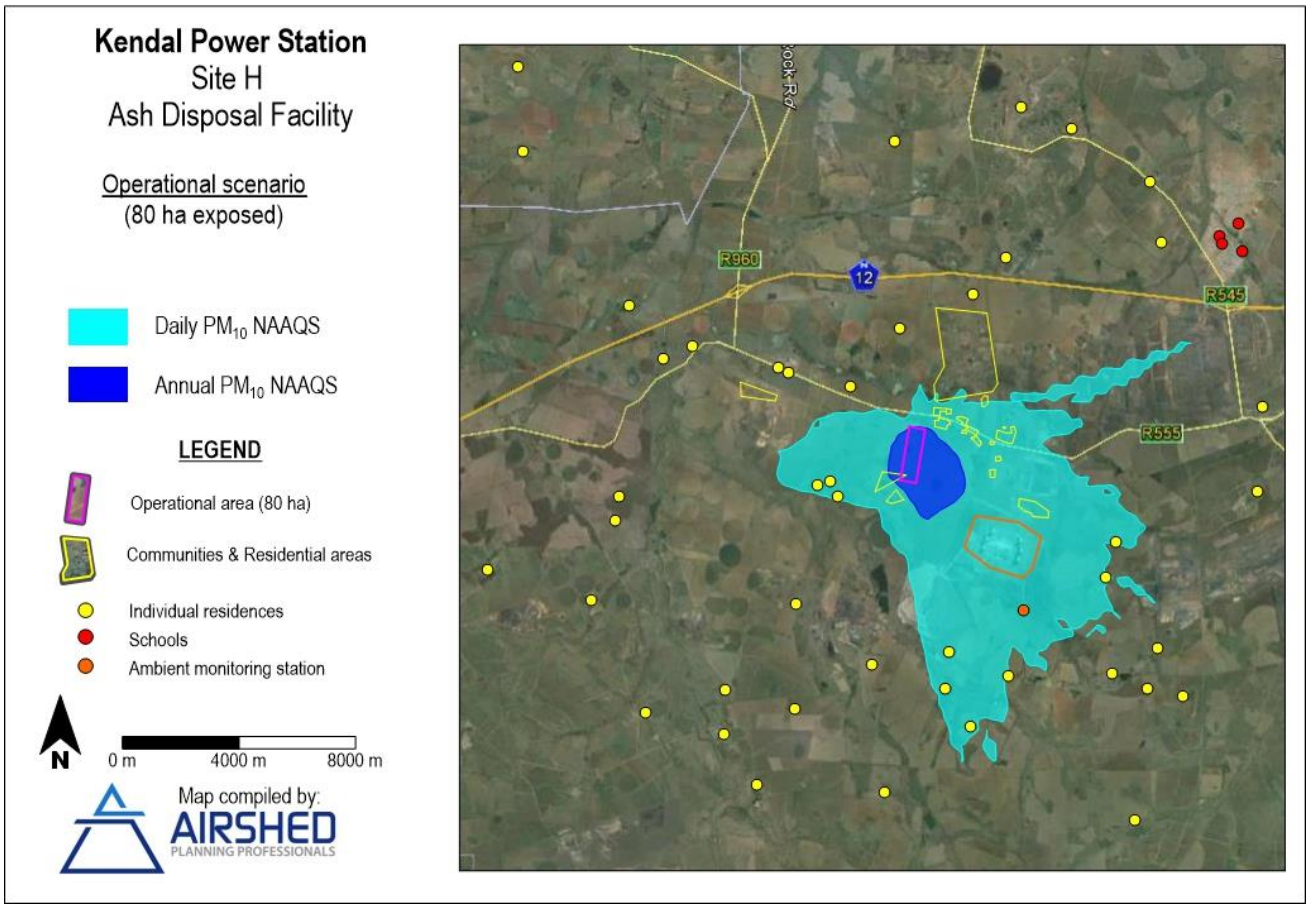


Figure 9-1: Simulated PM_{10} concentrations as a result of the ash disposal at KPS – unmitigated operational scenario, indicating areas of non-compliance with the daily and annual NAAQS

The NAAQS for PM2.5 will become more stringent from 2030 (when the Kendal 30-year ADF becomes operational. Figure 9-2 simulates how the non-compliant area affects receptors up to 8.0 km to the south of the facility (Figure 9-2).

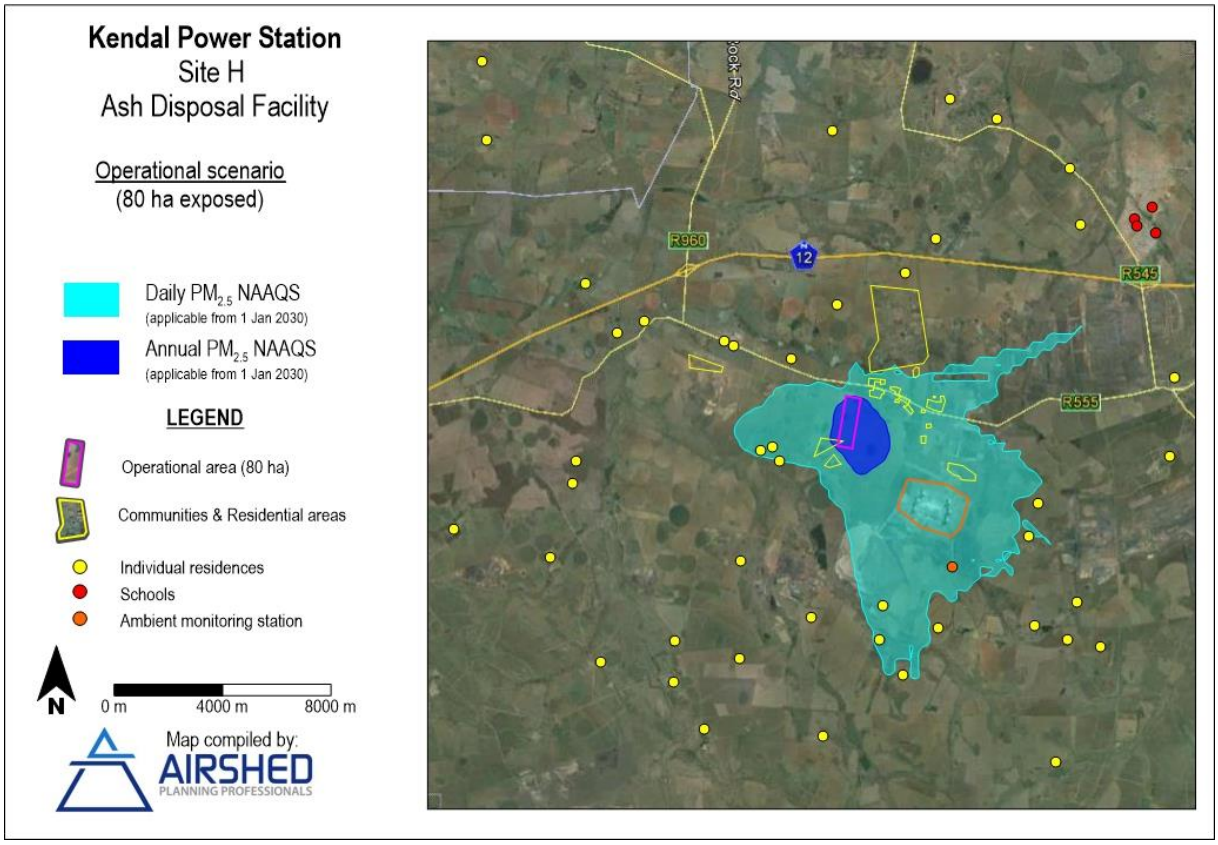


Figure 9-2: Simulated $PM_{2.5}$ concentrations as a result of the ash disposal at KPS – unmitigated operational scenario, indicating areas of non-compliance with the daily and annual NAAQS applicable from 1 January 2030

The impact of particulate emissions from the ADF on ambient concentrations will be dependent on the specific location of the 80 ha operational area. During dispersion modelling the operational area was located in the middle of the final footprint across the full width (north-south orientation). In practice, this area will migrate across the final footprint area as disposal of ash occurs. The simulated impact distance (where impact is considered non-compliance with the relevant standard) from the theoretical 80 ha operational area was approximated, using mapping software, in the four cardinal directions (north, east, south, and west) and in the predominant impact directions (Table 9-9). These distances were used to generate isopleth plots in order to assess the potential off-site impact of the operational scenario irrespective of the location of the 80 ha area within the full design ADF footprint. These plots can be viewed in Appendix F1.

Table 9-9: Simulated particulate impact distance from operational area in four cardinal directions and predominant wind direction(s)

Particulate fraction	Standard	Approximated impact distance (m)					
		North	East	South	West	Predominant direction (degrees from north)	
PM_{10}	NAAQS Annual	160	1 100	735	525	1 700 (110°)	1 175 (175°)
	NAAQS Daily	1 550	4 500	4 130	3 875	7 500 (135°)	8 750 (175°)

Particulate fraction	Standard	Approximated impact distance (m)					
		North	East	South	West	Predominant direction (degrees from north)	
$PM_{2.5}$	**2016 NAAQS Annual**	135	700	470	250	1 100 (120°)	600 (175°)
	2016 NAAQS Daily	600	3 215	3 125	2 625	5 000 (135°)	5 500 (175°)
	2030 NAAQS Annual	155	950	625	375	1 320 (120°)	850 (175°)
	2030 NAAQS Daily	1 100	4 000	4 000	3 750	7 250 (135°)	8 000 (175°)

- Mitigated Scenario

A mitigated scenario was simulated where the use of water-sprays on the operational area would reduce the emissions and impact from the ADF by 50%. This is the control efficiency of water sprays expected on mining stockpiles. Effective use of watering to maintain the moisture content of the ash at 5% could, however, increase the control efficiency up to 74%.

As a result of the control of emissions by water sprays, the area where simulated PM_{10} concentrations exceed the daily and annual NAAQS is smaller than the uncontrolled scenarios (Figure 9-3). Simulated annual average PM_{10} concentrations are compliant with the NAAQS across the domain, except for a small area to the south of the proposed ADF.

Under the most stringent NAAQS for $PM_{2.5}$ (applicable from 2030) the simulated non-compliant area affects receptors up to 5.0 km to the south of the facility (Figure 9-4).

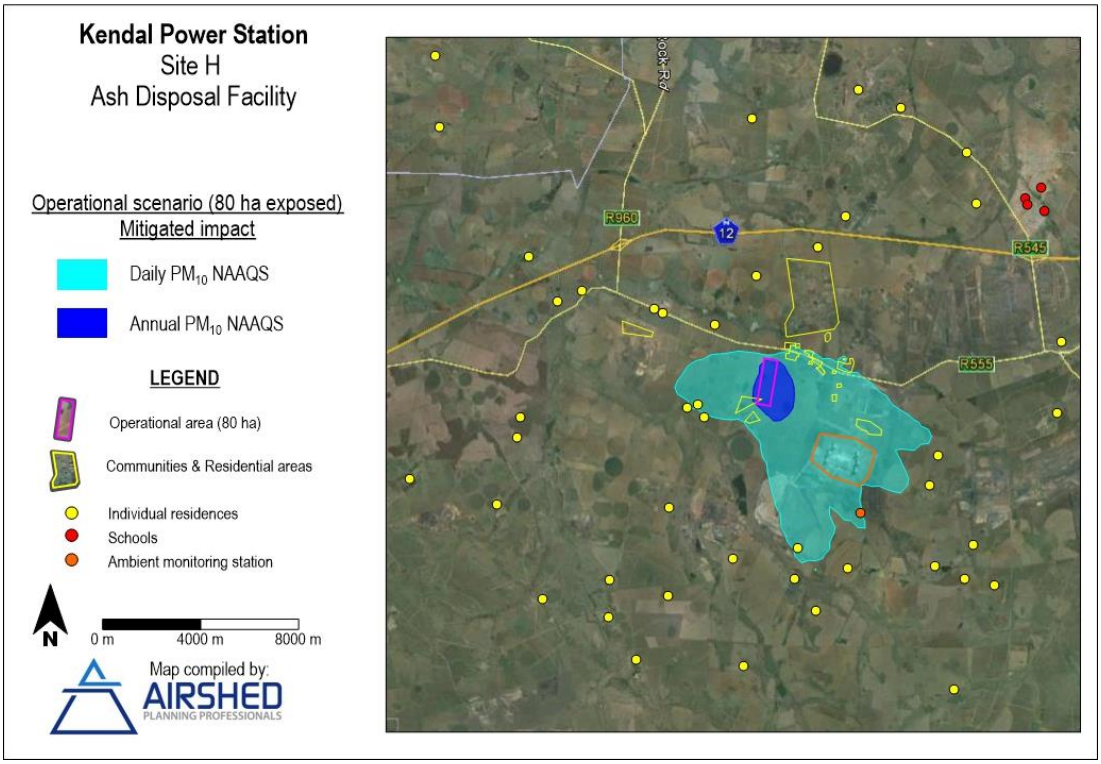


Figure 9-3: Simulated PM_{10} concentrations as a result of the ash disposal at KPS – mitigated operational scenario, indicating areas of non-compliance with the daily and annual NAAQS

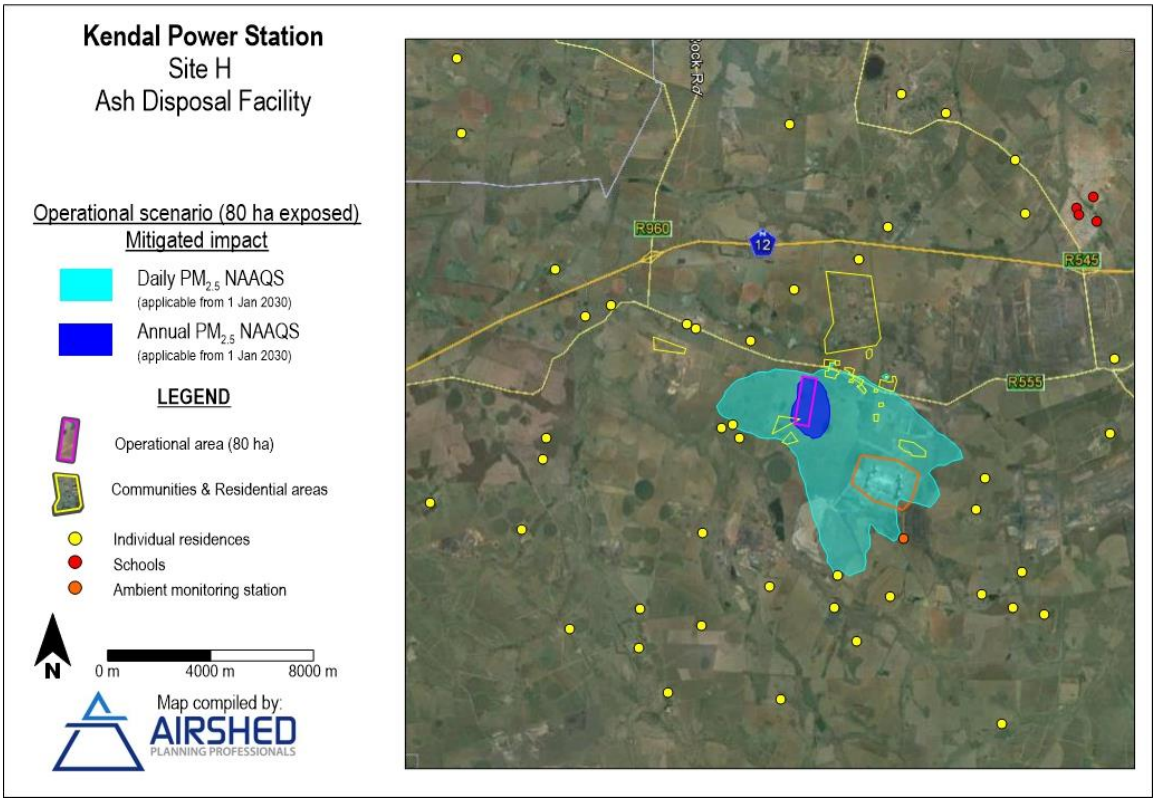


Figure 9-4: Simulated $PM_{2.5}$ concentrations as a result of the ash disposal at KPS – mitigated operational scenario, indicating areas of non-compliance with the daily and annual NAAQS applicable from 1 January 2030

Mitigation Measures

The windblown dust from the ADF is potentially significant during periods of high winds given the close proximity of sensitive receptors to the site. It is recommended that the sidewalls of the ADF be vegetated by means of the application of a top-soil layer and seeding with appropriate grass seeds. The vegetation cover should be such to ensure at least 80% control efficiency. The top surface area should only have 80 ha of ash material exposed at any time. The un-active surface should be stabilised with topsoil and seeded with appropriate grass seed as soon as possible. Exposed topsoil surfaces (before vegetation has established) must be watered regularly to eliminate additional windblown dust from these surfaces. Water spraying system should be implemented on the surface of the ADF covering the outer perimeter of the facility and the active 80 ha area, spraying water when winds exceed 4 m/s.

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Table 9-10: Air Quality Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Air Quality - Construction							
Construction Activities	Non-compliance with annual PM10 standards at sensitive receptors affected by proposed activity	Existing	4	3	3	3	2 - LOW
		Cumulative	2	2	2	4	1.6 - LOW
		Residual	2	1	1	4	1.1 - LOW
	Impact area where dustfall rates exceed 600 mg/m2/day	Existing	2	3	2	3	1.4 - LOW
		Cumulative	2	2	2	4	1.6 - LOW
		Residual	1	1	1	4	0.8 - VERY LOW
Air Quality - Operation							
Disposal of ash	Non-compliance with annual PM_{10} standards at sensitive receptors	Existing	4	4	3	3	2.2 - MOD
		Cumulative	4	4	4	4	3.2 - HIGH
		Residual	4	3	4	4	2.9 - MOD
	Impact area where non-compliance with daily PM_{10} standards was simulated	Existing	4	4	3	3	2.2 - MOD
		Cumulative	4	4	4	4	3.2 - HIGH
		Residual	4	3	4	4	2.9 - MOD
	Non-compliance with annual PM2.5 standards at sensitive receptors	Existing	4	4	1	3	1.8 - LOW
		Cumulative	3	4	4	4	2.9 - MOD

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
		Residual	3	3	4	4	2.7 - MOD
	Impact area where dustfall rates exceed 600 mg/m^2/day	Existing	2	3	2	3	1.4 - LOW
		Cumulative	3	4	4	4	2.9 - MOD
		Residual	2	3	4	4	2.4 - MOD
Air Quality - Closure							
Rehabilitation phase	Non-compliance with annual PM10 standards at sensitive receptors	Existing	4	3	3	3	2 - LOW
		Cumulative	2	2	2	4	1.6 - LOW
		Residual	2	1	1	4	1.1 - LOW
	Impact area where dustfall rates exceed 600 mg/m2/day	Existing	2	3	2	3	1.4 - LOW
		Cumulative	2	2	2	4	1.6 - LOW
		Residual	1	1	1	4	0.8 - VERY LOW

9.3.2 Aquatic Ecology

The Aquatic Ecology Impact Assessment was undertaken by Golder Associates. Refer to Appendix F2 for the full report.

Pre-construction and Construction

The proposed construction activities planned for the establishment of the 30 year ADF, including the associated infrastructure, will subsequently result in various impacts to the aquatic environment. These include:

- Loss of an aquatic ecosystem namely, the pan;
- Loss of aquatic biota;
- Disturbance to streams;
- Increased erosion;
- Increased sediment transport into water resources; and
- Water quality deterioration in adjacent water resources because of sediments and spills from mechanical equipment.

The pan, which falls within the footprint of the ADF and associated infrastructure, will be completely lost, coupled with impacts downstream on the surrounding streams. Earth works relating to the construction of these facilities will permanently destroy the water resource within the construction footprint. The importance of this pan extends far beyond their value as biodiversity hotspots of ecological importance for biodiversity. A variety of water birds including the Lesser Flamingo (*Phoenicopterus minor*) have been observed at the pan, during previous aquatic surveys. Consequently, the impact on this natural resource is very high and owing to the loss of this habitat. A study by Wetland Consulting Services (WCS) was conducted on the pans within the proposed study area. They have developed a wetland offset strategy and identified possible target sites for this pan in question. Refer to Appendix F14 for the report.

Loss of flow at the outlet of catchment B20F and B11F due to destruction of streams within the footprint of Site H is expected to be very low. Only the footprint required for the first 5 years of ash deposition will be cleared and prepared during the construction phase so the loss of water resources is expected to be greatest during the operational phase for the period 2030 to 2052 as per the report.

Construction activities are likely to increase the disturbance footprint beyond the boundaries of the actual development footprint through temporary stockpiles, laydown areas, construction camps and uncontrolled driving of machinery. This will lead to increased exposed soils and thus with limited groundcover and buffering capacity, will result in increased runoff velocities, increasing the risk of erosion with sediments potentially transported down the water resources and finally deposited in the Wilge River.

During the construction phase it is possible that potential spills and leaks of hazardous substances (*inter alia* cement, hydrocarbons, sewage) may occur. Run-off from the site would therefore lead to water quality deterioration.

With respect to the pan, the combined weighted project impact will be of High significance as the pan will be completely lost. It will be affected nationally (owing to it being the maximum extent of any impact) and the degree of probability of the impact occurring will most definitely occur primarily during the first 10 years of construction. A study by WCS was conducted on the pans within the proposed study area. They have developed a wetland offset strategy and identified possible target sites for this pan in question. Refer to Appendix F14 for this report. Overall, the impact risk class is thus High. The remaining potential identified impacts namely, water quality deterioration, altered flow regime, bed modification, erosion and increase in sedimentation, the extent scale will affect the study site to local area. The impact will act in the short/ medium term to permanent where loss of streams occurs, and is very likely to occur. The impact risk class is thus Low to Moderate.

Cumulative Impact

The Olifants River has a catchment (Water Management Area 4) of approximately 54 400 km^2 in size. The river originates in the Mpumalanga Highveld and flows through industrial, agricultural and mining areas such as eMalahleni (Witbank), Middelburg, Steelpoort and Phalaborwa on its way towards the Kruger National Park. Flowing through these economic hubs of mining and industry, combined with extensive agricultural activity within the catchment, the Olifants River has been classified as stressed with the overall condition of the river ecosystems being regarded as Fair to Poor. Associated with these activities are high surface run-off, water contamination and biotic community alteration. The Wilge River a tributary of the Olifants River flows roughly northwards until it is joined by its main tributary, the Bronkhorstspruit River. The river then flows in a north-easterly direction until it joins the Olifants River about 12 km upstream of the Loskop Dam.

With the existing land-use in the Wilge River catchment, agriculture, mining and Waste Water Treatment Works (WWTWôs) the river is already under pressure from nutrients and sulphate inputs (De Villiers and Mkwelo, 2009). This being said, sites within the Wilge River catchment show relatively good water quality in comparison to those in the Olifants River catchment. It is therefore important to maintain the ecological integrity of the Wilge River and strive to improve it.

A concern is that the rivers, streams and the pan in the area already contain high sediment loads (turbidity). This is due to the land use in the area. Any further increases in sedimentation and erosion may cause a further loss in habitat diversity and quality that will further contribute to impacts on biological communities. Additionally, the increase in development with mining (New Largo) and the new Kusile Power Station, cumulative impacts will be present. Furthermore, farm dam construction has resulted in some flow alteration.

The combined weighted project cumulative impact on the pan will be of High significance due to reasons stated above. The baseline remaining impacts are considered to be low and additional project impact (if no mitigation measures are implemented) will only marginally increase the significance of the existing baseline impacts, the cumulative unmitigated impact will likely be of a Low/Moderate impacts, affecting the study/ local area in extent. The impact is very likely and will

be short/ medium term to permanent where loss of streams occurs. The impact risk class is thus Low to Moderate.

Mitigation Measures

WCS have developed a wetland offset strategy to mitigate for the loss of the pan and identified possible target sites for this pan in question. Refer to Appendix F14 for this detail coupled with their mitigation measures. No other mitigation and management measures have been identified for the loss of the pan in this report owing to the complete loss of this aquatic feature over the next 10-year construction period.

Mitigation during construction for the surrounding water resources would include:

- Optimise design of the ADF to minimise the size of the footprint;
- Minimise area of vegetation clearing;
- Where practically possible, undertake the clearing of vegetation during the dry season to minimise erosion;
- The storm water management plan should be in place prior to construction being initiated;
- Install and maintain sediment traps as part of the storm water management plan where necessary and especially upstream of discharge points where erosion protection measures and energy dissipaters should be in place;
- Clean spills as quickly as possible;
- Store and handle potentially polluting substances and waste in designated bunded facilities;
- Waste should be regularly removed from the construction site by suitably equipped and qualified operators and disposed of in approved facilities;
- Locate temporary waste and hazardous substance storage facilities out of the 1:100 floodlines;
- Locate temporary sanitation facilities out of the 1:100 year floodlines; and
- An aquatic biomonitoring programme should be maintained for the Wilge River and adjoining tributaries. The monitoring programme should include the following indices monitored on a bi-annual basis during the wet and dry season:
  - *In situ* water quality;
  - Habitat availability using the IHAS;
  - Aquatic macroinvertebrates; and
  - Ichthyofauna.

Residual Impact

The residual impact of the construction of the ADF will include the permanent loss of water resources (pan), as well as a potential decline in water quality. Most of these impacts, with the exception of the pan, are expected to be restricted to the local scale; however, the potential deterioration of water quality within the Wilge River will increase the extent of the impacts.

The residual impact to water resources beyond the construction phase of the project will be reduced through mitigation, except for the pan which will be lost. Following mitigation, the impacts to the water resources will likely be of a Very low to low significance, affecting the study site to local area in extent. The impact could happen and certain cases related to water quality is very likely. The duration will be short term. The impact risk class is however Low. With respect to the pan, the combined weighted project impact will be of Very High significance, as it is affected nationally (owing to it being the maximum extent of any impact) and the degree of probability of the impact occurring will most definitely occur primarily during the first 10 years of construction.

Operational Phase

The impacts from the operational phase are likely to include:

- Water quality impacts and deterioration (sedimentation and chemical contamination) from operation of the ADF;
- Erosion and increased sediment transport into water resources as the ADF construction progresses; and
- Loss of streams, aquatic habitats, aquatic biota, bed modification and altered flows as the ADF construction progress.

The combined weighted project impact to water resources (prior to mitigation) during the operational phase will be of a Low to Moderate significance, affecting the site and local area. The impact will act in the short term to permanent (where water resources such as streams will be removed and pans lost) and is likely to occur. The impact risk class is Low to Moderate.

Cumulative impacts

Additional project impacts (if no mitigation measures are implemented) will increase the significance of the existing baseline impacts. The cumulative unmitigated impact will probably be of a Low to Moderate significance, affecting the study/ local area in extent. The impact is very likely and will be short term to permanent (where water resources such as streams and pans will be lost). The impact risk class is Low to Moderate.

Mitigation Measures

Mitigation during operation are the same as for the construction phase, with the addition of the following measures:

- Where areas need to be cleared of vegetation, the proposed project must aim to cap and revegetate as soon as possible to avoid run off and dust;
- Maintain sediment traps as part of the storm water management plan where necessary and especially upstream of discharge points where erosion protection measures and energy dissipaters should be in place;
- Maintain infrastructure for river crossings adequately to prevent spillages; and

Residual Impact

The residual impact of the construction (as the ADF progresses over the period 2030 to 2052) and operation of the ADF will include the permanent loss of water resources, as well as a potential decline in water quality, aquatic habitat and associated aquatic biota.

Most of these impacts are expected to be mostly restricted to the local area, however the potential deterioration of water quality within the Wilge River will increase the extent of the impacts.

The residual impact to water resources of the construction (as the ADF progresses over the period 2030 to 2052) and operation of the ADF of the project will be reduced through mitigation. After mitigation the impacts to the water resources will probably be of a low to moderate significance, affecting the site/ local area in extent. The impact is likely and will be short term to permanent where loss of water resources occurs, namely the pan. The impact risk class is likely to be reduced to Low.

Closure Phase

A number of impacts are expected to materialise as a consequence of the closure phase of the 30 year ADF and the associated infrastructure. Impacts relating to the rehabilitation of the ADF are also applicable to the operational phase of the project, as rehabilitation will take place concurrently. The decommissioning and removal of infrastructure during the closure phase is also likely to result in a number of impacts similar to the construction phase impacts:

- Stream deterioration and loss of aquatic habitat and biota;
- Increased sediment transport into water resources and further bed modification;
- Increased erosion; and
- Water quality deterioration in adjacent water resources.

Rehabilitation of the ADF will include the placement of topsoil on the side slopes and crest of the ADF and the establishment of vegetation on the ADF. Surface runoff on the steep side slopes is likely to erode the topsoil in the initial stages prior to the establishment of sufficient vegetation.

The combined weighted project impact to water resources (prior to mitigation) will be of a Low significance, affecting the site/local area. The impact will act in the short term and is very likely to occur. The impact risk class is thus Low.

Cumulative Impact

The cumulative impacts of the operational phase activities, if not mitigated successfully, as well as impacts from other developments (mines, industrial areas and urban development) in the area are likely to impact on the water resources.

In this respect additional project impact (if no mitigation measures are implemented) will increase the significance of the existing impacts, the cumulative unmitigated impact will probably be of a low to moderate significance, affecting the site/ local area in extent. The impact is very likely and will be short term to permanent where water resources have been removed throughout the various phases of the ADF development. The impact risk class is thus Low to Moderate (Table 30).

Mitigation Measures

Mitigation during closure would be to:

- Maintain sediment traps as part of the storm water management plan where necessary and especially upstream of discharge points where erosion protection measures and energy dissipaters should be in place; and
- An aquatic biomonitoring programme should be maintained for the Wilge River and adjoining tributaries (as per the monitoring points upstream and downstream of alternative site H in this report). The monitoring programme should include the following indices monitored on a bi-annual basis during the wet and dry season:
  - In situ water quality;
  - Habitat availability using the IHAS;
  - Aquatic macroinvertebrates; and
  - Ichthyofauna.

Residual Impact

The residual impact of the closure of the ADF will include the permanent loss of water resources (flow) although this is minimum, as well as a potential decline in water quality.

Most of these impacts are expected to be restricted to the local scale, however the potential deterioration of water quality and habitat availability within the Wilge River will increase the extent of the impacts.

The residual impact to water resources beyond the closure phase of the project will be reduced through mitigation. After mitigation the impacts to the water resources will probably be of a low significance, affecting the site/local area in extent. The residual impact from the closure phase is likely but will be short term. The impact risk class is therefore Low to very low.

Table 9-11: Aquatic Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Aquatic - Construction							
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	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	2	0.8 - VERY LOW
	Water quality deterioration within the surrounding tributaries owing to hydrocarbon spillages and sedimentation	Existing	3	3	3	4	2.4 - MOD
		Cumulative	3	3	3	4	2.4 - MOD
		Residual	2	2	2	4	1.6 - LOW
	Complete loss of the pan and associated aquatic biota, including the identified Lesser Flamingo (*Phoenicopterus minor*)	Existing	3	2	3	4	2.1 - MOD
		Cumulative	5	5	3	4	3.5 - HIGH
		Residual	3	3	3	4	2.4-MOD
Clearing of vegetation	Erosion	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	2	0.8 - VERY LOW
	Impaired habitat and reduced biotic integrity	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	2	0.8 - VERY LOW
	Loss of streams and altered flows	Existing	1	5	1	4	1.9 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
		Cumulative	1	5	1	4	1.9 - LOW
		Residual	1	5	1	4	1.9 - LOW
	Loss of the pan and associated aquatic habitat and aquatic biota of significance is the Lesser Flamingo identified in the pan	Existing	3	2	3	4	2.1- MOD
		Cumulative	5	5	3	4	3.5-HIGH
		Residual	3	3	3	4	2.4-MOD
	Increased sediment transport into water resources and bed modification	Existing	3	2	2	4	1.9 - LOW
		Cumulative	3	2	2	4	1.9 - LOW
		Residual	2	2	2	3	1.2 - LOW
	Water quality deterioration in the surrounding tributaries owing to potential hydrocarbon spills from mechanical equipment	Existing	3	3	3	4	2.4 - MOD
		Cumulative	3	3	3	4	2.4 - MOD
		Residual	2	2	2	4	1.6 - LOW
Aquatic - Operation							
Operation of ADF	Water quality impacts to surrounding tributaries (sedimentation, chemical contamination)	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	2	4	4	2.4 - MOD
		Residual	3	2	3	3	1.6 - LOW
	Erosion and increased sediment transport into the surrounding tributaries and bed modification	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	3	1.2 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Operation of ADF	Loss of streams, aquatic habitats, bed modification coupled with the loss of aquatic biota	Existing	1	5	1	4	1.9 - LOW
		Cumulative	1	5	1	4	1.9 - LOW
		Residual	1	5	1	4	1.9 - LOW
	Change to natural flow regime	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	2	4	4	2.4 - MOD
		Residual	3	2	3	3	1.6 - LOW
Aquatic - Closure							
Infrastructure removal	Disturbance to streams (Loss of streams, aquatic habitat, bed modifications, aquatic biota and altered flows)	Existing	1	5	1	4	1.9 - LOW
		Cumulative	1	5	1	4	1.9 - LOW
		Residual	1	5	1	4	1.9 - LOW
	Increased sediment transport into water resources and erosion	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW
	Water quality deterioration	Existing	3	2	2	3	1.4 - LOW
		Cumulative	3	2	2	3	1.4 - LOW
		Residual	2	2	1	3	1 - VERY LOW

9.3.3 Ecology (Terrestrial)

The Terrestrial Ecology Impact Assessment was undertaken by Golder Associates. Refer to Appendix F3 for the full report.

Several potential negative impacts on the ecology have been identified for the proposed project. It must be appreciated that there is interplay between impacts:

- Habitat loss and degradation;
- Establishment and spread of alien invasive species;
- Mortality and disturbance of general fauna;
- Loss and disturbance of fauna of conservation importance; and
- Loss and disturbance of flora of conservation importance.

Habitat Loss and Degradation

Habitat loss refers to the removal of natural habitat. In terrestrial ecosystems this occurs primarily through the clearing of indigenous vegetation and earthworks. The immediate result is the destruction of individual plants and some fauna species within the development footprint and the fragmentation of remaining habitat patches. This can also lead to a contingent breakdown or impairment of ecosystem integrity and functioning at broader ecological scales, if remaining habitat is insufficient in size and heterogeneity to sustain ecological processes.

Habitat loss can also refer to habitat degradation. In this instance, although habitat is present, it has been disturbed to the extent that compositionally and structurally it is markedly dissimilar to reference habitat conditions. In extreme cases of habitat disturbance, the mix of functional species-types is altered and ecosystem functioning is impaired as a result.

Impact in relation to proposed project

Most of the proposed development footprint comprises cultivated fields. Small areas of natural habitat are present within the footprint and these will be completely cleared of vegetation during the construction phase. The proposed conveyor traverses across areas of Dry mixed grassland vegetation, while the ADF covers small pockets of the Moist grass and sedge community that are associated with pans and wetlands ï a portion of this habitat in the north-east corner of the proposed ADF footprint is classified as CBA ï Optimal by the MBSP (2013).

Of particular concern is the large pan located in the south-eastern corner of the proposed ADF footprint. At the time of the field visits this pan was frequented by waterfowl such as Red-knobbed Coot (*Fulica cristata*) and anecdotal evidence suggests that Greater flamingo (*Phoenicopterus ruber*) have been recorded there ï see impact discussed in section 7.2.4: Disturbance of fauna of conservation importance for more information.

Mitigation measures proposed:

- 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.

Establishment and spread of alien invasive species

Disturbances caused by vegetation clearing and earthworks can create conditions conducive to the establishment and rapid colonisation of alien invasive vegetation. If left uncontrolled, infestations of alien species can spread exponentially, suppressing or replacing indigenous vegetation. This may lead to a breakdown in ecosystem functioning and a loss of biodiversity.

Impact in relation to proposed project

Several listed alien invasive plant species were recorded in the study area during the field programme (site visits). Construction related activities will disturb natural vegetation, which will facilitate the further establishment and spread of alien invasive plants. This potential impact will be present throughout the life of the project and will be of concern if not managed appropriately.

Mitigation measures proposed:

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.

Mortality and disturbance of general fauna

The study area has a notable fauna community. Apart from the large impacts associated with habitat loss, fauna may also be directly harmed or disturbed during all project phases:

- Small and less mobile species may be trapped, injured and killed during vegetation clearing and earthworks. These may include fossorial mammals (e.g. moles, rodents), nesting birds, reptiles and amphibians.
- Other common causes of fauna injury, death or disturbance during the operational phase include:

- Vehicle-wildlife collisions along haul and access roads;
- Fauna becoming trapped/caught in infrastructure (e.g. fences and excavations); and
- Lights can disrupt nocturnal species, such as bats, which can cause changes in community characteristics.

Mitigation measures proposed:

- An Environmental Control Officer (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.

Disturbance of fauna of conservation importance

During all phases of the proposed project, but particularly during the construction phase, fauna of conservation importance may be disturbed, either through the loss of viable habitat or through direct impacts as discussed in section 7.2.3. This impact is of particular concern viz Greater Flamingo that have been recorded at the pan in the south-eastern corner of the proposed ADF footprint. Both Flamingo species are listed as Near Threatened (IUCN regional status - 2013.1) and protected (NEMBA TOPS list 2013).

Loss and disturbance of flora of conservation importance

During vegetation clearing and earthworks, flora species of conservation importance may be destroyed or damaged. Several species of conservation importance have been recorded in the study area, with a number favouring moist habitats (e.g. *Crinum bulbispermum*, *Gladiolus spp*., *Eucomis autumnalis* and *Kniphofia* sp.). These may be destroyed or damaged during the clearing of vegetation around the pans and wetlands in the ADF footprint.

The majority of Site H comprises cultivated land, mostly under maize production. An exotic woodlot is present in the north of Site H and various small parcels of natural/semi-natural grassland habitat, often associated with wetland areas, are also present.

A prominent pan is located close to the southern boundary of Site H. Water in the pan appears to be supplemented and used for centre-pivot irrigation, and it is expected that the hydroperiod and water quality of the pan is altered as a result. Both the PES and EIS of the pan are rated as category D (WCS, 2016). This notwithstanding, the pan is used by waterfowl, and Greater Flamingo have previously been recorded at the pan.

The proposed development of the ADF at Site H will result in the complete loss of remaining patches of untransformed habitat in the proposed footprint, including the pan. Apart from restricting vegetation clearing outside of the immediate ADF footprint and implementing rehabilitation, habitat loss is inevitable. A number of other impacts have also been identified. These can however be mitigated, provided careful management is implemented throughout all stages of the proposed project. It is thus recommended that all the mitigation measures outlined in this report are included in the environmental management programme for the proposed ADF facility at Site H.

Mitigation measures proposed:

- Prior to construction, all areas designated for vegetation clearing should be clearly marked under the supervision of the ECO or to the ECOôs satisfaction.
- 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.

Table 9-12: Ecology Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Terrestrial - Construction							
Clearing of vegetation and earth works	Habitat loss and degradation	Existing	3	4	3	5	3.3 - HIGH
		Cumulative	3	5	4	5	4 - HIGH
		Residual	3	5	4	5	4 - HIGH
Clearing of vegetation and earth works	Establishment and spread of alien invasive species	Existing	2	4	4	5	3.3 - HIGH
		Cumulative	2	4	4	5	3.3 - HIGH
		Residual	1	3	3	5	2.3 - MOD
Clearing of vegetation and earth works & increased vehicle and machinery activity on-site	Mortality and disturbance of general fauna	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	2	3	3	3	1.6 - LOW
Clearing of vegetation and earth works	Loss and disturbance of fauna of conservation importance (e.g. Greater Flamingo)	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	4	5	4	5	4.3 - VERY HIGH
		Residual	4	5	4	5	4.3 - VERY HIGH
Clearing of vegetation and earth works	Loss and disturbance of flora of conservation importance	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	1	1	4	3	1.2 - LOW
		Residual	1	1	1	2	0.4 - VERY LOW
Terrestrial - Operation							
Clearing of vegetation and earth works	Establishment and spread of alien invasive species	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	2	4	4	5	3.3 - HIGH
		Residual	1	3	3	5	2.3 - MOD

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Vehicle and machinery activity on-site. Trapping of fauna in infrastructure.	Mortality and disturbance of general fauna	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	2	3	3	3	1.6 - LOW
Terrestrial - Closure							
Disturbance of vegetation	Establishment and spread of alien invasive species	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	2	4	4	5	3.3 - HIGH
		Residual	1	3	3	5	2.3 - MOD

9.3.4 Groundwater

The Groundwater Impact Assessment was undertaken by Golder Associates. Refer to Appendix F4 for the full report.

Modelling

Groundwater modelling was done to ascertain two things:

1. Predict the groundwater contributions to delineated hill-slope and valley bottom wetlands.
2. Evaluate the impacts of the proposed ADF on the ambient groundwater quality using a conservative advective-dispersive transport model

The results of the groundwater seepage rates in and out of the pan is presented in Table 9-13.

Table 9-13: Simulated groundwater seepage rates in- and out the Pan

Balance	Inflows from Pan	
	m^3/a	l/s
In	2 743	0.09
Out	-1 758	-0.06
Net	985	0.03

In terms of quality, the predicted plume extents within the weathered aquifer over the 27 years of active life of the ADF as well as 23 years post closure (total simulation time 50 years) are shown in Figure 9-5 to Figure 9-10. According to the simulation conducted, no significant seepage plume is likely to develop from the lined ADF during its operational life. The simulated plumes are essentially limited to the immediate vicinity of the ADF and associated infrastructure footprint areas. Due to the low seepage rate from the lined ADF, no significant pollutant load is predicted and associated concentrations disperse in the shallow weathered aquifer underlying the ADF.

A minor elongation of the post-closure seepage plume is recognisable in Figure 9-10 for the north-eastern corner of the ADF and for the residual plume in the northern edge of the stockpile area, although at significantly diminishing concentrations. The elongation of the plume at the north-eastern corner of the ADF (around 150 m extent) for concentrations between 20 and 10% of the already low source concentration can be related to the conservative assumption of continuous source strength for the post closure simulation, although this is not expected

Figure 9-5: Simulated plume development 5 years after commissioning of the ADF

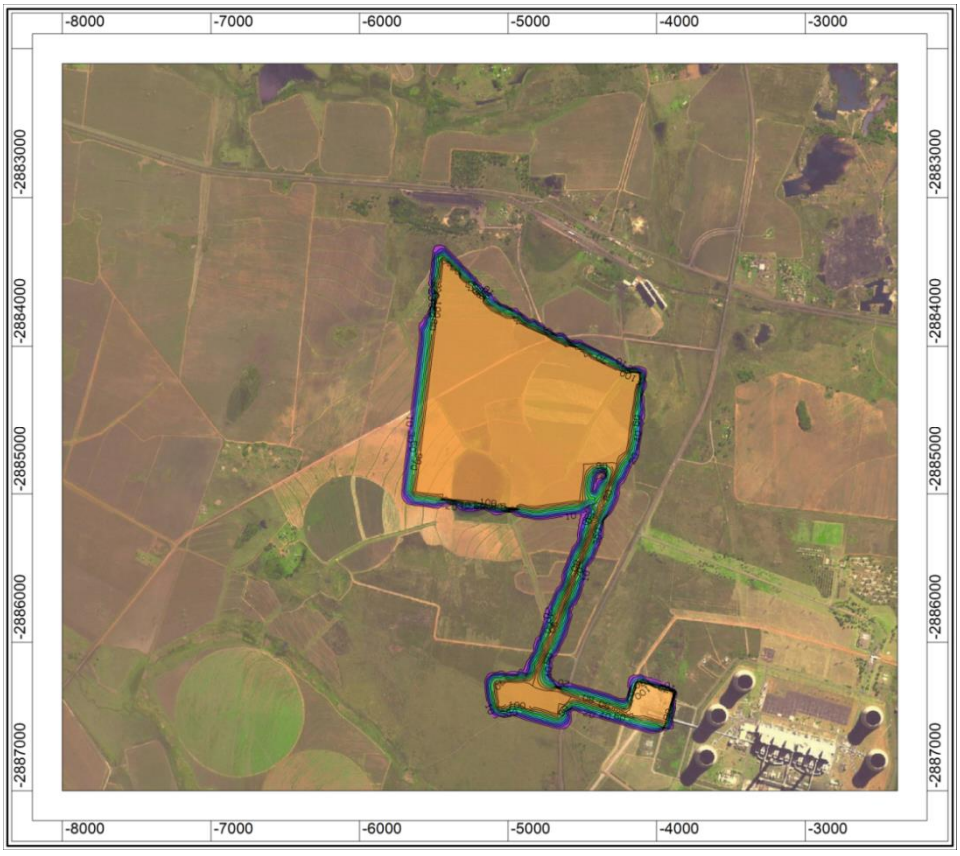

Figure 9-6: Simulated plume development 10 years after commissioning of the ADF

Figure 9-7: Simulated plume development 15 years after commissioning of the ADF

Figure 9-8: Simulated plume development 20 years after commissioning of the ADF

Figure 9-9: Simulated plume development 27 years after commissioning of the ADF (end of life)

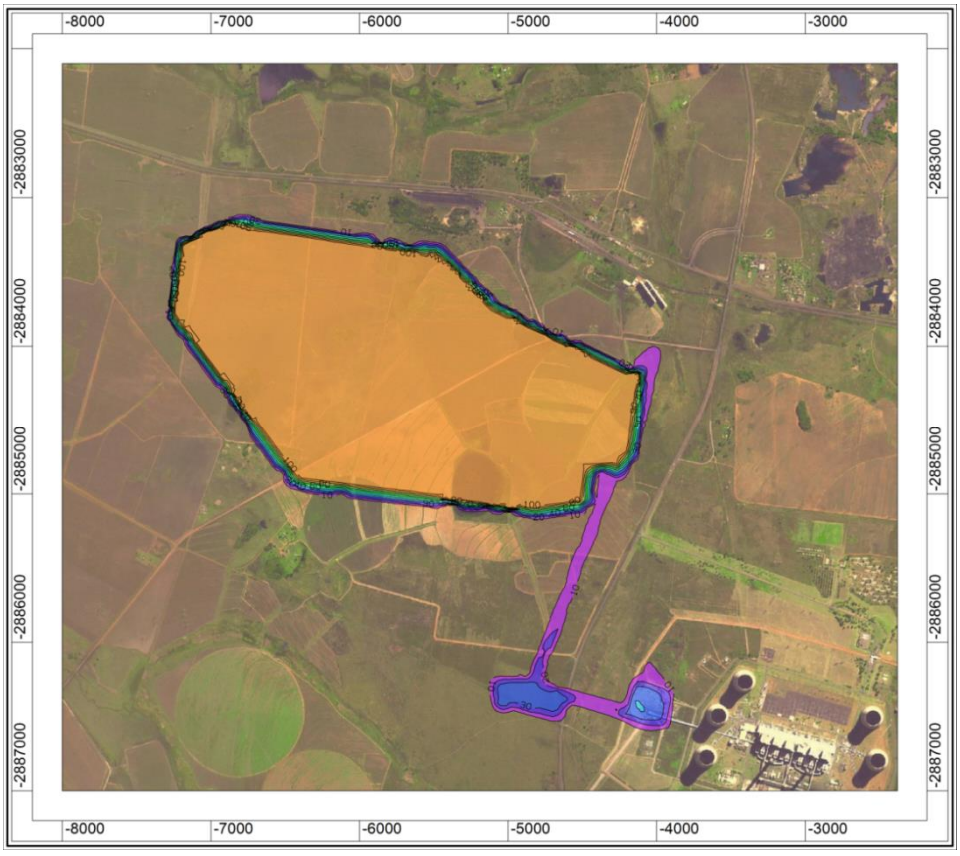

Figure 9-10: Simulated plume development 50 years after commissioning (23 years post closure) of the ADF

Groundwater Impacts

Based on the results of the groundwater model, the potential impacts of the ADF and associated infrastructure on the aquifer can be generally classified into:

- A change in the groundwater quality;
- A change in the volume of groundwater in storage or entering groundwater storage (recharge); or
- A change in the groundwater flow regime.

Groundwater Quality

- It is expected that seepage from the ADF will impact on the ambient groundwater quality of the underlying weathered aquifer. Seepage from the ADF will contain elevated concentrations of identified constituents of concern, which will migrate into the underlying aquifer and result in a measurable increase of these constituents in the aquifer. This will cause a moderate deterioration of the ambient groundwater quality. The predicted impact of seepage from the ADF on the ambient groundwater quality is:
- Of LOW significance based on the low leachate concentrations (if representative of the ash) and seepage rates
- Localised, within the study site boundary (not exceeding Eskom property), if surface run-off from potential seeps at the toe of the dump is contained.
- Long-term, with moderate increases of pollutant concentrations beyond closure.
- Probable to occur.

Due to the substantial uncertainties associated with the potential seepage quality from the ADF, Delta H assigns only a high degree of uncertainty to the predictions. In other words, Delta H is less than 40% sure of the likelihood of the low impacts on the groundwater quality occurring, due to the absence of leachate quality assessments.

Groundwater Quantity and Flow Regime

Due to dry deposition of ash on a lined ADF, a minor change in the volume of water entering groundwater storage (reduced recharge in comparison to status quo conditions) with NEGLIGIBLE changes in the groundwater flow regime are definitely (more than 90% sure) expected. However, these minor changes in the flow regime are not expected to result in measurable changes to groundwater contributions to the delineated wetlands as they will fall within the seasonal variability.

Based on the impact rating classes in Table 9-7 the impacts of Groundwater Quality (0.3 to 1.2) and Groundwater Recharge and Flow (1.0 to 1.2) fall in the Impact Classes 1 and 2, which are considered to be of a very low to low impact.

Mitigation Measures

The proposed lined ADF impact on groundwater regime is considered to be a very low to low and the following mitigation measures are proposed:

- Installation and testing of groundwater monitoring boreholes (see recommendations) to accommodate the final ADF layout; and
- Groundwater monitoring is recommended to form part of the mitigation and management of the proposed ADF. This monitoring must be included in the monitoring network and will be used as a warning system for contaminant migration.

Table 9-14: Groundwater Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Groundwater - Construction							
Clearing of vegetation and Construction of infrastructure	Groundwater Quality	Existing	2	2	2	3	1.2 - LOW
		Cumulative	2	2	2	3	1.2 - LOW
		Residual	2	2	2	3	1.2 - LOW
Clearing of vegetation and Construction of infrastructure	Groundwater Recharge	Existing	2	2	1	3	1 - VERY LOW
		Cumulative	2	2	1	3	1 - VERY LOW
		Residual	2	2	1	3	1 - VERY LOW
Clearing of vegetation and Construction of infrastructure	Groundwater Flow	Existing	2	2	1	3	1 - VERY LOW
		Cumulative	2	2	1	3	1 - VERY LOW
		Residual	2	2	1	3	1 - VERY LOW
Groundwater - Operation							
Stockpile Management	Groundwater Quality - potential seepage quality from the ADF	Existing	2	3	2	2	0.9 - VERY LOW
		Cumulative	2	3	3	3	1.6 - LOW
		Residual	2	3	2	2	0.9 - VERY LOW
Stockpile Management	Groundwater Recharge	Existing	2	3	1	3	1.2 - LOW
		Cumulative	2	3	1	3	1.2 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
		Residual	2	3	1	3	1.2 - LOW
Stockpile Management	Groundwater Flow	Existing	2	3	1	3	1.2 - LOW
		Cumulative	2	3	1	3	1.2 - LOW
		Residual	2	3	1	3	1.2 - LOW
Groundwater - Closure							
Rehabilitation of disturbed land & restoration of Soil utilization	Groundwater Quality	Existing	2	2	1	2	0.7 - VERY LOW
		Cumulative	2	4	1	2	0.9 - VERY LOW
		Residual	2	2	1	1	0.3 - VERY LOW
	Groundwater Recharge	Existing	2	2	1	3	1 - VERY LOW
		Cumulative	2	2	1	3	1 - VERY LOW
		Residual	2	2	1	3	1 - VERY LOW
	Groundwater Flow	Existing	2	2	1	3	1 - VERY LOW
		Cumulative	2	2	1	3	1 - VERY LOW
		Residual	2	2	1	3	1 - VERY LOW

9.3.5 Heritage

The Heritage Impact Assessment was undertaken by PGS Heritage. Refer to Appendix F5 for the full report.

The field work on Site H revealed a total of 8 newly discovered heritage sites. The heritage sites consist of 7 cemeteries (KAD10, KAD16, KAD17, KAD18, KAD14, KAD20 and KAD21) with approximately 149 graves and a single farmstead (KAD15).

The eight heritage sites identified consist of seven cemeteries and one farmstead. None of these sites are currently maintained. The impacts identified at the base line evaluation are:

During the construction of the ADF , access roads, pipelines, trenches / channels, Transmission lines re-routing, and installation of the barrier system impacts will occur to the identified and chance find heritage resources. These impacts will occur as a result of construction activities such as topsoil stripping, excavations and vegetation clearing. The most notable and definite impacts will be on the existing cemeteries and the palaeontological sensitive substrata.

Cemeteries

Two cemeteries KAD10 and KAD17 will be directly impacted by the construction activities associated with the proposed ashing facility.

The cumulative unmitigated impact will definitely be of a HIGH negative significance, local in extent as per Table 9-15. The impact is going to happen and will be permanent. The impact risk class is thus High.

Farmstead

The possibility of damage to the farmstead during construction activities does occur. Its locality lends itself to being utilised as construction camp for the project.

The cumulative unmitigated impact will definitely be of a LOW negative significance, on the proposed site in extent. The impact could happen and will be incidental. The impact risk class is thus Low as per Table 9-15.

Palaeontology

The impact on palaeontological resources associated with the Permian Vryheid Formation sediments of the Karoo Supergroup is rated as being moderately sensitive.

The cumulative unmitigated impact will definitely be of a MODERATE negative significance, on the proposed site in extent. The impact could happen and will be permanent. The impact risk class is thus Low as per Table 9-15.

Table 9-15: Heritage Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Heritage - Pre-construction							
Cemeteries and graves	Impact on cemeteries and graves	Existing	1	1	1	2	0.4 - VERY LOW
Impact on find spot	Destruction of heritage rated buildings	Existing	1	1	2	2	0.5 - VERY LOW
Heritage - Construction							
Earth works	Impact on cemeteries and graves	Existing	1	1	1	2	0.4 - VERY LOW
		Cumulative	2	5	4	5	3.7 - HIGH
		Residual	1	1	0	1	0.1 - VERY LOW
	Destruction of heritage rated buildings	Existing	1	1	2	2	0.5 - VERY LOW
		Cumulative	1	5	3	5	3 - MOD
		Residual	1	1	0	1	0.1 - VERY LOW
Earth works and deep excavations in to bedrock	Impact on palaeontological material	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	1	5	3	3	1.8 - LOW
		Residual	1	1	0	1	0.1 - VERY LOW

9.3.6 Noise

The Noise Impact Assessment was undertaken by Airshed Planning Professionals. Refer to Appendix F6 for the full report.

Noise - Construction and Closure

The extent and character of construction/closure phase noise will be highly variable as different activities with different equipment will take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site. Construction will include vehicle and machinery operations. The closure phase is usually characterised by noise from earthworks for rehabilitation.

Noise ï Operation

Noise Sources and Sound Power Levels

The most significant sources of noise associated with ashing include conveyor transfer and ash stacking. A noise sample was taken for the Kendal Continuous ADF Project at a distance of 10m from stacking operations on the existing KPS ash disposal facility in April 2013. The stacker/conveyor systemôs sound power levels (noise ëmissionsô) were calculated and are presented in Table 9-16.

Table 9-16: Ash stacking/conveying sound power levels as calculated from source measurements.

Source	Sound Power Levels, L_{Wi} (dB), at Octave Band Centre Frequencies							A-weighted Sound Power Level, L_{WA} (dBA)
	63 Hz	125 Hz	250 Hz	500 Hz	1 000 Hz	2 000 Hz	4 000 Hz	
Conveying and Stacking of Ash	108.1	103.4	102.3	103.1	99.9	97.3	89.6	**104.9**

Noise Propagation Modelling and Predicted Noise Levels

The propagation of noise from the operational phase was calculated in accordance with SANS 10103 and SANS 10357.
The propagation of noise was calculated over a 4 km east-west by 4 km north-south area at 40m intervals. Due to the nature of the ash stacker (mobile source), the results are presented as expected increase in ambient noise level over the average measured baseline as a function of distance from the source.

To facilitate comparison with International Finance Corporation (IFC) and SANS 10103 guidelines, results are presented as follows:

- Cumulative day and night-time noise levels as a result of the Project (cumulative refers to noise levels as a result of the project superimposed on baseline noise levels) (Figure 9-11).

- The increase in day- and night-time noise levels over the baseline as a result of the Project (Figure 9-12).

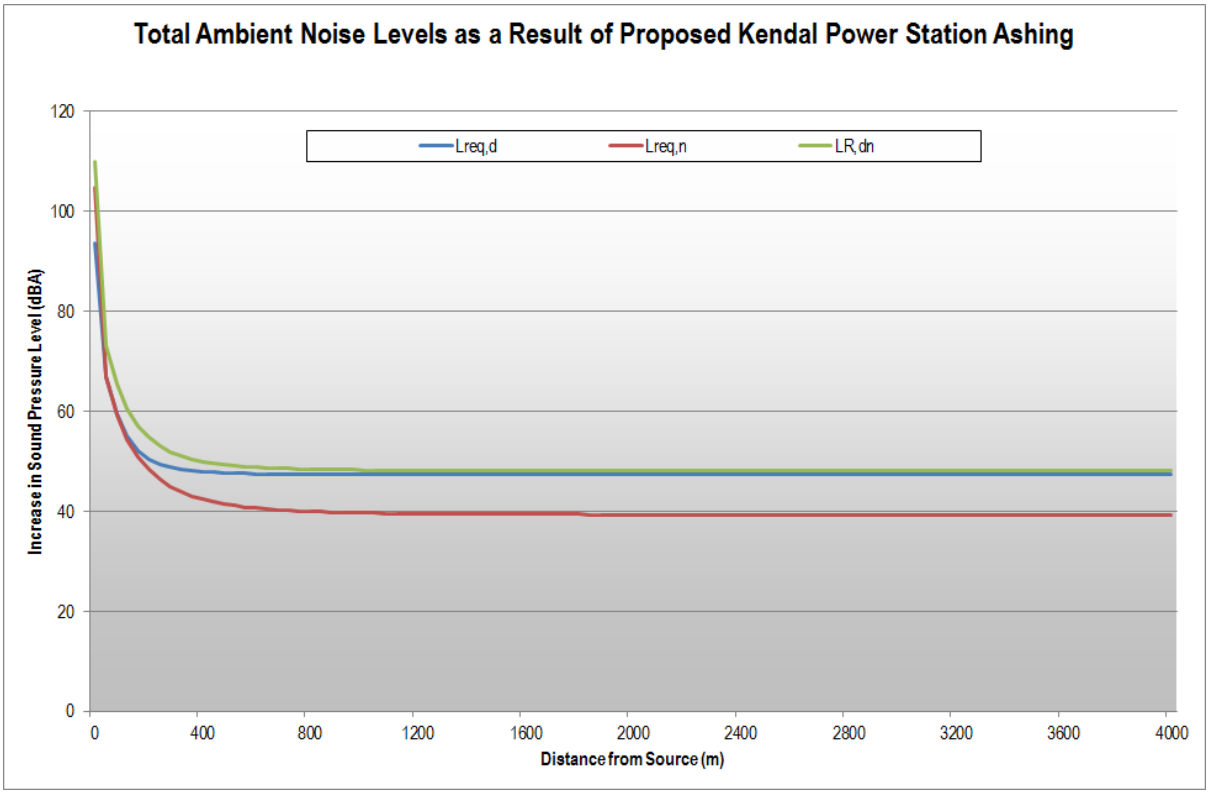

Figure 9-11: Estimated cumulative day-and night-time noise levels (due to proposed Project operations and baseline noise levels)

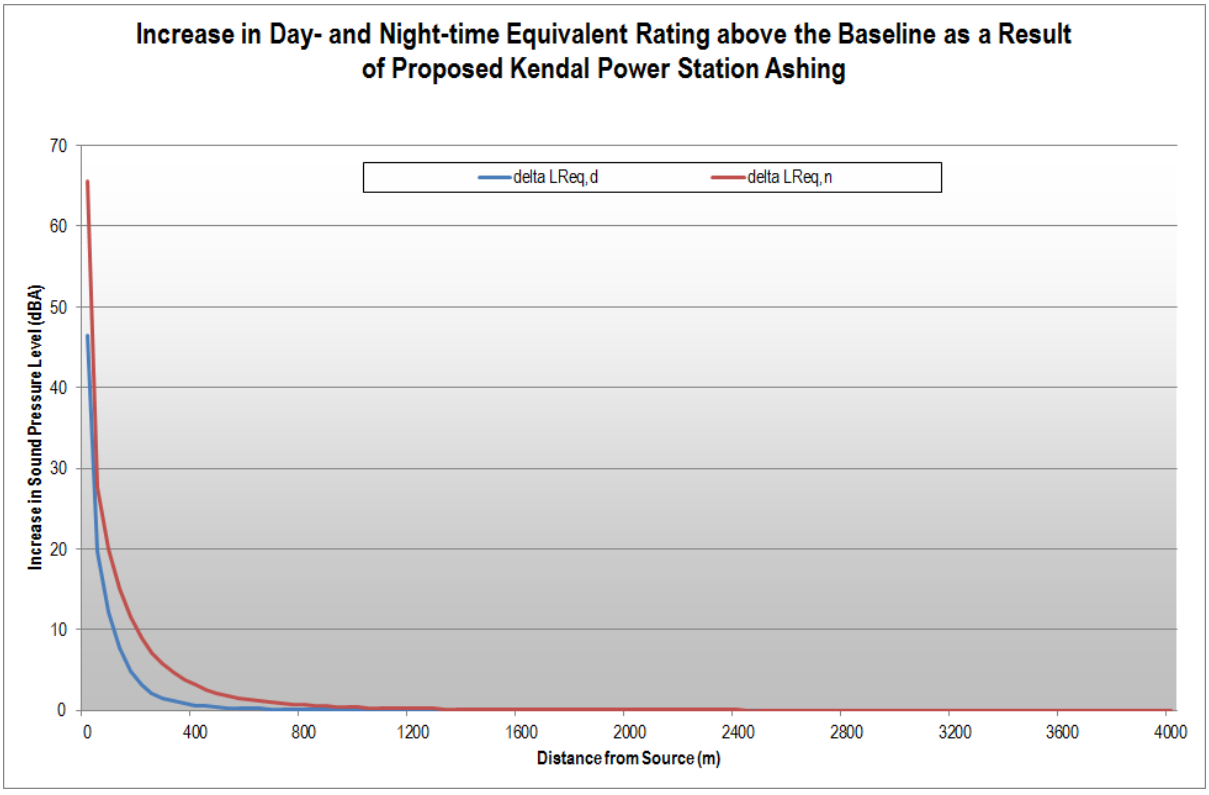

Figure 9-12: Estimated increase in day-and night-time equivalent ratings above the baseline

Simulations indicate exceedances of the IFC day-time guideline of 55dBA up to a distance of 120m and night-time guideline of 45dBA up to a distance of 280m. An increase of 3dBA due to the proposed Project operations is up to 200m during day-time conditions and 400m during night-time conditions.

The noise impact will be dependent on the specific location of the operations. Figure 9-11 and Figure 9-12, however, provide a distance from the ADF boundary in order to understand sensitive receptors that may be affected at any one time as operations progress.

According to SANS 10103 (2008) ólittleôreaction with ósporadic complaintsôcan be expected from noise sensitive receptors during the day.

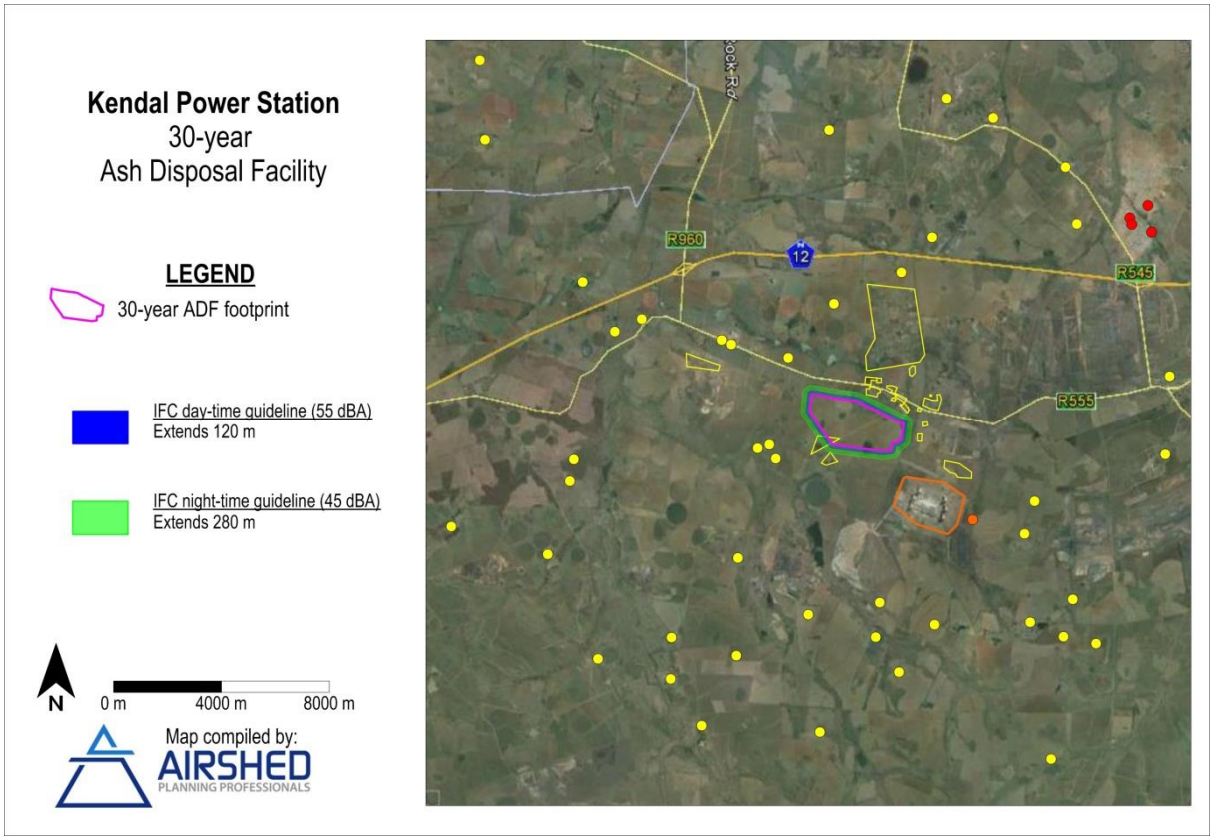

Figure 9-13: Generalised noise impact with reference to IFC guidelines, irrespective of location of operational area

Extended Life –Footprint to Accommodate Ash Disposal until 2058

During the assessment process a contingency period for the decommissioning of the power generating units at the KPS was added to extend the life of the power station to 2058. This contingency period (5 years) would require an additional 45 ha for ash disposal.

The extended potential noise levels due to this increase footprint are slight and are provided in Figure 9-13 and Figure 9-14.

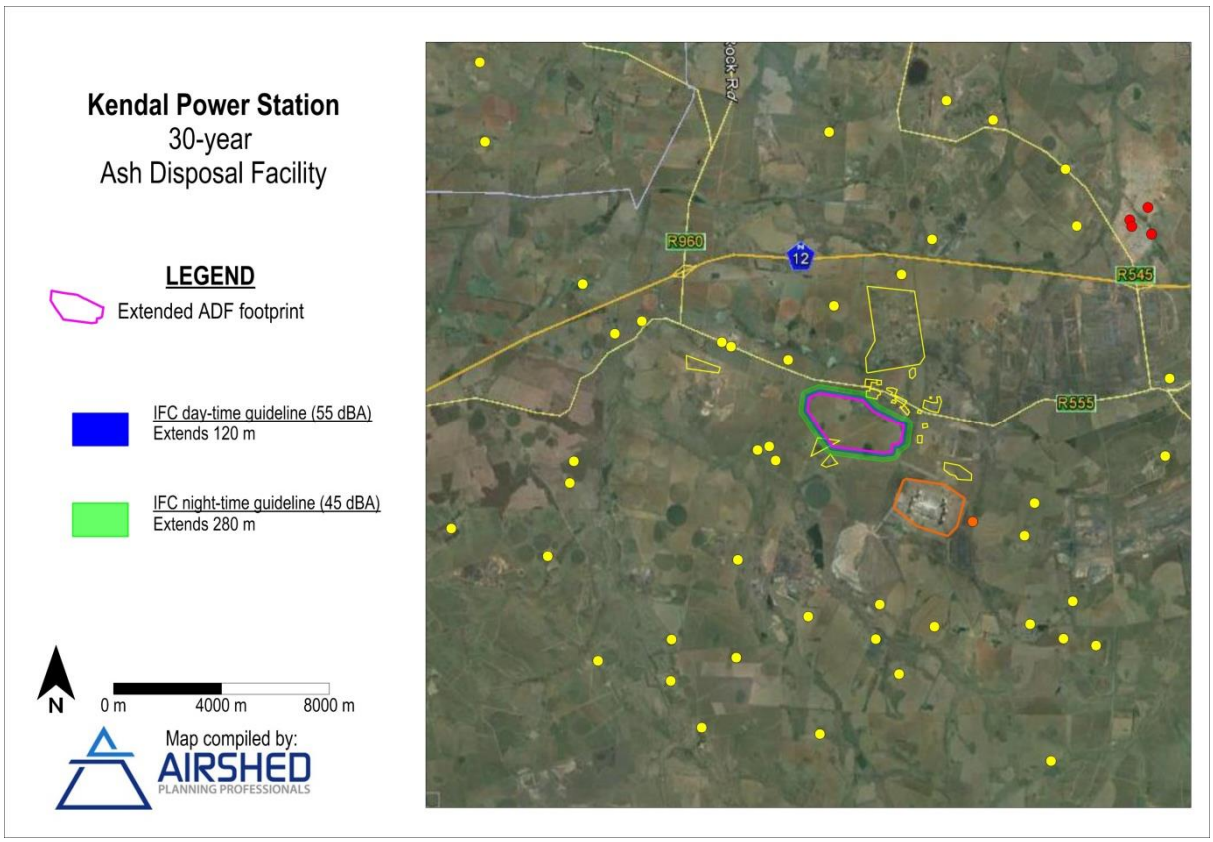

Figure 9-14: Generalised noise impact with reference to IFC guidelines, irrespective of location of operational area

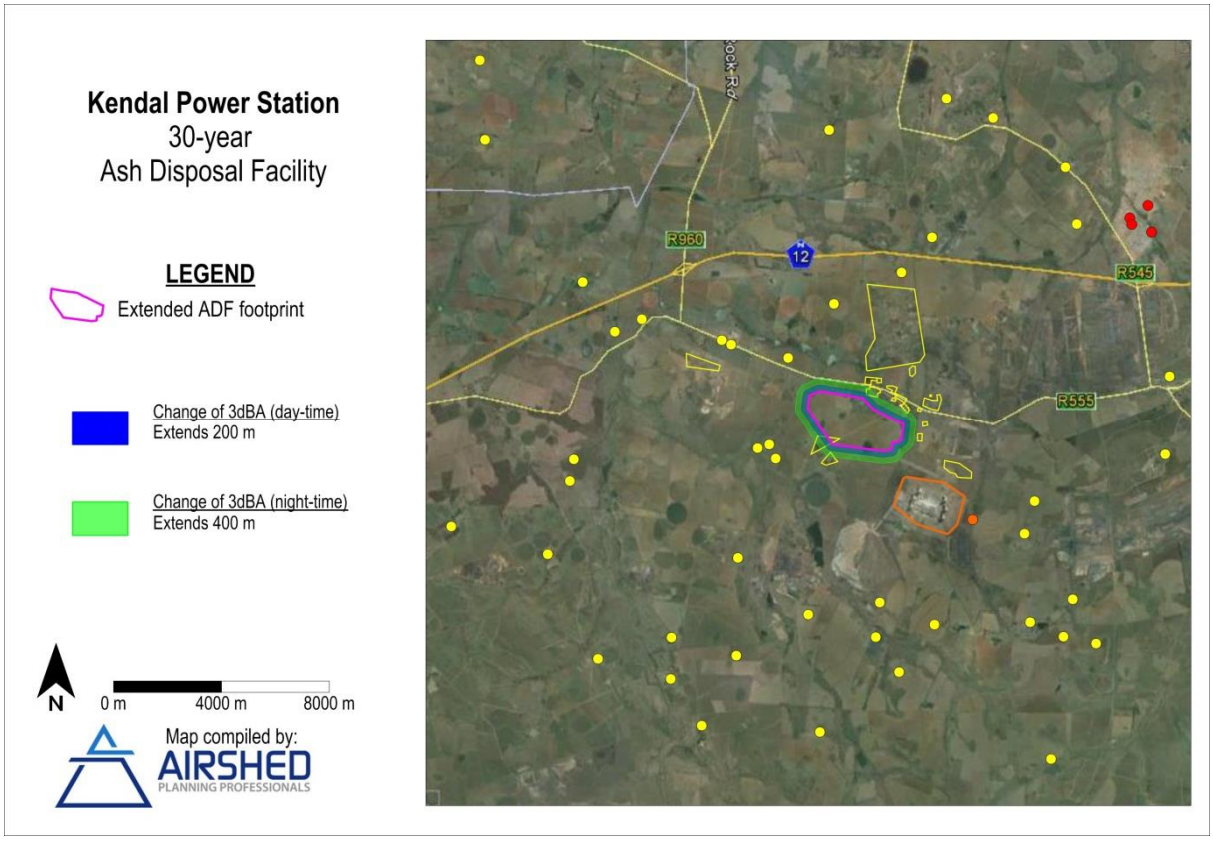

Figure 9-15: Generalised noise impact with reference to an increase in 3dBA, irrespective of location of operational area

Table 9-17: Noise Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Noise - Construction							
Disposal of Ash	Exceedance of IFC guidelines at closest noise sensitive receptors	Existing	2	2	2	4	1.6 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW
Disposal of Ash	Change in noise levels of 3dBA at closest noise sensitive receptors	Existing	2	2	2	4	1.6 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW
Noise - Operation							
Disposal of Ash	Exceedance of IFC guidelines at closest noise sensitive receptors	Existing	2	3	2	4	1.9 - LOW
		Cumulative	2	3	2	4	1.9 - LOW
		Residual	2	3	2	3	1.4 - LOW
Disposal of Ash	Change in noise levels of 3dBA at closest noise sensitive receptors	Existing	2	3	2	4	1.9 - LOW
		Cumulative	2	3	2	4	1.9 - LOW
		Residual	2	3	2	3	1.4 - LOW
Noise - Closure							
Disposal of Ash	Exceedance of IFC guidelines at closest noise sensitive receptors	Existing	2	2	2	4	1.6 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW
Disposal of Ash	Change in noise levels of 3dBA at closest noise sensitive receptors	Existing	2	2	2	4	1.6 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW

9.3.7 Soil and Land Capability

The Soil and Land Capability Impact Assessment was undertaken by Earth Science Solutions. Refer to Appendix F7 for the full report.

Construction Phase

Issue: Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinization.

The construction phase will require:

- The stripping of all utilisable soil (Top 250mm to 700mm depending on activity);
- The preparation (levelling and compaction) of lay-down areas, foundations and pad footprint areas for stockpiling of utilisable soil removed from the footprint to the ADF, Pollution Control Dams (PCD) and Soil Stockpiles (SS),
- The stormwater management system (Dams, Water Reservoir etc.), and the foundations for the Site Offices and Site Workshops and all related support infrastructure;
- The clearing, stripping and stockpiling from the construction of all access and Conveyancing and Haulage Ways, Electrical Servitudes and Water Reticulation (pipelines and overhead power lines);
- The use of heavy machinery over unprotected soils;
- The creation of dust and loss of materials to wind and water erosion, and
- The possible contamination of the soils by dirty water, chemicals and hydrocarbons spills (dust and dirty water runoff).

The loss of the utilisation of the soil resource will negatively impact the land use practice of low to moderate intensity livestock grazing and commercial cultivation of cereal crops (major land use activities) being undertaken on the dryland soils at present. These activities are perceived to be of great economic benefit to the local economy and land owners and contribute to the ecosystem services.

The construction for the ADF and its support activities will, if un-managed and without mitigation have a definite, MODERATE to HIGH negative significance, that will affect the development site and its immediate surroundings for the medium to long term (life of the project and possibly beyond), and it is going to occur.

The proposed activities will, during construction result in:

- The loss of the soil materials, and as a result the use of the resource with the associated negative effects on the eco system services;

- Have the potential for contamination (hydrocarbon and reagent chemical spills, raw materials and spillage of coal, etc.), compaction of working/laydown areas and storage facility footprint and the potential for erosion (wind and water ï dust and suspended solids) over unprotected/disturbed areas;
- Have a moderate to high negative intensity potential ranking based on the confined (limited to footprint of impact) nature/design of the facility and associated infrastructure;
- An impact that will continue throughout the construction phase and into the operational phase;
- Will be permanent but reversible (can be broken down and rehabilitated) for all but the actual depositional facility, and
- Is confined to the site only - localised.

However, with management, the loss, degree of contamination, compaction and erosion of the resource can be mitigated and reduced to a level that is more acceptable.

The reduction in the risk rating of the impact can be achieved by:

- Limiting the area of impact to as small a footprint as possible, inclusive of the resource (soils) stockpiles and the length of servitudes, access and haulage ways and conveyencing systems wherever possible;
- Construction of the facility and associated infrastructure over the less sensitive soil groups (reduce impact over wetlands and soils sensitive to erosion and/or compaction);
- An awareness of the length of time that the resource (soil) will need to be stored and managed;
- The development and inclusion of soil management as part of the general housekeeping operations, and the independent auditing of the management;
- Concurrent rehabilitation of all affected sites that are not required for the operation;
- The rehabilitation of temporary structures and footprint areas used during the feasibility investigation (geotechnical pits, trenching etc.) and the construction phase;
- Effective soil stripping during the less windy months when the soils are less susceptible to erosion;
- Separation of the utilisable soils and wet base materials (inclusive of any ferricrete) from each other and from the soft overburden;
- Effective cladding of the berms and soil stockpiles/heaps with vegetation or large rock fragments, and the minimising of the height of storage facilities to 15m and soil berms to 1,5m wherever possible;
- Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction;
- Soil amelioration (cultivation) to enhance the oxygenation and growing capability (germination) of natural regeneration and/or seed within the stockpiled soils (maintain the soils viability during storage) and areas of concurrent rehabilitation.

It is noted within the industry, that failure to manage the impacts on this important resource (soil) will result in the total loss of the resource, with a resultant much higher significance rating.

The above management procedures will probably reduce the negative significance rating and resultant risk impact to a MODERATE LOW rating that will be confined to the development site and its immediate (500m) surroundings in the medium term. Based on the historical actions of the proponent these actions are very likely to occur.

Operational Phase

Issue: Loss of utilisable resource (Sterilization and erosion), compaction, de-nutrification and contamination or salinization.

The operation of the ADF development (deposition of ash, management of water and associated activities) will see the impact of the transportation of materials into and out of the waste site (ash and water in, water out), the potential for spillage and contamination of the in-situ and stockpiled materials, contamination due to dirty water run-off and/or contaminated dust deposition/dispersion, the de-nutrification of the stockpiled soils due to excessive through flow and the leaching out of nutrients and metals due to rain water on unconsolidated and poorly protected soils, and, the potential for compaction of the in-situ materials by uncontrolled vehicle movement and the loss to the environment (down-wind and downstream) of soil by wind and water erosion over un-protected ground.

In summary, the operation will potentially result in:

- The sterilisation of the soil resource on which the facilities are constructed. This will be an on-going loss for the duration of the operation and beyond;
- The creation of dust and the possible loss (erosion) of utilisable soil down-wind and/or downstream, and the potential for contamination of the soils from dust fallout and overland flow of dirty water;
- The compaction of the in-situ and stored soils and the potential loss of utilisable materials from the system;
- The contamination of the soils by dirty water run-off and or spillage of hydrocarbons from vehicle and machinery or from dust and emissions from the process;
- Contamination of soils by use of dirty water for road wetting (dust suppression) and irrigation of the stockpile vegetation;
- Potential contamination of soils by chemical spills of reagents being transported to site;
- Sterilisation and loss of soil nutrient pool, organic carbon stores and fertility of stored soils;
- Impact on soil structure and soil water balance.

Un-managed soil stockpiles and soil that is left uncovered/unprotected will be lost to wind and water erosion, will lose the all-important, albeit moderately poor nutrient content and organic carbon stores (fertility), and will be prone to compaction.

A positive impact will be the rehabilitation of the temporary infrastructure used during the start-up and construction phase.

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

It is inevitable that some of the soils will be lost during the operational phase if they are not well managed and a mitigation plan is not made part of the general management schedule.

The impacts on the soils during the operational phase (stockpiled, peripheral soils and downstream (wind and water) materials) may be mitigated with well initiated management procedures.

These should include:

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

It will be necessary as part of the development plan to maintain the integrity of the stored soils so that they are available for rehabilitation at decommissioning and closure. If the soil quantities and qualities (utilisable soils) are managed well throughout the operational phase, rehabilitation costs will be reduced and natural attenuation will more easily and readily take effect. This will result in a more sustainable ñEnd Land Useò being achieved.

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

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

Decommissioning & Closure Phase

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

The impacts on the soil resource during the decommissioning and closure phase have both a positive and a negative effect, with:

- The loss of the soils original nutrient status and store and the reduction in the already low organic carbon by leaching of the soils while in storage;
- Erosion and de-oxygenation of materials while stockpiled;
- Compaction and dust contamination due to vehicle movement and wind impacts on the soil while rehabilitating the area;
- Erosion of soils during slope stabilisation and re-vegetation of disturbed areas;
- Contamination of replaced soils by use of dirty water for plant watering and dust suppression on roadways;
- Hydrocarbon or chemical spillage from contractor and supply vehicles;
- Positive impacts of reduction in areas of disturbance and return of soil utilisation potential, uncovering of areas of storage and rehabilitation of compacted materials.

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

This will result in an irreversible impact that is continuous.

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

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

The intensity potential of the initial activities during rehabilitation and closure will be moderate and negative due to the necessity for vehicle movement while removing the demolished infrastructure and rehabilitating the operational footprints. Dust will potentially be generated and soil will probably be contaminated, compacted and eroded to differing extents depending on the degree of management implemented.

The positive impacts of rehabilitation on the area are the reduction in the footprint of disturbance, the amelioration of the affected soils and oxygenation of the growing medium, the stabilizing of slopes and the revegetation of disturbed areas.

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

Chemical amelioration of the soils will have a low but positive impact on the nutrient status (only) of the soils in the medium term.

At closure (obtaining of certificate of closure from authorities) the residual impact should, if all rehabilitation and management efforts have been complied with, result in a positive impact, with the area being returned to a land capability of low intensity grazing or wilderness status, and the use of the land being returned to that of livestock management.

Table 9-18: Land Capability Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Land Capability - Construction							
Exploration and Geotechnical,	Loss of soil resource	Existing	1	2	2	5	1.7 - LOW
		Cumulative	1	2	1	5	1.3 - LOW
		Residual	1	1	1	4	0.8 - VERY LOW
Environmental Studies and Design		Existing	1	2	2	5	1.7 - LOW
		Cumulative	1	2	1	5	1.3 - LOW
		Residual	1	1	1	4	0.8 - VERY LOW
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	Existing	3	3	4	5	3.3 - HIGH
		Cumulative	3	3	4	5	3.3 - HIGH
		Residual	2	3	3	4	2.1 - MOD
	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.)	Existing	2	3	3	4	2.1 - MOD
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	2	3	2	4	1.9 - LOW
	Loss of soil resource and utilisation potential due to contamination by reagents and hydrocarbons spills and/or dirty water	Existing	2	3	3	4	2.1 - MOD
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	2	3	2	4	1.9 - LOW
	Loss of resource and its utilisation potential due to compaction over unprotected ground/soil.	Existing	2	3	3	4	2.1 - MOD
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	2	3	2	4	1.9 - LOW
	Loss of soil and land capability due to reduction in nutrient status - de-nutrification and leaching due to	Existing	2	3	3	5	2.7 - MOD
		Cumulative	2	3	3	5	2.7 - MOD

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
	stripping and stockpiling of resource	Residual	2	3	2	4	1.9 - LOW
Land Capability - Operation							
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	Existing	3	3	4	5	3.3 - HIGH
		Cumulative	2	3	4	4	2.4 - MOD
		Residual	2	3	2	4	1.9 - LOW
	Loss of resource due to unprotected overland flow of water (suspended solids) and erosion of soil due to wind - potential off site dust issues	Existing	3	4	3	5	3.3 - HIGH
		Cumulative	2	3	4	4	2.4 - MOD
		Residual	2	3	2	4	1.9 - LOW
	Continued loss of soil utilisation due to contamination from spillage of waste, reagents and hydrocarbons from vehicles and mechanised infrastructure and from storage facilities (soil stockpiles).	Existing	3	3	3	5	3 - MOD
		Cumulative	2	3	2	4	1.9 - LOW
		Residual	2	3	2	4	1.9 - LOW
	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.	Existing	3	3	3	5	3 - MOD
		Cumulative	2	3	2	4	1.9 - LOW
		Residual	2	3	2	4	1.9 - LOW
Land Capability - Closure							
Rehabilitation and Closure of the ADF and Associated Infrastructure	Loss of soil nutrient store and organic carbon stores while in storage and while being replaced onto rehabilitated areas - leaching of unprotected materials	Existing	2	4	3	5	3 - MOD
		Cumulative	2	4	3	5	3 - MOD
		Residual	2	3	2	3	1.4 - LOW
	Contamination of in-situ and stored materials by dirty water outwash and use of dirty water for irrigation of rehabilitated sites	Existing	3	3	3	5	3 - MOD
		Cumulative	3	3	3	5	3 - MOD
		Residual	3	3	2	4	2.1 - MOD
	Hydrocarbon spills from rehabilitation	Existing	3	3	3	5	3 - MOD

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
	equipment plus potential for compaction of replaced materials, erosion from water and dust and impacts on off-site streams and rivers (sedimentary load)	Cumulative	3	3	3	5	3 - MOD
		Residual	3	2	2	4	1.9 - LOW
	Addition of fertiliser and composite with potential for contamination to vadose zone and soil water	Existing	3	2	3	3	1.6 - LOW
		Cumulative	3	2	3	3	1.6 - LOW
		Residual	3	2	2	4	1.9 - LOW
	Uncontrolled access to rehabilitated sites by animal, people and vehicles - compaction and erosion due to loss of vegetative cover (over grazing etc.)	Existing	3	2	3	4	2.1 - MOD
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	3	2	2	4	1.9 - LOW

9.3.8 Social

The Social Impact Assessment was undertaken by Equispectives Research and Consulting Services. Refer to Appendix F8 for the full report.

Existing and cumulative impacts

Given that the KPS is an existing facility, with an existing ADF, it must be considered that most of the impacts are existing impacts. When considering existing impacts, the complexity of the social environment must be contemplated. Social impacts are not site-specific, but occur in communities surrounding the site. The high concentration of human and industrial activities taking place in a relatively small area surrounding the project site has caused a number of impacts. From a social perspective it is not possible to pinpoint which percentage of any given impact results from a specific activity. For example, agricultural, mining and power generation activities may cause an influx of people into an area due to the possibility of employment creation. It is not possible to say that 10% of people moving into the area looked for an agricultural job, 40% for a job at a power station and 60% at a mine. It is, however possible to say that all these industries contributed to the honeypot effect (project-induced in-migration where people move to the project site in search of work or economic opportunities that arise from the project) that is experienced in the area. The existing social impacts in the area are therefore not caused by the KPS and its activities in isolation, but the facility does contribute to these impacts, and will continue to do so through the life of the Kendal 30 year ADF. The existing impacts that are associated with the proposed project will be discussed in the paragraphs below.

Health impacts (Construction and Operation)

- Description of impact

Community members and people living and working in the surrounding areas all mentioned health impacts associated with air quality. Health issues mentioned include chronic respiratory diseases such as asthma, bronchitis, emphysema and other health issues such as sinusitis. It is also a matter of concern that people harvest rainwater that may be contaminated, and grow crops for human consumption in soil that may be contaminated, especially in the vulnerable communities within a 1km radius of the proposed site. The major concern is the potential health impacts that may occur over time due to chronic exposure. These communities rely on borehole water and some of them live in informal houses that do not provide adequate protection against environmental exposure to pollutants. There are a number of polluting sources in the area, and this impact will continue through construction into operation.

- Mitigation measures

Eskom should initiate a local environmental forum with representatives of the mining and agricultural industries within a 10km radius of the proposed project. Each party is responsible for water and dust monitoring associated with its activities, and by combining results a better picture of the cumulative effects can be obtained, which will assist with managing these impacts. Recommendations of the water and air quality studies should be implemented stringently. Physical dust barriers must be erected between the proposed Kendal 30 year ADF and communities that

are located in the prevailing wind direction. It is recommended that a human health study (similar to that required for gold mines) should be commissioned in the area to determine the current health baseline in terms of pollution plumes and potential impacts on human health. This study should be repeated every second year. Through the environmental forum, all industries in the area should contribute to the cost of such a study. The local, district and provincial municipalities, DEA and DWS should be involved in the forum. If the health impacts are deemed significant, the municipalities should start a process of providing alternative accommodation in established municipal areas in close proximity. The contact details of Eskomøs community liaison person and the grievance management procedure must be shared with the communities to ensure a direct communication channel between the communities and Eskom, which will assist with dealing with issues faster.

Quality of crops decrease (Construction and Operation)

- Description of impact

There is a concern that the ash dust settling on the crops and the soil around the crops may decrease the quality of the crops, which in turn will have a negative economic impact on the farmers. Less produce from the area will also have an impact on food security in the long term.

- Mitigation measures

Dust suppression measures as recommended in the air quality study must be applied. It is recommended that the agricultural role players meet with the soil and air quality specialists for a feedback session, and a focus group with all these parties and Eskom is conducted to agree on the most suitable mitigation, monitoring and management measures. As part of the proposed environmental forum, the monitoring results must be shared with all the parties involved to ensure any problems are picked up and dealt with early on.

Nuisance dust lead to a decrease in quality of life experience (Construction and Operation)

- Description of impact

Dust is an existing problem in the area, and agriculture and mining activities contribute to the problem, together with the existing ADF of the KPS. Local residents experience dust as a nuisance ï it stains the buildings, settle in their houses and prevents them from hanging their washing outside.

- Mitigation measures

The mitigation suggested in the air quality study must be implemented. Physical dust barriers must be erected between the proposed Kendal 30 year ADF and communities that are located in the prevailing wind direction. Monitoring and management of dust must be discussed in the proposed environmental forum.

Lack of infrastructure (Construction and Operation)

- Description of impact

Due to the high concentration of mining, agriculture and industrial activities in the area, people have migrated into the area in search for opportunities. Some of these migrants came from other provinces and from neighbouring countries, and some are illegal immigrants. Several people do not have identity documents, which make service delivery a challenge. While there are people who benefitted from the development in the area, many only managed to obtain short term jobs, and do not have the resources or will to go back the their areas of origin, due to limited opportunities in these areas. The social and physical infrastructure in the area is insufficient. There are limited access to electricity, water and sanitation. There are no schools, clinics or churches and the municipality does not deliver the services due to residents in the area. The human settlements in the area are not sustainable and residents are caught in a downward spiral of poverty. The area reflects environmental injustice and the greater societal problems experienced in South Africa. Although the industries in the area undeniably contribute to the economic development of the country at large, the social development opportunities of the residents in the area is severely lacking, and residents are paying the ultimate price.

- Mitigation measures

It must be understood that there is not only one party responsible for the current situation, but that all parties do contribute to it, even if it just by being present in the area. It would therefore not be fair or possible to expect of a single proponent to resolve it, but as responsible corporate citizens, all parties should contribute to seeking a solution and better outcomes, especially because most industrial role players have staff that reside in the local communities. Local government must be consulted when Corporate Social Investment measures proposed for the area is considered, and it is recommended that the different role players join forces to create a bigger impact as opposed to several small interventions. Eskom should also capitalise on its significant presence in the area, by putting pressure on the local government to use the rates and taxes that it generates in the interest of affected communities.

<u>Water quality (Operation)</u>

- Description of impact

The local communities and agriculture group depends on surface and ground water for their livelihoods. Any negative impact on water quality will have a negative impact on the livelihoods of these parties.

- Mitigation measures

It is acknowledged that there are processes in place to manage potential water pollution and monitor water quality. These processes should be applied rigorously. Emergency measures in place for pollution incidences must include assessing the risks to communities and the farming industry, supplying them with clean water if the source of pollution comes from the proposed Kendal 30 year ADF and remediating the water sources of these parties as soon as possible.

<u>Employment (Construction, Operation and Closure)</u>

- Description of impact

The proposed Kendal 30 year ADF will be constructed and operated by current Eskom employees. It is not anticipated that significant employment creation will take place. Although no new opportunities will be created, the proposed facility will ensure job security for the current employees, and contribute to their skills development. These opportunities will be lost when the KPS close.

- Mitigation measures

Job security and skills development is a positive impact. To enhance this impact, Eskom should ensure that employees develop transferable skills. If any vacancies are available, local people should be given preference. On closure, skilled people should be transferred to similar facilities in the area, and fair and transparent retrenchment procedures should be followed.

Electricity generation (Operation and Closure)

- Description of impact

South Africa currently experiences an energy crisis, and the generation of electricity is a high priority in order to ensure social and economic development. Despite the issues associated with coal generated electricity, the continued operation of the KPS is in the interest of the South African community at large, as it provides a current solution. The continued operation of the power station in this point in time will have a positive impact on the country. It is assumed that the power station will only close down once there is no further need for the electricity it generates.

- Mitigation measures

The continued operation of the KPS is a positive impact. To enhance this impact it should be ensured that this does not happen at the cost of the communities, and Eskom should adhere to the mitigation measures proposed by the specialists.

The following sections describe and discusses impacts specific to the Kendal 30 year ADF. These impacts would not occur without the project.

Impacts on food security (Pre-construction and construction)

- Description of impact

The area earmarked for the proposed Kendal 30 year ADF is currently used for agriculture, specifically the production of food. The agricultural industry in the area has lost significant land to mining and industrial activities. Farmers are concerned about the impact of the loss of high potential agricultural land on food security in the future. They acknowledge that the ADF will be rehabilitated, but feel that once the land has been disturbed it will never yield the same quality of crops. The other side of the coin is the current environmental degradation in the area that can be attributed to the mining, industrial and agricultural activities.

- Mitigation measures

It is difficult for the proponent to mitigate this impact, as other development in the area is not within its control. It is recommended that Eskom work closely with the agricultural role players, and if Eskom have land available that can be used for food production, it should be rented out to farmers for this purpose. Rehabilitation of the ADF should also focus on achieving a high quality of soil to ensure the future land use of the area could be used for economic purposes.

Loss of income (Construction and operation)

- Description of impact

Some farmers will be displaced from land that they've been using for commercial agricultural purposes. Although the land will be bought from them in a commercial transaction, it still means that the area on which they practice their agricultural activities will decrease, and they will no longer be able to use it to generate an income. It is also not a case of willing buyer/willing seller, as they would probably not sell the land if it were not for the project. Good agricultural land is a scarce commodity in the area. Although there may be land available further afield, it is not commercially viable for farmers to travel long distances between their agricultural activities. Some agricultural implements are also a high risk or not allowed to travel on public roads. Smaller areas to farm in may force farmers to retrench some of their workers. It must be acknowledged that farming activities in the area has been impacted on significantly by the presence of Kusile power station and the mines that are developed to feed it. The cumulative impacts and numerous EIA processes to which the farmers were subjected caused significant stakeholder fatigue amongst the farming community, especially because they are of the opinion that they are paying the price for all the development by having to endure dust, crime, arson and water quality issues amongst others, all brought about by development. They are almost always forced to give up their land in the interest of industry, while they were in the area first.

- Mitigation measures

Farmers indicated that they would prefer land-for-land swops if it is at all possible. If not, they should be paid the replacement cost of their lost assets. Replacement cost is an economics and insurance concept that refers to the full cost of replacing an asset. The valuation for compensation purposes of assets destroyed by a project can be controversial. Insurance assessors often use the depreciated value of an asset. In project-induced displacement, such as is the case with the proposed Kendal 30 year ADF, full replacement cost should be provided to ensure that people are not made worse off. Given that there is significant time left before the construction of the proposed Kendal 30 ADF will commence, Eskom should rent the properties to the farmers at a reasonable market rate to ensure that they can continue with their current economic activities and have enough time to look for alternatives. The name of the community liaison officer and grievance mechanism must be given to the farmers as it would be beneficial to both Eskom and the farming community to have solid long term relationships instead of having to resort to crisis management should anything happen.

Potential economic impact on road users (Construction and Operation)

- Description of impact

The D1390 road must be realigned as it currently runs across the proposed site. The farming community mainly use this road to access the AFGRI silos. Some of the mining groups also use the road to access their properties. There were concerns that the re-routing of the road would increase travel distances significantly. The traffic study found that the road would be less than 2km longer, and therefore this is not a significant impact. The period of road construction can potentially create some nuisance impacts, but it can be mitigated and managed.

- Mitigation Measures

The new alignment of the D1390 must be completed before the old road is closed. The requirements of the Mpumalanga Provincial Department of Public Works, Roads and Transport must be adhered to. Given the presence of communities in the area, stringent health and safety requirements must be implemented during construction.

Resettlement of the Triangle Community (Pre-construction)

- Description of impact

The Triangle community live on Site H, and in order to construct the Kendal 30 year ADF they must be resettled. Resettlement is the planned process of relocating people and communities from one location to another as part of the project-induced land acquisition necessary to allow a project to proceed. Resettlement is regarded as involuntary when the location of the project is fixed and local communities have, in effect, no choice but to be resettled, as in the case of the Triangle community. The Triangle community consist of 12 families (approximately 68 people) that occupy 14 units on a piece of land that is owned by Eskom. According to the residents, some of them have been living there for 60 years and have living rights on the property. At this stage they are not allowed to add any rooms or extensions to their houses.

Resettlement causes significant social impacts. Being displaced and/or resettled can be a very traumatic experience for people, disrupting their sense of place, their livelihoods, their social networks and community connectedness. Resettlement is a major cause of human rights risks for companies. However, where projects are genuinely committed to a shared value proposition, the emotional distress from physical and economic displacement can be minimised and many livelihood benefits can be created when resettlement processes are effectively implemented. The Triangle community is seen as a vulnerable community, and in order to minimise the fear and anxiety associated with the proposed resettlement, Eskom should include them in the process from the start.

- Mitigation measures

The costs and time taken to do resettlement are typically underestimated, leading to project delays and cost over-runs, therefore the resettlement process must commence as soon as possible. Because resettlement is a major task in itself, and such an impact, resettlement can be regarded as a project within a project. Just like the project itself, the act of resettlement is a planned intervention that creates social impacts and therefore is a process that needs to be managed carefully and planned and conducted in a participatory way. Resettlement should be regarded both as an impoverishment risk, and an opportunity for development especially when all feasible

opportunities for livelihoods enhancement and local content are fully explored. Resettlement is the planned process of relocating people and communities from one location to another as part of the project-induced land acquisition necessary to allow a project to proceed. The resettlement process must be done independent of the EIA process, and commence as soon as possible. It is important that it is a participatory process with significant input from the affected communities. The resettlement process is intended to fully re-establish people in well-functioning communities and with appropriate sustainable livelihoods. The social impacts on host communities (the communities which will host the people being resettled) also need to be considered, and there must be risk management and benefits to host communities as well as to the relocated peoples. It is recommended that the Triangle community must be relocated to an established urban area with access to services, and be given title deeds of the houses to ensure security of tenure. Eskom must appoint a resettlement specialist to develop a Resettlement Policy Framework (RPF) that outlines the projectôs policy and general procedures about how land acquisition, resettlement, compensation and livelihood restoration and enhancement will be undertaken.

Once the RPF is finalised and communicated to the affected community, Eskomôs resettlement specialist must develop a Resettlement Action Plan (RAP) that fully details the operational process of enacting the resettlement. To avoid speculative or opportunistic behaviour by local people and to manage in-migration, an inventory of houses, other buildings and all assets should be undertaken as soon as practical. There should be a firm Cut-off Date after which no additional structures or other assets become eligible for compensation. Good communication with affected communities and a fair resettlement and compensation process will assist with obtaining approval of the cut-off deadline from the community. Because resettlement is a project within a project, there needs to be a high level of coordination between resettlement activities and the rest of the project.

The resettlement process should not be considered to be complete until all negative impacts of resettlement have been addressed. A Completion Audit should be undertaken by an independent external party to assess whether all impacts have been addressed, how the standard of living of resettled individuals compares to their previous situation, whether they have remaining grievances, whether international standards and national legislation has been observed, and whether all provisions within the RAP have been met. The Completion Audit should only be undertaken once all mitigation measures have been substantially completed and once displaced persons have been provided adequate opportunity and assistance to sustainably restore their livelihoods. This will necessarily be several years after being resettled, and not straight after the relocation. For resettlement to be sustainable, Eskom must be able to exit in a responsible manner at some point in time. It is very important, therefore, to plan for exit during the development of the RAP. The Exit Plan should be agreed with the community and approved by the regulatory authority. In addition, the capacity (in human and financial terms) of local governments to take over the management of resettlement towns is critical to the long-term improvement of livelihoods. Building this capacity within government should therefore be part of exit planning.

Table 9-19: Social Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Social Impact - Construction							
Generation of dust due to construction activities	Health Impacts	Existing	3	2	4	5	3 - MOD
		Cumulative	3	2	4	4	2.4 - MOD
		Residual	3	2	4	4	2.4 - MOD
	Quality of crops decrease	Existing	3	2	4	4	2.4 - MOD
		Cumulative	3	2	4	4	2.4 - MOD
		Residual	3	2	3	3	1.6 - LOW
	Dust nuisance lead to frustration and lowers perceived quality of life	Existing	3	2	3	5	2.7 - MOD
		Cumulative	3	2	3	5	2.7 - MOD
		Residual	3	2	3	4	2.1 - MOD
Influx of people looking for economic opportunity	Lack of infrastructure	Existing	4	2	4	5	3.3 - HIGH
		Cumulative	4	2	4	5	3.3 - HIGH
		Residual	4	2	3	4	2.4 - MOD
Construction of ADF	Create employment opportunities	Existing	2	2	4	4	2.1 - MOD
		Cumulative	2	2	4	4	2.1 - MOD
		Residual	2	2	5	5	3 - MOD
Change of land use from agriculture to industrial	Food security	Existing	5	2	3	3	2 - LOW
		Cumulative	5	2	3	3	2 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
		Residual	5	2	2	3	1.8 - LOW
	Loss of income	Existing	3	2	3	4	2.1 - MOD
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	3	2	2	3	1.4 - LOW
Alignment of Road D1390	Potential economic impact on road users	Existing	4	5	2	2	1.5 - LOW
		Cumulative	4	5	2	2	1.5 - LOW
		Residual	4	5	1	1	0.7 - VERY LOW
Demolish houses of the Triangle Community to prepare project area	Resettlement of the Triangle community	Existing	3	5	5	5	4.3 - VERY HIGH
		Cumulative	3	5	5	5	4.3 - VERY HIGH
		Residual	3	5	4	5	4 - HIGH
Social Impact - Operation							
Operation of Kendal 30 year ADF	Health impacts, especially chronic health issues for community members in a 1km radius and employees	Existing	3	5	4	4	3.2 - HIGH
		Cumulative	3	5	5	4	3.5 - HIGH
		Residual	3	4	4	3	2.2 - MOD
	Quality of crops decrease	Existing	3	3	4	4	2.7 - MOD
		Cumulative	3	3	4	4	2.7 - MOD
		Residual	3	3	4	3	2 - LOW
	Potential impact on water resources	Existing	3	4	4	2	1.5 - LOW
		Cumulative	3	4	4	2	1.5 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
		Residual	3	4	3	2	1.3 - LOW
	Maintain employment opportunities	Existing	2	3	4	5	3 - MOD
		Cumulative	2	3	4	5	3 - MOD
		Residual	2	3	5	5	3.3 - HIGH
	Increase in capacity to create electricity and ensuring security of supply **POSITIVE IMPACT**	Existing	5	3	5	4	3.5 - HIGH
		Cumulative	5	3	5	4	3.5 - HIGH
		Residual	5	3	5	5	4.3 - VERY HIGH
Social Impact - Closure							
Closure of KPS	Loss of employment opportunities	Existing	2	5	3	5	3.3 - HIGH
		Cumulative	2	5	3	5	3.3 - HIGH
		Residual	2	5	4	5	3.7 - HIGH
	Decrease in capacity to generate electricity	Existing	5	5	5	1	1 - VERY LOW
		Cumulative	5	5	5	1	1 - VERY LOW
		Residual	5	5	5	1	1 - VERY LOW
Change in land use due to rehabilitation	Creation of new economic activities	Existing	3	4	4	3	2.2 - MOD
		Cumulative	3	4	4	3	2.2 - MOD
		Residual	3	4	4	4	2.9 - MOD

9.3.9 Surface Water

The Surface Water Impact Assessment was undertaken by Golder Associates. Refer to Appendix F9 for the full report.

Construction Phase

Status quo

Site H straddles quaternary catchments B20F and B20E. There are a few non-perennial surface water resources adjacent to Site H with a pan located within the site. The site is located west of the power station and drainage would be towards the unnamed tributary flowing to the Wilge River in B20F and an unnamed tributary that joins the Leeufonteinspruit south of the site in B20E. The footprint of the Site H is currently utilised extensively for agriculture.

Project impact (Unmitigated)

A number of impacts are expected to materialise as a consequence of the construction activities required for the establishment of the 30 year ADF and the associated infrastructure such as conveyors, access roads and storm water management facilities:

- Altered flows;
- Disturbance to adjacent streams;
- Increased erosion;
- Increased sediment transport into water resources; and
- Water quality deterioration in adjacent water resources because of sediments and spills from mechanical equipment.

Water resources falling within the footprint of the ADF and associated infrastructure will be lost, however except for the pan there are very limited surface water resources on the site. Earth works relating to the construction of these facilities will permanently destroy the water resources within the construction footprint. Loss of flow at the outlet of catchment B20F and B20E due to construction within the footprint of Site H is therefore expected to be very low.

Construction activities are likely to increase the disturbance footprint beyond the boundaries of the actual development footprint through temporary stockpiles, laydown areas, construction camps and uncontrolled driving of machinery leading to increased flow velocities off the site, increasing the risk of erosion with sediments potentially transported down the water resources and finally deposited in the Wilge River.

During the construction phase it is likely that spills and leaks of hazardous substances such as cement, oil and diesel, sewage spills from temporary ablutions may occur. Run-off from the site would therefore lead to water quality deterioration in downstream streams.

The combined weighted project impact to water resources (prior to mitigation) will be of a negative LOW to MODERATE significance, affecting the study site to local area. The impact will act in the short/ medium term to permanent where loss of streams occurs, and is very likely to occur. The impact risk class is thus Low to Moderate (Table 9-20).

Cumulative Impact

The agricultural activities on site have had limited impact on the water resources quality although some impacts very likely due to existing industries, mines and upstream urban development are noted. Farm dam construction in the area, albeit not necessarily on Site H, has resulted in some flow alteration in the area. In addition, three tenants currently pumps farm dam water to the pan.

The baseline impacts are considered to be low and additional project impact (if no mitigation measures are implemented) will only marginally increase the significance of the existing baseline impacts, the cumulative unmitigated impact will likely be of a LOW/ MODERATE negative significance, affecting the study/ local area in extent. The impact is very likely and will be short/ medium term to permanent where loss of streams occurs. The impact risk class is thus Low to Moderate.

Mitigation Measures

Mitigation during construction would be to:

- Optimise design of the ADF to minimise the size of the footprint;
- Minimise area of vegetation clearing;
- Where practically possible, undertake the clearing of vegetation during the dry season to minimise erosion;
- Comply with GN704 in relation to storm water measures so that sediment transport off site is minimised and clean water is diverted around the cleared area;
- The storm water management plan should be in place prior to construction being initiated;
- Install sediment traps as part of the storm water management plan where necessary and especially upstream of discharge points where erosion protection measures and energy dissipaters should be in place;
- Design infrastructure adequately to prevent spillages;
- Clean spills as quickly as possible;
- Store and handle potentially polluting substances and waste in designated bunded facilities;
- Waste should be regularly removed from the construction site by suitably equipped and qualified operators and disposed of in approved facilities;
- Locate temporary waste and hazardous substance storage facilities out of the 1:00 floodlines;
- Locate temporary sanitation facilities out of the 1: 100 year floodlines; and

- Implement a water quality monitoring programme.

Residual Impact

The residual impact of the construction of the ADF will include the permanent loss of water resources (flow), as well as a potential decline in water quality. Most of these impacts are expected to be mostly restricted to the local scale. However, the potential deterioration of water quality within the Wilge River will increase the extent of the impacts.

The residual impact to water resources beyond the construction phase of the project will be reduced through mitigation. After mitigation the impacts to the water resources will probably be of a VERY LOW to LOW negative significance, affecting the study site to local area in extent. The impact could happen and certain cases related to water quality is very likely. The duration will be short term except for the stream losses which will be permanent. The impact risk class is however Low.

Operational Phase

The impacts from the operational phase are likely to include:

- Water quality impacts (sedimentation and chemical contamination) from operation of the ADF;
- Water quality impacts from potential overflows from contaminated dams;
- Erosion and increased sediment transport into water resources as the ADF construction progresses;
- Loss of streams and altered flows as the ADF construction progresses;
- Water quality deterioration in adjacent water resources because of spills from mechanical equipment during ADF operation and as the ADF construction progresses;
- Erosion with increased sediment transport into water resources from cleared areas as the ADF construction progresses;
- Emptying of dam and disposal of contaminated sediment during rehabilitation of dirty storm water dams to clean water dams.

The combined weighted project impact to water resources (prior to mitigation) during the operational phase will be of a LOW to MODERATE negative significance, affecting the site and local area. The impact will act in the short term to permanent (where water resources such as streams and pans may be removed) and is likely to occur. The impact risk class is Low to Moderate.

Cumulative impacts

The construction phase, if inadequately mitigated will have had some impact on the water quality of the local water resources and ultimately the Wilge River.

Additional project impact (if no mitigation measures are implemented) will increase the significance of the existing baseline impacts. The cumulative unmitigated impact will probably be of a LOW to MODERATE negative significance, affecting the study/ local area in extent. The impact is very likely and will be short term to permanent (where water resources such as streams and pans may be removed). The impact risk class is Low to Moderate.

Mitigation Measures

Mitigation measures in the operational phase are the same as for the construction phase, with the following additional measures:

- Maintain sediment traps as part of the storm water management plan where necessary and especially upstream of discharge points where erosion protection measures and energy dissipaters should be in place; and
- Maintain infrastructure adequately to prevent spillages.

Residual Impact

The residual impact of the construction (as the ADF progresses over the period 2030 to 2058) and operation of the ADF will include the permanent loss of water resources however in the case of Site H these will be limited; as well as a potential decline in water quality. Most of these impacts are expected to be mostly restricted to the local area, however the potential deterioration of water quality within the Wilge River will increase the extent of the impacts.

The residual impact to water resources of the construction (as the ADF progresses over the period 2030 to 2058) and operation of the ADF of the project will be reduced through mitigation. After mitigation the impacts to the water resources will probably be of a LOW to MODERATE negative significance, affecting the site/ local area in extent. The impact is likely and will be short term to permanent where loss of water resources occur. The impact risk class will likely be reduced to Low

Closure Phase

A number of impacts are expected to materialise as a consequence of the closure phase and the associated infrastructure. Impacts relating to the rehabilitation of the ADF are also applicable to the operational phase of the project, as rehabilitation will take place concurrently. The decommissioning and removal of infrastructure during the closure phase is also likely to result in a number of impacts similar to the construction phase impacts as per Table 9-20.

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Table 9-20: Surface Water Impact Tables

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Surface Water - Construction							
Clearing of vegetation	Erosion	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	2	0.8 - VERY LOW
	Loss of Streams and altered flows	Existing	1	5	1	4	1.9 - LOW
		Cumulative	1	5	1	4	1.9 - LOW
		Residual	1	5	1	4	1.9 - LOW
	Increased sediment transport into water recourses	Existing	3	2	2	4	1.9 - LOW
		Cumulative	3	2	2	4	1.9 - LOW
		Residual	2	2	2	3	1.2 - LOW
	Water quality deterioration in adjacent water resources because of spill from mechanical equipment	Existing	3	3	3	4	2.4 - MOD
		Cumulative	3	3	3	4	2.4 - MOD
		Residual	2	2	2	4	1.6 - LOW
Construction of dams and associated storm water drains	Erosion with increased sediment transport into water resources	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	2	0.8 - VERY LOW
	Water quality deterioration in adjacent water resources because of spill from mechanical equipment	Existing	3	3	3	4	2.4 - MOD
		Cumulative	3	3	3	4	2.4 - MOD
		Residual	2	2	2	4	1.6 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Construction of site access road	Erosion with increased sediment transport into water resources	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	2	0.8 - VERY LOW
	Water quality deterioration in adjacent water resources because spills from mechanical equipment	Existing	3	3	3	4	2.4 - MOD
		Cumulative	3	3	3	4	2.4 - MOD
		Residual	2	2	2	4	1.6 - LOW
Surface Water - Operation							
Operation of ADF	Water quality impacts (sedimentation and chemical contamination)	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	2	4	4	2.4 - MOD
		Residual	3	2	3	3	1.6 - LOW
	Water quality impacts from overflows from contaminated dams	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	3	4	4	2.7 - MOD
		Residual	3	2	3	3	1.6 - LOW
Clearing of vegetation over the period 2030 - 2052	Erosion and increased sediment transport into water resources	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	3	1.2 - LOW
Operation of ADF	Loss of streams and altered flows (same scores as construction phase)						
Operation of ADF	Water quality deterioration in adjacent water resources because of spills from mechanical equipment	Existing	3	3	3	4	2.4 - MOD
		Cumulative	3	3	3	4	2.4 - MOD
		Residual	2	2	2	4	1.6 - LOW

Activity	Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Dam Construction	Erosion with increased sediment transport into water resources	Existing	2	2	3	4	1.9 - LOW
		Cumulative	2	2	3	4	1.9 - LOW
		Residual	2	2	2	3	1.2 - LOW
Dam Rehabilitation	Emptying of dam and disposal of contaminated sediment leading to water quality impacts	Existing	2	2	4	3	1.6 - LOW
		Cumulative	3	2	4	4	2.4 - MOD
		Residual	2	2	2	3	1.2 - LOW
Surface Water - Closure							
Infrastructure removal	Loss of streams and altered flows (same scores as construction phase)						
	Increased sediment transport into water resources	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW
	Erosion	Existing	2	2	3	4	1.9 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	2	2	2	3	1.2 - LOW
	Water quality deterioration	Existing	3	2	2	3	1.4 - LOW
		Cumulative	3	2	2	3	1.4 - LOW
		Residual	2	2	1	3	1 - VERY LOW

9.3.10 Traffic

The Traffic Impact Assessment was undertaken by Hatch Goba. Refer to Appendix F11 for the full report.

The additional traffic is expected to impact on the environment in two aspects or phases. There will be traffic generated due to construction of the liner or foundation of the ADF and the impact of this traffic is generally short term. The second aspect refers to the traffic generated post construction and this traffic is referred to as operational traffic.

Construction phase traffic

This traffic relates directly to the traffic expected during the construction of the liner or foundation of the ADF which is expected to take place over a period of 36 months (3 years). This traffic is expected to dissipate shortly after completion of construction of the liner or foundation.

A worst case scenario of 26 truck/hour trips has been calculated. This assumes that construction clay material has to be trucked in from an external source using public roads. If indeed this is the case, then the impact on pavement loading to the surrounding roads may, however, be more significant and therefore the developer has to contribute towards the maintenance and rehabilitation of the affected roads.

The only new trips expected to be generated by the development will be during the construction phase.

Post-construction traffic

A traffic count at the access of the existing facility was conducted on the 5th of February 2013 in order to determine the traffic accessing and exiting the facility during the AM and PM Peak hours. This traffic was used as a base in estimating the trips generated by the new proposed ADF post construction.

Eskom further provided information on daily traffic to and from the disposal facility and the traffic that is permanently based on site. The existing facility is operated by Roshcon SOC Ltd. Roshcon is responsible for the daily operation including site personnel. The site staff is transported to and from site by means of minibus taxis operated by Roshcon SOC Ltd. The summary of the Roshcon Ltd daily traffic provided by Eskom is as follows:

- ADTôs
- 1 tipper truck
- 4 Front-end loaders
- 2 Dozers
- 2 Mini buses

- 3 Bakkies (Pick-up truck)
- 1 TLB
- 1 Bob cat
- 1 Water Tanker.

Of this traffic only the 2 minibuses and 3 bakkies leave the site on a daily basis. The summary of the Eskom traffic from the Power Station to the ADF is as follows:

- 10 Bakkies
- 5 Tipper trucks
- 5 x 30-ton trucks.

Only the 10 bakkies and the 5 tipper trucks leave the site on a daily basis.

The 5x30-ton trucks are only used in emergency situations when the conveyor that transports the ash from the power plant to the ADF fails. This means that the road network between the ADF and the Power Station will carry an additional number of trucks for the duration of the conveyor failure.

The traffic count conducted shows that 7 vehicles accessed the site during the peak hour from the south along D686 Road in the morning and 5 vehicles in the afternoon. A total of 9 vehicles accessed from the north along D686 Road in the morning and zero in the afternoon.

When the construction of the first 5 year phase of the new disposal facility is complete, it is assumed that all operations will be moved from the existing disposal facility to the new disposal facility thereby dictating that the operations on the new ash dump will be of the same magnitude as the existing situation. The only difference being the location of the disposal facility access ï off the realigned D1390 on the southern side of the proposed site. In other words there will not be additional traffic generated for the operation of the continuous ADF. The only additional traffic that will be generated will be that during the construction phase.

The operation and maintenance traffic impact will be low, the scale will be limited to the study area, the duration is medium term, and the probability of the impact occurring is very unlikely. The risk of this impact is very low.

Realignment of Road D1390

The D1390, from its intersection with the D686, runs through the middle of Site H in a south easterly direction. It is necessary to re-route the gravel road either north or south of the Site. The route currently carries in the order of 110 vehicles in both directions during a 12-hour period. The shortest route to reconnect the D1390 to the D686 is via an alignment to the south of the site, at the existing Eskom access junction. The current route from the D686 to the tie-in point is 4km, the realigned route will be 4.5km. All properties that are currently served by this portion of the D1390

will become part of Site H. The only development whose access will be affected is the grain silos located to the north of Site H. It is therefore proposed to retain the northern portion of the D1390 and its intersection with the D686 as an access road to the silos only.

The realigned route will tie in to the existing D1390 via a T-junction at the current access road to the Schoongezicht Agricultural Holding (AH). This portion of land is owned by Eskom and leased to the farmer.. He is however more widely impacted as his property also falls within the footprint for Site H. The remainder of the alignment is mostly along agricultural land and could require additional land appropriation if the land is privately owned. Once again, these properties from part of the wider Site H footprint and will in any event become the property of Eskom.

The D1390 falls under the Nkangala District Municipality however it is a Provincial Road and therefore falls under the custodianship of the Mpumalanga Department of Public Works, Roads and Transport. The relevant officials from both levels of government were contacted and informed of the need to deviate the road around Site H and the proposed re-alignment submitted to them. The basic route alignment was agreed with in principle by the Mpumalanga Department of Public Works, Roads and Transport.

Recommended upgrades

The footprint of Site H will result in the realignment of a portion of Provincial Route D1390. The reconnection of the route to the D686 is proposed at the existing D686/KPS access road intersection. Based on a background growth in traffic of 2% pa, the access to the KPS will drop to a LOS F in the PM peak hour by 2030. It is therefore recommended that the junction which currently operates as an All Way Stop Controlled junction, be converted to a priority or Two Way Stop Controlled junction in 2025, when the D1390 leg of the junction (which includes access to the ADF) is constructed. Due to the relatively low volume of traffic on the D686, there will be sufficient gaps for the KPS/D1390 traffic to enter the main stream of traffic.

There are no upgrades required to accommodate the additional traffic that might be generated during the construction phase of the development, however due to the envisaged increase in volume of truck movement entering and exiting the development site in the case that clay material has to be hauled from a source outside the site, a temporal short right turn lane is recommended at the abovementioned access on the north approach along D686 Road to improve safety for both the turning vehicles and the through traffic on D686 Road.

9.3.11 Visual

The Visual Impact Assessment was undertaken by Newtown Landscape Architects. Refer to Appendix F12 for the full report.

Landscape Impact

The landscape impact (i.e. the change to the fabric and character of the landscape caused by the physical presence of a development) of the proposed project will be high as the physical impact of

the operation and closure of the mining activities will disturb a great percentage of the proposed project site. The main disturbance would be during the operational phase of the project.

However, as stated in the approach, the physical change to the landscape should be understood in visibility and aesthetic terms within the context of the study area. The following sections discuss the effect that the proposed project activities will have on the visual and aesthetic environment.

Severity of Visual Impact

The severity of visual impact is determined using visibility, visual intrusion, visual exposure and viewer sensitivity criteria. When the severity of impact is qualified with spatial, duration and probability criteria the significance of the impact can be predicted (refer to Appendix B).

Visual Intrusion

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the cultural aesthetic of the landscape as a whole? As discussed in Section 5.3, the study area is characterised by a moderately undulating topography with some small scattered wetlands and pans. Vegetation within the study area is mainly agricultural croplands with clusters of exotic shrubs and trees where the natural grassland has been disturbed. The residential component includes farmsteads, the Kendal Agricultural Holdings, the towns of Kendal, Ogies and Phola. The industrial component includes the KPS with associated power lines and substations, transport infrastructure such as the roads and railways as well as the mining structures and activities.

The Project entails existing new ADF with its associated infrastructure, the proposed project components are similar to those of the existing ADF. Thus the project would be in context with the surrounding land used and other land uses within the study area even though a large portion of the study area consists of agricultural activities.

During the site investigation it was evident that the existing ADF is already being rehabilitated. Should the continuous ADF not be mitigated the visual intrusion would be much worse as the contrast between the two projects would be clear and prominent. The visual intrusion of the Project after sunset would form an extension of the existing activities and thus add cumulatively to the existing scenario.

Table 9-21 rates and summarises visual intrusion of the project components when the worst case scenario (no mitigation) is taken into account.

Table 9-21: Visual Intrusion

High (if not rehabilitated successfully)	**Moderate** if rehabilitated successfully	**Low** • operational and closure phases; • after sunset	**Positive**
Because the proposed project:	Because the proposed project:	Because the proposed project:	The proposed project:

High (if not rehabilitated successfully)	**Moderate** if rehabilitated successfully	**Low** • operational and closure phases; • after sunset	**Positive**
- Has a substantial negative effect on the visual quality of the landscape; - Contrasts dramatically with the patterns or elements that define the structure of the immediate landscape; - Contrasts with land use, settlement or enclosure patterns of the immediate environment; - Cannot be ôabsorbedô into the landscape from key viewing areas. *Result*: Notable change in landscape characteristics over an extensive area and/or intensive change over a localized area resulting in major changes to key views	- Has a moderate negative effect on the visual quality of the landscape; - Contrasts with the patterns or elements that define the structure of the landscape; - Is partially compatible with land use (utilities) patterns of the general area; **- Is partially 'absorbed' into the landscape from key viewing areas.** *Result:* Moderate change in landscape characteristics over localized area, resulting in a moderate change to key views	- **Contrasts minimally with the patterns or elements that define the structure of the landscape;** - **is mostly compatible with land use, (utility) patterns;** - is ôabsorbedôinto the landscape from key viewing areas. *Result* Moderate change in landscape characteristics over localized area resulting in a minor change to a few key views.	- Has a beneficial effect on the visual quality of the landscape; - Enhances the patterns or elements that define the structure of the landscape; - Is compatible with land use, settlement or enclosure patterns. *Result* Positive change in key views.

Sections that are placed in bold are applicable to the proposed Project.

In the light of the findings in the table above, and the discussion above, the visual intrusion of the proposed Project will be moderate to low since the Project is mostly compatible with land use, (utility) patterns and would contrast minimally with the patterns or elements that define the structure of the landscape. The Project would however result in a moderate change in landscape characteristics over an extensive area resulting in a moderate change to key views. Due to the volume (mass and height) as well as the location of the Ashing Facility near a crest in the topography, it will only be partially absorbed into the landscape.

Visibility and Visual Exposure

In determining the visibility of the project the ôzone of potential influenceô was established and is regarded to be 15km. Over 15km the impact of the proposed activities would have diminished due to the diminishing effect of distance (the project recedes into the background) and atmospheric

conditions (haze) on visibility. Also, at this distance the features would appear in the background of a view and thus begin to be óabsorbedôinto the landscape setting.

Visual exposure of the project is determined by the proximity of the viewer to the proposed new project component. Refer to Table 9-22 below. The impact of an object in the foreground (0 ï 1.5km) is greater than the impact of that same object in the middle ground (1.5km ï 5.0km) which, in turn is greater than the impact of the object in the background (greater than 5.0km) of a particular scene. Therefore, the visibility and visual exposure for viewers within 1.5km of the proposed project will be high, for viewers between 1.5km and 5.0km it will be moderate and beyond 5.0km it will be low.

Table 9-22: Visibility of the proposed Project

High	Moderate	Low
Visual Receptors **If the project is visible from over half the zone of potential influence, and/or views are mostly unobstructed and / or the majority of viewers are affected.**	*Visual Receptors* If the project is visible from less than half the zone of potential influence, and / or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the project is visible from less than a quarter of the zone of potential influence, and / or views are mostly obstructed and or few viewers are affected.

Sections that are placed in bold are applicable to the proposed Project.

Day Time

The proposed Project will be visible from over more than half the Zone of Potential Influence. In the high exposure zone views would be screened by existing vegetation and buildings / built structures (the viewshed analysis only take topography into account and not vegetation and structures). In the middle to outer ranges of the moderate exposure zone, topography starts to screen views of the ADF. In the low exposure zone, the topography screens views of the facility for over half the area. The settlement of Kendal as well as a small section of the Kendal Agricultural Holdings, in the northeast, as well as a couple of farmsteads in the north and southwest fall within the high exposure zone. The remainder of the Kendal Agricultural Small Holdings as well as a couple of farmsteads in the north and southwest fall within the moderate exposure zone. Some more farmsteads as well as sections of the towns of Phola and Ogies fall within the low exposure zone. Table 9-23 below, summarizes the visual exposure of the Project.

During closure and rehabilitation, the Project will remain visible as the ADF will remain on site. The negative impact can however be reduced by implementing mitigating measures as described below.

Night Time

The proposed Project will add cumulatively to the effect of the existing lights at night. Visual exposure is summarized in Table 9-23 below.

Table 9-23: Visual Exposure of the proposed Project

	High Exposure (significant contribution to visual impact)	Moderate Exposure (moderate contribution to visual impact)	Low Exposure (minimal influence on visual impact)	Insignificant Exposure (negligible influence on visual impact)
Farmsteads	**0 – 1.5 km**	**1.5 – 5.0 km**	**5.0 – 10.0 km**	**Over 10.0 km**
Kendal Agricultural Small Holdings	**0 – 1.5 km**	**1.5 – 5.0 km**	5.0 ï 10.0 km	Over 10.0 km
Towns ï Phola & Ogies	0 ï 1.5 km	1.5 ï 5.0 km	**5.0 – 10.0 km**	Over 10.0 km

Sections that are placed in bold are applicable to the proposed Project.

Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity (visual receptors) criteria the intensity of the visual impact of the proposed project can be determined.

With reference to Table 9-24 below, residents within and visitors to the study area have a high sensitivity. Travellers passing through the study area have a moderate sensitivity. People at their place of work or whom are engaged in similar activities have a low sensitivity.

Table 9-24: Sensitivity of Receptors for the proposed Project

High (residents)	**Moderate** residents	**Low** (travelers) workers
Users of all outdoor recreational facilities including public rights of way (tourist routes), whose intention or interest may be focused on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; **Occupiers of residential properties with views affected by the development**.	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); **People travelling through or past the affected landscape in cars, on trains or other transport routes.**	The least sensitive receptors are likely to **be people at their place of work, or engaged in similar activities,** whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas). **Roads going through urban and industrial areas.**

Sections that are placed in bold are applicable to the proposed Project.

However, it should be remembered that all viewers will already be exposed to views of the existing ADF as well as other mining activities. Therefore, their sensitivity rating would drop one category

lower as indicated on Table 9-24. I.e. residents and visitors will therefore have a moderate rating and travellers a low rating.

Severity of Visual Impact

In qualifying the criteria used to establish the severity of visual impact, a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgement. These results are based on worst-case scenarios when the impact of all aspects is taken together and when viewed from the various sensitive viewing points as indicated in **Table 9-25** below.

According to the results tabulated in **Table 9-25** below the severity of visual impact will be moderate to low as the Project would introduce elements that are not uncharacteristic when set within the attributes of the receiving landscape and would result in a partial alteration to the key features of the receiving landscape. The Project would in most instances be viewed against a backdrop including the existing ADF as well as the KPS and other mining activities.

Table 9-25: Severity of Impact of the proposed Project

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements / features / characteristics of the baseline.	**Partial loss of or alteration to key elements / features / characteristics of the baseline**.	Minor loss of or alteration to key elements / features / characteristics of the baseline.	Very minor loss or alteration to key elements/features/characteristics of the baseline.
i.e. Pre-development landscape or view and / or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape.	i.e. Pre-development landscape or view and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape.	i.e. **Pre-development landscape or view and / or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.**	i.e. Pre-development landscape or view and / or introduction of elements that is not uncharacteristic with the surrounding landscape ï approximating the ónoô changeôsituation.
High scenic quality impacts would result.	**Moderate scenic quality impacts would result**	**Low scenic quality impacts would result.**	Negligible scenic quality impacts would result.

Mitigation Measures

In considering mitigating measures there are three rules that were considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management / maintenance) and acceptable (within the framework of the existing landscape and land use policies for the area). To address these, the following principles have been considered:

- Mitigation measures should be designed to suit the existing landscape character and needs of the locality. They should respect and build upon landscape distinctiveness.
- It should be recognized that many mitigation measures, especially the establishment of planted screens and rehabilitation, are not immediately effective.

The following mitigation measures are suggested.

Project Area Development

- 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.

Earthworks

- 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 óconstruction buffer zoneôaround the proposed Project should be exposed. In all other areas, the natural vegetation should be retained.

Landscaping

- 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.
- A registered Professional Landscape Architect could assist with the final design of the ash dump.
- A registered Professional Landscape Architect could be appointed to assist with the rehabilitation plan for the ADF.
- Rehabilitate / restore exposed areas as soon as possible after construction activities are complete.
- Only indigenous vegetation should be used for rehabilitation / landscaping purposes.

Access and Haul Roads

During construction, operation, rehabilitation and closure of the Project, access and haul roads will require an effective dust suppression management programme, such as the use of non-polluting chemicals that will retain moisture in the road surface.

Lighting

Even though the area is already scattered with lights at night, light pollution should still be seriously and carefully considered and kept to a minimum. Security lighting should only be used where absolutely necessary and carefully directed.

The negative impact of night lighting, glare and spotlight effects, can be mitigated using the following methods:

- Install light fixtures that provide precisely directed illumination to reduce light ñspillageò beyond the immediate surrounds of the substation.
- Light public movement areas (pathways and roads) with low level ñbollardôtype lights and avoid post top lighting
- Avoid high pole top security lighting along the periphery of the substation site and use only 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.

9.3.12 Wetland

The Wetland Impact Assessment was undertaken by Wetland Consulting Services. Refer to Appendix F13 for the full report.

Identification of Impacts

Likely impacts have been identified and are discussed individually below. The assessment of impacts has been split into two sections:

- Impacts related to the ADF and associated infrastructures
- Impacts related to infrastructure deviations

Impacts have been grouped per development phase during which they are likely to manifest:

- Pre-construction and construction phase
- Operational phase
- Closure phase

ADF and Associated Infrastructures

Pre-construction & Construction Phase – Loss of wetland habitat & wetland functionality

The proposed Kendal 30-year ADF Project will result in the permanent loss of all wetland habitats located within the direct footprint of the proposed ADF (Site H) and associated infrastructure. A total of 86.5 ha of wetland falls within the direct development footprint and will be permanently lost. Added to this direct loss is a further 1.5 ha of pan/depression wetland habitat in which all functionality is expected to be lost as more than 50 % of each of the two pan/depression wetlands will be permanently lost due to the proposed ADF, with the remaining sections unlikely to remain functional. It is however expected that some of the remaining adjacent wetlands will also be impacted. Although an extensive list of mitigation measures is proposed and detailed as part of this report and in the full EIA/IWULA reports, some residual impact is likely to remain, resulting in further wetland degradation, mostly as a result of decreased water inputs to the wetlands due to catchment exclusion and changes in hydrology. These are referred to as indirect impacts and refer to the loss of wetland functionality that can occur due to habitat degradation, although the wetlands themselves will remain post-mining.

In total, the direct and indirect impacts will affect 149.3 ha, of which 88 ha will be permanently lost. In terms of hectare equivalents, the overall impact was determined to be 63.5 hectare equivalents.

It is important to note that not all wetland loss will be realised during the construction phase. As the ADF will be constructed in phases, considerable wetland loss will be realised during the operational phase. Wetland impact, direct and indirect, during the construction phase will be 73.5 ha.

Table 9-26. Table summarising the extent of wetland impacted per development phase.

Development Phase (Years)	Wetland Loss	Hectare Equivalents
0 - 5	73.5	31.4
5 - 10	28.5	10.6
10 - 15	12.5	7.5
15 - 20	6.3	3.8
20 - 27	28.5	10.2
Total Loss	149.3	63.5

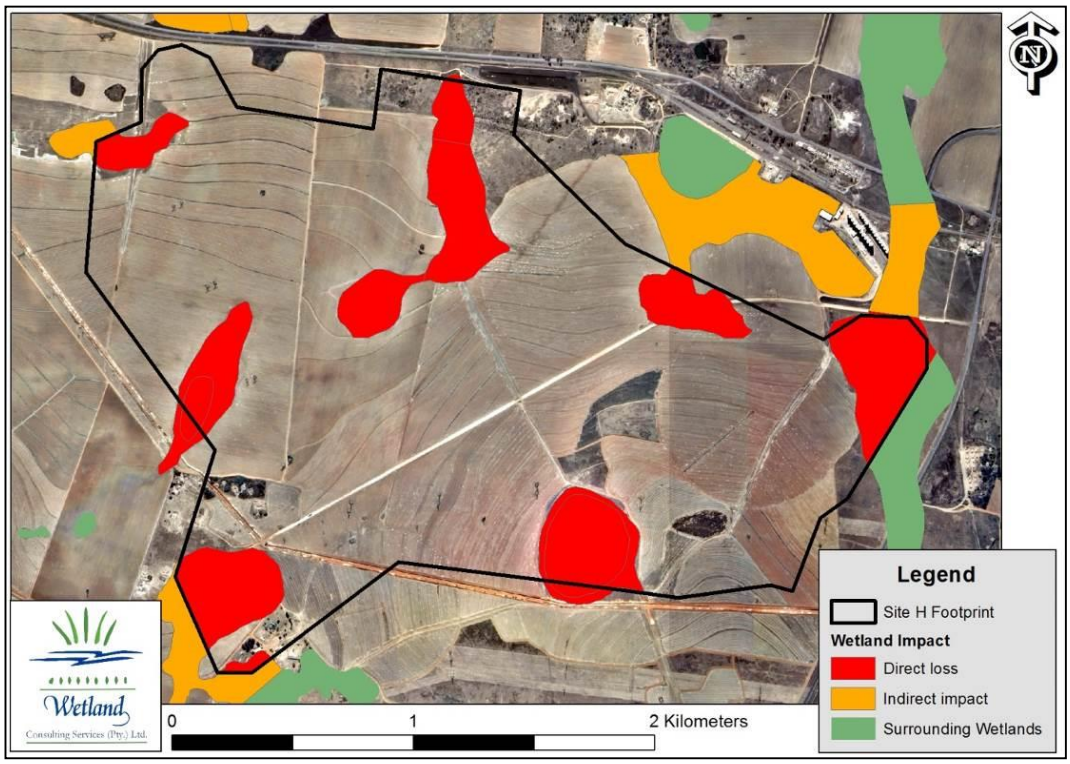

Figure 9-16: Map showing the extent and location of direct and indirect impacts to wetlands. Wetlands shown in red will be permanently lost, while wetlands shown in orange are likely to experience indirect impacts.

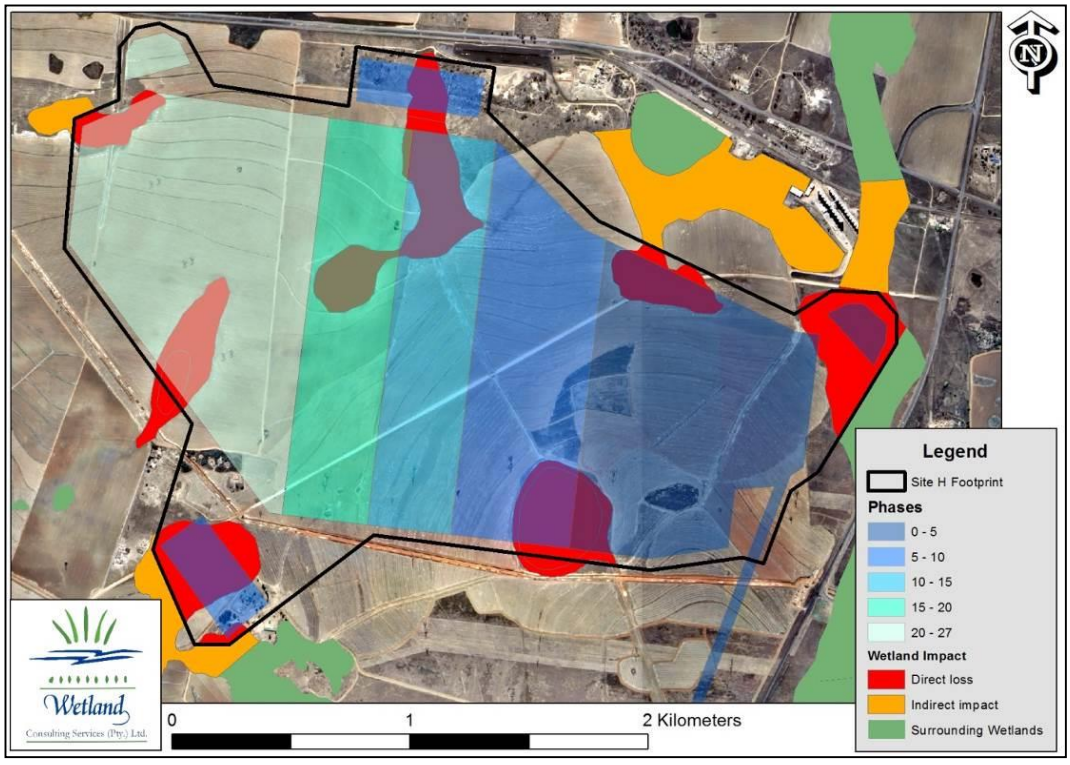

Figure 9-17. Map showing the 5 project phases and the wetland impact, direct and indirect, associated with each phase.

Mitigation

The mitigation hierarchy has been applied and followed throughout the project as far as possible. In trying to avoid impacts to wetlands, a detailed site selection process was undertaken

considering numerous potential sites within the greater Kendal environs. However, given the extent of wetlands and especially also the extent of active mining in the area, as well as the extent of existing mining rights not yet actively mined, the currently selected site appeared as the only suitable option.

Minimisation of impacts through alteration of the ADF layout and footprint were also considered. Any reduction in the ADF footprint does however impact on the volumes of ash that can be deposited. A study undertaken by Zitholele (Technical Memorandum, 18 March 2016, and attached as Appendix K of the Engineering Report (Appendix F) indicated that excluding the main pan and the north eastern hillslope seepage wetland from the ash dam footprint would result in the loss of 5 yearsô storage space and significantly increase construction costs associated with the clean and dirty water dams. Such a scenario raises the possibility that a further ADF site would then need to be found to accommodate an additional 5 years of storage space.

Even though the ADF will be capped and vegetated following completion of ash deposition, no wetland habitat is expected to reform on the ADF and the direct loss of wetland habitat within the ADF footprint can thus not be mitigated on site. The loss of this wetland habitat will thus require a wetland offset/wetland mitigation strategy. The need for such a wetland offset strategy was already identified during discussions with the DWS and requested by the DWS, and is in the process of being developed (Wetland Consulting Services, 2016).

Such an offset can be achieved either through the rehabilitation, protection and management of identified wetlands to achieve a net gain in functional hectare equivalents as well as achieving certain ecosystem conservation targets. The newly developed draft SANBI Wetland Offsetting Guidelines should be used to guide the latter in cases where offsetting is recommended.

Disturbance of wetland habitat outside the direct development footprint should however be avoided and minimised:

- 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, constructorôs 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 below.

Pre-construction & Construction Phase – Increased sedimentation and erosion in wetlands

Vegetation clearing and soil stripping will result in large areas of bare, compacted soils that will increase surface runoff volumes and velocities, and reduce time to concentration in adjacent wetlands and watercourses. Changes in runoff will be most significant during regular return runoff events and lead to more regular bank full events in receiving streams, increasing the erosive energy of flows and enhancing channel incision and lateral erosion. Increased channel erosion will lower the local water table and increase channel capacity, decreasing the occurrence of channel overtopping events, further leading to desiccation of the valley bottom wetlands.

Mitigation

A construction stormwater management plan must be developed and implemented prior to the commencement of large scale vegetation clearing activities or construction activities. Such a plan should aim to minimise the transport of sediment off site as well as prevent the discharge of high velocity flows into downslope wetlands. Sediment traps and sediment barriers should be installed where necessary, and discharge points should be protected against erosion and incorporate energy dissipaters.

Vegetation clearing and soil stripping activities should be phased to minimise the extent of bare soils surfaces exposed at any one time. Vegetation clearing and soil stripping should also only be undertaken immediately preceding the onset of construction activities on site. A scenario of cleared areas lying bare and unused for weeks on end must be avoided.

To minimise the impact of increased runoff and sediment transport into adjacent wetlands, vegetation clearing and soil stripping should be concentrated in the dry season as far as this is partially possible. Given the duration of construction activities as well as uncertainties around the commencement date, limiting all construction activities to the dry season is likely to be impossible.

- 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

Pre-construction & Construction Phase – Water quality deterioration in wetlands

During the construction phase, as activities are taking place adjacent to wetlands, there is a possibility that water quality can be impaired through contaminated surface runoff entering wetlands. Typically, impairment will occur as a consequence of sediment disturbance resulting in an increase in turbidity. Water quality may also be impaired as a consequence of accidental spillages and the intentional washing and rinsing of equipment within the wetlands. It is possible that hydrocarbons will be temporarily stored and used on site, as well as cement and other potential pollutants.

Mitigation

Refer to the sedimentation and turbidity control measures above.

In addition, 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. No abstraction of water from the wetlands is allowed unless expressly authorized by the DWS.

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 (DWS) immediately, with specialists appointed to oversee the clean-up operations.

Operational Phase - Loss of wetland habitat & wetland functionality

This operational phase impacts are a continuation of the impact commencing during the construction phase and described above.

In total, the direct and indirect impacts will affect 149.3 ha, of which 88 ha will be permanently lost. In terms of hectare equivalents, the overall impact will be 63.5 hectare equivalents. 31.4 hectare

equivalents will be lost during the construction phase and **32.1 hectare equivalents will be lost during the operational phase.**

It is important to note that not all wetland loss will be realised during the construction phase. As the ADF will be constructed in phases, considerable wetland loss will realised during the operational phase. Wetland impact, direct and indirect during the construction phase will be 73.5 ha.

Table 9-27. Table summarising the extent of wetland impacted per development phase.

Development Phase (Years)	Wetland Loss	Hectare Equivalents
0 - 5	73.5	31.4
5 - 10	28.5	10.6
10 - 15	12.5	7.5
15 - 20	6.3	3.8
20 - 27	28.5	10.2
Total Loss	149.3	63.5

Mitigation

Refer to mitigation measures for the ADF and Associated Infrastructures above.

Closure Phase - Water quality deterioration due to seepage out of the ADF

The ash disposed of on the ADF will contain a number of pollutants. Contaminated surface water runoff from the ADF or water seeping out of the ADF or the pollution control dams will result in water quality deterioration in receiving water resources. Overflow of pollution control dams could also occur and impact on water quality within receiving systems, which will ultimately be the Wilge River.

Mitigation

It is important that all dirty water areas, including the entire ADF, are isolated from the surrounding catchment and that all dirty water is retained on site. To ensure this, the ADF will be lined using an engineered Class C liner, which will include a combination of geotextile, compacted clay layers and HDPE plastic layers, as well as an under drainage system to collect seepage. All dirty water will be collected and stored in pollution control facilities and re-used for dust suppression within the dirty water areas. During closure the ADF will be capped and vegetated. Capping will take the form of a soil saver followed by a 30cm layer of topsoil and covered by a further soil saver. This will then be hydro-seeded to ensure establishment of vegetation. Runoff from the capped ADF will then be classed as clean water runoff.

Integrity and stability of the capping layer must be ensured in the long-term. Regular inspections and maintenance work must be undertaken to ensure this. A log book of inspections and maintenance activities must be kept.

Surface runoff from the ADF must be reintroduced into adjacent wetland systems in a manner that will prevent erosion and mimic natural water inputs to the wetlands as far as possible.

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. If any deterioration linked to the ADF is discerned, corrective measures should be put in place.

Closure Phase – Mobilisation of ash due to erosion of capping layer

During closure the ADF will be capped and vegetated. Capping will take the form of a soil saver followed by a 30cm layer of topsoil and covered by a further soil saver. This will then be hydro-seeded to ensure establishment of vegetation. Runoff from the capped ADF will then be classed as clean water runoff. Should this capping layer erode, the underlying ash will be exposed and could potentially be transported into adjacent wetlands.

Mitigation

Integrity and stability of the capping layer must be ensured in the long-term. Regular inspections and maintenance work must be undertaken to ensure this. A log book of inspections and maintenance activities must be kept.

Surface runoff from the ADF must be reintroduced into adjacent wetland systems in a manner that will prevent erosion and mimic natural water inputs to the wetlands as far as possible.

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. If any deterioration linked to the ADF is discerned, corrective measures should be put in place.

Closure Phase – Increase in alien vegetation

It is likely that alien vegetation will utilise areas disturbed during the rehabilitation activities to become established, including on the slopes of the ADF. Alien vegetation could then spread to adjacent wetland areas as seed is transported by surface runoff to these wetlands.

Mitigation

- Compile and implement an alien vegetation management plan for the entire affected area.
- Regular surveys for alien vegetation should be undertaken and populations of alien species controlled. Where possible, the populations should be removed and impacted areas rehabilitated.
- All removal of alien vegetation must be undertaken under supervision of suitably trained and qualified individuals.

Infrastructure Deviations

In order to construct the Site H ADF, the following infrastructure will have to be deviated:

- The D1390 (gravel road);
- Distribution lines: 11kV, 22kV, 88kV, 132kV;
- Transmission line: 400 kV;
- Transnet 180 fuel pipeline.

Based on the information provided, 4 wetland crossings have been identified (see Figure 9-18). All of the 4 crossings will be located in wetlands immediately downslope of the proposed ADF and as such these wetlands will be impacted on by the ADF as well. The indirect impact of the ADF on these wetlands, which is expected to be manifest in the form of decreased flows and soil saturation, has already been included in the hectare equivalent losses determined for the ADF. Crossings are as follows (numbering as per Figure 9-18):

1. Crossing of the re-aligned D1390 gravel road over a hillslope seepage wetland. This is an existing crossing that will be somewhat modified, with the disturbed footprint expected to increase somewhat. The crossing will be located immediately downslope of the proposed ADF.
2. Crossing of the re-aligned Transnet fuel pipeline through an isolated hillslope seepage wetland.
3. Crossing of the re-aligned Transnet fuel pipeline through a hillslope seepage wetland. This hillslope seepage wetland is expected to dry out an lose all functionality as a result of the construction of the proposed ADF. The loss of this wetland has already been accounted for in the hectare equivalent losses determined for the ADF.
4. Crossing of the re-aligned D1390 gravel road over a hillslope seepage wetland. This crossing will be located immediately downslope a set of clean and dirty water control dams associated with the ADF. The wetland is likely to suffer decreased flows due to the construction of the ADF and water management dams. Downslope of the crossing the river diversion required for the extension of the existing ash dump will be constructed.

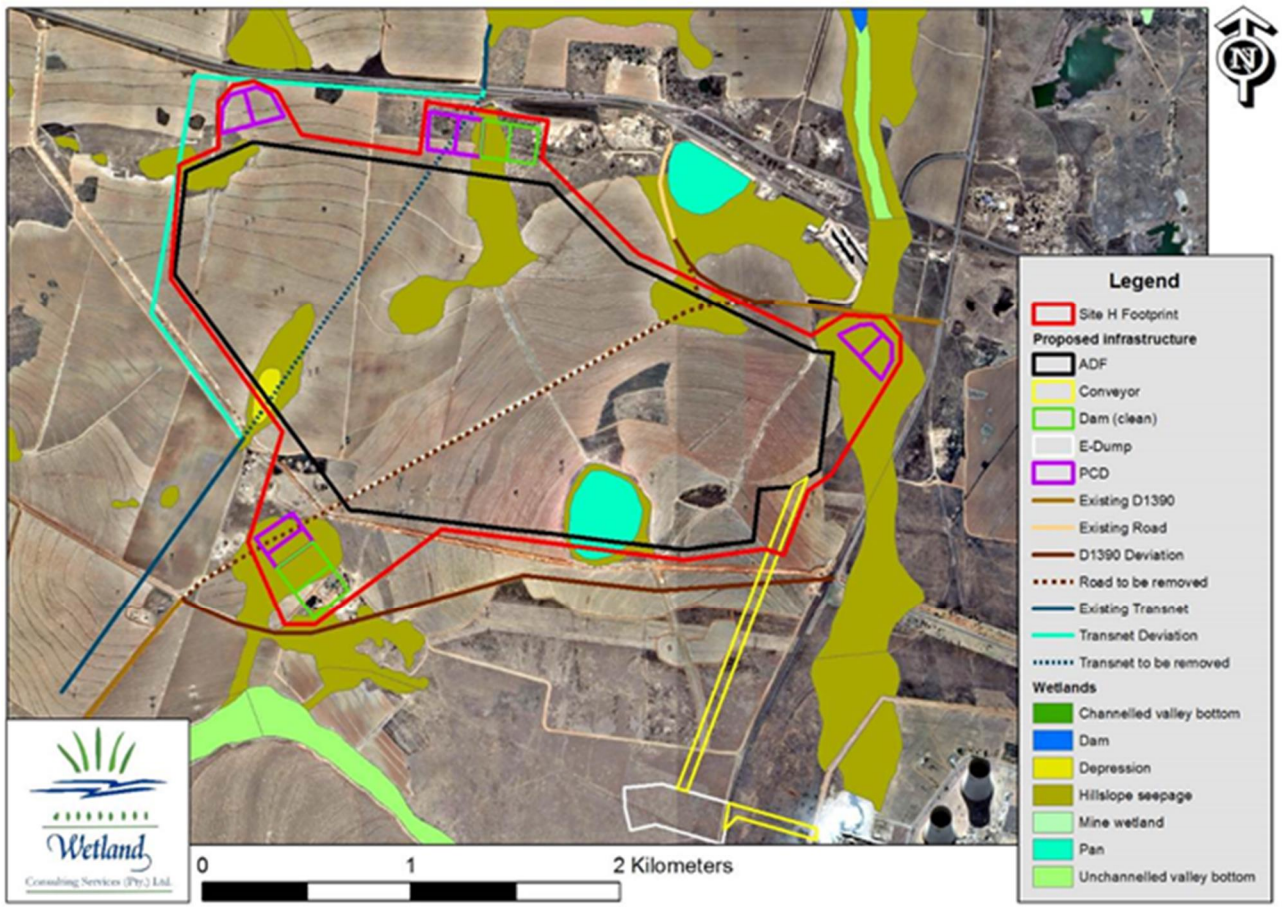

Figure 9-18: Map showing the location of the linear infrastructure crossings described in the text.

It is clear from the above descriptions that all of the identified crossings will be located in wetlands that are already impacted and will further be substantially impacted and altered by the proposed construction of the ADF. None of the crossings are therefore considered of high sensitivity, though adequate mitigation will be required for each of the crossings to ensure impacts to the downstream water resources are minimised.

8.2.3.1 Preconstruction & Construction - Disturbance and degradation of wetland habitat

4 wetland crossings have been identified along the proposed linear infrastructure deviations, consisting of a number of hillslope seepage wetlands. Wetland habitat falling within the footprint of the proposed linear infrastructure, especially the gravel road and the pipeline, will be disturbed during the construction process, and some wetland habitat is also likely to be lost.

In addition, construction vehicles accessing the routes, turning, offloading materials on site etc. are also likely to contribute to disturbance and destruction of wetland habitat outside the servitudes. Disturbance of the wetland vegetation is also likely to provide opportunity for invasion by alien vegetation and increase the risk of erosion.

Mitigation

- To minimise the significance of impacts, the following mitigation measures should be strictly enforced:

- 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.
- The servitude should be fenced off using a suitable fence/demarcation 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 Transnet 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.
- Ideally construction activities within wetlands should take place in winter (during the dry season).

Preconstruction & Construction - Increased risk of erosion in wetlands

The soils within the hillslope seepage wetlands affected by the identified crossings are generally fairly shallow. Such soils can be highly susceptible to erosion. The clearing of vegetation, together with the disturbance of the soil and the potential flow concentration within wetlands during the construction phase pose a significant erosion risk, with eroded sediment transported downstream into adjacent wetland areas.

Mitigation

- 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. Measures could include low berms on approach and departure slopes to crossings to prevent flow concentration, sediment barriers along the lower edge of bare soil areas, placement of hay bales around the within wetland construction areas and re-vegetation of disturbed areas as soon as possible.

- 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. Where hillslope seepage wetlands are crossed parallel to the direction of flow (i.e. perpendicular to the contour), no means of conveying flow under the road is required. However, measures should be put in place to prevent the formation of preferential flow paths along the road verges. This should be achievable through the placement of regular low berms parallel to the contour along the road verges. Where hillslope seepage wetlands are crossed perpendicular to the direction of flow (i.e. parallel to the contour), provision will need to be made to allow flows to pass through underneath the road. Key here would be to prevent the concentration of flows as this would lead to erosion at the discharge point on the downslope side, as well as partial desiccation of the wetland area. Consideration should be given to installing subsurface drains under the road. This could be achieved through installing a coarse gravel pioneer layer at natural ground level (from just below natural ground level to just above) under the pavement layers of the road through which water could flow. To prevent water just flowing along the drain, impermeable plastic trench breakers should be installed within the coarse gravel layer across the road. 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.

Preconstruction & Construction - Sediment transport into wetlands

Sediment washed off the bare soil areas associated with construction areas will be deposited in wetland areas and eventually enter tributaries of the Wilge River. Sediment deposition in wetlands will lead to changes in wetland vegetation.

Mitigation

- 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.
- 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.

Preconstruction & Construction - Water quality deterioration

During construction, as activities are taking place adjacent to wetlands, there is a possibility that water quality can be impaired. Typically, impairment will occur as a consequence of sediment disturbance resulting in an increase in turbidity. Water quality may also be impaired as a consequence of accidental spillages and the intentional washing and rinsing of equipment within the wetlands. It is likely that hydrocarbons will be stored and used on site, as well as cement and other potential pollutants.

Mitigation

- 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. No abstraction of water from the wetlands or nearby streams should be allowed unless expressly authorized in the IWULA.
- 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, with specialists appointed to oversee the clean-up operations

Preconstruction & Construction - Habitat fragmentation

Although linear infrastructure developments can often contribute significantly to habitat fragmentation, the fact that all of the proposed infrastructure deviations will be located immediately adjacent to the proposed ADF will ensure that further habitat fragmentation will not be caused by the required linear infrastructure.

Mitigation

Position linear infrastructure as close as possible to the security fence around the ADF.

Preconstruction & Construction - Establishment and spread of alien species

Areas disturbed during the construction process will be susceptible to invasion by alien vegetation, e.g. *Acacia mearnsii* (black wattle). These alien species could spread to the adjacent wetland areas and result in decreased flows, increased erosion and decreased biodiversity in these systems.

Mitigation

An alien vegetation management plan should be compiled by an ecologist during the construction/operational phase of the ADF and 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.

Operation - Disturbance of wetland habitat

Regular operation and maintenance of the road and associated culverts and stormwater interventions (e.g. mitre drains) could result in localised disturbances to the wetland habitat adjacent to the road.

Maintenance, repair and inspection activities along the pipeline servitude could likewise result in localised disturbances to wetlands as vehicles and/or machinery need to access the wetland crossings.

Mitigation

- 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.

Operation - Erosion and sedimentation due to storm water discharges from road

Culverts and stormwater drains associated with the road could become blocked/damaged during operation and lead to suboptimal functioning, possibly leading to flow impoundment or concentration and increased erosion risk.

Mitigation

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.

Closure - Disturbance of wetland habitat

The decommissioning and removal of linear infrastructures could result in the disturbance and destruction of wetland habitat, much as during the operational phase. In addition, vehicles accessing the route, turning, loading materials on site etc. could also contribute to disturbance and destruction of wetland habitat outside the servitudes. Disturbance of the wetland vegetation is also likely to provide opportunity for erosion and invasion by alien vegetation.

Mitigation

Limit disturbance to wetland habitat by limiting decommissioning activities to the actual disturbance footprint. No access to wetland areas should be allowed unless infrastructure to be decommissioned is located within a wetland area. Only make use of existing roads and tracks to access the site during decommissioning phase. Implement an alien vegetation management plan to prevent establishment and spread of alien species.

Closure - Increased risk of erosion in wetlands

The soils within the hillslope seepage wetlands affected by the identified crossings are generally fairly shallow. Such soils can be highly susceptible to erosion. The removal of infrastructure, together with the likely disturbance of the vegetation and soils, could pose an erosion risk, with eroded sediment transported downstream into adjacent wetland areas.

Mitigation

All disturbed areas should be landscaped to approximate the natural landscape profile, but should avoid steep slopes and concentrated run-off. Compacted soils should be ripped and scarified. The rehabilitated areas should be re-vegetated (using a mix of locally occurring indigenous species) as soon as possible following completion of the earthworks to minimise erosion. Regular long-term follow up of rehabilitated areas will be required to ensure the successful establishment of vegetation and to survey for any erosion damage on site. Erosion damage should be repaired immediately. The recommendations contained within the specialist vegetation and soils reports should be fully implemented to ensure successful rehabilitation.

Closure - Sediment transport into wetlands

Sediment washed off the bare soil areas associated with the decommissioning and closure process will be deposited in wetland areas and eventually enter tributaries of the Wilge River. Sediment deposition in wetlands will lead to changes in wetland vegetation.

Mitigation

- Install erosion prevention measures and sediment barriers prior to the commencement of decommissioning and closure activities.
- Minimise the decommissioning and closure footprint within the wetland area. Clearly demarcate the required servitude and maintain all activities within the demarcated area.
- Make use of existing roads and tracks to access decommissioning and closure 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 decommissioning and closure during the dry season as far as possible.
- Re-vegetate and rehabilitate areas as soon as possible after completion of decommissioning and closure.
- Locate all stockpiles, laydown areas and temporary decommissioning and closure infrastructure at least 50m from the edge of delineated wetlands.

Closure - Establishment and spread of alien species

Areas disturbed during the decommissioning and closure process will be susceptible to invasion by alien vegetation, e.g. *Acacia mearnsii* (black wattle). These alien species could spread to the adjacent wetland areas and result in decreased flows, increased erosion and decreased biodiversity in these systems.

Mitigation

An alien vegetation management plan should be compiled by an ecologist during the construction/operational phase of the ADF and 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.

Table 9-28: Wetland Impact Tables

Activity	Description of Impact	Impact type	Spatial	Duration	Significance	Probability	Rating
Wetland 'ADF Mitigation' - Construction							
Site clearing & preparation	Loss of wetland habitat & functionality	Existing	1	3	3	5	2.3 - MOD
		Cumulative	3	5	4	5	4 - HIGH
		Residual	2	5	2	5	3 - MOD
	Increased sedimentation and erosion in wetlands	Existing	1	2	2	4	1.3 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	1	2	2	5	1.7 - LOW
	Water quality deterioration in wetlands	Existing	1	2	2	4	1.3 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	1	2	2	5	1.7 - LOW
Wetland 'Linear Infrastructure' - Construction							
Servitude clearing & construction	Disturbance and degradation of wetland habitat	Existing	1	3	3	5	2.3 - MOD
		Cumulative	2	3	4	5	3 - MOD
		Residual	1	3	3	5	2.3 - MOD
	Increased risk of erosion in wetlands	Existing	1	2	1	3	0.8 - VERY LOW
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	1	3	2	3	1.2 - LOW
	Sediment transport into wetlands	Existing	1	2	2	4	1.3 - LOW
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	1	3	2	4	1.6 - LOW
	Water quality deterioration	Existing	1	2	2	4	1.3 - LOW
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	1	2	2	4	1.3 - LOW
	Habitat fragmentation	Existing	3	3	3	5	3 - MOD
		Cumulative	3	3	3	5	3 - MOD

Activity	Description of Impact	Impact type	Spatial	Duration	Significance	Probability	Rating
		Residual	3	3	3	5	3 - MOD
	Establishment and spread of alien species	Existing	1	3	1	3	1 - VERY LOW
		Cumulative	3	4	3	3	2 - LOW
		Residual	1	3	1	2	0.7 - VERY LOW
Wetland 'ADF Mitigation' - Operation							
Ongoing construction of ADF phases	Loss of wetland habitat & functionality	Existing	1	3	3	5	2.3 - MOD
		Cumulative	3	5	4	5	4 - HIGH
		Residual	2	5	2	5	3 - MOD
	Increased sedimentation and erosion in wetlands	Existing	1	2	2	4	1.3 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	1	2	2	5	1.7 - LOW
	Water quality deterioration in wetlands	Existing	1	2	2	4	1.3 - LOW
		Cumulative	3	2	3	4	2.1 - MOD
		Residual	1	2	2	5	1.7 - LOW
Ash deposition on the ADF	Water quality deterioration due to seepage out of ADF	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	3	4	4	3	2.2 - MOD
		Residual	2	4	3	2	1.2 - LOW
	Water quality deterioration due to ash dust deposited in wetlands	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	2	3	3	3	1.6 - LOW
		Residual	2	4	2	2	1.1 - LOW
Wetland 'Linear Infrastructure' - Operation							
Operation	Disturbance and degradation of wetland habitat	Existing	1	3	3	5	2.3 - MOD
		Cumulative	2	4	3	5	3 - MOD
		Residual	1	4	3	5	2.7 - MOD
	Erosion and sedimentation due to storm water discharges from road	Existing	1	2	2	4	1.3 - LOW
		Cumulative	2	4	3	4	2.4 - MOD

Activity	Description of Impact	Impact type	Spatial	Duration	Significance	Probability	Rating
		Residual	1	4	2	3	1.4 - LOW
Wetland 'ADF Mitigation' - Closure							
Closure activities	Water quality deterioration due to seepage out of ADF	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	3	4	4	3	2.2 - MOD
		Residual	2	4	3	2	1.2 - LOW
	Mobilisation of ash due to erosion of capping layer	Existing	1	1	0	1	0.1 - VERY LOW
		Cumulative	3	4	4	3	2.2 - MOD
		Residual	2	4	2	2	1.1 - LOW
	Increase in alien vegetation	Existing	1	3	1	3	1 - VERY LOW
		Cumulative	3	4	3	3	2 - LOW
		Residual	1	2	1	3	0.8 - VERY LOW
Wetland 'Linear Infrastructure' - Closure							
Decommissioning	Disturbance and degradation of wetland habitat	Existing	1	3	3	5	2.3 - MOD
		Cumulative	2	3	3	5	2.7 - MOD
		Residual	1	3	3	5	2.3 - MOD
	Increased risk of erosion in wetlands	Existing	1	2	1	3	0.8 - VERY LOW
		Cumulative	3	4	3	4	2.7 - MOD
		Residual	1	2	2	3	1 - VERY LOW
	Sediment transport into wetlands	Existing	1	2	2	4	1.3 - LOW
		Cumulative	2	3	3	4	2.1 - MOD
		Residual	1	2	2	4	1.3 - LOW
	Establishment and spread of alien species	Existing	1	3	1	3	1 - VERY LOW
		Cumulative	3	4	3	3	2 - LOW
		Residual	1	3	1	2	0.7 - VERY LOW

10 NEEDS AND DESIRABILITY

In accordance with the Regulation 31(2)(f) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations published in Government Notice No. R.543, this part of the FEIR provides a detailed account of the Need and Desirability of the proposed Kendal 30-year ADF project. In considering the need and desirability of the proposed project the strategic concept of the project along with the broader societal needs and public interest has been taken into account. In the Guideline on Need and Desirability (DEA, 2010) a number of questions formulated to guide the identification of the Need and Desirability of a proposed development are provided. The information provided in Table 10-1 and Table 10-2 affords answers specific to the project at hand for each of the guiding questions contained in Section 5 of the Guideline on Need and Desirability (DEA, 2010).

Based on the answers that have been provided in Table 10-1 and Table 10-2 it is evident that ample consideration has been given to the need and desirability of the proposed project. The determination of the need and desirability project also served as further confirmation that all reasonable measures have been taken to determine the best practicable environmental option.

Table 10-1: Assessment of the Need of the proposed Kendal 30 year ADF Project

Need ('timing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant authority?	To determine whether the KPS and associated infrastructure has been considered within the timeframe intended by the local authority's SDF, the Nkangala District Municipality (NDM) Spatial Development Framework (SDF) was referred to. The SDF illustrates the desired spatial form of the NDM and is informed by the long-term spatial development vision statement and plan of the District Municipality. The NDM SDF shows the location of each of the power stations as well as the mining areas which fall within the boundaries of the District Municipality. These Land Uses have therefore been taken into account during the development of NDM's SDF and are considered within the timeframe intended by the SDF.	Yes
2.	Should the development, or if applicable, expansion of the town / area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time.	The locality of coal fired power stations is largely determined by the locations of coal mines. Therefore, the majority of Eskom SOC Limited's coal fired power stations are located in the Mpumalanga Province which is rich in coal reserves. In the case of KPS, the coal used for the electricity generation processes, is currently supplied by the nearby Khuthala Mine. South Africa's coal reserves are estimated at 53 billion tonnes, and with our present production rate there should be almost 200 years of coal supply left.	Yes
3.	Does the community / area need the activity and the associated land use concerted (is it a societal priority)? This refers to the strategic	The NDM Integrated Development Plan (IDP) (2014 / 2015) places emphasis on the substantial contribution to the local economy that is made by the KPS. As indicated in the IDP (2014:87) the KPS makes a significant contribution to the economy of Ogies and Phola. This is largely due to the fact that the majority of the residents of Ogies and Phola residents are employed either by the KPS of the Khuthala Mine supplying the power station.	Yes
4.	Are the necessary services with adequate capacity currently available or must additional capacity be created to cater for the development?	Construction of the KPS began in July 1982 with its last unit coming into operation in 1993. The KPS is therefore an existing operating power station. The proposed project is centred on continuing the existing ashing activities of the KPS to create sufficient capacity for the storage of ash for the remaining operating life of the KPS.	Yes

Need ('timing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?	As was mentioned previously, the NDM SDF shows the location of each of the power stations as well as the mining areas which fall within the boundaries of the District Municipality. These Land Uses have therefore been taken into account during the development of NDM's SDF as well as in determining the land uses for respective areas within the District Municipality.	Yes
6.	Is this project part of a national programme to address an issue of national concern of importance?	Eskom is a critical and strategic contributor to the South African government's goal of ensuring security of electricity supply in the country as well as economic growth and prosperity[9]. The provision of electricity can be regarded as a national priority. Ensuring the optimal function of all energy generating infrastructure is therefore essential in ensuring continued electricity supply. Eskom relies greatly on coal fired power stations (including the KPS) to produce approximately 90% of its electricity.	Yes

[9] Eskom 2014 http://www.eskom.co.za/OurCompany/CompanyInformation/Pages/Business_Vision.aspx

Table 10-2: Assessment of the Desirability of the proposed Kendal 30 year ADF Project

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
7.	Is this development the Best Practicable Environmental Option (BPEO) for this land / site?	The selection of the option (i.e. alternative) that provides the most benefit or causes the least adverse environmental impacts as a whole, emanated from the comparative assessment of the identified alternatives (refer to Chapter 6) as well as from the Sustainability Assessment (Appendix F10). Taking the aforementioned into account the EAP is confident that the BPEO have been selected for the proposed Kendal 30-year ADF project.	Yes
8.	Would the approval of this application compromise the integrity of this existing approved and credible municipal IDP and SDF as agreed by the relevant authorities?	Refer to the answer provided for Question 1 in Table 10-1.	No
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	EMFs for the Emalahleni Local Municipality and Nkangala District Municipality (NDM) could not be sourced by the EAP. A Terrestrial Ecology Study was however carried out for the proposed Project (refer to Chapter 7 and Appendix F3). The findings of the study included the identification of sensitive habitats including Red Data species. All mitigation measures recommended by the specialist to ensure the least disturbance to sensitive habitats, have been included in the EMPr.	No
10.	Do location factors favour the land use associated with the activity applied for at this place?	The preferred site (SiteH) has been selected because of various reasons as detailed in Chapter 6 and Appendix F10. One of the favourable considerations for selecting Site H is because it is the site closest to the power station and the existing ADF. For this reason, the cumulative impacts will be more centralised instead of fragmented over divided areas. The ADF is largely dependent of the location of the KPS, and the location thereof is determined by the the locations of coal mines.	Yes
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural or cultural areas (built and rural / natural environment)?	The anticipated impacts of the proposed project activities on the biophysical and social environment are described in detail in Chapter 9 of this EIR. Refer to this Chapter for details surrounding the manner in which the proposed activities will impact on the receiving environment.	-
12.	How will the development impact on peopleõs health and well-being?	The anticipated impacts of the proposed project activities on the biophysical and social environment are described in detail in Chapter 9 of this EIR. Refer to this chapter for details surrounding the manner in which the proposed activities will impact on the receiving environment.	-
13.	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	Opportunity costs can be defined as the net benefit that would have been yielded by the next best alternative (for example, if farming is the next best alternative for a piece of land, then the foregone benefit of losing the farming option will be the opportunity	No

Desirability (‘placing’) of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
		cost of any other land use, or if not proceeding with the activity, then the foregone benefits of the proposed activity is the opportunity cost of not proceeding). Opportunity costs also relate to the use of limited resources, for example water. If a limited volume of water is available in an area the most desirable use of the water considering the needs in the area must be determined in order to consider the opportunity costs associated with the different uses of the water. The concept of opportunity costs is applicable to project alternatives as well as policy selection. A key part of considering opportunity costs is commonly to comparatively consider and assess the different alternatives in terms of the benefits and/or disadvantages associated with each alternative. A Sustainability Assessment was undertaken and is available in Appendix F10. The study calculates (with certain assumptions) that the total loss of potential income from agriculture for the impacted area is approximately R3 901 951/year.	
14.	Will the proposed land use result in unacceptable cumulative impacts?	A cumulative impact is defined in the NEMA EIA Regulations as meaning ñthe impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the areaò It is anticipated that the most significant Cumulative Impact associated with the proposed ADF will include its contribution to the current poor air quality of the region. The poor regional air quality can be attributed to the particulate emissions emanating from the surrounding mining activities, agricultural activities and power stations. Furthermore, the site falls within the Highveld Priority Area which is associated with poor air quality, and elevated concentrations of criteria pollutants occur due to the concentration of industrial and non-industrial sources. The implementation of adequate mitigation measures aimed at managing the release of particulate emission will reduce the significance of the anticipated air quality impacts thereby reducing the impact of the ADF on the surrounding ambient air quality. It is therefore the opinion of the EAP that the proposed ADF will not result in unacceptable cumulative impacts. A detailed account of the impact assessment including the methodology as well as the significance assigned to each of the assessed impacts is provided in Chapter 9 of this EIR. As is seen in Chapter 9, the significance for most of the assessed impacts is reduced by the implementation of mitigation measures.	No

11 ENVIRONMENTAL IMPACT STATEMENT

The Environmental Impact Statement provides an account of the key findings of the EIA. Based on the significance ratings assigned to the anticipated environmental impacts, it is evident from the ratings that have been given to the that the major concerns with regards to the proposed Kendal 30-year ADF Project include impacts on wetlands, social communities, air quality and loss of agricultural land.

Key findings of Impact Assessment

The results of the impact assessment (Chapter 9) showed that the most significant impacts on the receiving environment are on:

- Wetlands and the associated loss of potential habitat for the Lesser Flamingo (*Phoenicopterus minor)* and other waterfowl. In this regard, it should be noted that the proponent, Eskom, have initiated a wetland offset study to mitigate this impact. Please refer to Appendix F14 for the wetland offset study at its current level of detail. It should be noted that this study is still being finalised and will be completed, with the guidance of DWS and SANBI, outside of the EIA process.
- Socially, the relocation of the Eskom Triangle Community will have a significant impact. The Triangle community consist of 12 families (approximately 68 people) that occupy 14 units on a piece of land that is owned by Eskom. According to the residents, some of them have been living there for 60 years and have living rights on the property. In order to respond appropriately to this impact, Eskom intends to initial a resettlement process if and when Environmental Authorisation is received. Once the RPF is finalised and communicated to the affected community, Eskom's resettlement specialist must develop a Resettlement Action Plan (RAP) that fully details the operational process of enacting the resettlement.
- The impact of particulate emissions from the ADF on ambient concentrations will be dependent on the specific location of the 80 ha operational area. This area will migrate across the final footprint area as disposal of ash occurs. Eskom is committed to effectively implementing the mitigation measures proposed by the Air Quality Specialist in Appendix F1. The specialist recommends that the sidewalls of the ADF be vegetated by means of the application of a top-soil layer and seeding with appropriate grass seeds. The vegetation cover should be such to ensure at least 80% control efficiency. The top surface area should only have 80 ha of ash material exposed at any time. The un-active surface should be stabilised with topsoil and seeded with appropriate grass seed as soon as possible. Exposed topsoil surfaces (before vegetation has established) must be watered regularly to eliminate additional windblown dust from these surfaces. Water spraying system should be implemented on the surface of the ADF covering the outer perimeter of the facility and the active 80 ha area, spraying water when winds exceed 4 m/s.
- The loss of the utilisation of the soil resource will negatively impact the land use practice of commercial cultivation of cereal crops being undertaken on the dryland soils at present. These activities are perceived to be of great economic benefit to the local economy and land owners and contribute to the ecosystem services. One of the ways in which this impact can be

minimised is by phasing the project in over several years. Refer to Table 3-1 for the project phases.

The implementation of the proposed mitigation measures will reduce the significance of the anticipated environmental impacts. Mitigation measures which have been proposed in the various specialist studies that were undertaken for the proposed project have also been included. The findings of the Impact Assessment showed that the proposed Kendal 30-year ADF Project will not lead to unacceptable environmental costs.

Opinion regarding Authorisation of Activity

The Scoping and Environmental Impact Reporting Process have been undertaken in accordance with the NEMA (1998) and the regulations thereunder. All reasonable measures have been taken to ensure that a comprehensive assessment of the environmental impacts likely to result from the proposed project activities are identified and assessed. Based on the findings of the Impact Assessment, the EAP sees no reason why Environmental Authorisation should not be granted for the proposed project to proceed.

Proposed Conditions of Authorisation

Taking into account the outcome of the S&EIR Process, and in particular the EIA Phase, it is proposed that the CA include the following conditions, intended to ensure that the BPEO for all proposed activities associated with the Kendal 30 year ADF Project is implemented:

All feasible mitigation measures included in the specialist studies carried out for the proposed project is implemented during the project lifecycle;

Eskom SOC Limited may not alter the location of any of the project activities included in this Environmental Impact Report without obtaining the required Environmental Authorisation(s) to do so under the NEMA (1998).

The draft EMPr must be implemented fully at all stages of the proposed Kendal 30-year ADF Project life cycle.

12 CONCLUSION

Eskom appointed Zitholele Consulting to undertake the EIA for the proposed development of the Kendal 30-yead ADF for the KPS. This EIA study was undertaken with the aim of investigating potential impacts both positive and negative on the biophysical and socio-economic environment and identifying issues, concerns and queries from I&APs.

This FEIR documents the process followed and the findings and recommendations of the study. Additionally, attached to this document is a Draft EMPr that has been developed in order to implement the proposed mitigation measures.

The way forward recommended by this study is as follows:

- ~~The Draft EIR and EMPr is submitted to the Public, Commenting Authorities and Competent Authority (DEA) for a period of 30 days;~~
- The Water Use Licence Application process has been initiated, and the application documents will be finalised and submitted to the DWS following the submission of the FEIR to DEA. ~~DEIR public review period~~.
- ~~Once~~ All the comments received from the stakeholders have been received and incorporated into the EIR, and it will now be released as a Final EIR and submitted to the DEA for decision making.
- Upon receipt of the decision, Zitholele will notify all I&APs on the stakeholder database of the DEAôs decision within the prescribed timeframe as stipulated by the Environmental Authorisation.

13 REFERENCES

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