

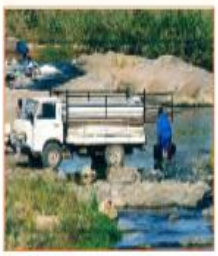




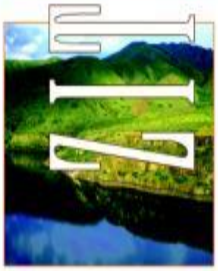

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Kendal Power Station

Continuous Ash Disposal Facility

DEA Reference Number: 14/12/16/3/3/3/63

NEAS Reference Number:
DEA/EIA/00001508/2012

September 2014
Project 12810

Proponent:
Eskom Holdings SOC Limited
P O Box 1091
Johannesburg
2000

FINAL ENVIRONMENTAL IMPACT REPORT

YOUR COMMENT ON THE FINAL ENVIRONMENTAL IMPACT REPORT (FEIR)

The FEIR is available for comment from Friday, **12 September 2014 to** Friday, **24 October 2014.** This FEIR has been distributed to the authorities, and copies thereof are available at strategic public places in the project area (see below).

List of public places where the Draft Environmental Impact Report is available:

PLACE	Address / Contact details
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 – 28 Hofmeyer Street	013 653 3116
Kungwini Public Library	013 932 6305
Kendal Power Station – Security Reception	013 647 6002

The Final Environmental Impact Report is also available electronically from the Public Participation office or on the Zitholele web site: http://www.zitholele.co.za, or the Eskom website http://www.zitholele.co.za/ea-and-wml-for-the-on-going-ash-disposal-at-kendal-power-station *(Kendal)*

Registered Interested and Affected Parties (I&APs) must submit comments on this FEIR to the Competent Authority (i.e. Department of Environmental Affairs) and provide a copy of such comments to the applicant or EAP (i.e. Zitholele Consulting (Pty) Ltd.).

All changes and amendments to the document 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~~.

For the sake of readability where drawings have been updated or replaced only the new drawings are shown.

DUE DATE FOR COMMENT ON THE FINAL ENVIRONMENTAL IMPACT REPORT IS 24 October 2014.

SEND YOUR COMMENTS TO THE PUBLIC PARTICIPATION OFFICE:

Nicolene Venter
Zitholele Consulting, PO Box 6002,
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AN EIA AND WMLA CONSISTS OF SEVERAL PHASES

EXECUTIVE SUMMARY

The last unit of the Kendal Power Station (KPS) became operational in 1993, eleven (11) years after construction of the Power Station commenced. Boasting as the world's largest coal-fired Power Station and holding several Eskom performance records, the KPS can be regarded as one of Eskom's flagship projects. Furthermore, the KPS's cooling towers are the largest structures of their kind in the world with a height and base diameter of 165 metres. The KPS is located approximately 40km south of Witbank in the Mpumalanga Province (refer to **Figure 1-1**) and employs more than 830 staff.

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 Ash Disposal Facility (ADF) site 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 (8) year contingency period. Subsequent to the completion of the design and construction of the Continuous 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 KPS, the storage capacity of the initial ADF would no longer suffice to accommodate the volume of ash that will be generated over the 60 years as well as during the 5 year contingency period. To ensure that the KPS ADF has adequate storage capacity for the full operating life of the Power Station, two primary actions have been identified as possible resolutions. These actions include:

a) Continuing the existing ADF over the short term to accommodate ash disposal while the establishment of a new ADF site takes place; and
b) Securing an additional ADF Site and the development thereof to accommodate the volume of ash that will be generated over the remainder of the 60 year and 5 year contingency period of the Power Station's lifespan.

The continuation of the existing ADF will necessitate the construction of supporting infrastructure. In addition to the construction of the supporting infrastructure required for the operation of the proposed Continuous ADF, the proposed project activities also include increasing the capacity of the existing Emergency-Dump. A detailed account of all activities that are associated with the proposed KPS ADF Project is provided in **Part 2** of this Final Environmental Impact Report.

As the existing KPS Ash Disposal Facility was constructed prior to the promulgation of the National Environmental Management Waste Act, 2008 (59 of 2008), it is regarded as a lawful Waste Management Activity. It is however the intent of Eskom, and therefore KPS, to ensure that all Waste Management Activities that are carried out subsequent to the promulgation of the NEM:WA (2008) and all regulations thereunder, are done so in compliance with the applicable environmental legislation. The only existing Environmental Authorisation that is held by Eskom SOC Limited, which is specific to the existing Ash Disposal Facility, is a Water Use License.

The Environmental Authorisation Processes (i.e. S&EIR[1] and WULA[2] Processes) that are underway for the proposed KPS Continuous ADF Project are indicative of Eskom's endeavour to ensure conformance with all Environmental Legislation that has a bearing on their operations as well as improving overall Environmental Management and Monitoring at the KPS.

It must be pointed out that this Environmental Impact Report (EIR) and the Scoping and Environmental Impact Report (S&EIR) Process followed to date is only intended to provide information relating to the continuation of the existing Ash Disposal Facility. This project is termed "Continuous ADF". The Environmental Authorisation Process that will be carried out for the new Ash Disposal Facility will constitute a separate process and does not form part of this Application. The Scoping and Environmental Impact Reporting Process for the proposed KPS Continuous Ash Disposal Facility (ADF) Project was initiated with the submission of the Application for Environmental Authorisation Form to the Department of Environmental Affairs on 08 October 2012 (refer to **Appendix D2**). The proposed KPS Continuous ADF Project is therefore specific to continuing the existing ADF over the short term to accommodate ash disposal while the establishment of a new ADF site takes place. The supporting infrastructure and activities which are associated with the proposed KPS Continuous ADF Project also forms part of this Application.

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) is considered as South Africa's framework legislation which is concerned specifically with the protection of the environment through the use of various environmental management tools such as the Environmental Impact Assessment (EIA) Process. The project activities which are associated with the proposed KPS Continuous ADF Project triggers activities which are defined in the NEMA (1998) EIA Regulations Listing Notice 1 (R.544[3]), Listing Notice 2 (R.545[4]) and Listing Notice (R.546[5]). The proposed KPS Continuous ADF Project also triggers Waste Management Activities which are listed in Government Notice 921[6] and therefore requires a Waste Management License before these activities may be implemented (refer to **Chapter 3.3**). An Integrated Environmental Authorisation and Waste Management License Application Process, leading up to the submission of this final EIR to the Competent Authority, was been carried out, for the proposed KPS Continuous ADF Project.

The EIA process also serves as the mandatory environmental management tool, as indicated in Chapter 5, Section 24(5) of the NEMA (1998), which has led to the determination of the environmental impact that the proposed KPS Continuous ADF Project will have on the receiving environment. This EIR has been structured to comply with the

[1] S&EIR: Scoping and Environmental Impact Report
[2] WULA: Water Use License Application
[3] R544: Environmental Impact Assessment Regulations Listing Notice 1 of 2010 published in Government Notice R544 in Government Gazette 33306 dated 18 June 2010.
[4] R545: Environmental Impact Assessment Regulations Listing Notice 2 of 2010 published in Government Notice R544 in Government Gazette 33306 dated 18 June 2010.
[5] R546: Environmental Impact Assessment Regulations Listing Notice 3 of 2010 published in Government Notice R544 in Government Gazette 33306 dated 18 June 2010.
[6] Government Notice 921: Government Notice 921 List of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment, published in Government Gazette 37083, 29 November 2013

requirements set out in the NEMA (1998) EIA Regulations R.543 (2010) under the NEMA (1998). All other pieces of legislation which may have a bearing on the proposed project have also been taken into account during the compilation of this report (refer to **Chapter 3**). A comprehensive account of the activities which are associated with the proposed KPS Continuous ADF Project is provided in **Chapter 2** of this Final Environmental Impact Report (EIR). A description of all project activities which form part of the proposed project as well as the corresponding Environmental Authorisation requirements in terms of both the NEMA (1998) as well as the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) is also provided in **Chapter 2** of this Report.

The Baseline environmental description of the study area which is associated with the proposed KPS Continuous ADF Project is provided in **Chapter 6** of this final Environmental Impact Report. A number **of** studies were conducted by suitably qualified persons, the reports of which have been included as **Appendix E** and are summarised in **Chapter 7** of this report. During the EIA process for the proposed KPS Continuous ADF Project, the Public Participation provisions provided in Regulation 54 of the EIA Regulations R.543 (2010), under the NEMA (1998) were adhered to. A detailed account of the Public Participation Process is provided **Chapter 4** of this Final EIR. A detailed account of all alternatives which were considered for the proposed project is provided in **Chapter 5** of this report.

A detailed assessment of the status, magnitude, extent, duration, probability and significance of each identified impact was undertaken, a summary of which is provided in **Chapter 9** of this draft EIR. An Environmental Impact Statement is provided in **Chapter 11** of this report. The remaining knowledge gaps, uncertainties and assumptions are described in **Part 12** of this draft EIR.

Due to the processes that need to be followed and the timeframes required for preparation of the footprint and construction of the barrier system, there will necessarily be a transition period from current operations to disposal on the barrier system. It is expected that the transition period will be approximately 3 years. This transition period has been discussed with the ~~Department of Water Affairs~~ Department of Water and Sanitation.

In motivating for the transition period, it must be noted that the transition period is practically unavoidable as the barrier design must first be approved before work can commence on ground preparation and construction. During this time, it is in national best interests that the KPS continue to operate in the current manner, requiring that ash disposal continue as at present. This will mean that during the transition period there will be continued ashing on an unlined surface and implementation of Storm Water Management as licensed under the current Water Use License.

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ABBREVIATIONS

CO_2 ..... Carbon Dioxide
DEA ..... Department of Environmental Affairs
DMR ..... Department of Mineral Resources
DWS ..... Department of Water and Sanitation
DWEA ..... Department of Water and Environmental Affairs (Ministry)
EAP ..... Environmental Assessment Practitioner
ECA ..... Environment Conservation Act
EIA ..... Environmental Impact Assessment
EIR ..... Environmental Impact Report
EMP ..... Environmental Management Programme
GCL ..... Geosynthetic Clay Liner
GNR ..... Government Notice Regulation
HDI ..... Historically Disadvantaged Individuals
I&APs ..... Interested and Affected Parties
IEA ..... Integrated Environmental Authorisation
IEM ..... Integrated Environmental Management
IEP ..... Integrated Energy Plan
ISEP ..... Integrated Strategic Electricity Planning
kV ..... Kilo Volts
MVA ..... Mega Volt Ampere
NEM:WA ..... National Environmental Management: Waste Act
NEMA ..... National Environmental Management Act
NERSA ..... National Energy Regulator of South Africa
NIRP ..... National Integrated Resource Plan
PCD ..... Pollution Control Dam
SIA ..... Social Impact Assessment
SO_2 ..... Sulphur Dioxide
SR ..... Scoping Report
ToR ..... Terms of Reference
RMD ..... Relative Abundance of Monovalent and Divalent Cations
WMLA ..... Waste Management License Application
ADF ..... Ash Disposal Facility
CA ..... Competent Authority

1 INTRODUCTION

1.1 Project Background

The last unit of the Kendal Power Station (KPS) became operational in 1993, eleven (11) years after construction of the Power Station commenced. Boasting as the world's largest coal-fired Power Station and holding several Eskom performance records, the KPS can be regarded as one of Eskom's flagship projects. Furthermore, the KPS's cooling towers are the largest structures of their kind in the world with a height and base diameter of 165 metres.

Kendal Power Station has an indirect dry-cooling system that uses cooling towers and water. This is a closed system as there is little loss of water due to evaporation and the system utilises less water in its cooling processes than conventional wet cooled Power Stations. Kendal has six (6) 686 megawatt (MW) units. The Power Station is located approximately 40km south of Witbank in the Mpumalanga Province and employs more than 830 staff.

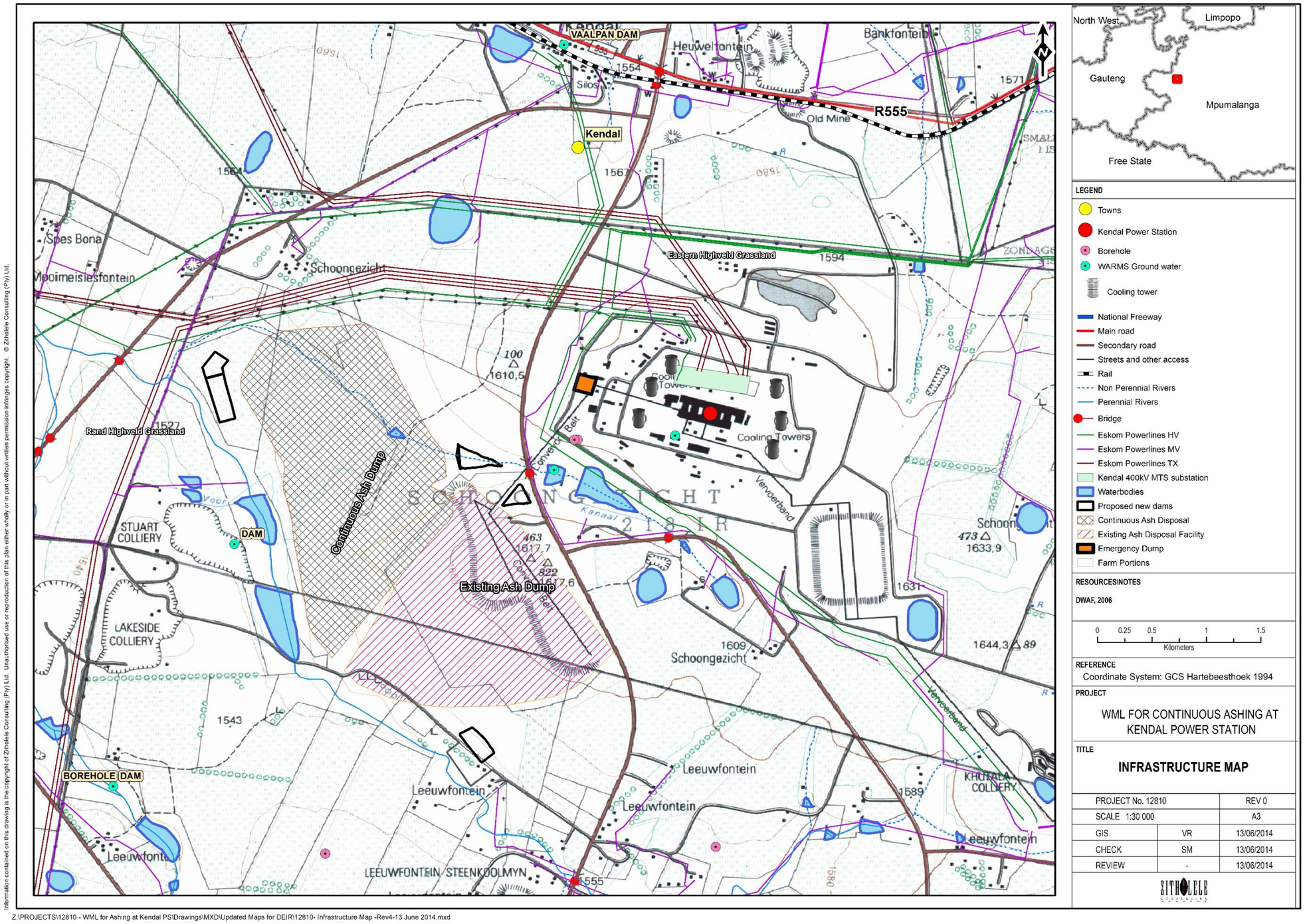
The existing Ash Disposal Facility (ADF) utilised by KPS for the disposal of ash from the electricity generation process is running out of capacity. This is, primarily, due to the KPS life span being extended from 40 to 60 years up to 2053, plus a 5 year contingency up to 2058, thereby requiring the construction of a continued and/or new ADF footprint in order to address disposal of ash for the next +/- 40 years. The KPS is expected to be decommissioned at the end of 2053. The Conceptual Engineering Designs show that ash may be accommodated at the proposed Continuous ADF up to 2030. Thereafter an alternative / supplementary site will be required for the disposal of ash for the remaining period up to the end of 2053. The aforementioned alternative / supplementary ADF does not form part of this Application. A separate Environmental Authorisation Process will be initiated for the supplementary ADF (Kendal 30 year ADF application).

Taking the aforementioned into account the extent of the proposed KPS Continuous ADF footprint will have a bearing on the remaining required capacity of the additional ADF (Proposed 30 Year ADF for KPS Project). By allowing for the maximum footprint of the proposed KPS Continuous ADF, and therefore disposal capacity, may result in a reduced footprint of the additional required ADF (Proposed 30 Year ADF for KPS Project). As the EIA Process for the proposed KPS Continuous ADF Project has proceeded further along than the EIA Process than the proposed 30 Year ADF for KPS Project, the full extent of the implication of the proposed KPS Continuous ADF on the latter cannot fully be examined at this time.

1.2 Project overview

The KPS and associated infrastructure is located approximately 40 km south-west of Emalahleni in the Mpumalanga Province. Within a regional context the Power Station falls within the borders of the Emalahleni Local Municipality which in turn forms part of the larger

Nkangala District Municipal area. The regional setting of the proposed project area is shown in **Figure 1-1**.



Z:\PROJECTS\12810 - WML for Ashing at Kendal PS\Drawings\MXD\Updated Maps for DEIR\12810- Infrastructure Map -Rev4-13 June 2014.mxd

Figure 1-1: Regional Map

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 Ash Disposal Facility site 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 (8) year contingency period. Subsequent to the completion of the design and construction of the Continuous 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 would no longer suffice to accommodate the volume of ash that will be generated over the 60 years as well as during the 5 year contingency period.

To ensure that the KPS ADF has adequate storage capacity for the full operating life of the Power Station, two primary actions have been identified as possible resolutions. These actions include:

c) Continuing the existing ADF over the short term to accommodate ash disposal while the establishment of a new ADF site takes place; and
d) Securing an additional ADF Site and the development thereof to accommodate the volume of ash that will be generated over the remainder of the 60 year and 5 year contingency period of the Power Station's lifespan.

It must be pointed out that this Environmental Impact Report (EIR) and the Scoping and Environmental Impact Report (S&EIR) Process followed to date is only intended to provide information relating to the continuation of the existing Ash Disposal Facility. This project is termed "Continuous ADF". The Environmental Authorisation Process being carried out for the new Ash Disposal Facility constitutes a separate process and does not form part of this Application.

The proposed KPS Continuous ADF Project comprises of the following principal project activities:

a) Continuation of the existing ADF in a north westerly direction;
b) Increase the storage capacity of the existing Emergency-Dump (hereafter referred to as the E-Dump);
c) Construction of Pollution Control Dams, Clean Water Dams and Storm Water Management infrastructure.
d) Diversion of a natural stream to accommodate the Continuous ADF footprint.
e) Remedial works to an existing in-stream farm dam within Eskom's property boundary, to address the mixing of flow from the final voids of the adjacent mining operations. The dam does not form part of Eskom's Water Management System.

Zitholele Consulting (Pty) Ltd has been appointed by Eskom to carry out the following Environmental Authorisation Processes:

a) An Environmental Impact Assessment Process in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) as amended, and the regulations thereunder.
b) A Waste Management License Application Process in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA), as amended, and the regulations thereunder.

The proposed project triggers a number of Water Uses as defined in Section 21 of the National Water Act, 1998 (Act 36 o 1998) (NWA). Accordingly a Water Use License Application (WULA) Process in accordance with the provisions of the NWA (1998), as amended, will be carried out. As part of the Water Use License Application a Technical Report will be prepared along with the completion of the required WULA Forms. The Technical Report and WULA Forms will be submitted to the Department of Water Affairs. The WULA documents and process do not form part of this Environmental Impact Report.

1.3 Details of the environmental assessment practitioner

In accordance with Regulation 31(2) of the NEMA (1998) Environmental Impact Assessment Regulations (2010) published in Government Notice No. R.543, this part of the Environmental Impact Report provides the details and expertise of the Environmental Assessment Practitioner (EAP) who compiled this report. The details of the Environmental Assessment Practitioner is provided in Table 1-1 and Appendix A. The expertise of the EAP is also provided below.

1.3.1 Project Environmental Assessment Practitioner

Eskom appointed Zitholele Consulting (Pty) Ltd. to undertake the regulatory Environmental Impact Assessment, Waste Management License Application and Water Use License Application Processes for the proposed KPS Continuous ADF Project. Zitholele Consulting (Pty) Ltd. is an empowerment company formed to provide specialist consulting services primarily to the public sector in the fields of Water Engineering, Integrated Water Resource Management, Environmental and Waste Services, Communication (public participation and awareness creation) and Livelihoods and Economic Development. Zitholele Consulting (Pty) Ltd has no vested interest in the proposed project and hereby declares its independence as required by the EIA Regulations.

Table 1-1: Details of the Environmental Assessment Practitioner

Name and Surname	Sharon Meyer-Douglas
Company Represented	Zitholele Consulting (Pty) Ltd.
Physical Address	Building 1, Maxwell Office Park, Magwa Crescent West, Corner Allendale Road and Maxwell Drive, Waterfall City, Midrand
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1.3.2 Expertise of Environmental Assessment Practitioner – Project Manager

Sharon Meyer-Douglas has over 14 years of experience within the field of Environmental Assessment and Impact Management. Ms Meyer-Douglas has a BSc Honours in Geography and Environmental Science and an MSc in Zoology and Biological Control.
Ms Meyer-Douglas is a long-time member of the International Association for Impact Assessments (IAIA) and is a registered professional natural scientist (*Pr. Sci. Nat.)* in the

field of environmental management with the South African Council for Natural Scientific Professionals since 2005.

Ms Meyer-Douglas has been involved in electricity generation, transmission and distribution projects and their potential impacts on the environment since the start of her career. Sharon has vast experience in managing integrated environmental authorisation processes. She has successfully managed large projects through the phases of EIA for the purposes of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and National Environmental Management Waste Act, 2008 (Act No. 59 of 2008). Ms Meyer-Douglas has also been involved in Water Use Licensing as a component of integrated authorisation processes.

Sharon has a comprehensive understanding and working knowledge of the relevant environmental legislation and works intimately with specialist consultants to ensure that potential impacts are accurately identified, assessed and mitigated. With her experience in similar projects, Ms Meyer-Douglas is ideally positioned to manage this environmental authorisation process with integrity and independence, while advising the client toward alternatives that have less potential for environmental impact.

2 PROJECT DESCRIPTION

In accordance with Regulation 31(2)(b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment (EIA) Regulations (Government Notice No. R543) this chapter of the Environmental Impact Report (EIR) serves to provide a detailed account of the planned project activities.

2.1 Project Activities

Emphasis is drawn to the fact that the proposed KPS Continuous Ash Disposal Facility (ADF) Project comprises of various elements. However, the focus of this Chapter is to provide the Competent Authority (CA) with a description of the project activities which trigger activities listed in the National Environmental Management Act (Act No. 107 of 1998) (NEMA) EIA Regulations Listing Notice 1 of 2010 (Government Notice No. R544) and Listing Notice 2 of 2010 (Government Notice No. R545). A number of the proposed project activities also trigger Waste Management Activities which are defined in Government Notice No. 921[7] promulgated in terms of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA).

The description of the project activities included in this Chapter correlates with the activities which have been included in the Application Form for Integrated Environmental Authorisation and Waste Management License. The applicability of the proposed project activity in relation to the listed activity was provided in the aforementioned Application Form. This Chapter of the EIR therefore seeks to unpack each of the proposed project activities to ensure that all environmental aspects of the proposed project activities are assessed. This will provide the CA with a comprehensive account of the environmental consequences associated with each of the activities. To ensure that the CA is provided with a holistic view of the proposed KPS Continuous ADF Project, a brief description of each of the project activities will be provided. Where the project activity triggers a listed activity, it will be indicated as such.

2.1.1 Emergency-Dump

The E-Dump is located between the KPS and the existing ADF, on the Power Station terrace. The facility functions as an emergency storage area for ash in the event of the spreaders or stacker at the dump becoming inoperable or if the ash plant is not working properly. Once the equipment is operable, the ash is loaded onto the conveyor reporting to the ADF. This area is cleared by means of trucking the ash to the ADF, which is the emergency method of removal of the ash in the event that the on-loading conveyor is not available, in order to clear the emergency dump area as quick as possible.

[7] South Africa. 2013. National Environmental Management: Waste Act, 2008 (Act No.59 of 2008) List of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment, 2013. (Notice 921). Government gazette 37083:3, 29 Nov.

Description of Emergency Dump

The storage capacity of the E-Dump will be increased to accommodate the emergency temporary storage of ash for a period not exceeding seven days' ash production, in terms of current coal qualities. The total footprint area of the surface bed will therefore increase to 28 850m², and will accommodate a total volume of 190,000 m^3. The area will be bunded within a 1 metre high reinforced concrete wall.

The surface bed will be a concrete slab cast in 25 m^2 panels, with expansion joints in between the panels. The expansion joints will comprise of an 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 towards the existing silt traps. It is proposed to use fibre reinforced concrete due to the ease of construction. The capacity of the existing E-Dump can only accommodate less than 2 days ash production, on the surface bed, in terms of the current coal qualities. The strength and durability of the concrete and its functionality will not be compromised by this choice of material. The existing storm water impoundment dam will not be upgraded. Water from the impoundment facility will be used in that area for wash water and dust suppression. Excess water from this area will gravitate to the Dirty Water Dam. ~~A five (5) meter clearance between the toe and the outer walls of the ADF have been allowed to allow vehicles access to the E-Dump for truck loading.~~

The surface bed will be cast in 25 m^2 panels, with expansion joints in between the panels. The expansion joints will comprise of an 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. An access road around the facility will facilitate the removal of ash.

Waste Classification of Ash

A study was carried out to classify the ash produced by the combustion of coal and electricity generation process and to develop an appropriate barrier design for the proposed Continuous ADF (refer to **Chapter 2.1.2**). The key findings of the study showed that in terms of the Department of Environmental Affairs' ~~draft~~ Waste Classification System, the ash is classified as a Type 3 Waste (Low Hazard Waste), therefore requiring disposal on a facility with a Class C barrier system. This classification was mostly attributable to the leachable concentration of boron and the total concentration of barium and fluoride in the ash. ~~Therefore the E-Dump will also be suitably lined with an accepted Class C barrier system including the concrete slab.~~ The surface bed will be cast in 25 m^2 panels, with expansion joints in between the panels. The expansion joints will comprise of an 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.

E-Dump: Requirement for Environmental Authorisation – NEMWA (2008)

Owing to the nature and composition of the ash that is generated by the combustion of coal, it is considered to be waste and falls within the ambit of the NEM:WA (2008). Although the increased footprint / continuation of the E-Dump will only be utilised during events where ash cannot be transferred from the KPS to the ADF via the conveyor system, the usage of the facility will necessitate and entail the disposal of hazardous waste (i.e. ash) to land. As such the proposed continuation of the E-Dump triggers Listed Activity 7 and Listed Activity 10 of Government Notice No. 921 (2013). These activities may therefore not proceed prior to the CA granting a Waste Management License for the particular activities.

E-Dump: Requirement for Environmental Authorisation – NEMA (1998)

The ash will be temporarily stored at the E-Dump until such time that the ash can be onloaded and conveyed to the ADF via the conveyor-system or by trucks in an emergency. Ash in excess of 50 tons, up to a maximum of 190 000 m^3, would be temporary stored at the E-Dump during a maximum deposition period of seven days. The ash will be removed and conveyed or trucked to the ash dump as soon as possible to ensure the E-Dump is available to allow the power station to continue operating when the ADF stacking system is not available. As was explained in **Chapter 2.1.1.3** the ash which is produced as a product of the combustion of coal is classified as hazardous waste. Therefore Listed Activity 6 of the NEMA (1998) EIA Regulations Listing Notice 2 (Government Notice No. R545) is triggered by the temporary storage of ash at the E-Dump. This proposed increase of the E-Dump storage capacity may therefore not proceed prior to the Competent Authority granting Environmental Authorisation for the particular activity.

2.1.2 Continuous Ash Disposal Facility

As was explained in **Chapter 1.2** following the completion of the design and construction of the ADF, the operating life of the KPS was extended to 60 years. As the capacity of the initial ADF was designed to accommodate the volume to ash that would be generated during the original 40 years' operating life of the KPS, plus an 8 year contingency, the storage capacity of the initial ADF would no longer suffice to accommodate the volume of ash that will be generated over the 60 year Operating Life, plus a 5 year contingency period. As a remedial measure to ensure that the KPS ADF has adequate storage capacity for the full operating life of the Power Station, it is proposed that the existing ADF be continued to accommodate ash disposal while the establishment of a new[8] ADF site takes place.

[8] It must be pointed out that this Environmental Impact Report (EIR) and the S&EIR Process followed to date is

Alternatives considered for the Continuous Ash Disposal Facility

In determining the air space required for the Continuous facility two broad options were considered. The options included:

- Option 1: Minimum Dump – The ADF is positioned between the two streams as previously described.
- Option 2: Maximum Dump (Preferred Option) – The positioning of the ADF requires the northern stream to be diverted.

A Trade-Off study as well as a Sustainability Assessment Study (refer to **Appendix E12**) was carried out to determine the Best Practicable Environmental Option (BPEO) for the Continuous ADF. Factors which were considered in determining the BPEO and conceptualising possible alternatives included environmental considerations, engineering aspects and financial considerations. The key outcomes of the Trade-Off Study included conceptualising the above mentioned two options, which have subsequently been taken forward to the EIA Phase. Option 2 (Maximum Dump / Volume) was selected as the preferred alternative. More information relating to the approach and outcomes of the Trade-Off Study is provided in Part 5 of this FEIR. A detailed account of the comparative assessment of alternatives is provided in Part 5 of this FEIR.

Preferred Alternative – Maximum Dump

The maximum volume option (refer to **Figure 2-2**) falls outside the existing design's footprint and will require the diversion of the stream located to the north-east of the proposed Continuous ADF. The physical parameters of the Maximum Dump are provided in **Table 2-1**.

Table 2-1: Physical Parameters of the Maximum Dump

Total Footprint Area:	583 hectares
Remaining dump volume	98 Mm^3 from January 2015
Remaining life:	15 years from January 2015
Maximum Height	60 meters
Lined Area	224 hectares

Ash disposal facility conceptual design

The ash is deposited onto the "dry" ADF by means of a conveyor stacker system. The transverse conveyors move the ash from the Power Station to Transfer House E. The E-Dump is located just to the north of the transfer house and was initially designed to provide a capacity of two days of ashing for emergencies such as breakdowns and maintenance to the overland conveyors etc.

- only intended to provide information relating to the continuation of the existing ADF. This project is termed "Continuous ADF".

From Transfer House E the ash is transported via the overland conveyors which cross under a provincial road and over the north eastern stream to Transfer House F at the ADF. The extendable conveyors transfer the ash from Transfer House F to the shiftable conveyors. The extendable conveyors were initially designed to extend in the direction of their current bearing as soon as the shiftable conveyors are perpendicular to the extendable conveyors. This method of deposition is called parallel shifting, but this deposition strategy cannot be implemented due to the new boundary extents of the existing area.

The shiftable conveyors are the stacker shiftable conveyor (Primary system) and the spreader shiftable conveyor (Standby system). These are used to deposit the ash onto the ADF. The current deposition strategy is to place ash only via radial shifting. The layout and various elements of the conveyor system are shown in **Figure 2-1**.

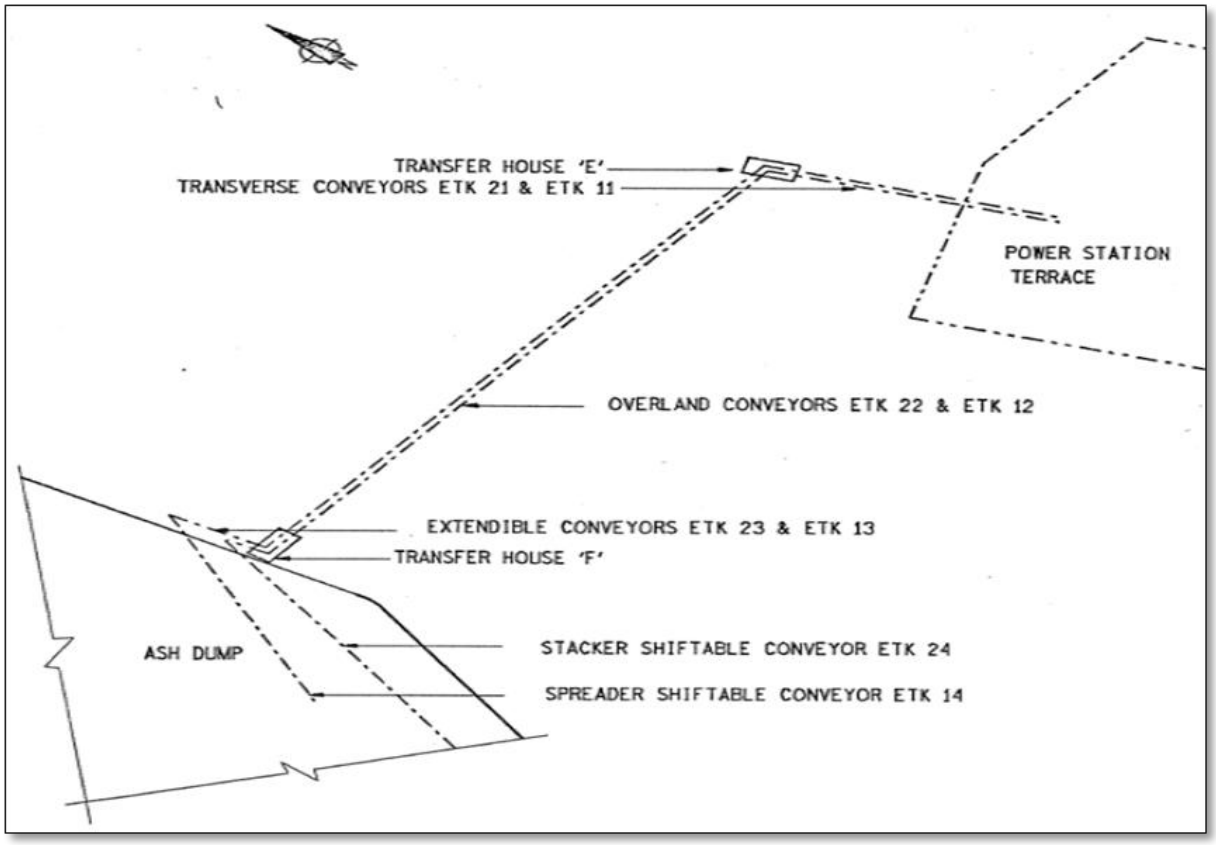

Figure 2-1: Schematic Layout of conveyor system used to deposit ash

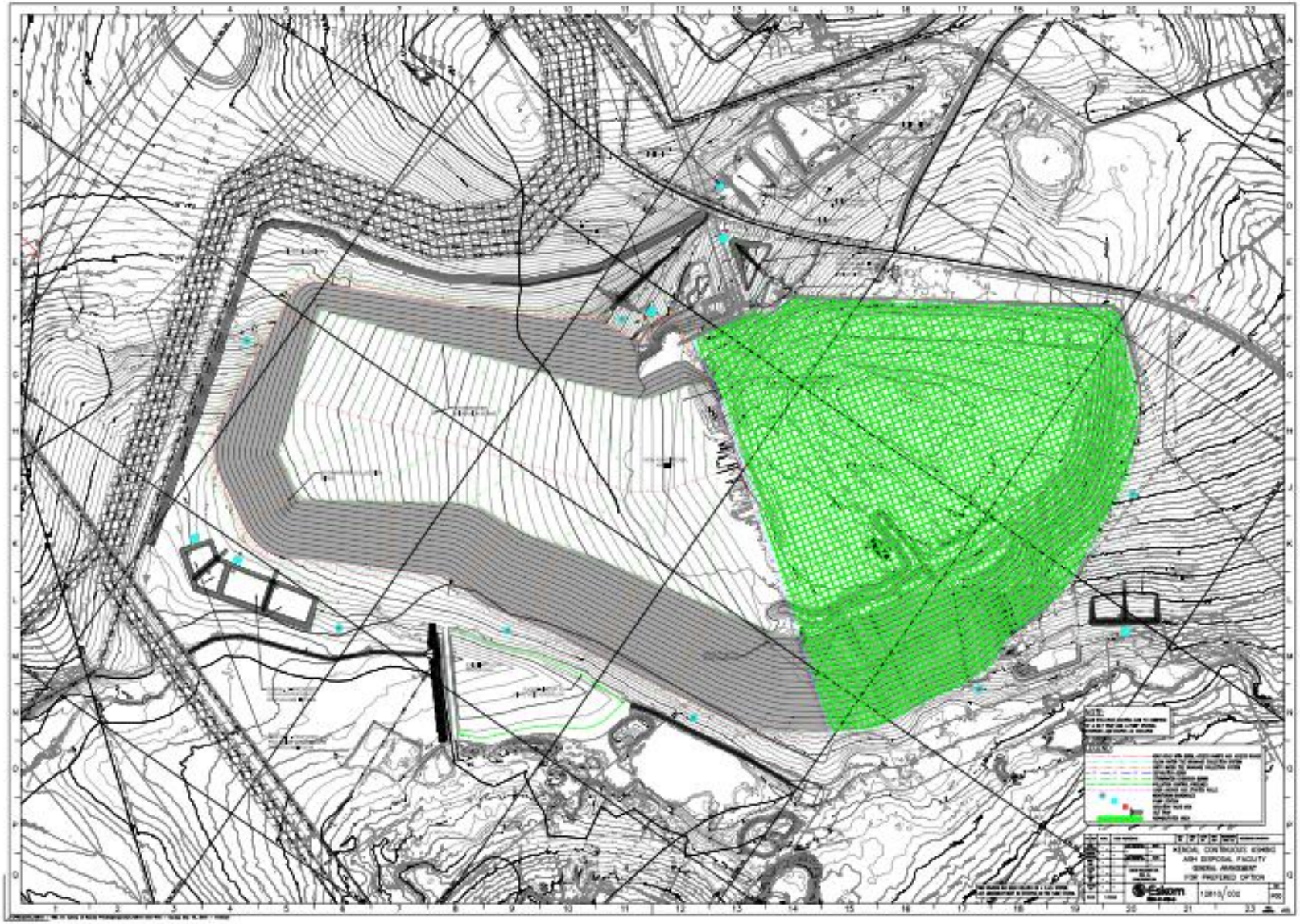

Figure 2-2: Option 2 (Preferred Option) - Maximum Dump

There are some limitations to these shiftable conveyor systems as the ash is only placed radially. Some of the limitations are:

- The maximum gradient the system can traverse is 1V:20H
- As the conveyor cannot bend in plan, the advancing face as well as the final face position cannot have any kinks or bends as this meant that the conveyor had a bend in place
- The maximum frontstack height the of the spreader system is approximately 45m and 62m for the stacker system
- The spreader system can only place a front stack where the stacker system can place a front stack and back stack.
- Shift intervals need to be kept to a minimum, between 4-6 months per shift.

The estimated time it would take to get all the authorisations in place as well as provide detailed designs, tender and construction would extend up to July 2017. During this time the KPS still needs to continually ash and thus a certain amount of ashing will still take place, as per the existing operation after the authorisation has been given as it would then be impractical to line the area. The proposed Continuous ADF will include an appropriate barrier system. Details pertaining the proposed liner system is provided below.

Liner System

A suite of regulations as well as norms and standards, aimed at the classification and disposal of waste, was published in Government Notice No. R.634[9], R.635[10] and R.636[11] under the Section 73 of the NEM:WA (2008). The aforementioned regulations as well as norms and standards informed the classification and assessment of the ash (i.e. waste) to determine the mandatory method of disposal. In accordance with the provisions of Government Notice No. R.635 the proposed Continuous ADF facility will include an appropriate barrier system. Following the Waste Classification of the ash disposed of at KPS, it was recommended that a Class C liner be implemented because the ash was classified as Type 3 waste.

The Class C liner is made up of, amongst other materials, a 300 mm clay layer. Due to the lack of natural clay in close proximity to KPS, a Geosynthetic Clay Liner (GCL) was proposed as an alternative to the natural clay layer. This proposal was put forth to the Technical Compliance Unit at Department of Water and Sanitation (DWS) and the

[9] South Africa. 2013. National Environmental Management: Waste Act, 2008 (59 of 2008) Waste Classification Regulations, 2013. (Notice 634). *Government gazette*, 36784: 3, 23 Aug.
[10] South Africa. 2013. National Environmental Management: Waste Act, 2008 (59 of 2008) National norms and standards for the Assessment of Waste for Landfill Disposal, 2013. (Notice 635). *Government gazette,* 36784:22, 23 Aug.
[11] South Africa. 2013. National Environmental Management: Waste Act, 2008 (59 of 2008) National norms and Standards for disposal of waste to a landfill, 2013. (Notice 636). Government gazette, 36784: 34, 23 Aug.

Department of Environmental Affairs (DEA) for approval. The DWA raised a concern that bentonite in the GCL will result in an increased permeability of the liner. This may occur due to the potential effect that divalent cations, such as calcium and magnesium, may have on the permeability of bentonite contained in the GCL. The DWA recommended additional tests to determine the Relative Abundance of Monovalent and Divalent Cations (RMD).

a) Ash Bentonite Tests

In response to queries raised by the DWA additional tests were carried out including Ash Bentonite Tests. The objectives of these additional tests were to:

- Conduct leach tests on the Kendal ash and analyse the leach solution for the major mono and divalent cations in order to calculate the RMD[12];
- Conduct swell tests on the bentonite using the leach solution and verify whether or not the leach solution has an impact on the short term hydration of the bentonite.

The findings of the tests concluded that the long term permeability of the bentonite in the GCL may be negatively affected due to a low RMD. Long term hydraulic conductivity testing using facility specific ash leachate was recommended to establish the likely hydraulic conductivity of the GCL considered for the barrier system, once equilibrium with respect to cation exchange is realised. However, this will be a time consuming exercise and it is not guaranteed that the results will prove in Eskom's favour. Due to urgency of the proposed KPS Continuous ADF this option it is not recommended.

b) Preferred Alternative – Liner System

In light of the findings of the Ash Bentonite Test, as prescribed for a Class C liner sodium enriched bentonite blended at a rate of between 6 – 8% into in-situ silty material is recommended as opposed to making use of a clay layer as prescribed. Similar blended material has proven successful on other sites for similar applications. The permeability rate achieved in tests was less than 10^{-7}cm/s, which meets the target for a barrier material.

The base material can be sourced from site and the bentonite is available on the local market. However, it is the opinion of the regulator that the bentonite in the enriched soil, although a small percentage, will still be subject to significant swell and hence compromise the integrity of the barrier system. It was advised that the in-situ material be used in lieu of clay, due to the grading of it, compacted to 98% Standard Proctor at between optimum and 2% wet to achieve a target permeability of 10^{-5}cm/s. The proposed 1.5mm geo-membrane that is placed on top of the clay will need to be upgraded to 2mm.

The regulator also had a concern regarding the heat of the leachate that comes into contact with the geo-membrane. The regulator proposed that a cuspated drain be placed on top of the geo-membrane, filled with 100mm layer of blended fly ash and in-situ soils (refer to Drawing 9 included in Appendix B3). This will act as a leachate collection system as well as

[12] RMD: Relative Abundance of Monovalent and Divalent Cations

a void former between the leachate and geo-membrane. The KPS will need to address this as it is an operation requirement.

Motivation for transition period

a) Timeframes

As discussed above, the KPS has carried out conceptual design for the preferred and accepted (in principal) barrier system for implementation at the Continuous ADF. It is important to note that there are several phases for design and construction of the barrier system. Please see the table below (Table 2-2).

Table 2-2: Timeframes anticipated for design, construction and implementation of liner.

Task	Expected timeframes	Status
Conceptual Design	6 months	Complete and accepted in principle by DWA
EIA, WML approval and licensing	2 years ETA January 2015	Expected that the final report will be submitted in September 2014, with authorisation anticipated by January 2015
Detailed Design	6 months ETA July 2015	Can only commence on approval/ licensing of applications.
Construction	2 years ETA July 2017	Can only commence on approval of detailed designs.

Due to the processes that need to be followed and the timeframes required for preparation of the footprint and construction of the barrier system, there will necessarily be a transition period from current operations to disposal on the barrier system. It is expected that the transition period will be approximately 3 years. This transition period has been discussed with the Department of Water Affairs during meetings held with Kelvin Legge. The meetings in question were held on Thursday, 30 May 2013 (refer to **Appendix C2**) and Friday, 21 February 2014 (refer to **Appendix C3**).

In motivating for the transition period, it must be noted that the transition period is practically unavoidable as the barrier design must first be approved before work can commence on ground preparation and construction. During this time, it is in national best interests that the KPS continue to operate in the current manner, requiring that ash disposal continue as at present. This will mean continued ashing on an unlined surface and Storm Water Management which are provided for in the current Water Use License, during the transition period.

b) Expected Impacts of Transition Period

From the groundwater study it is evident that the current “Dry” ADF is not presenting any impacts to groundwater resources. According to the Groundwater Baseline Study that was conducted by Golder Associates Africa (2014:28) the groundwater vulnerability at the proposed Kendal Continuous and emergency ash sites are shown on the national map as low to medium. Furthermore, the impact assessment for groundwater indicates that the

Continuous ADF, unlined, will pose a risk to groundwater that is of low significance and will be limited to the study area.

The groundwater assessment report indicates that: “from the available data and assessment thereof it is concluded that the current ash disposal facility (that has been in operation for more than 25 years) has currently an insignificant impact on the local groundwater quality if compared to the background levels and DWAF Water quality guidelines for Domestic use.” (2014:27). The soils assessment report (Earth Science Solutions, 2014) has indicated that the majority of the soils within the existing ADF area are free draining. This means that any polluted leachate from the existing ADF would definitely be mobile through these soil layers and reach groundwater resources. Therefore, the fact that, despite free draining soils, no significant impact from the existing ADF has been evidenced in the groundwater monitoring, is evidence that there is a low risk that polluted leachate is leaving the existing ADF. This is indicative that there is a very low risk that continued operation of the Continuous ADF in the current manner will pose an impact to the receiving environment during the 3 year transition period.

c) Mitigation measures

While there is a low risk of environmental impact posed by the proposed transition period, Eskom is working under the principles of best practices, and will nevertheless action mitigation and management measures to reduce the risk of impact.

Mitigation measures that will be implemented will include:

- Topsoil will be recovered from position in front of the advancing ash face before it is covered by ash. Once stripped the topsoil shall be utilised for rehabilitation purposes (Eskom, 1999:2-9);
- It is proposed that surface water monitoring be undertaken on a monthly basis at the following points to assess water quality trends before and after the extension and the river diversion. The location of the water quality monitoring sites is shown in **Table 2-3**. It is recommended that the ICP-MS technique be used to do a full spectrum of metals.

  The analysis should include at least:

  - Electrical Conductivity;
  - Total Dissolved Solids;
  - Major anions and cations;
  - Metals; and
  - Faecal coliforms.

Table 2-3: Water quality monitoring sites

Monitoring ID	Latitude (S)	Longitude (E)
Dirty Water Dam	-26.095695	28.960331
Emergency Dam	-26.093758	28.957645
Clean Water Dam	-26.094133	28.955616
LEE01/ Spruit at bridge (upstream)	-26.127733	28.958387
Farm Dam	-26.096567	28.930477
SCH02 ()	-26.08263	28.93350
LEE02 (downstream)	-26.08466	28.92078
SCH01 (upstream of the diversion)	-26.09397	28.95495

- Drilling of additional seven pairs of boreholes to monitor the shallow and deep groundwater through intersecting aquifers, dolerite dykes and fault zones; and

  During the transitional period, should pollution be detected through monitoring, a deep mitigation trench or curtain will be dug between the ADF and the stream to the west of the ADF. This trench will assist in capturing polluted groundwater before it poses risk to surface water and groundwater resources west of the facility.

Ash Characteristics

Determining the characteristics of the ash which is generated by the combustion of coal and electricity generation processes at the KPS took into account various determining factors. The determining factors included the grading and specific gravity of the ash, stability of the final ADF and permeability.

a) Grading and Specific Gravity

The fly ash varies from silty sand to silty clay using a triangular soil classification chart (US corps of Engineers). The grading curve exhibits a uniform particle size distribution. According to ASTM D422-63:

- Clay sized particle is larger than 1 micrometre and smaller than 5 micrometre;
- Silt sized particle is larger than 5 micrometre and smaller than 75 micrometre; and
- Sand sized particle is larger than 75 micrometre and 425 micrometre.

Taking into account the above mentioned envelopes the grading of ash was determined (refer to **Table 2-4**).

Table 2-4: Ash Grading[13]

Particle size	Weathered fly ash	Median	Fly ash

[13] Data used from: J.S. Mahlaba et al. Fuel 90 (2011)

Particle size	Weathered fly ash	Median	Fly ash
Clay-sized (%)	5-77	16	14
Silt sized (%)	23-83	60	59
Sand sized (%)	0-64	30	27
D_{50} (µm)	3-120	23	27.5
Specific Gravity ($G_{s)}$	2-2.2	-	2.2

b) Stability

The Stability of the final ADF was not investigated in this phase as the already rehabilitated slopes are at 1V:5H which has been assessed through an observational approach as stable slopes. There is however a concern for the advancing ash face which is at angle of repose of 1V:1.2H. On the site visit held on 9 April 2013, some cracks have already formed close to the edge of the ash disposal facility.

There are measures to mitigate the stability concerns of the ash face on the base liner. A textured geo-membrane can be used, as this will increase the interface friction angle between the critical friction interfaces. Other measures such as terracing the natural ground can also be considered. Further investigations during the detailed design will have to be done to confirm the stability of the advancing face when it is placed on the liner.

c) Permeability

The permeability is largely dependent on the density of the ash on the facility. A value of 11.5m/year for medium dense ash was assumed. This is the mean of 3m/y (dense ash) to 20m/year (loose ash) (Brackley et al, 1987) (6.34*10-7 m/sec). This is required for calculating the seepage pool to the leachate collection system.

Ash Disposal Facility: Capacity requirements

The existing ash disposal facility was commissioned in the 1980's for a 40 year life span and an 8 year contingency period. The operating life of the ash disposal facility has since then been increased to 60 years with a 5 year contingency period and, with a number of other design and operational changes, the existing ADF geometry is grossly under capacity.

The total additional capacity required for the ash disposal facility is 291 Mm^3 from January 2015 until December 2058. With the current boundary and operating machinery limitations this capacity will not be reached on the current site. The remaining area between the western and northern streams does not have sufficient capacity to allow a new facility to be established. If the northern stream is diverted, the continuous ash dump will only provide 98 Mm^3 capacity, requiring a new "30"year ADF of 193 Mm^3. There are current investigations to identify a suitable site for the remaining ash to be deposited. The size and commissioning date of this new site is dependent on the Continuous ADF site capacity.

Ash Disposal Facility: Dust suppression

The current approach is to use water from the three dam system (Dirty Water Dam, Emergency Dirty Water Dam and Clean Water Dam) that is located on the East side of the ADF and then via irrigation, spray the exposed ash areas to minimise the mobilisation of the ash by wind.

Key operational staff members, in Eskom, are of the opinion that the current system is not fulfilling its intended purpose and that the system will have to be modified so that the ash mobilisation is minimal. There are a number of techniques and products that can be used including (but not limited to):

- 50 mm subsoil cover;
- Using a dust suppression chemical;
- Using a self-propelled spraying system; using pressure to propel itself forward; and
- Upgrading the current system with better controls in place.

The aforementioned options will have to be investigated further in the following phase of design as there might be a lot of other innovative approaches that can be followed.

Ash Disposal Facility: Annual tonnages

The indicated annual tonnage of ash placed on the ash disposal facility is 5500kt/annum. This information is from a previous report (Report nr: 11613601-10981-2) in which Golder Associates Africa developed an industry waste management plan for Eskom where all the waste types and quantities of all the Power Stations were considered. The density of the ash is 850kg/m^3 and thus the annual airspace required for the Continuous ADF is approximately 6.5Mm^3/annum. Based on this the remaining life for the Continuous ADF is determined.

Ash Disposal Facility: Rehabilitation of Continuous ADF

It is proposed that the current system of top-soiling and grassing be continued on the Continuous ADF (Refer to **Figure 2-3**).

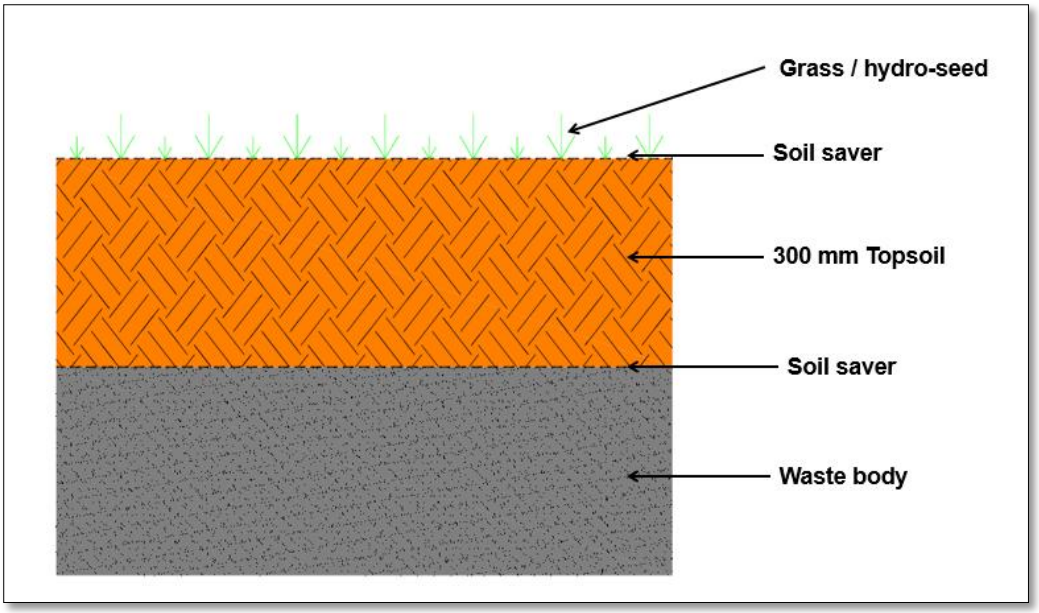

Figure 2-3: Cross Section of rehabilitated ADF

Ash Disposal Facility: Toe Paddocks

The slope available to facilitate self-cleansing velocities in the channels discharging to the pollution control dams could not be achieved. In order to prevent siltation within the channels and reduce the required velocities, it is proposed that paddocks be constructed at the toe of the advancing face to intercept run-off from the disposal facility and allow this to overflow to the discharge channels. These temporary structures will facilitate siltation (refer to **Figure 2- 4**). It is envisaged that the paddocks will be constructed from ash and will be located on top of the lined portion of the facility. The paddocks will be covered over when dozing the side slope down to the final 1:5 slope for rehabilitation of that section of the facility.

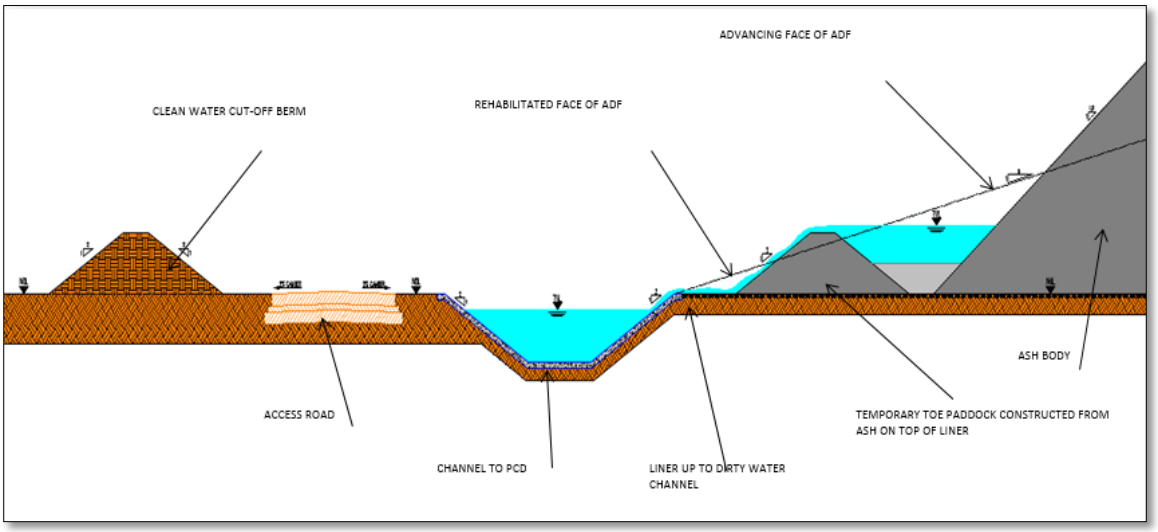

Figure 2-4: Positioning of Temporary Toe Paddocks

Ash Disposal Facility: Requirement for Environmental Authorisation – NEMA (1998)

The footprint of the Continuous ADF will cover an area greater than 50 square metres. Furthermore as was explained in **Chapter 1.2** continuing the ADF will necessitate the diversion of the stream forming the eastern border of the proposed Continuous ADF. The stream will be diverted in a northerly direction thereby bypassing the footprint of the proposed Continuous ADF. Taking the aforementioned into account the proposed Continuous ADF triggers Listed Activity 11(xi) and Listed Activity 15 of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R545) and Listing Notice 2 (Government Notice No. R545), respectively. In addition the proposed Continuous ADF will serve to store ash which is generated by the combustion of the coal and electricity generation processes of the KPS. The ash is conveyed from the KPS to the ADF by means of a conveyer system. The manner in which the ash is conveyed to the Continuous ADF along with the anticipated capacity of the ADF triggers Listed Activity 6 of the NEMA (1998) EIA Regulations Listing Notice 2 (Government Notice No. R545). The aforementioned project activities may therefore not proceed prior to the CA granting Environmental Authorisation.

Ash Disposal Facility: Requirement For Environmental Authorisation – NEM:WA (2008)

Owing to the nature and composition of the ash that is generated by the combustion of coal, it is considered to be waste and falls within the ambit of the NEM:WA (2008). The continuation of the ADF together with the nature and composition of the ash triggers Listed Activity 7 and Listed Activity 10 of Government Notice No. 921 (2008). These activities may therefore not proceed prior to the CA granting a Waste Management License for the particular activities.

2.1.3 Stream Diversion

The current extent of the Ash Disposal Facility is bordered by one perennial stream to the east and one non-perennial stream to the west. A non-perennial stream drains the north eastern site of the ash disposal facility. The stream to the East flows in a north-westerly direction whilst the stream to the West flows northerly. The two streams converge north of the existing ADF. In order to achieve the maximum volume footprint as required for the Continuous ADF, it is proposed that the stream forming the eastern border of the ADF be diverted in a northerly direction. The diversion channel will be sized to match the discharge capacity of the existing clean water dam spillway, as well as the additional storm water runoff to the east side of the diversion channel. This clean water dam spillway is located upstream of the culvert system across the district road adjoining the R555 and R50 national roads.

Description of Stream Diversion

The stream serves as a receptor for discharge from the existing clean water dam and the storm water runoff to the east below the culverts, located up-slope. The maximum discharge over the dam's spillway is 100m^3/s, plus the storm water runoff to the east below the culverts. The diversion channel will be sized to cater for this flow while incorporating an additional freeboard of 1 meter. The preliminary sizing of the stream diversion channel includes a bottom width of 10 meters and a depth of 2 meters. The left and right side slopes are 1V:2.5 and 1V:3H respectively. A side berm will be constructed on the lower left bank to provide the 1 meter freeboard. A typical section for the stream diversion is shown in **Figure 2-5.**

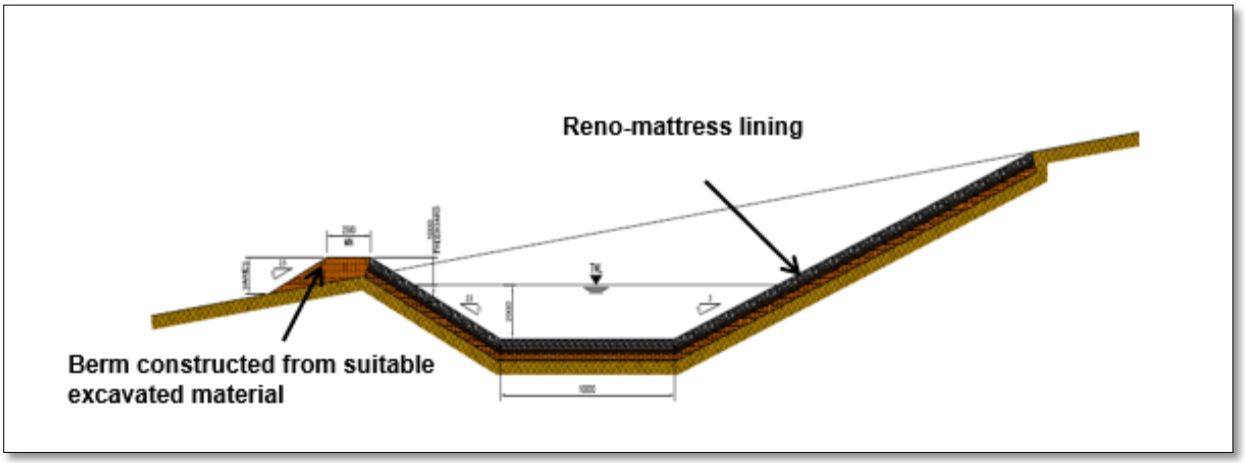

Figure 2-5: Cross Section of Stream Diversion Channel

To ensure the provision of an optimal solution for the stream diversion, the following aspects will be investigated during the subsequent design phase:

- Investigating impact of stream diversion on downstream ecosystem;
- Establishing appropriate indigenous vegetation in the new stream diversion canal;
- Erosion mitigation in initial stages; and
- Probability of leachate of the existing facility migrating towards the stream diversion.

Stream diversion: Requirement for Environmental Authorisation – NEMA (1998)

The proposed stream diversion will entail the construction of a channel. Furthermore the construction activities associated with the diversion of the stream will inherently necessitate excavations within and the removal / moving soil from the stream. The proposed stream diversion therefore triggers Listed Activities 18 and 11(ii) of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R544). The aforementioned project activities may therefore not proceed prior to the CA granting Environmental Authorisation.

Requirement for Environmental Authorisation – NEM:WA (2008)

The proposed stream diversion will not entail any Waste Management Activities listed in Government Notice No. 921 and does therefore not fall within the ambit of the NEM:WA (2008).

2.1.4 Farm Dam

A farm dam is located to the west of the existing ADF. The farm dam is in-stream on a diverted watercourse created in order to undertake open cast coal mining on its original course. Although the property associated with the farm dam is owned by Eskom SOC Limited, this area does not form part of the ADF water management philosophy. The dam is currently used by a farmer to irrigate two centre pivots, located on the footprint of the proposed extension. The irrigation activities will however cease once the construction of the Continuous ADF commences.

Lowering of the Farm Dam Wall

The dam sustains a wetland located at the toe of the farm dam wall. The wetland is sustained via seepage through the farm dam wall. The height of the dam wall poses a significant institutional challenge for Eskom SOC Limited as the top water level may at times reach the surface levels of the final mine voids which are located adjacent to the farm dam. This is not ideal as flow enters the final voids when the level in the dam is high. By lowering the dam wall, the dam extent will be decreased, reducing the inflow into the final voids. However, the mine may decant uncontrollably into the farm dam, thereby contributing to flow from the dam entering the final voids. This matter falls outside the scope of Environmental Assessment Practitioner and should be tended to by the mining house.

The following works are proposed to prevent the continued flow from the farm dam entering the final voids:

- New lower earth dam wall to be built downstream of the existing farm dam to prevent overflow into mining voids and vice-versa (Preferred Option);
- Existing dam wall to be removed;
- Engineered seepage from the new dam to downstream of wall taken into consideration for wetland sustainability;
- Upstream approach channel and outlet channel to dam to be lined using reno mattress – flat gradients; and
- Channel designed for the 1:2 year storm flow velocities.

Lowering farm dam wall: Requirement for Environmental Authorisation – NEMA (1998)

The nature of the construction activities associated with lowering the farm dam wall will fundamentally entail excavations within and the removal / moving soil from the watercourse. The proposed lowering of the farm dam wall therefore triggers Listed Activities 18, 12 and Listed Activity 11(iv) of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R544). The aforementioned project activities may therefore not proceed prior to the CA granting Environmental Authorisation.

Lowering farm dam wall: Requirement for Environmental Authorisation – NEM:WA (2008)

The proposed lowering of the farm dam wall and associated activities will not trigger any Waste Management Activities listed in Government Notice No. 921 and do therefore not fall within the ambit of the NEM:WA (2008).

2.1.5 Pollution Control Dams

To ensure sufficient capacity for the containment of contaminated run-off ("dirty water") two additional Pollution Control Dams (PCDs) (PCD 1 and PCD5) are proposed. Existing Pollution Control Dams (PCDs) within the footprint of the KPS include a Dirty Water Dam and Emergency Dirty Water Dam. The capacities of PCD 1 and PCD 5 will be 120Mℓ and 76Mℓ (plus 2 days storage for dust suppression water) respectively. The sizing of these dams was achieved by developing a 50 year integrated station and ADF water balance model, to ensure the PCDs do not spill more than once in 50 years, as per GN704 (refer to **Chapter 2.4.** of this draft EIR). These PCDs may be constructed within 32m of a watercourse. The coordinates for each of the proposed PCDs are shown in **Table 2-5**.

Table 2-5: "Dirty" Water Channels Concept Design Parameters

COORDINATES OF PROPOSED PCDs		
Description	**Latitude (South)**	**Longitude (North)**
Pollution Control Dam 1		
Point 1	-26.0848420	29.0705140
Point 2	-26.0841310	29.0715990
Point 3	-26.0854290	29.0726410
Point 4	-26.0863110	29.0723630
Point 5	-26.0859350	29.0708970
Point 6	-26.0854480	29.0710010
Pollution Control Dam 5		
Point 1	-26.0917880	29.0515210
Point 2	-26.0938170	29.0513570

Requirement for Environmental Authorisation – NEMA (1998)

As the construction of PCDs requires a Water Use Licence (refer to **Chapter 4**), Listed Activity 5 of the NEMA (1998) EIA Regulations Listing Notice 2 (Government Notice No. R545) will be triggered. As defined in Chapter 12, Section 117 (c) of the National Water Act, 1998 (Act no. 36 of 1998) a dam with a safety risk means "*any dam which can contain, store or dam more than 50 000 cubic metres of water, whether that water contains any substance or not, and which has a wall of a vertical height of more than five metres, measured as the vertical difference between the lowest downstream ground elevation on the outside of the dam wall and the non-overspill crest level or the general top level of the dam wall*". The vertical height of the proposed PCD 1 and PCD 5 is 6 meters and 8 meters respectively. The storage capacity of PCD 1 and PCD 5 is 120 000 m^3 and 76 000 m^3 respectively. The vertical height and storage capacity of the proposed PCDs (i.e. PCD 1 and PCD 5) therefore exceeds the thresholds provided in Section 117(c) of the NWA (1998) and are therefore also classified as a dams with a safety risk. The applicable provisions included in Government Notice No. 704[14], promulgated in terms of the NWA (1998) must therefore be adhered to.

The proposed PCDs will extend over an area greater than 50 square metres and may fall within 32 m of various watercourses. Therefore Listed Activities 11(iv) and 11(xi) of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R544) will be triggered by the proposed PCDs. Furthermore Listed Activity 15 of the NEMA (1998) EIA Regulations Listing Notice 2 (Government Notice No. R545) will also be triggered due to the footprint of the proposed PCDs. The aforementioned project activities may therefore not proceed prior to the CA granting Environmental Authorisation.

[14] South Africa. 1999 National Water Act Regulations on use of water for mining and related activities aimed at the protection of water resources, 1999. (Notice 704). *Government gazette* 20119, 4 June.

Requirement For Environmental Authorisation – NEM:WA (2008)

The proposed PCDs will not trigger any Waste Management Activities listed in Government Notice No. 921 and do therefore not fall within the ambit of the NEM:WA (2008).

2.1.6 Clean Water Dams

In addition to the existing power station Clean Water Dam, three additional Clean Water Dams (Dam 2, Dam 3 and Dam 4) are proposed for the rehabilitated ash dump storm water containment, in order to not mix this water with the highly impacted storm water from the open ash areas in Dam 1 and Dam 5. The capacities of Dam 2, Dam 3 and Dam 4 will be 257Mℓ, 76Mℓ and 32Mℓ (plus two days storage for irrigation water) respectively.

The proposed Clean Water Dams will be operated on a controlled release principle which is based on the receiving water quality. It is not the intention to impound clean water if not required, provided that the discharge quality is acceptable. If the water in these dams is deemed impacted, it will be irrigated onto the areas that it emanated from or utilised in the KPS Water Balance if possible.

Requirement for Environmental Authorisation – NEMA (1998)

The footprint of the proposed Clean Water Dams will cover an area exceeding 20 hectares. The containment of water in the proposed Clean Water Dams also constitutes as the off-stream storage of water. Taking the aforementioned into account the proposed Clean Water Dams trigger Listed Activity 12 of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R544) as well as Listed Activity 15 of Listing Notice 2 (Government Notice No. R545). The aforementioned project activities may therefore not proceed prior to the CA granting Environmental Authorisation.

Requirement for Environmental Authorisation – NEM:WA (2008)

The proposed Clean Water Dams will not trigger any Waste Management Activities listed in Government Notice No. 921 and do therefore not fall within the ambit of the NEM:WA (2008).

2.1.7 Conveyance infrastructure (pumps, pipelines and channels)

The proposed operational philosophy around storm water management will involve the construction of new infrastructure. Conveyance infrastructure, including pumps, pipelines and channels, will be required for the following reasons:

- Conveyance of spills from one facility to the next;

- Conveyance of ash / dust suppression water from the relevant dams to the dedicated storage reservoirs;
- Conveyance of rehabilitated runoff water from the ADF to the dedicated storage reservoirs;
- Dust suppression from storage reservoir to open ash area of the ADF;
- Irrigation from storage reservoir to the rehabilitated area of the ADF; and
- Irrigation of the Power Station terrace grassed areas from the Clean Water Dam.

Requirement for Environmental Authorisation – NEMA (1998)

The internal diameter of the pipelines and channels as well as the peak throughput may exceed 0.36 m and 120 l/s respectively. As the proposed conveyance infrastructure will also function to transfer water between impoundment (i.e. dams) Listed Activity 9 of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R544) will be triggered.

Requirement for Environmental Authorisation – NEM:WA (2008)

The proposed conveyance infrastructure will not trigger any Waste Management Activities listed in Government Notice No. 921 and does therefore not fall within the ambit of the NEM:WA (2008).

2.1.8 Access Road

To accommodate construction vehicles travelling to and from the site during the Construction Phase it is proposed to construct a temporal short right turn lane on the north approach of D686 Road and the proposed Continuous ADF. The location of the access road is showed in **Table 2-6**.

Table 2-6: Description of access road location

LOCATION OF ACCESS ROAD		
Points along road	**Latitude (South)**	**Longitude (North)**
Point 1	-26.0974600	29.0482460
Point 2	-26.1094110	29.0391580
Point 3	-26.1096250	29.0621320
Point 4	-26.0825810	29.0671010

Requirement for Environmental Authorisation – NEMA (1998)

No road reserve has been defined for the proposed access road. It is however anticipated that the access road will exceed 8m in width. Therefore, Listed Activity 22 of the NEMA (1998) EIA Regulations Listing Notice 1 (Government Notice No. R544) will be triggered.

Requirement for Environmental Authorisation – NEM:WA (2008)

The proposed access road will not trigger any Waste Management Activities listed in Government Notice No. 921 and does therefore not fall within the ambit of the NEM:WA (2008).

2.2 Dust Suppression Abstraction Philosophy

Impacted (dirty) storm water will be contained in four PCDs namely:

- Dirty Water Dam (existing);
- Emergency Dirty Water Dam (existing);
- Dam 1 (proposed); and
- Dam 5 (proposed).

Apart from capturing runoff from their respective areas, dust suppression and irrigation water will be stored in Dam 5 and Dam 4 respectively. It is proposed that additional two days storage be allowed for in the capacity of these dams. The operating philosophies of these dams are interlinked with respect to abstraction of water for dust suppression and will need to be managed effectively to ensure peak performance. The relationship between these dams is as follows:

- The Emergency Dirty Water Dam will need to always have a minimum of 55Mℓ available storage capacity to contain spills from the Dirty Water Dam, therefore it should be given priority for dust suppression to maintain this capacity;
- If the Emergency Dirty Water Dam has the minimum storage capacity available, then water for dust suppression will be abstracted from either the Dirty Water Dam or Dam 1 (proposed). Water will be abstracted from the dam with the highest volume by percentage of its storage capacity; and
- Dam 5 is used as a storage reservoir for dust suppression. Water from the three other PCDs are pumped here for dust suppression.

2.3 Hydraulic Analysis

2.3.1 Sizing of “Clean” Storm Water Diversion Drains and Berms

The topography of the area earmarked for the Continuous ADF has a natural rolling terrain in a north-westerly direction. Consequently, “clean” surface runoff can only be expected from the contributing sub-catchments located to the east of the study area. The river diversion will be sized to convey the peak discharge generated during a 1:100 year storm event from the contributing catchment downstream of the spillway and the clean water dam spillway

capacity of 100 m^3/s. The spillway is used as a control point from the contributing catchments upstream.

2.3.2 Sizing of "Dirty" Storm Water Conveyance Drains

Surface runoff generated from within the footprint of the Continuous ADF will ultimately report into toe-drain canals running northerly along the western and eastern toe lines. This system comprises of two types of drains (Toe line drain D1 & Dam 5 Outlet Drain O1) in series leading into PCD 1 shown in the figure below. The toe line drain D1 and Outlet Drain O1 are situated on the western and eastern sides of the ADF and are permanent lined trapezoidal drains (refer to **Figure 2-6**).

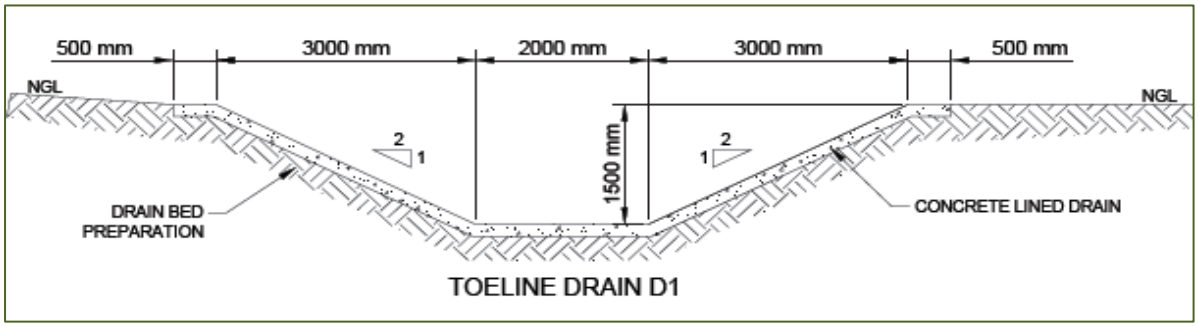

Figure 2-6: Toe Line Drain (D1)

It is assumed that the runoff from sub-catchment 2A & 2B will flow across the catchments towards sub-catchment 1B. Thus no drain is required at the toe of sub-catchment 2B. However there will be a separation berm at the toe of sub-catchment 2B to have a clear separation between the clean and dirty water areas. As soon as Cell 2 is constructed, the final toe drain is constructed on the northern side of the final footprint, this drain will only be designed in the next phase of design. Outlet Drain O1 is constructed from where sub-catchment 2B and 1B converges (refer to **Figure 2- 7**).

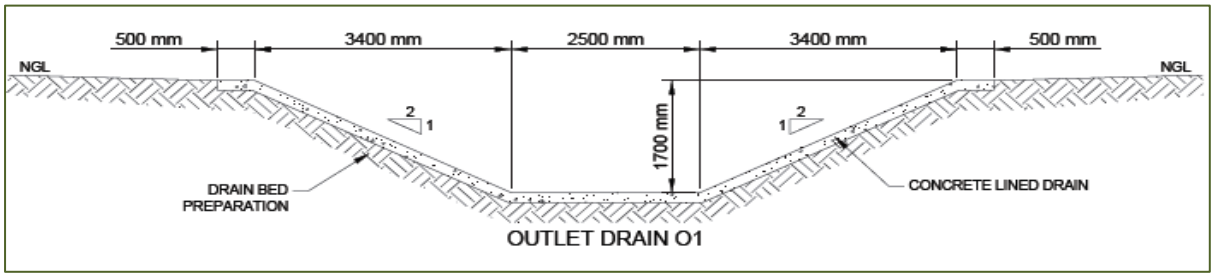

Figure 2-7: Outlet Drain O1

The Preliminary design parameters for the "dirty" storm water drains are shown in **Table 2-7**.

Table 2-7: "Dirty" Water Channels Concept Design Parameters

DESIGN PARAMETER	"DIRTY" WATER CHANNEL	
	Toe line Drain (D1)	**Outlet Drain (O1)**
Channel Type	Trapezoidal	Trapezoidal

DESIGN PARAMETER	"DIRTY" WATER CHANNEL	
	Toe line Drain (D1)	**Outlet Drain (O1)**
Lining Type	Concrete	Concrete
Friction Calculation Method	Manning's Formula	Manning's Formula
Flow Rate Q(m^3/s)	33	46
Bed Slope S (m/m)	0.005	0.005
Manning's N ($s/m^{1/3}$)	0.016	0.016
Velocity V(m/s)	4.1 (to be optimised at detailed design stage)	4.4 (to be optimised at detailed design stage)
Side Slopes (m/m)	0.5	0.5
Bottom Width (m)	2	2.5
Normal Depth (m)	1.5	1.7

2.4 Storm Water Management

The management philosophy for the routing and capturing of storm water is summarised as follows:

- The separation of the runoff draining south-easterly towards the Continuous ADF (i.e. from the area upslope of the ADF) and runoff generated from within the footprint of the Continuous ADF;
- The diversion of "clean" surface runoff generated from the upslope contributing catchments away from the Continuous ADF, thereby isolating the ADF as "dirty areas" in accordance with the requirements Government Notice No. 704 in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA); and
- Containment of all "dirty" surface runoff generated from within the "dirty" catchment, conveyance and discharge into a dedicated pollution control dam sized in accordance with the requirements Government Notice No. 704 in terms of the NWA (1998).

A detailed account of the Storm Water Management Philosophy for the proposed KPS Continuous ADF is provided in the Engineering Report (refer to **Appendix B**) as well as in the Integrated Water Use License Technical Report. A copy of the existing Water Use License is included in **Appendix C**. For the purpose of this report, which is to provide the CA with sufficient information relating to the proposed project activities to make an informed decision, only an overview of storm water management measures that will be implemented during both the Construction and Operational Phases are provided below.

2.4.1 Existing Storm Water Management Measures

The existing storm water management system entails that clean and impacted water are separated within the Power Station terrace and handled separately. The clean water reports to the Clean Water Dam and the impacted water reports to the Dirty Water Dam via a water Crossover Plant and Silt Trap. Surface runoff within the catchment draining naturally to the above Dirty Water Dams is diverted around these dams to the Clean Water Dam by means

of a berm, located to the north of the dams, and conveyed via a concrete channel located to the south of the dams.

2.4.2 Proposed Storm Water Management Measures

The new system will need to manage the storm water run-off from the ADF as well as manage the impacts that this has on the existing three dam system. All dams operated within the Water Management Philosophy will need to be in compliance with Government Notice No. 704. This will entail the following:

- Confine any unpolluted water to a clean water system, away from any dirty area;
- Design, construct, maintain and operate any clean water system so that it is unlikely to spill into any dirty water system more than once in 50 years;
- Design, construct, maintain and operate any dirty water system so that it is unlikely to spill into any clean water system more than once in 50 years;
- Collect the water arising within any dirty area, including seepage; and
- Design, construct and maintain all storm water systems in such a manner as to guarantee the serviceability of such conveyances for flows up to and including those arising as a result of the maximum flood with an average period of recurrence of once in 50 years.

2.5 Operational Requirements

In sizing the proposed infrastructure, several assumptions were made for the operational philosophy surrounding the ADF and its infrastructure. These assumptions need to be realised during operation in order to ensure the performance of the new infrastructure.

2.5.1 Monitoring of Quality in Clean Water Dams

The Clean Water Dams have been sized not to spill more than once in fifty years, which takes into consideration irrigation onto the rehabilitated areas. These dams will need to be monitored for water quality on a continuous basis. If the water is deemed clean with respect to the discharge quality of the receiving environment, then it may be released. However, if the quality does not meet the discharge quality, then this water must be irrigated onto the rehabilitated areas.

2.5.2 Maintaining Open Ash Areas for Dust Suppression

It is recommended that an optimum open ash area of 82 hectares be maintained during operations. The respective dams have been sized accordingly. If significantly smaller areas of open ash area are maintained, the dams recommended is this report will be too small to ensure that KPS does not spill more than once in fifty years from the pollution control dams.

2.5.3 Maintaining Silt Traps

The storage capacity of the proposed dams does not assume a continuous influx of silt into the dams as the dams are equipped with silt traps. If these silt traps are not maintained as per their design requirements, the performance of the dams will be compromised. The design of the silt traps will be finalised during detailed design and the operations thereof need to be communicated to the Power Station operators.

3 ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

This part of the Environmental Impact Report (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[15] (1998) is regarded as South Africa's Environmental Management Framework Act. An overview of sector specific environmental Acts which govern specific elements or project activities and the relevance on the proposed project will also be provided. 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[16]. 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.

3.1 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 –

Everyone has the right –

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 –
   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.

The National Environmental Management Act, 1998 (Act No. 107 of 1998) 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 Environmental Assessment Practitioner (EAP[17]), Applicant and Competent Authority to ensure that this right is not infringed upon. The Sector Guidelines for Environmental Impact Assessment (2010) (Government Notice 654[18]) describe a number of responsibilities which are placed on the

[15] NEMA: National Environmental Management Act, 1998 (Act 107 of 1998).
[16] EIR: Environmental Impact Report.
[17] EAP: Environmental Assessment Practitioner.
[18] 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.

EAP, Applicant and Competent Authority to ensure conformance with the statutory Environmental Right.

These responsibilities include:

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

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

Environmental Management can be defined as the management of human interaction with the environment. Fuggle and Rabie (2009:1) defines Environmental Management as the regulation of the effects of peoples' activities, products and services on the environment. Although South Africa has a comprehensive array of environmental legislation and policies in place, these must be aligned with the provisions of the NEMA (1998), in particular the National Environmental Management Principles stipulated in Chapter 1 of the NEMA (1998). The Environmental Management Principles are centred on providing explicit guidance for co-operative and environmental governance on all matters relating to decision-making which will affect the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state and to provide for matters connected therewith.

Although the proposed project is primarily concerned with continuation of the existing Ash Disposal Facility (ADF) at the Kendal Power, the Continuous ADF will require additional supporting infrastructure including Pollution Control Dams. The supporting infrastructure and project activities, in addition to the Continuous ADF, fall within the ambit of the NEMA (1998). These project activities trigger activities listed in the Environmental Impact Assessment Regulations Listing Notice 1 (Government Notice R544[19]) and Environmental Impact Assessment Regulations Listing Notice 2 (Government Notice R545[20]) as amended, therefore requiring Environmental Authorisation before they may be implemented. The proposed activities prompt a full Scoping and Environmental Impact Reporting Process.

[19] R544: Environmental Impact Assessment Regulations Listing Notice 1 of 2010 published in Government Notice R544 in Government Gazette 33306 dated 18 June 2010.
[20] R545: Environmental Impact Assessment Regulations Listing Notice 2 of 2010 published in Government Notice R545 in Government Gazette 33306 dated 18 June 2010

Each of the project activities as well as the corresponding listed activity is provided in **Table 3-1**.

Table 3-1: Description of Listed Activities

No.	Listing Notice	Listed Activity		Project Activity	Description
1.	Listing Notice 1 of 2010, Government Notice R544	18	The infilling or depositing of any material of more than 5 cubic metres 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;	Stream Diversion Channel	The nature of the construction activities required for the stream diversion will inherently entail excavations within, and the removal / moving soil from the stream. The volume of soil that will be removed by the excavations may exceed 5 cubic metres.
				Farm Dam	The nature of the construction activities associated with lowering the dam wall will inherently entail excavations within, and the removal / moving soil from the watercourse. The volume of soil that will be removed by the excavations may exceed 5 cubic metres.
2.	Listing Notice 1 of 2010, Government Notice R544	11(ii)	The construction of: (ii) channels; 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.	Stream Diversion Channel	Diversion of the stream forming the eastern border of the extended ADF[21] in a northerly direction. *The construction of the stream diversion channel will require work / activities to be undertaken within the stream.*
3.	Listing Notice 1 of 2010, Government Notice R544	11(xi)	The construction of: (xi) infrastructure or structures covering 50 square metres 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.	Ash Disposal Facility	The existing dry ash dump (i.e. 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. *Although the stream forming the eastern border of the extended ADF will be diverted, specific points along the border of the ADF may still fall within 32 meters from the stream.*

[21] ADF: Ash Disposal Facility

No.	Listing Notice	Listed Activity		Project Activity	Description
4.	Listing Notice 1 of 2010, Government Notice R544	11(iv)	The construction of: (iv) dams; 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.	Farm Dam	The following works are proposed for the farm dam: • Existing dam wall to be removed. • New earth dam wall to be built to prevent overflow into mining voids and vice-versa, lowering the dam wall to below final void decant level. • Upstream approach channel and outlet channel to dam to be lined using reno-mattress. *The works proposed for the farm dam will take place in-stream and therefore also within a watercourse.*
5.	Listing Notice 1 of 2010, Government Notice R544	11(iv) & 11(xi)	The construction of: (iv) dams; (xi) infrastructure or structures covering 50 square metres 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.	Pollution Control Dam 1	A Pollution Control Dam (PCD[22]) will be constructed to catch and store run-off from the open-ash area. *The PCD may extend over an area greater than 50 square meters may be located within 32 meters from a watercourse.*
6.	Listing Notice 1 of 2010, Government Notice R544	11(iv) & 11(xi)	The construction of: (iv) dams; 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.	Pollution Control Dam 5	A PCD will be constructed to catch and store run-off from the rehabilitated area. In addition dust suppression and irrigation water will be stored in the PCD. *The PCD may extend over an area greater than 50 square meters may be located within 32 meters from a watercourse.*
7.	Listing Notice 1 of 2010, Government Notice R544	22	The construction of a road, outside urban areas; (ii) where no reserve exists where the road is wider than 8 metres	Access Road	A road linking the N12 to the R545 will be constructed. The width of the proposed road will exceed 8 metres. No reserve for the proposed road exists.

[22] PCD: Pollution Control Dam

No.	Listing Notice	Listed Activity		Project Activity	Description
8.	Listing Notice 2 of 2010, Government Notice R545	15	Physical alteration of undeveloped vacant or derelict land for residential retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more.	• Clean Water Dams: o Dam 2. o Dam 3. o Dam 4. • Pollution Control Dam 1 • Pollution Control Dam 5 • Ash Disposal Facility.	Three Clean Water Dams are proposed for clean water containment. Run-off from various areas within the development footprint will be stored in the PCDs. The existing ADF will also be expanded to provide sufficient storage capacity for the remaining life of the Power Station. The proposed PCDs, ADF and Clean Water Dams will cover an area exceeding 20 hectares.
9.	Listing Notice 2 of 2010, Government Notice R545	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.	Pollution Control Dam 1 Pollution Control Dam 5	The proposed PCDs are classified as dams which poses a safety risk. The applicable provisions included Government Notice 704[23] promulgated in terms of the National Water Act, 1998 (Act No. 36 of 1998) must therefore also been adhered to. Furthermore the proposed PCDs also triggers Water Uses defined in Section 21 of the National Water Act, 1998 (Act No. 36 of 1998). Prior to onset of the construction and operation of the PCDs a Water Use License must be issued by the Department of Water Affairs.
10.	Listing Notice 2 of 2010, Government Notice R545	6	The construction of facilities or infrastructure for the bulk transportation of dangerous goods – (iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.	Ash Disposal Facility	The dry ash generated by the combustion of coal in the electricity generation process will be disposed of at the extended Ash Disposal Facility.

[23] Government Notice 704: Government Notice 704 Regulations on use of water for mining and related activities aimed at the protection of water resources, published in Government Gazette, 4 June 1999 (Vol. 408, No. 20119)

3.3 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) 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[24]). A number of the project activities associated with the proposed KPS Continuous Ash Disposal Facility project are regarded as Waste Management Activities. As such these activities are governed by the NEM:WA[25] (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 Government Notice 921[26] (2013) in terms of the NEM:WA (2008) requires licensing from the Competent Authority before these activities may proceed. Prior to the implementation of any waste management activity listed in Category A, of Government Notice 921 (2013), a Basic Assessment Process as set out in the Environmental Impact Assessment Regulation made under Section 24(5) of the NEMA (1998) must be carried out as part of the Waste Management License Application Process. However prior to the implementation of any Waste Management Activities listed in Category B of Government Notice 921 (2013), a Scoping and Environmental Impact Reporting Process must be carried out as part of the Waste Management License Application Process. Each of the project activities, as well as the corresponding waste management activity, is provided in **Table 3-2**.

Table 3-2: Description of applicable Waste Management Activities listed in Government Notice 921 (2013)

No.	Category	Waste Management Activity		Project Activity	Description
1.	Category B	7	The disposal of any quantity of hazardous waste to land.	Ash Disposal Facility	The dry ash generated by the combustion of coal in the electricity generation process will be disposed of at the Continuous Ash Disposal Facility. Owing to the nature and composition of the ash that is generated by the combustion of coal, it is considered to be hazardous waste.

[24] NEMWA: National Environmental Management Waste Act, 2008 (Act No. 59 of 2008).
[25] NEMWA: National Environmental Management Waste Act, 2008 (Act No. 59 of 2008)
[26] Government Notice 921: Government Notice 921 List of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment, published in Government Gazette 37083, 29 November 2013

No.	Category	Waste Management Activity		Project Activity	Description
2.	Category B	10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	Ash Disposal Facility	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.

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

The activities associated with the proposed KPS Continuous Ash Disposal Facility 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 3-3**). Accordingly these Water Uses may not be undertaken without being granted a Water Use License from the DWA[27]. In accordance with Sections 40 and 41of 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 DWA for review and decision making. Although a joint PPP is followed for the WULA within the EIA Phase, these two EA processes constitute separate applications and submissions are made to the respective Competent Authorities.

Table 3-3: Description of Water Uses

Water Use	Description	Potential Section 21 Water Uses
Section 21 (a)	Taking of water from a water resource.	Water will be abstracted from the Clean Water Dam for use in the Power Station, to irrigate the lawns or for dust suppression of clean areas.
Section 21 (b)	Storing of water.	Three dams (Dam 2, 3 and 4) will be constructed around the ADF to collect water running off of the ADF rehabilitated areas. Should the water in the dams meet the effluent water quality standards, it could be released. If not, these dams will act as dirty water facilities, and the water in them will be irrigated back onto the rehabilitated areas of the ADF.
Section 21 (c)	Impeding or diverting the flow of water in a water course.	

[27] DWA: Department of Water Affairs

Water Use	Description	Potential Section 21 Water Uses

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).	The following activities within or near wetlands or streams will be undertaken:
		• Stream diversion (North of ADF)
		• Lowering of water level (farm dam)
		• Any facilities placed on top of, or within 500 m from a wetland
		  ○ ADF extension
		  ○ E-Dump
		  ○ Dam1
		  ○ Dam2
		  ○ Dam3
		  ○ Dam4
		  ○ Dam5

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.	Water that run off of the rehabilitated areas of the ADF will be collected in Dams 2, 3 and 4 and will be irrigated back onto the rehabilitated areas of the ADF from Dam 4, if they do not meet the discharge water quality standards.
Section 21 (g)	Disposing of waste in a manner which may impact on a water resource.	All facilities which contain “waste” or waste water. These include: • ADF extension • E-Dump • Dam1 • Dam2 • Dam3 • Dam4 • Dam5 • Coal Stock Yard (CSY) which include the attenuation basin

3.5 Additional Environmental Legislative Requirements

A number of additional legislation and guidelines may have a bearing on the proposed KPS Continuous Ash Disposal Facility project. Although authorisation in terms of these various acts may not necessarily be mandatory the requirements of these acts have been taken into account.

Table 3-4: List of additional applicable Environmental Legislation

Act	Applicable Section	Relevance on 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. 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[28] 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.

[28] SAHRA: Heritage Resources Agency

Act	Applicable Section	Relevance on project
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 Rand Highveld vegetation type which forms part of the greater Grassland Biome and is listed as Vulnerable Ecosystem. 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 Final Draft 2014/2015	-	The Integrated Development Planning is regarded as a tool for municipal planning and budgeting to enable municipalities to deliberate on developmental issues identified by communities. The IDP points 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.

Act	Applicable Section	Relevance on project
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

4 ENVIRONMENTAL IMPACT ASSESMENT PROCESS

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

The NEMA (1998) is regarded as South Africa's framework legislation which is centred on facilitating the protection of the environment through the use of various tools to ensure integrated environmental management of activities. The listed activities which are associated with the proposed KPS Continuous ADF included activities that are defined in the NEMA (1998) EIA Listing Notice 1 (R.544), Listing Notice 2 (R.545) and Listing Notice 3 (R.546).

As the proposed project triggers activities from all three listing notices (R.544 (2010), R.545 (2010) as well as R.546 (2010)) a full S&EIR process as defined in the EIA Regulations R.54310 (2010) must be carried out. A detailed account of the identified Listed Activities in relation to the applicability thereof on the project activities are discussed in Part 3 of this report.

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

The proposed KPS Continuous Ash Disposal Facility Project triggers activities from both Category A and Category B listed in the NEM:WA[29] (2008) List of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment published in Government Notice No.921 in Government Gazette 37083 of 29 November 2013. In accordance with the provisions stipulated in the Schedule no Waste Management Activity may be undertaken prior to the carrying out of the specified Environmental Authorisation Process as part of the Waste Management License Application Process. As the proposed project triggers activities from both Category A and B of Government Notice No.921 under the NEM:WA (2008) an S&EIR Process as stipulated in the EIA Regulations (2010) made under Section 24(5) of the NEMA[30] (1998) must be carried out. The S&EIR[31] Process will serve to identify and assess the anticipated environmental consequences associated with the proposed project activities and to provide the Competent Authority with sufficient information to reach a decision with regards to granting or refusal of a Waste Management License.

An overview of the steps which were undertaken during the Scoping Process as well as the EIR Process up to the placement of the EIR[32] for public review, is provided in **Chapter 4.1** and **Chapter 4.3** respectively. A detailed account of the PPP[33] which has been undertaken for the Scoping Process and subsequent EIR Process is provided in **Chapter 4.1.5** and **Chapter 4.2.3** of this EIR. A summary of the various steps which form part of the S&EIR Process as well as the PPP is shown in **Figure 4-1**.

[29] NEMWA: National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
[30] NEMA: National Environmental Management Act, 1998 (Act No. 107 of 1998)
[31] S&EIR: Scoping and Environmental Impact Reporting
[32] EIR: Environmental Impact Report
[33] PPP: Public Participation Process

4.3 Scoping Phase

The S&EIR Process was initiated with the submission of the Application for Integrated Environmental Authorisation and Waste Management License Form to the Department of Environmental Affairs (DEA) on 08 October 2012 (refer to **Appendix D1**). The DEA acknowledged receipt of the Application and issued a project reference number on 22 October 2012 (refer to **Appendix D2**). The acknowledgement of receipt of the Application for the proposed KPS Continuous Ash Disposal Facility Project marked the start of the Scoping Phase.

4.3.1 Scoping Process

In accordance with Regulations 26 – 29 of the EIA Regulations (2010) under the NEMA (1998) the following steps were undertaken during the Scoping Phase:

- A Public Notification Period was undertaken, aimed at announcing the proposed project to Interested and Affected Parties (I&APs) and providing IAPs with information relating to the proposed KPS Continuous Ash Disposal Facility Project. A detailed account of the PPP is provided in **Chapter 4.1.5** and **Chapter 4.2.3** of this document.
- Information relating to the potential environmental impacts which may result from the proposed project activities and the identification of reasonable and feasible alternatives of the proposed activity was collected. The Scoping Process also served to identify significant issues to be taken forward to the EIA Phase and eliminate the issues of very low significance. In accordance with Regulation 28 of the EIA Regulations (2010) under the NEMA (1998) this information was collated into a Scoping Report which also included Plan of Study for the subsequent EIA Phase.
- The draft Scoping Report was placed for a 40 day public review period, during which time I&APs and Commenting Authorities were provided with the opportunity to review the contents of the Scoping Report and supporting documentation. All comments that were received from I&APs, Commenting Authorities and stakeholders during the public review period were taken into account and collated into a Comments and Response Report. The Comments and Response Report provided details of the comments that were received as well as the responses provided by the EAP.
- The final Scoping Report was simultaneously submitted to the DEA and placed for a 40 day public review period. The DEA acknowledged receipt and submitted approval of the Scoping Report on 24 April 2013 (refer to **Appendix D3**).
- Following the approval of the Scoping Report by the DEA, the EIA Process mapped out in the approved Plan of Study commenced.

4.3.2 Additional Steps undertaken by EAP

During the Project Inception Phase various steps were taken by the EAP to gather information relating to the proposed project activities. The steps included arranging a project inception meeting with all members of the project team including the proponent (i.e. Eskom) and the EAP (i.e. Zitholele Consulting (Pty) Ltd). The meeting was held on 17 July 2012. Key discussion items for the project inception meeting included determining the Project Scope and requirements, Project Schedule, Identification of key stakeholders and role players. Following the project inception meeting, a site visit was undertaken on 23 October 2013 to familiarise the project team with the study area.

4.3.3 Specialist Studies

A number of Specialist Studies to be undertaken for the proposed KPS Continuous Ash Disposal Facility Project were identified during the Scoping Phase. The following Specialist Studies were identified for input into the Impact Assessment Phase:

- Soils, land capability and agricultural potential;
- Geology and Geotechnical investigations (Phase 1 geotechnical investigations);
- Surface water resources (aquatic) and wetlands (including wetlands delineation);
- Groundwater resources;
- Surface Hydrology;
- Air quality;
- Noise pollution;
- Visual impact;
- Ecology (Terrestrial flora and fauna and Avifauna assessment);
- Heritage impact studies;
- Traffic impact studies;
- Socio-economic investigations;
- Ash classification;
- Conceptual designs of the ADF; and
- Legal investigation/review of all other environmental relevant legal requirements that sit outside of the EIA as well as provide legal opinion to the project.

The Specialist Studies are intended to provide information regarding the baseline environmental conditions and identify anticipated impacts on the receiving environment. The Terms of Reference for each of the identified Specialist Studies were included in Chapter 8

of the Scoping Report. A summary of the findings of the Specialist Studies is provided in **Chapter 7** and the full reports have been included in **Appendix E** of this EIR.

4.3.4 Competent Authority Information Requirements

In the acceptance of the Scoping Report letter received from the DEA on 24 April 2013 (refer to **Appendix D3**), the Department specified a number of information requirements and considerations to be taken forward to the EIA Phase. The DEA requested that the following information be included in the EIR:

- All comments that are received from stakeholders must be included in the EIR. This includes comments that are received from:
  - MDEDET;
  - National and Provincial Department of Water Affairs;
  - WESSA[34];
  - SAHRA[35]; and
  - Any other stakeholder which deals with environmental matters within the province.
- Proof of correspondence with the various stakeholders must be included in the Final EIR. Should no comments be obtained from any of the above parties, proof of attempts to obtain comments should be included in the Final EIR;
- In addition, the following amendments and additional information are required for the EIR:
  - Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advance technologies;
  - The total footprint of the proposed development should be indicated. Exact location of the disposal facilities, and associated infrastructure should be mapped at an appropriate scale;
  - Should a Water Use License be required, proof of application for a license needs to be submitted;
  - Possible impacts and effects of the development on the surrounding industrial area;
  - 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.
  - Information on services on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained?
  - A construction and operational phase EMP to include mitigation and monitoring measures;
  - Should blasting be required, appropriate mitigation measures should be provided.

[34] WESSA: Wildlife and Environment Society of South Africa
[35] SAHRA: South African Heritage Resources Agency

- The Final EIR should include at least one A3 regional map of the area and the locality maps included in the Final EIR must illustrate the existing ash disposal facilities and associated infrastructure. The maps must be of acceptable quality and as a minimum, have the following attributes:
  - ❖ Maps are relatable to one another;
  - ❖ Cardinal points;
  - ❖ Co-ordinates;
  - ❖ Legible legends;
  - ❖ Indicate alternatives;
  - ❖ Latest land cover;
  - ❖ Vegetation types of the study area; and
  - ❖ A3 size locality map.

All information requirements and considerations that were specified by the DEA have been addressed and incorporated into this EIR. The relevant chapters of the documents where the information requirements specified by the DEA have been addressed are provided in **Table 4.1.**

Table 4-1: Incorporation of DEA requirements into EIR

No.	DEA Comment	Relevant EIR Chapter
a)	All comments that are received from stakeholders must be included in the EIR. This includes comments that are received from: ○ MDEDET; ○ National and Provincial Department of Water Affairs; ○ WESSA; ○ SAHRA; and ○ Any other stakeholder which deals with environmental matters within the province.	Chapter 7: Issues and Concerns Raised / Public Participation Process
b)	Proof of correspondence with the various stakeholders must be included in the Final EIR. Should no comments be obtained from any of the above parties, proof of attempts to obtain comments should be included in the Final EIR.	Chapter 7: Issues and Concerns Raised / Public Participation Process Appendix F
c)	Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advance technologies.	Chapter 3: Project Description
d)	The total footprint of the proposed development should be indicated. Exact location of the disposal facilities, and associated infrastructure should be mapped at an appropriate scale.	Chapter 3: Project Description
e)	Should a Water Use License be required, proof of application for a license needs to be submitted.	Chapter 4: Legal Requirements Appendix C: WUL
f)	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.	Chapter 18: Needs and Desirability
g)	A construction and operational phase EMP to include mitigation and monitoring measures.	Appendix G: EMPr
h)	The Final EIR should include at least one A3 regional map of the area and the locality maps included in the Final EIR must illustrate the existing ash disposal facilities and associated infrastructure. The maps must be of acceptable quality and as a minimum, have the following attributes: ○ Maps are relatable to one another; ○ Cardinal points; ○ Co-ordinates; ○ Legible legends; ○ Indicate alternatives; ○ Latest land cover; ○ Vegetation types of the study area; and ○ A3 size locality map.	Refer to Figure 1-1 of this DEIR.

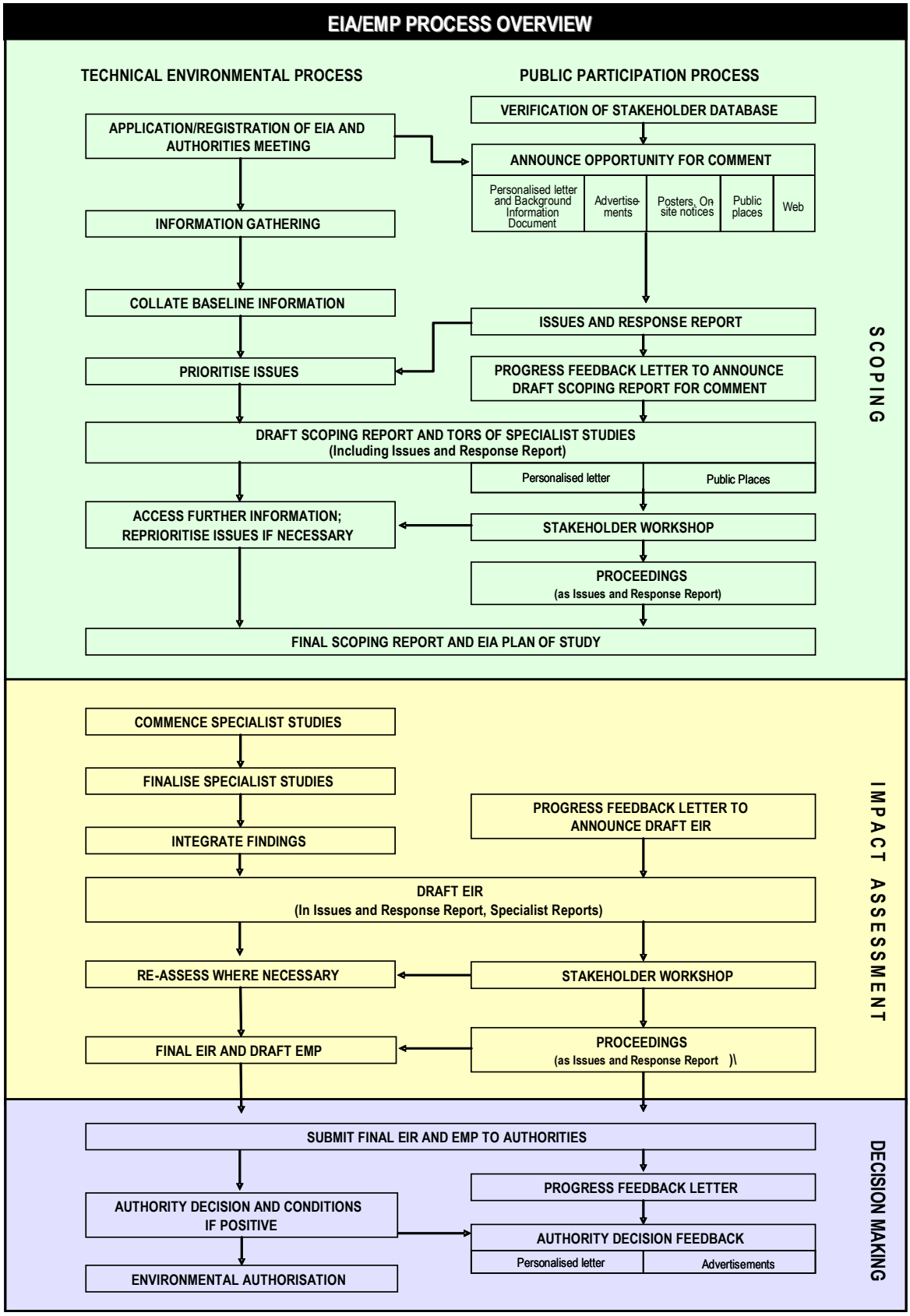

Figure 4-1: Overview of S&EIR Process

4.4 Environmental Impact Assessment Phase

4.4.1 Environmental Impact Reporting Process

Following the approval of the final Scoping Report and EIA Plan of Study for the EIA Phase by the DEA, the EIR Process commenced. Each of the steps that were included in Plan of Study have been undertaken during the EIA Phase leading up to the public review of the draft EIR. The primary objective of the EIA Phase is to investigate, assess and communicate the possible environmental impacts identified during the Scoping Phase, which are likely to transpire as a result of the project activities. Additional objectives of the EIA Phase include:

- Ensuring that all environmental considerations relating to the life-cycle are taken into account.
- Develop mitigation measures which are aimed at preventing the environmental impacts from transpiring or reducing the significance thereof.
- Facilitate informed decision-making by the Competent Authority.

The EIA Phase entailed the following overarching steps:

- Completion of the various Specialist Studies.
- Carrying out a PPP specific to the EIA Phase.
- Preparing an EIR and EMPr[36] in accordance with Regulation 31 and 33 of the EIA Regulations (2010) under the NEMA (1998).
- Placing the draft EIR for a 40 day public review period extending from **beginning** of **July 2014** to **mid-August 2014**.
- Incorporating comments that were received from I&APs, Commenting Authorities and Stakeholders into the final EIR.
- Simultaneous submission of the final EIR to the DEA for review and decision-making and placing the document for a 30-calendar public review period.
- Within 12 days from the date on which the Competent Authority reaches a decision with regards to granting or refusal of Environmental Authorisation, communicate the decision made to all registered I&APs.

[36] EMPr: Environmental Management Programme

4.4.2 Contents of the Environmental Impact Report

This Environmental Impact Report for the proposed KPS Continuous Ash Disposal Facility Project aims to conform to the requirements stipulated in Government Notice No. R543 (18 June 2010), Regulation 31(2) and have been structured as such. **Table 6-3** presents the document's structure, in terms of the aforementioned regulatory requirements. Based on the contents of **Table 4-2** it is evident that the EIR conforms to the regulatory requirements and provides sufficient information to facilitate the Competent Authority to reach an informed decision with regards to granting or refusal of Environmental Authorisation.

Table 4-2: Document Roadmap

DOCUMENT ROADMAP		
Regulation 31(2) of the EIA Regulations (2010)	**Description of Regulation 31(2)**	**Relevant Chapter of Document**
Regulation 31(2)(a)	a) Details of - i) the EAP who compiled the report; and ii) the expertise of the EAP to carry out an environmental impact assessment;	Chapter 1
Regulation 31(2)(b)	A detailed description of the proposed activity.	Chapter 2
Regulation 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— 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;	Chapter 2
Regulation 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 6
Regulation 31(2)(e)	Details of the public participation process conducted in terms of sub-regulation (1), including— i) steps undertaken in accordance with the plan of study; ii) a list of persons, organisations and organs of state that were registered as interested and affected parties; 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 iv) copies of any representations and comments received from registered interested and affected parties;	Chapter 4 Chapter 4
Regulation 31(2)(f)	A description of the need and desirability of the proposed Activity.	Chapter 10
Regulation 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 5
Regulation 31(2)(h)	An indication of the methodology used in determining the significance of potential environmental impacts.	Chapter 4
Regulation 31(2)(i)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process.	Chapter 5

DOCUMENT ROADMAP		
Regulation 31(2) of the EIA Regulations (2010)	**Description of Regulation 31(2)**	**Relevant Chapter of Document**
Regulation 31(2)(j)	A summary of the findings and recommendations of any specialist report or report on a specialised process.	Chapter 7
Regulation 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 Chapter 11
Regulation 31(2)(l)	An assessment of each identified potentially significant impact, including— 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;	Chapter 9
Regulation 31(2)(m)	A description of any assumptions, uncertainties and gaps in knowledge.	Chapter 8
Regulation 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
Regulation 31(2)(o)	An environmental impact statement which contains - 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;	Chapter 11
Regulation 31(2)(p)	A draft environmental management programme containing the aspects contemplated in Regulation 33.	Appendix G
Regulation 31(2)(q)	Copies of any specialist reports and reports on specialised processes complying with Regulation 32.	Appendix E
Regulation 31(2)(r)	Any specific information that may be required by the Competent Authority.	Chapter 4 Table 4-1
Regulation 31(2)(s)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.	Not Applicable

4.4.3 Impact Assessment Methodology

In order to ensure uniformity, a standard impact assessment methodology is utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Direction of Impact (Positive / Negative);
- Magnitude / Significance;
- Spatial scale;
- Duration / Temporal scale;
- Probability of Impact Occurring; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the afore-mentioned 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 4-3**.

Table 4-3: Quantities rating and equivalent descriptors for the impact assessment criteria.

Rating	Magnitude	Extent scale	Temporal scale
1	VERY LOW	*Isolated Site / Development site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*National*	Permanent

For ease of reference, the following notation format is used to highlight the various components of the assessment:

- Significance or magnitude- IN CAPITALS
- Duration – in underline
- Probability – *in italics and underlined.*
- Degree of certainty - **in bold**
- Spatial Scale – *in italics*

4.4.4 Mitigation and Management Measures

The development of mitigation and management measures was undertaken throughout the course of the process, from the assessment of the first alternative to the selection of a preferred design. Mitigation measures through the design review iterations and development of the preferred options have been recorded. In addition best practices were considered when identifying mitigation and management measures for potential impacts.

4.4.5 Environmental Management Programme

In accordance with Regulation 31(2)(p) of the EIA Regulations (2010) under the NEMA (1998) a draft EMPr conforming to the information requirement stipulated in Regulation 33 must be included in the EIR. All mitigation and management measures which emanated from the EIA Process as well as the specialist findings have been included in the EMPr. The EMPr therefore functions as an important management tool to ensure that these mitigation and management measures are implemented throughout all phases of the project life-cycle. The EMPr included in **Appendix G** of this EIR is furthermore also intended to ensure that adverse or reasonably avoidable adverse impacts associated with the Construction Phase, Operational Phase and Decommissioning Phase of the proposed KPS Continuous Ash Disposal Facility project are prevented and that the positive benefits associated with the projects are enhanced.

4.4.6 Public Participation Process: Environmental Impact Assessment Phase

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the DEIR and Draft Environmental Management Programme (DEMPr) is made available to the public for review and comments. I&APs were 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 Final EIR (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, and the relevant findings. Stakeholders will be notified of the availability of the Final EIR and the EMPr for review and comments and afforded an opportunity to engage with the project team at the public meeting(s) which were held during the review period of the DEIR.

4.4.7 Issues Raised during Scoping Phase 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 addressed by the environmental specialists' team. The following key issues were identified during the scoping phase and attended to in the impact phase:

Table 4-4: Issues identified and addressed in the impact phase

Issue Identified	Addressed in the impact phase
Possible impact on Transnet servitudes	It was found that Transnet's infrastructures will not be impact upon. Response by: Warren Kok

Issue Identified	Addressed in the impact phase
Lining of the new ash disposal facility	A lining system has been presented to DWS and has been discussed within the conceptual design. The DWA has accepted the design in principal and further detail will be provided to DWA during the detailed design phase. Response by: Sharon Meyer
Impact on Mr Troskie Neethling's farm	A meeting was held with Mr Neethling on 12 February 2013 and it was identified that Mr Neethling's farm would not be impacted upon by the Kendal Continuous ADF but probably by the Kusile 60 Year ADF. Response by: Nicolene Venter, Public Participation Practitioner
Impact on highly productive agricultural land and leaching of harmful substances and metals that impacts human health and soil	The proposed footprint for the Continuous ADF has been investigated in terms of land capability. While there is some agricultural potential of the soil in question, this is a relatively small component of the site. The ADF will be lined and there will be regular groundwater monitoring to ensure that there is little to no leaching of harmful substances into the groundwater resources. Response by: Sharon Meyer
SAHRA stating the requirement for an HIA.	A Heritage and Palaeontology Specialist was appointed and the Heritage Impact Assessment Report is attached to the DEIR as **Appendix E5**.
Prospecting rights of Kusile Mining and impact thereon.	During a meeting that was held between Eskom SOC Limited and Kusile Mining / BGH representatives on 08 May 2014, Kusile Mining / BGH confirmed that prospecting on the following Eskom properties have been concluded and that no coal was found: Portion 24 of the Farm Schoongezicht IR218; Portion 25 of the Farm Schoongezicht IR218; Portion 27 of the Farm Schoongezicht IR218; Portion 38 of the Farm Schoongezicht IR218; and Portion 43 of the Farm Schoongezicht IR218. Following the meeting held in May 2014, another meeting was held between During a meeting held on the 29 May 2014, Eskom SOC Limited and Kusile Mining / BGH representatives. During the aforementioned it was agreed that Kusile / BHG gives written consent to Eskom to continue with the proposed KPS Continuous ADF Project on the properties listed above (refer to **Appendix F3**).

4.4.8 EIA Newsletter

An EIA Newsletter was distributed to I&APs registered on the proposed project's database on Friday 30 May 2014 (English version) and an Afrikaans version was distributed on Tuesday 10 June 2014. The purpose of the newsletter was to provide I&APs with an update regarding the EIA process, including environmental and engineering tasks and public

consultation still to be undertaken. It also provided a brief overview of the background to the project, project description and way forward.

A comment sheet was included with the distribution of the EIA Newsletter, providing I&APs an opportunity to comment on the content of the EIA Newsletter and to submit comments / queries / concerns as at that stage. Comments received have been captured in the Comments and Responses Report (CRR).

4.4.9 Authority Consultation

Due to the ecological sensitivity of groundwater, streams and rivers in the study area, an extensive consultation process was undertaken with the DWS (national and regional). A summary of the key issues that were discussed at the various meeting held and the outcomes of the discussions are as follows:

Table 4-5: Key issues discussed and conclusions made from authority consultation meetings

Key Issue	Conclusion(s)
Abstractions from clean dam: • Would it be possible • What application process needs to be followed?	Information relating to abstractions from the clean water dam will be provided in the final EIR.
Alkalinity results	Regular sampling to be done and results submitted to DWA
Diversion of streams	In principle not a problem, but motivation by specialist required as to how the diversion will benefit the ecosystem

The agendas and minutes of the meetings held with the DWA are included in **Appendix C**. It is important to note that consultation with other authorities i.e. Provincial, District and Local Authorities will continue during the final EIR review period whereby representatives of these Government Departments as well as representatives from Organs of State, NGOs, etc. This consultation process will include the proposed Key Stakeholder Workshop (refer to point **4.4.13** below).

4.4.10 Availability of the DEIR and DEMPr

The DEIR and Draft EMPr was made available for public review and comment from **Friday 11 July 2014** to **Wednesday 20 August 2014**. All I&APs registered on the proposed project's database were notified of the availability of the DEIR and Draft EMPr and the DEIR and Draft EMPr was made available at the following public places and will also be freely available in electronic format, including Zitholele's website.

Table 4-6: Advertisements placed during the DEIR and Draft EMPr review period

Location	Address	Contact

Location	Address	Contact
Printed Copies		
City of Tshwane (previously Kungwini) Public Library	Cnr Mark and Botha Street, Bronkhorstspruit	071 671 8626
Emalahleni Public Library	19 OR Thambo Street, Emalahleni	013 653 3116
Ogies Public Library,	61 Main Street, Ogies	Ntombi Jela Tel: 013 643 1150 or 643 1027
Phola Public Library	Qwabe Street, Phola Location	Tel: 013 645 0094
Kendal Power Station – Security Reception	Kendal Power Station, Off the R545, Kendal	013 647 6002
Electronic Copies		
Zitholele Consulting website: http://www.zitholele.co.za/ea-and-wml-for-the-on-going-ash-disposal-at-kendal-power-station		
Available on CD on request		Nicolene Venter or Patiswa Mnqokoyi Phone: 011 207 2060 E-mail: publicprocess@zitholele.co.za

The DEIR availability and invitation to the Public Meeting were advertised in the same newspapers as used during the Scoping Phase, and they are:

Newspaper	Insertion Date
The Echo	Thursday 10 July 2014
Springs Advertiser	Thursday 10 July 2014
Beeld	Friday 11 July 2014
Streek Nuus	Friday 11 July 2014
Citizen	Friday 11 July 2014
Witbank News (English)	Friday 11 July 2014

4.4.11 Invitation to Meetings

4.4.12 Focus Group Meeting

During the DEIR and DEMPr review period a Focus Group Meeting (FGM) were held with adjacent landowners around the proposed ADF site to obtain their comments on the environmental findings as per the DEIR and the recommended mitigation measures. It also provided them a further opportunity to raise comments / concerns not yet raised to date. The purpose of a FGM is to hold a smaller meeting with a specific group or organisation who

have similar interest in or concerns about the proposed project. It is envisaged that the FGM mentioned above will be held as follows:

Table 4-7: Focus Group Meeting with adjacent landowners

Date & Time of Meeting	Venue
Date: Wednesday 23 July 2014 Time: 10h00 – 12h00	The Oakhouse Lodge, Near Ogies

4.4.13 Key Stakeholder Workshop

During the DEIR and DEMPr review period a Key Stakeholder Workshop (KSW) will be was held with stakeholders representatives such as the Provincial, District and Local Authorities, chairpersons of Organisations, etc. A KSW is valuable to a proposed project as it allows stakeholders the opportunity to hear each other's views and issues in context to their own, thus allowing for a more integrated EIA approach. The details of the KSW mentioned above is provided in Table 4-8.

Table 4-8: Key Stakeholder Workshop

Date & Time of Meeting	Proposed Venue
Date: Wednesday 23 July 2014 Time: 14h00 to 16h00	The Oakhouse Lodge, Near Ogies

4.4.14 Public Meeting

During the DEIR and DEMPr review period a Public Meeting (PM) was held with the broader public and community members interested in the proposed project. The PM allowed I&APs the opportunity to be informed of the environmental findings as per the DEIR, the mitigation measures proposed and allowing them the opportunity to raise any issues / concern not yet raised to date. The PM mentioned above was held as summarised in Table 4-9.

Table 4-9 : Public Meeting

Date & Time of Meeting	Venue
Date: Wednesday 23 July 2014 Time: 17h30 to 19h30	Phola Community Hall, Phola Village

The draft Minutes of the meetings held was send to those who attended and those who submitted apologies. ~~After the draft Minutes comment period~~, The Minutes of the EIA Phase Public Meeting is included in Appendix F of the FEIR, together with a copy of the presentation and the attendance record.

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

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

4.4.16 Announcement of Environmental Authorisation

Once the DEA issues a decision, Eskom must, in writing and within 12 days of the date of the decision (i.e. within 12 days after the date that the decision was made by the DEA and not within 12 days of having been notified of the decision) notify the registered I&APs of the decision. The DEA's reasoning, as contained in the copies of the DEA's decision, are to be attached to the notice.

In addition to the notification to the registered I&APs, Eskom must also within 12 days of the date of the decision, place a notice in the same newspaper(s) used in the PP Process. The notices should inform I&APs of the DEA's decision and describe where copies of the DEA's decision can be accessed. It must be made public knowledge that appeals may be lodged against the DEA's decision, and the process to do so should be explained.

5 ALTERNATIVES ASSESSMENT

One of the objectives of integrated environmental management stated in NEMA is to identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage. In addition, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management (DEA; 2009) should be evaluated.

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) also specifies that when considering an application for a waste management licence, the licensing authority must take into account all relevant matters, including the "…need for, and desirability of, the waste management activity and alternatives…" (DEA; 2008).

This chapter summarises the formal alternatives assessments that were undertaken for the proposed project. The main aspects for which alternatives were considered are the Continuous ADF layout options and the storm water management infrastructure proposed. The information contained in this Chapter was extracted from the Conceptual Engineering Report, **Appendix B** (Zitholele; 2014).

5.1 Ash Disposal Facility Alternatives Assessment

As explained in Chapter 1, the existing ADF utilised by KPS for the disposal of ash from the electricity generation process is running out of capacity. To address the additional 40 years of ash disposal required, Eskom is proposing to construct a Continuous ADF footprint at the current site (± 15 years[37]).

5.1.1 Objectives of Trade-off Study

The objective of the trade-off study is to select a preferred alternative from those considered, with which to go forward to subsequent development stages of the project. Selection of an alternative does not render it inflexible to improvement opportunities, but instead provides a broad engineering framework for the development of the ADF.

5.1.2 Modelled ADF Options

The implementation of the proposed KPS Continuous ADF Project must allow for the continued operations of the KPS. All Modelled ADF Options took cognisance to ensure that continuing the existing ADF does not impede the continued operation of the KPS. Any possible site options for the continued ADF which would entail the temporary halting of production was considered as fatally flawed. The vacant area to the south of the existing

[37] For Option 2A – Maximum Dump Volume (Preferred Alternative) the capacity gives a remaining life of 15 years from January 2015.

ADF between the rehabilitated area and the National Road R545 was considered as fatally flawed and ruled out as a feasible site, due to the following:

- The advancing face of the current ashing operations is in a northerly direction; and
- Continuing the existing ADF in a southern direction would necessitate stopping the operation of the KPS to re-configure the conveyors and stackers.

A number of criteria including environmental influences, engineering aspects and financial considerations were considered for determining the most feasible and preferred alternative. The engineering aspects considered whether the airspace model for each of the alternatives provides sufficient capacity to reach the required timeline of 2030. In addition the environmental considerations took into account the implication of the various alternatives on the proposed 30 Year KPS ADF Project (refer to Part 5.1.6 and Table 5-1).

5.1.3 Ash Disposal Facility Alternatives

Two broad alternatives, were considered in determining the air space required for the Continuous ADF. An optimisation strategy referred to as “piggybacking” may be carried out concurrently with the current operations or done once the existing footprint is exhausted at the prevailing levels to increase the life of the Continuous ADF. However, the feasibility of this optimisation strategy has not yet been established. Therefore only the broad alternatives are discussed in this report.

The broad alternatives are as follows:

- Alternative 1 Minimum Dump – The ADF is positioned between the two streams previously described.
- Alternative 2 Maximum Dump – The positioning of the ADF requires the northern stream to be diverted.

5.1.4 Alternative 1A: Minimum volume

The minimum volume alternative stays within the original footprint area and is lined from the set timeline of mid 2017 as shown in **Figure 5-1**. Physical parameters of the alternatives are:

- Total Footprint Area: 480 ha;
- Remaining dump volume: 32.5 Mm3
- Remaining life: 5 years from January 2015
- Maximum height: 60 m
- Lined area: 114 ha

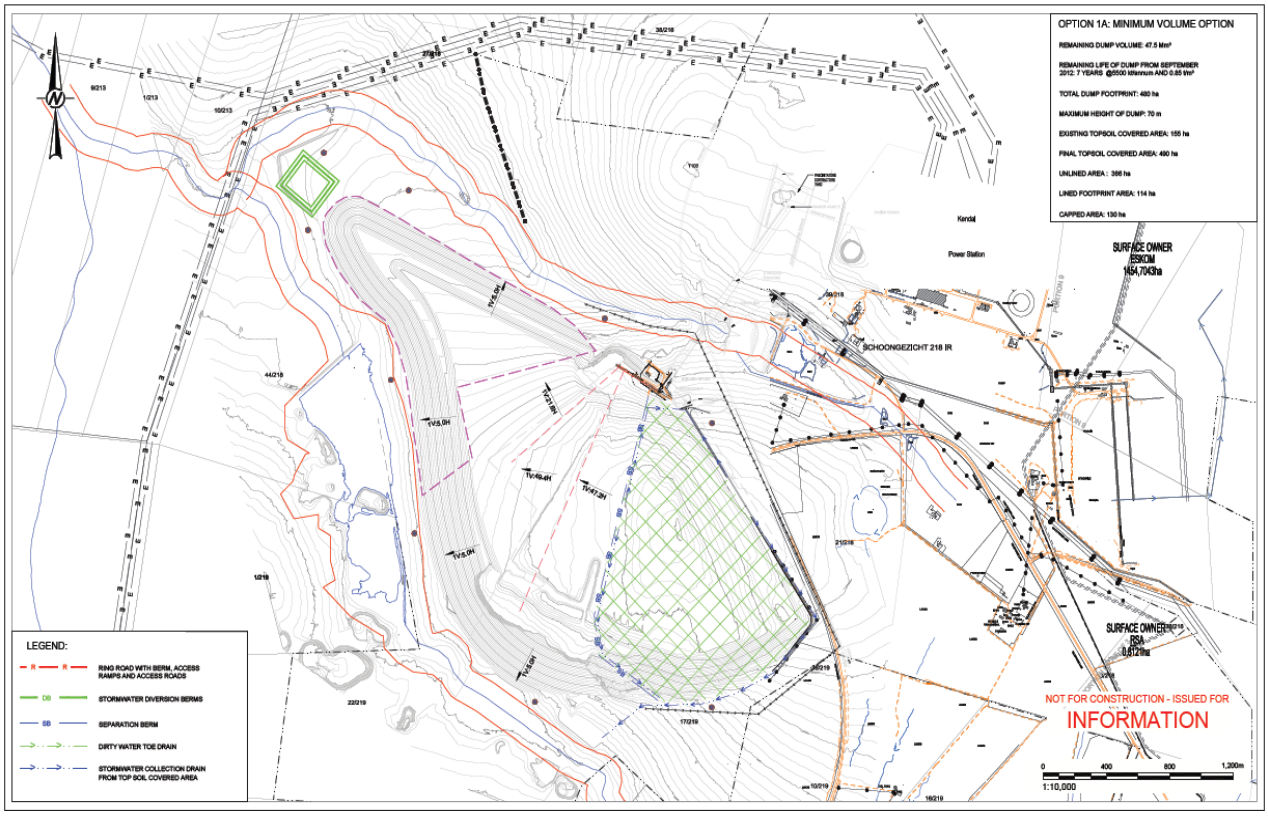

Figure 5-1: Alternative 1A

5.1.5 Alternative 2A: Maximum volume

The maximum volume alternative falls outside the existing footprint and entails that the north eastern stream be diverted up against the slope and is lined from the set timeline of early 2017 as shown in **Table 2.2**. The physical parameters are:

- Total Footprint Area: 583 ha
- Remaining dump volume: 98 Mm^3 from January 2015
- Remaining life: 15 years from January 2015
- Maximum height: 60 m
- Lined area:224 ha

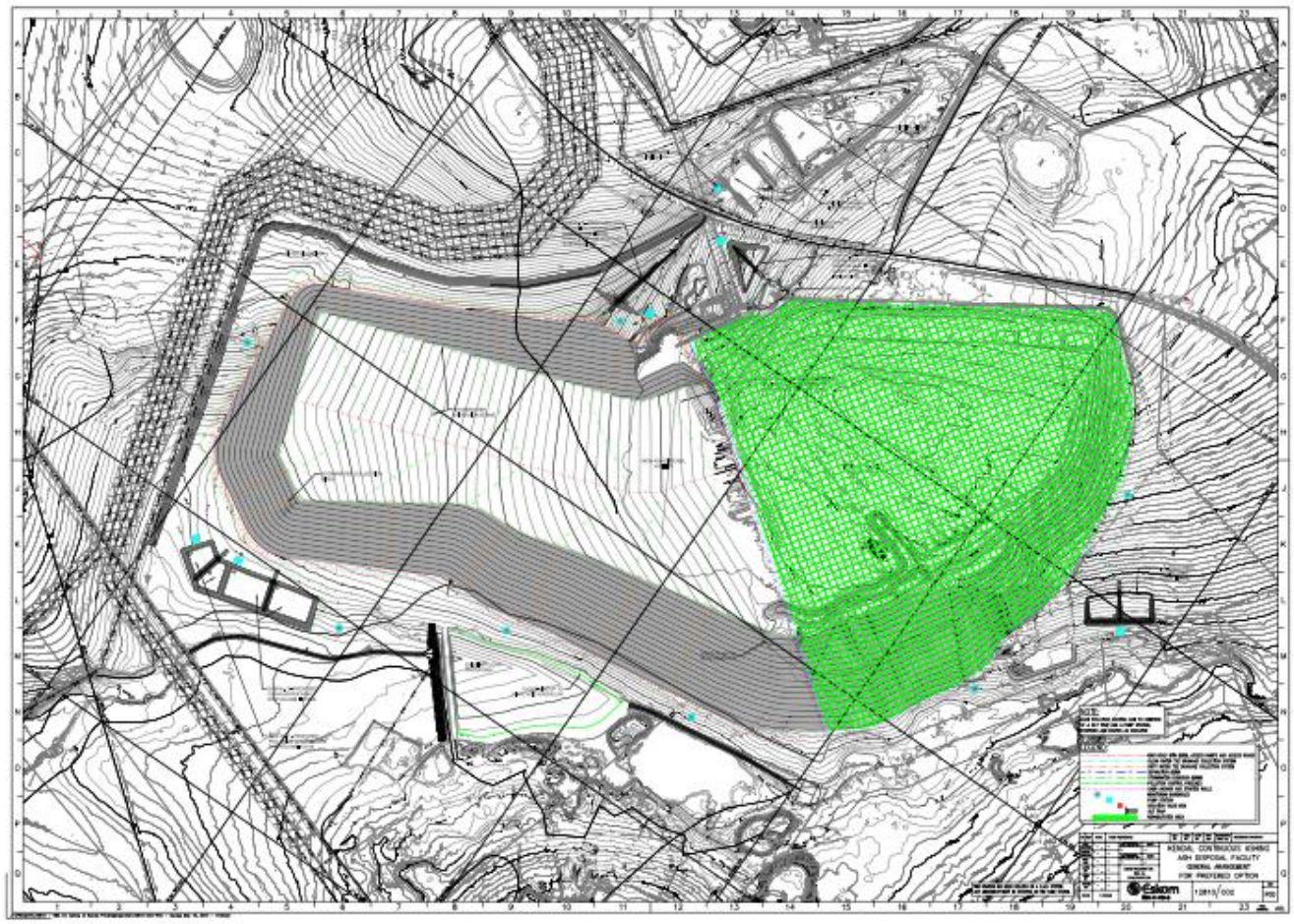

Figure 5-2: Alternative 2A

5.1.6 Approach to Trade-off study

Six possible alternatives for the deposition of ash were conceptualised for consideration in the trade-off study. These alternatives included the minimum and maximum dump alternatives (1A and 2A) with some optimisation strategies (piggybacking). However, since the feasibility of piggybacking has not yet been established, only the two primary alternatives are presented here.

Three broad criteria were selected for analysis of the alternatives, namely:

- Environmental influences;
- Engineering aspects;
- Financial considerations.

Each of these criteria was given a weighting in terms of perceived importance or influence on the project. Each criterion was also subdivided into sub-categories which were deemed to be relevant to the project. The overall criteria and weighting matrix used for evaluating and comparing the alternatives is shown in **Table 5-1**.

Table 5-1: Weightings for the alternatives analysis workshop

Engineering		Environmental Considerations		Financial	
50%		**30.0%**		**20%**	
Airspace won	15.0%	Level of impact of the footprint size	15.0%	Lowest Cost in terms of R/m^3	70%
Does the airspace model provide sufficient capacity to reach the required timeline of 2020	1.0%	Impact on the 30 year scheme	15.0%	Least Total Capital Spent	30%
What is the complexity of the operations for the Spreader and Stacker	20.0%	Significance of encroachment on current land uses and natural habitat (Zone of Influence)	15.0%		
What is the complexity of the phase construction	5.0%	Influence of proximity to water course	20.0%		
Complexity of disposal facility geometry	12.0%	Complexity of disposal facility geometry for closure	5.0%		
What is the size and complexity of the leachate collection system	5.0%	Level of impact that the proposed alternative has on the ground water system	20.0%		
What is the complexity of the storm water management system on the dump	7.0%	Visual impact assessment of post closure landform	5.0%		
What is the complexity of the proposed storm water management system around the dump	5.0%	Impact of exposed ash body on air quality	5.0%		
What is the impact on the proposed height	10.0%				
What is the impact of the required capping system	10.0%				
Impact on slope erosion and resulting sediment transport	10.0%				

A trade-off study workshop was conducted on 9 May 2013. Environmental and engineering representatives from Eskom, Zitholele and Golder Associates were present. Air Quality,

Noise and Visual Specialist representatives were also present. During the workshop, the cells in the matrix were populated by robust debate between all representatives and disciplines present. Financial criteria were not discussed at the trade-off workshop because the workshop was seen as a qualitative workshop in which only the technical feasibility and the environmental impacts were evaluated.

Financial comparison was conducted by analysing capital and closure costs associated with each alternative and calculating the cost-benefit in terms of a rate – Rands paid per m^3 airspace won or R/m^3. The total costs and the cost benefit rates were shown in the trade-off matrix and rated accordingly. Costs were determined by measurements from the CADD models and using rates obtained from previous work done on similar projects.

5.1.7 Results of the Trade-Off Study

The results of the trade-off study are shown in **Table 5-2**.

Table 5-2: Results from the Trade-off matrix

Alternative Description		Environmental	Engineering	Financial	Total
		Weighting			
		30.0%	50%	20%	100.0%
Alternative 1A	Minimum dump	3.6	Fatally Flawed	0	FF
Alternative 2A	Maximum dump	1.75	3.85	4	3.25

Note: The optimisation strategies assessed in the workshop are not included in this table, as the feasibility thereof has not yet been determined

From the two main alternatives considered, Alternative 1A is the preferred alternative for the environmental influences criteria. A greater environmental weighting was given to Alternative 1A as opposed to Alternative 2A. Alternative 1A is deemed fatally flawed in the engineering aspects criterion as it does not meet the timeline required to establish the next ADF up to the end of the KPS' operating life, and has been discarded as a feasible alternative. Taking all these considerations into account, Alternative 2A is the preferred alternative and is recommended to be taken forward to the next phase of design.

5.2 Storm Water Management Alternatives Assessment

The storm water management system for the proposed project comprises the following conceptualised structures:

- Extension to the existing ashing facility;
- Pollution control dam(s) to contain the dirty water runoff;
- Stream diversion to facilitate the construction of the Continuous ADF footprint.

The pollution control dams as indicated above will need to be designed in compliance with Government Notice 704. More specifically, Clause 6 (d) of the regulation indicates that:

Design, construct, maintain and operate any dirty water system at the mine or activity so that it is not likely to spill into any clean water system more than once in 50 years. In order to achieve the above, a continuous model had to be set-up to simulate the duration as mentioned in the regulation in order to determine the performance of the proposed storm water impoundment infrastructure under normal operating conditions. Following the finalisation of the model, the water balance was derived for the facility once all proposed storm water infrastructure was determined.

In order to understand the storm water management system and the relevance of each of the proposed impoundment and conveyance structures, an integrated water balance was required. An integrated water balance was also needed to inform the design of all facilities that need to comply with Government Notice 704. KPS did not have an existing integrated water balance at the time of the study. Therefore, an up-to-date, conceptual water balance is being proposed here for the storm water management system.

5.2.1 Objectives of Trade-off Assessment

The objective of the trade-off study was to select a preferred alternative from those considered with which to proceed to subsequent development stages of the project. Selection of an alternative does not render it inflexible to improvement opportunities, but instead provides a broad engineering framework for the development of the ADF.

5.2.2 Storm water Management Alternatives

Nineteen alternatives under three scenarios were modelled. Each of the alternatives are described in **Table 5-3**.

Table 5-3: Alternatives modelled

ALTERNATIVES MODELLED			
SCENARIO 1: Minimum open ash working area = 63 hectares			
SCENARIO 2: Optimum open ash working area = 82 hectares			
SCENARIO 3: Piggyback open ash working area = 98 hectares			
ALTERNATIVE 1	**ALTERNATIVE 2**	**ALTERNATIVE 3**	**ALTERNATIVE 4**
Status Quo	Proposed system – 5 new dams.	Proposed system – 5 new dams.	Proposed system – 5 new dams.
	All dams considered to be dirty. Spills from Dams 2, 3, 4 & 5 over flow to Dam 1.	Dam 1 & 5 considered dirty. Dam 2, 3 and 4 considered clean.	Dam 1 & 5 considered dirty. Dam 2, 3 and 4 considered clean.
	Dust suppression from Dam 1, DWD & EDWD.	Dust suppression from Dam 1, DWD & EDWD.	Dust suppression from Dam 1, DWD & EDWD.
	Spills from E-Dump overflow to DWD.	Spills from E-Dump overflow to DWD.	Spills from E-Dump overflow to DWD.
	Upper catchment not bypassed. (Total catchment area = 330 hectares)	Spills from Dam 5 over flow to Dam 1.	Spills from Dam 5 over flow to Dam 1.

ALTERNATIVES MODELLED			
SCENARIO 1: Minimum open ash working area = 63 hectares			
SCENARIO 2: Optimum open ash working area = 82 hectares			
SCENARIO 3: Piggyback open ash working area = 98 hectares			
ALTERNATIVE 1	**ALTERNATIVE 2**	**ALTERNATIVE 3**	**ALTERNATIVE 4**
	No irrigation to rehabbed areas.	Upper catchment not bypassed. (Total catchment area = 330 hectares)	Upper catchment bypassed. (Total catchment area = 4 hectares)
	Irrigation from existing CWD to Power Station terrace. (20mm)	Irrigation to rehabbed areas. (20mm)	Irrigation to rehabbed areas. (20mm)
	Dam capacities for Dams 2, 3 & 4 determined for 50 year storm event. Dam 2 = 166,000 m^3, Dam 3 = 57,000 m^3, Dam 4 = 32,000 m^3	Irrigation from existing CWD to Power Station terrace. (20mm)	Dam capacities for Dams 2, 3 & 4 sized to spill once in 50 years.
	Resultant Dam 1 sized to GN704 to only spill once in 50 years.	Dam capacities for Dams 2, 3 & 4 sized to spill once in 50 years.	Resultant Dam 1 sized to GN704 to only spill once in 50 years.
		Resultant Dam 1 sized to GN704 to only spill once in 50 years.	CWD becomes process dam, i.e. EDWD spills into CWD
	ALTERNATIVE 2a	**ALTERNATIVE 3a**	**ALTERNATIVE 4a**
	Spills from EDWD spill into Dam 1	Spills from EDWD spill into Dam 1	Spills from CWD spill into Dam 1
	ALTERNATIVE 2b	**ALTERNATIVE 3b**	**ALTERNATIVE 4b**
	Water treatment plant at EDWD	Water treatment plant at EDWD	Water treatment plant at CWD

5.2.3 Approach to Trade-off Assessment

Nineteen possible alternatives for the storm water management system around the ADF were conceptualised for consideration in the trade-off study. Three broad criteria were selected for analysis of the alternatives, namely:

- Environmental and social influences;
- Engineering aspects; and
- Financial considerations.

Each of the above criteria was given a weighting in terms of perceived importance or influence on the project. Each criterion was also sub-divided into sub-categories which were deemed to be relevant to the project. The overall criteria and weighting matrix used for evaluating and comparing the alternatives is shown in **Table 5-4**:

Table 5-4: Alternative Analysis Criteria and Weighting

Category Description	Category Weight
Engineering (Overall Weight = 35%)	
No and size of dams required	10.0%
What is the complexity of the proposed storm water management system around the dump	7.5%
Ease of maintenance of storm water management infrastructure	7.5%
Complexity of operational philosophy	12.5%
Experienced human resources to run facility (controlled release, water treatment plant)	10.0%
Infrastructure requirements (more pipelines to divert spillages, erosion control at multiple discharge points, etc.)	10.0%
Air space lost due to larger PCD requirements	12.5%
Management of excess water (dust suppression, irrigation and WTP optimisation)	10.0%
Dam safety requirements due to higher dam walls	5.0%
Security risk to storm water management equipment	5.0%
Construction and monitoring complexity to ensure clean and dirty water separation	10.0%
Environmental (Overall Weight = 35%)	
Encroachment on wetlands and flood lines	15.0%
Level of impact that the proposed alternative has on the surface water system	20.0%
Regulatory process risks	15.0%
Groundwater impacts	10.0%
Compliance with GN704	30.0%
Multiple points of discharge from dams to receiving waters	10.0%
Financial (Overall Weight = 30%)	
Net Present Value (Rands)	100%

A workshop was convened with all stakeholders involved in this project. Delegates present at this workshop participated in critically discussing each criteria and sub-category. The ranking and rating matrix was modified and agreed to by the meeting. Following the above process, each cell in the matrix was populated by robust debate between all representatives and disciplines present. Financial criteria were not discussed at the trade-off workshop because the workshop was seen as a qualitative workshop in where only the technical feasibility and the environmental impacts were evaluated.

Financial comparison was conducted by analysing net present value of the capital costs associated with each alternative. The total costs and the cost benefit rates were shown in the trade-off matrix and rated accordingly. Costs were determined by measurements from the CAD models and using rates obtained from previous work done on similar projects. The summary of the results of the rating and ranking workshop are shown in Error! Reference source not found.**Table 5-5**.

Table 5-5: Results of Trade-off Study Workshop

Alternative Description		Environmental Considerations	Technical	Financial		
		Weighting				
		40.0%	30%	30%	Score	Rank
Scenario 0	Status Quo	0.00	0.00	5.00	0.00	14
Scenario 1	Alternative 2A	2.95	0.00	0.10	0.00	14
	Alternative 2B	2.95	1.98	0.10	1.80	13
	Alternative 3A	3.85	0.00	0.10	0.00	14
	Alternative 3B	3.70	2.28	0.10	2.19	10
	Alternative 4A	3.90	0.00	0.10	0.00	14
	Alternative 4B	3.60	2.38	0.10	2.18	11
Scenario 2	Alternative 2A	3.10	0.00	0.10	0.00	14
	Alternative 2B	2.95	2.63	0.10	2.00	12
	Alternative 3A	4.30	3.53	4.93	4.26	4
	Alternative 3B	4.30	3.53	4.98	4.27	3
	Alternative 4A	4.20	2.80	4.35	3.83	6
	Alternative 4B	3.90	2.88	0.10	2.45	9
Scenario 3	Alternative 2A	4.20	0.00	1.92	0.00	14
	Alternative 2B	4.20	2.63	0.10	2.50	8
	Alternative 3A	4.60	3.33	4.95	4.32	2
	Alternative 3B	4.60	3.33	5.00	4.34	1
	Alternative 4A	4.30	3.25	4.83	4.14	5
	Alternative 4B	4.30	3.08	0.10	2.67	7

Alternative 3B, Scenario 3 is the preferred alternative following the technical, environmental and financial scoring. However, this Scenario assumes that piggybacking is feasible. This has not been proven as yet and cannot be considered at this stage. If proven feasible in future, the proposed infrastructure will need to be sized adequately to accommodate the potential flows during this Scenario. Since Scenario 3 is the best case scenario, it is proven that the infrastructure implemented under the other Scenarios will accommodate flow generated under Scenario 3.Taking all these considerations into account and looking at the criteria as a whole, Alternative 3B Scenario 2 was selected as the preferred alternative and it is recommended to be taken forward to the next phase of design. Refer to **Chapter 2** which describes the proposed infrastructure for this selected storm water management philosophy.

6 RECEIVING ENVIRONMENT

Regulation 31(2)(d) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (Government Notice R543[38]) stipulates that the Environmental Impact Report must:

- Provide a description of the environment that may be affected by the proposed project activities; and
- Provide a description of the activity / ies and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activities.

This chapter of the Environmental Impact Report (EIR) is therefore intended to satisfy the provisions included in Regulation 31(2)(d) of the NEMA (1998) EIA Regulations (Government Notice R543) thereby providing a baseline description of the receiving environment.

The baseline environmental description provided in this chapter will ensure that a holistic approach to the anticipated environmental consequence associated with the project activities is adopted in the assessment of the impacts. The findings of each of the specialist studies have also been drawn from and incorporated into the baseline description of the receiving environment. A summary of the specialist studies which were carried out for the proposed KPS Continuous Ash Disposal Facility is provided in Chapter 7 of this EIR. As the footprint of the KPS has already been disturbed by the operational activities of the KPS, the overall environmental conditions can no longer be regarded as pristine. This EIR is focussed on determining and assessing the environmental consequences which may result from the proposed KPS Continuous ADF Project activities.

6.1 Climate

The information pertaining to this section was sourced from the South African Weather Services.

6.1.1 Data Collection

Climate information was attained using the climate of South Africa database. Due to the close vicinity of the Kusile Power Station to the KPS, the Air Quality Impact Assessment Report which was compiled by Airshed Planning Professionals[39] for the Phola - Kusile overland conveyor system was used as reference. The weather related information extracted from this weather report was obtained from the Kendal 2 monitoring station (hereafter referred to as “Kendal 2”) in close proximity to KPS.

[38] South Africa. 2010. National Environmental Management Act, 1998 (Act No.107 of 1998) Environmental Impact Assessment Regulations, 2010. (Notice 543). Government gazette 33306;3, 18 June.

[39] Air Quality Impact Assessment for the ‘*Air Quality Specialist Impact Assessment for the Proposed New Phola-Kusile Coal Conveyor, Nkangala District Municipality, Mpumalanga*’. Report No.: APP/09/SYN-03B Rev 0.2, 2011.

6.1.2 Regional Description

The site area displays warm summers and cold winters typical of the Highveld climate. The region falls within the summer rainfall region of South Africa, rainfall occurs mainly as thunderstorms (Mean Annual Precipitation 662mm) and drought conditions occur in approximately 12% of all years. The mean annual potential evaporation of 2 060mm indicates a loss of water out of the system.

The area experiences frequent frosts, with mean frost of 41 days per year. In addition to frost the area is prone to hail storms during the summer time. Winds are usually light to moderate, with the prevailing wind direction north-westerly during the summer and easterly during winter.

6.1.3 Ambient Temperature

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers. Minimum, mean and maximum temperatures for Kendal 2 for the period January 2005 – April 2011 are illustrated in **Figure 6-1.**

Annual average maximum, minimum and mean temperatures for Kendal 2 are given as 27°C, 10°C and 16°C, respectively, based on the January 2005 to April 2011 record. Average daily maximum temperatures range from 31°C in December to 20°C in June, with daily minima ranging from 15°C in January to 3°C in July.

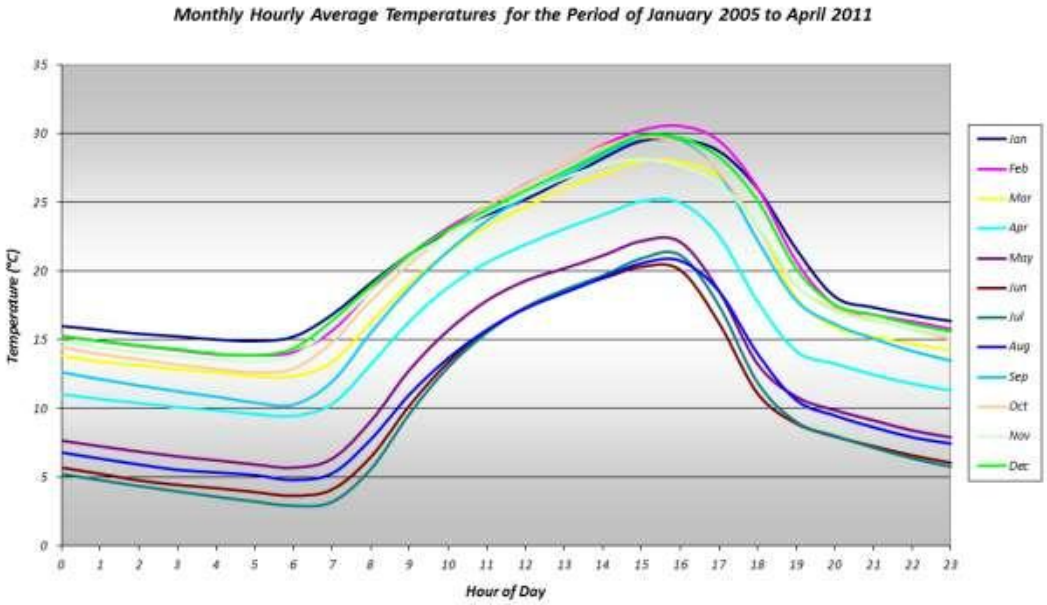

Figure 6-1: Diurnal temperature profile at Kendal 2 monitoring station for the period

6.1.4 Meso-Scale Wind

The predominant wind direction at Kendal 2 for the period January 2005 to April 2011 is from the west-northwest (~16% frequency of occurrence). Calm periods and low wind speeds are more prevalent during the night-time, as is to be expected. The gentle slope of the terrain may account for the increased frequency of occurrence of west-north-westerly winds during the day-time and increased east-south easterly winds during the night-time.

During winter months (July to August), the enhanced influence of westerly wave disturbances is evident in the increased frequency of south-westerly winds at Kendal 2 (refer to **Figure 6- 2** and **Figure 6-3**).An increase in the frequency of easterly and east-south-easterly winds during summer months (December to February) reflects the influence of easterly wave systems. Autumn months are associated with a greater frequency of calm wind conditions, with the smallest number of calms occurring during spring months.

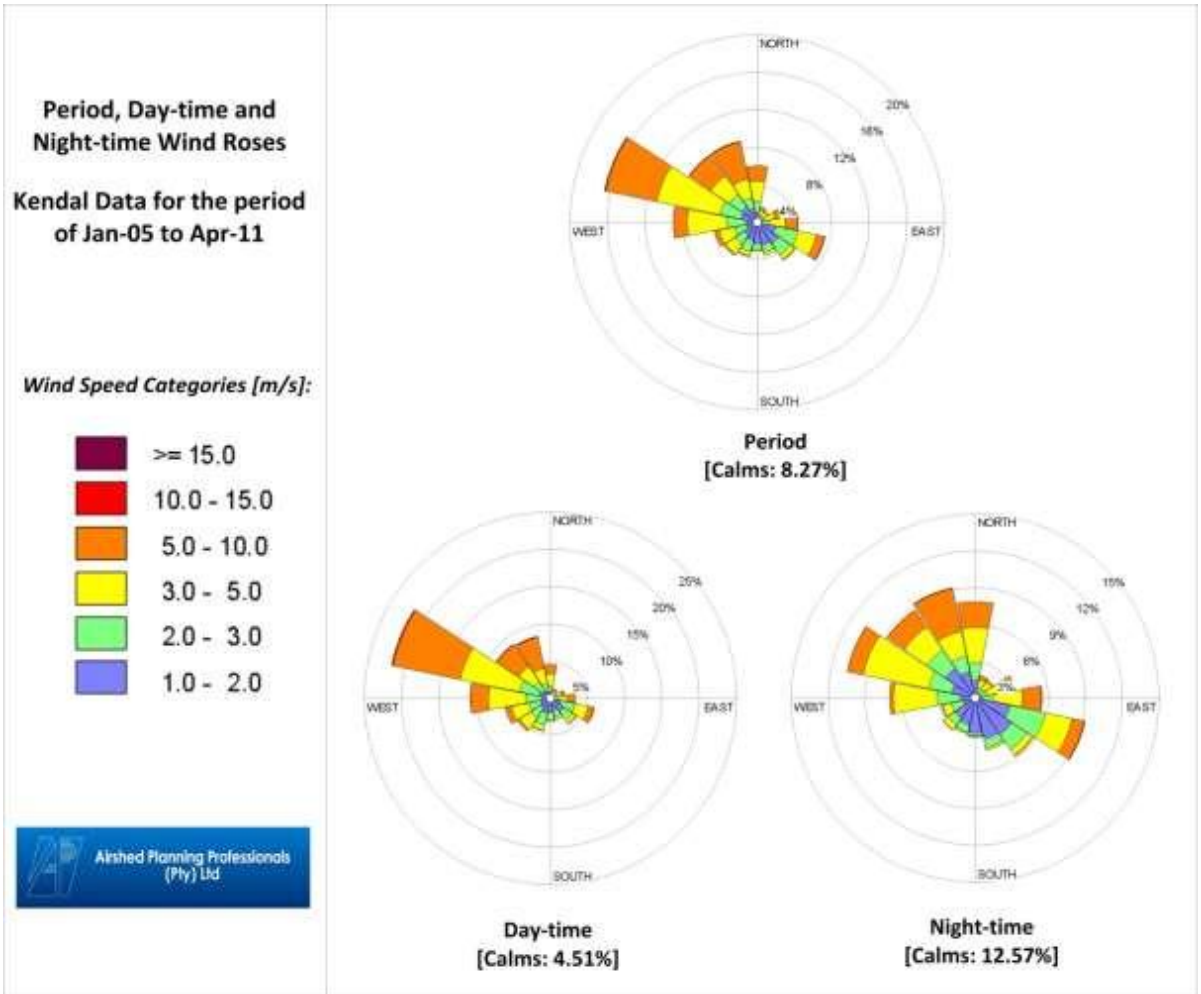

Figure 6-2: Period, day- and night-time wind roses for the Kendal 2 monitoring station (January 2005 to April 2011)

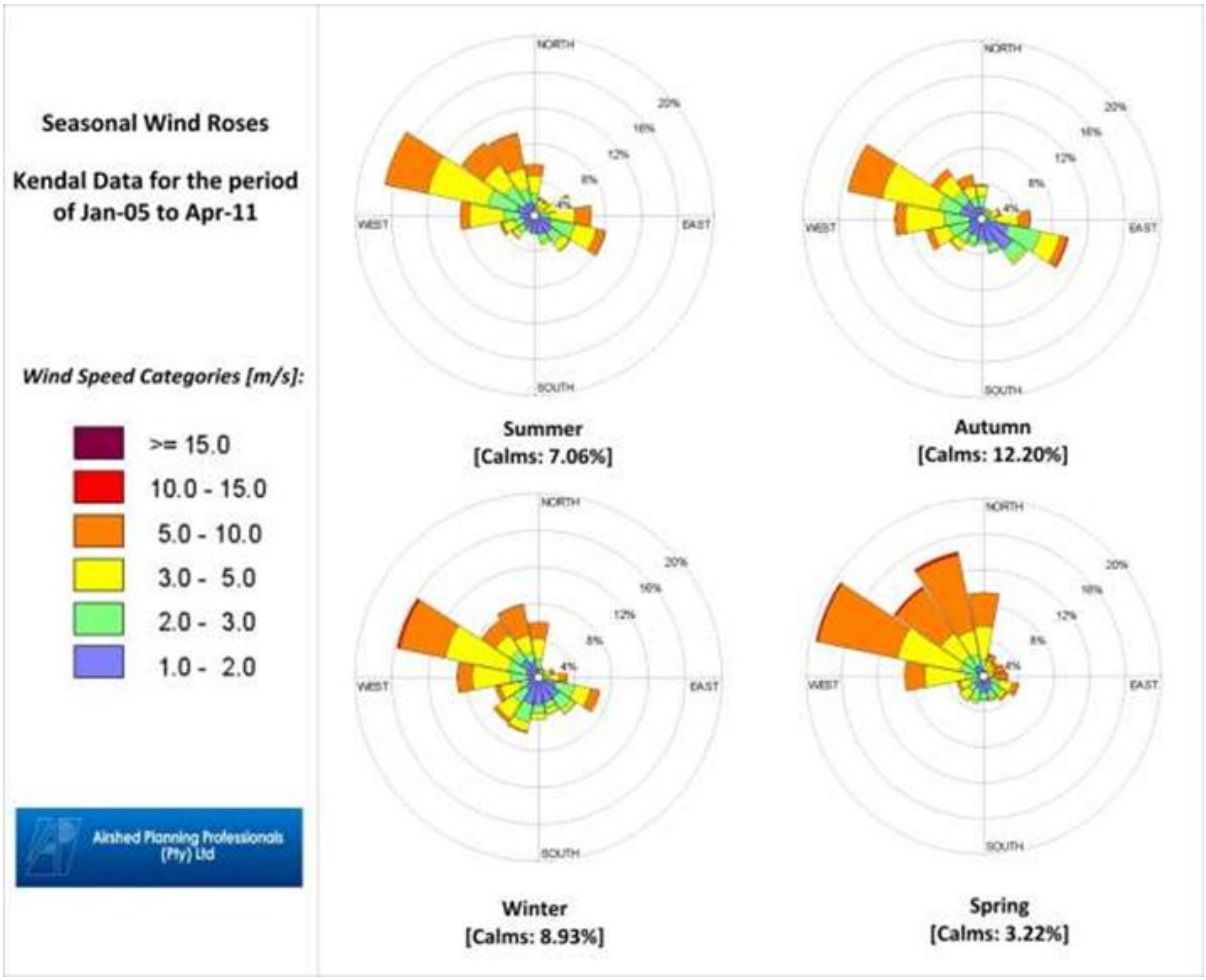

Figure 6-3: Seasonal wind roses for the Kendal 2 monitoring station (January 2005 to April 2011)

6.2 Geology

The information contained in this section was sourced from the following report:

- Kendal Power Plant: Geotechnical Investigation for Proposed Extensions to the Present Ash Dump Facilities (Revision 2) compiled by Golder Associates dated January 2014 (refer to **Appendix E13**).

6.2.1 Methodology and Data Sources

The geological analysis was undertaken through the desktop evaluation using a Geographic Information System (GIS) and relevant data sources.

6.2.2 Regional Description

According to the published geology map (1:250 000 Geology Series 2628 East Rand) of the proposed development area, the development area is underlain by the following four geological facets namely:

- Porphyritic rhyolite of the Selons River Formation which forms part of the Rooiberg Group, Transvaal Sequence;
- Shale and coal of the younger Vryheid Formation, Ecca Group, Karoo Sequence;
- Diabase of the Marico Diabase Suite, Bushveld Complex; and
- Hornblende and biotite granite of the Lebowa Suite, Bushveld Complex.

6.2.3 Sensitivities

With regards to the construction of an ash disposal facility geological sensitivities to consider include:

- Areas of unstable geology, which in this instance refer to the areas of deep clay layers. The clay deposits tend to shrink and swell and can slip under the foundation of the ash disposal facility. Special foundation designs will need to be made to accommodate this type of geological founding conditions.
- Areas of shallow soils or rock outcrops also present problematic founding conditions and are also deemed to constitute sensitive geology. In such areas cut to fill operations may be required to create suitable ash storage areas / capacity, resulting in permanent damage to in-situ geology.

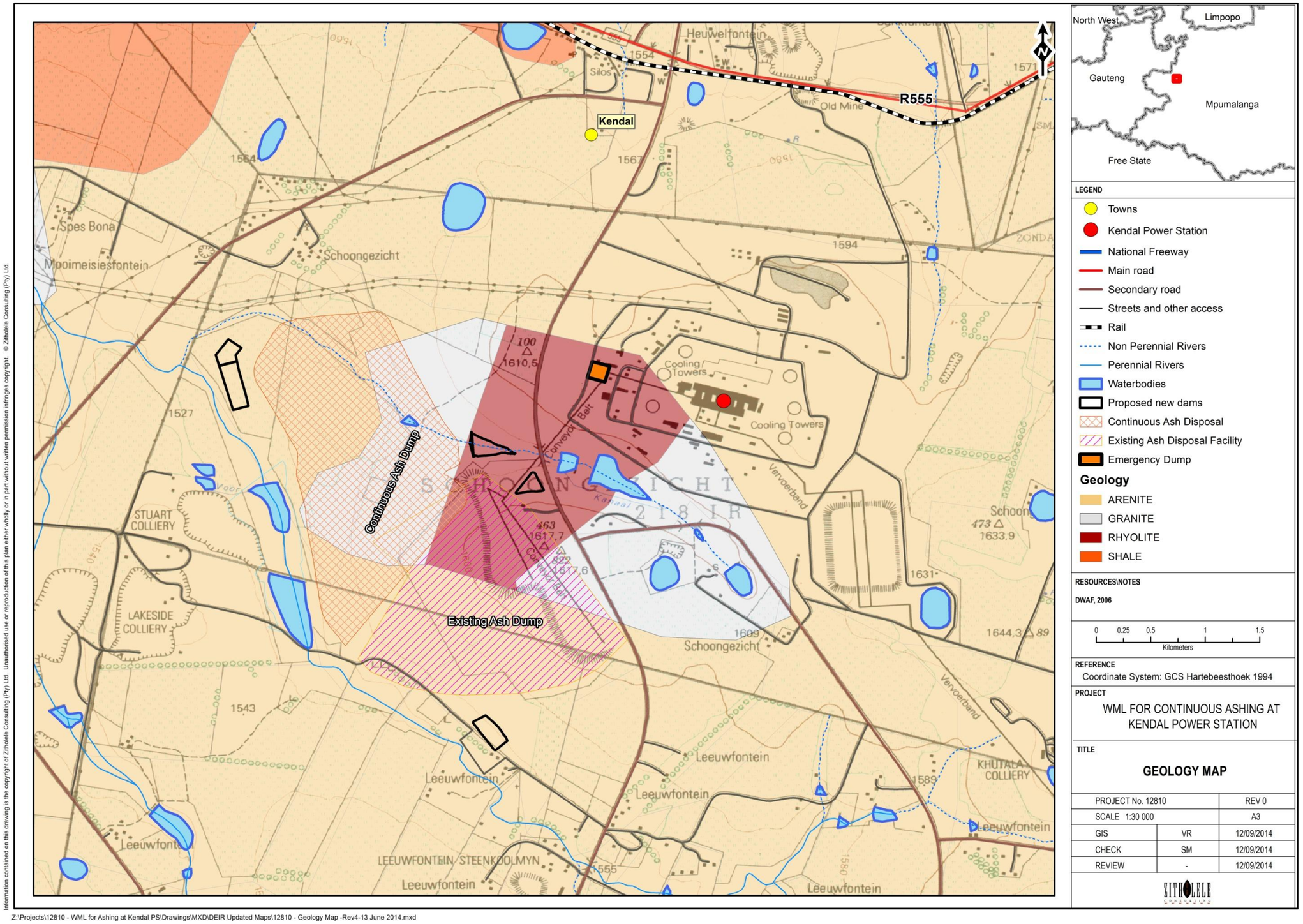

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Figure 6-4: Geology of development area

6.3 Soils and Land Capability

The information contained in this section was sourced from the following report:

- Eskom Holdings SOC (Pty) Ltd Kendal Continuous Ashing & "E" disposal expansion project Specialist Soils & Land Capability Studies Baseline investigation environmental impact assessment and management plan compiled by earth science solutions dated June 2014 (refer to **Appendix E7**).

6.3.1 Data Collection

In addition to the grid point observations, a representative selection of the soil forms mapped were sampled and analysed to determine their chemistry and physical attributes. The soil mapping was undertaken on a 1:10,000 scale orthophotographic base (Refer to **Figure 6-5**). The majority of observations used to classify the soils were made using a hand operated bucket auger and Dutch (clay) auger. Standard mapping procedures and field equipment were used throughout the survey. Fieldwork was also undertaken and comprised a number of site visits during which profiles of the soil were excavated.

6.3.2 Regional Description – Soil Characterisation

The soils which are found within the proposed development area may be broadly categorised into four major groupings, with a number of dominant and sub dominant forms that have been grouped and that characterise the area of concern. The major soil forms are closely associated with the lithologies from which the soils are derived (in-situ formation) as well as the topography and general geomorphology of the site, with the effects of slope and attitude of the land forms and the pedogenetic processes involved affecting the soil formation and ultimately the soil forms mapped.

The generally flat to slightly undulating topography has resulted in the in-situ formation of many of the soils and a moderately well-developed pedogenisis for the site. There is retention of soil water within the dadoes zone (lack of preferred horizontal flow) due to the horizontal bedding of the sediments and fine grained nature of the siltstone and mudstone interlayers resulting in the creation of an inhibiting layer (calcrete/ferricrete) within some of the soil profile. The resultant perched water within the profile creates areas or relatively much wetter soil features, a factor that is considered important to the ecology and biodiversity of the area. It is hypothesised that, the ferricrete layer that is found associated with the horizontally bedded sediments is responsible for the restrictive layer that is holding water within the soil profile and resulting in the development of moderately extensive areas of wet based soils.

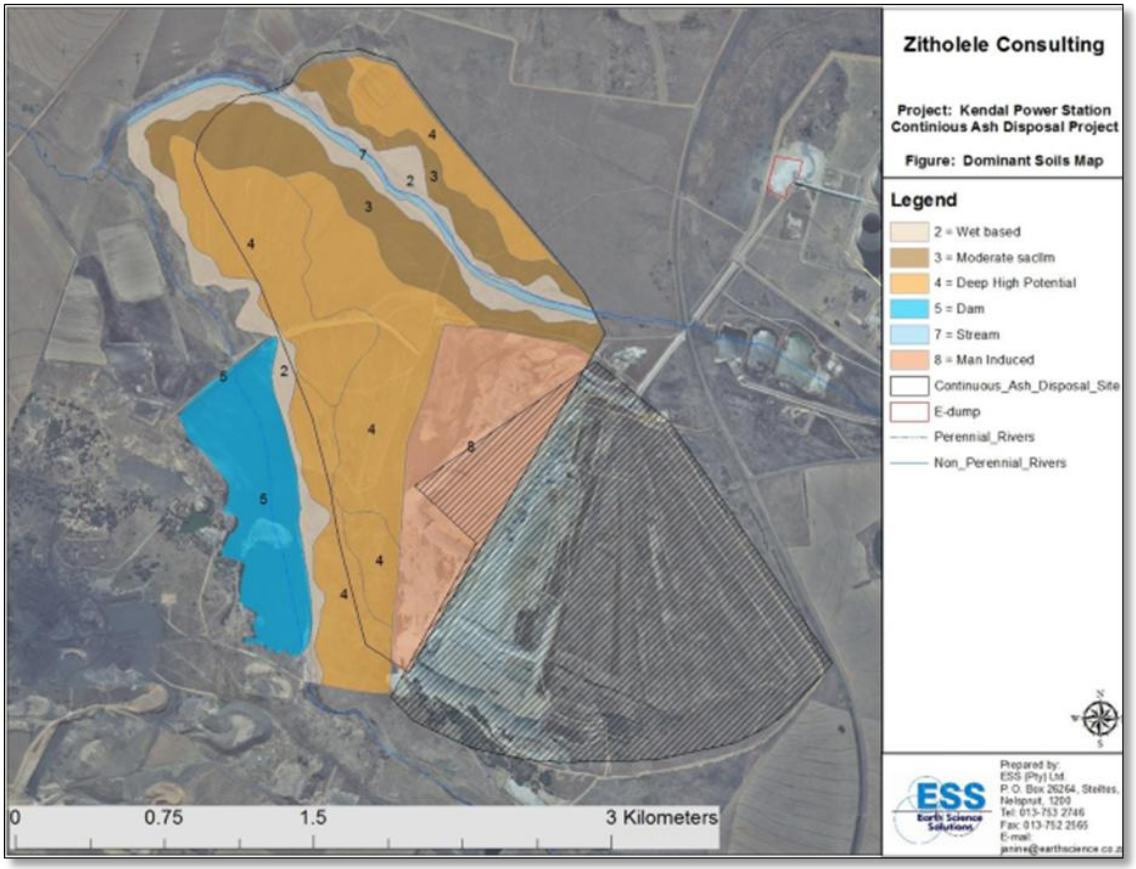

Figure 6-5: Dominant Soils Map[40]

6.3.3 Regional Description – Land Capability

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.

6.3.4 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

[40] This map is taken from the Soil and Land Capability Report entitled "Eskom Holdings SOC (Pty) Ltd Kendal Continuous Ashing and "E" Disposal Expansion Project" dated June 2014. The report was compiled by Earth Science Solutions for Zitholele Consulting.

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.

6.3.5 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 subsoil's 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.

6.3.6 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 (refer to **Figure 6-6**).

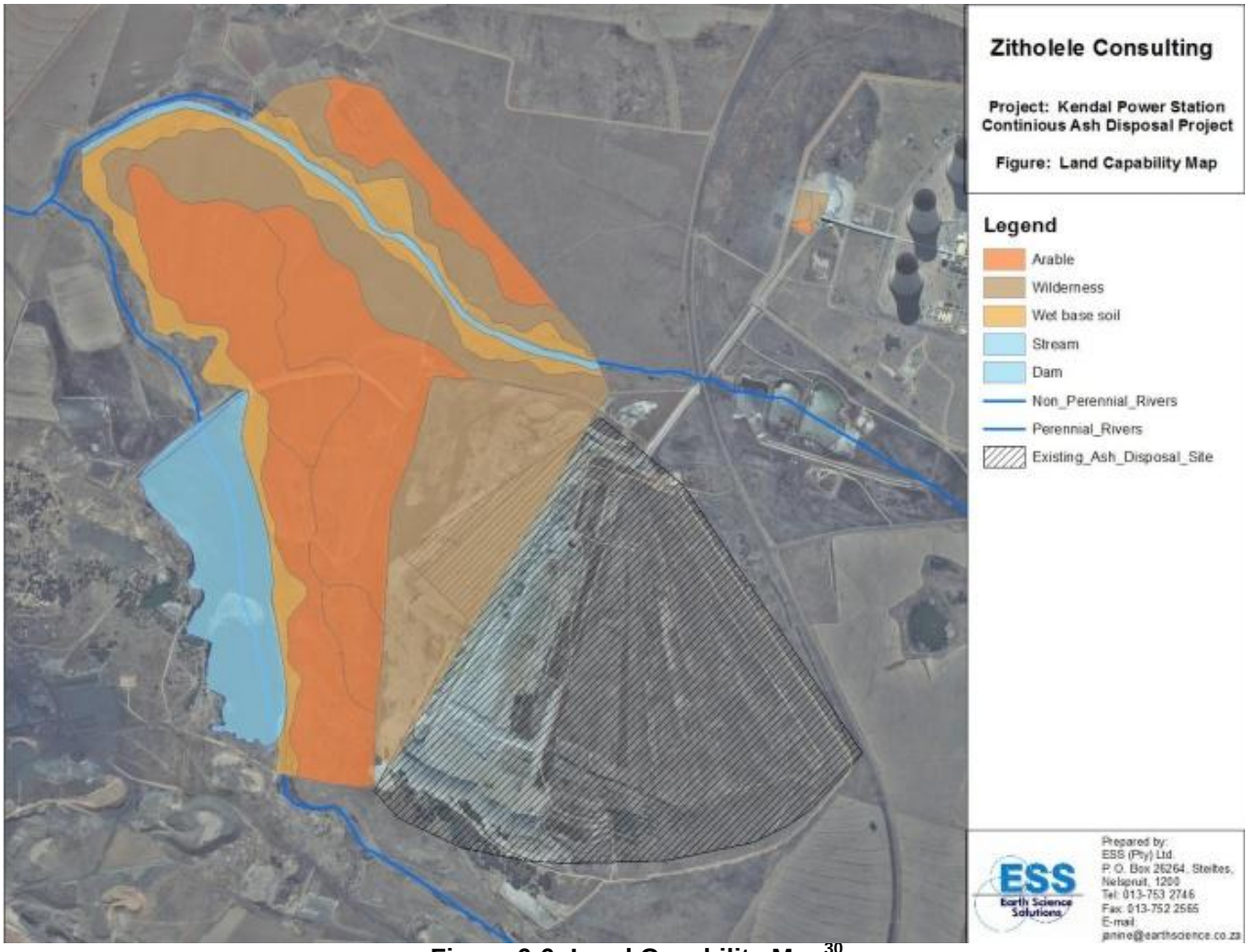

Figure 6-6: Land Capability Map[30]

6.3.7 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).

6.3.8 Sensitivities

The occurrence of extensive calcrete and /or ferricrete horizons within the soil profile classify as “relic” land forms for the most part. However, a significant area of more recent laterite development was mapped in association with the large alluvial river and stream flood plains and the wetlands that make up many of the soils associated with these geomorphologically sensitive areas.

6.4 Air Quality

The information contained in this section was sourced from the following report:

- Continuous Disposal of Ash at Kendal Power Station T. Bird R. Von Gruenewaldt Air Quality Basic Evaluation Report No.: APP/12/ZIT04 Rev 0.3 Final prepared by Airshed Planning Professionals dated June 2014 (refer to **Appendix E1**).

6.4.1 Data Collection

The KPS and therefore the proposed KPS Continuous ADF Project fall within the Highveld Priority Area (HPA). The HPA is known for its poor air quality. It is likely that the ash disposal facility influences the air quality within the Priority Area. Therefore the particulate emissions from the facility are likely to 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.

6.4.2 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; where industrial processes dominate the source contribution (HPA, 2011). Dispersion modelling projected exceedances of the daily PM10 limit for more than 12 days across the Emalahleni Hot Spot (HPA. 2011). Monitored daily PM10 concentrations within the Hot Spot, at Witbank and Greendale High School show regular exceedances of the daily limit, between 2008 and 2011. The HPA Air Quality Management Plan (2011) reported exceedance of the annual limit, for 2008 / 2009, at one of the two monitoring stations in Witbank with annual averages ~83µg.m-3 for Witbank 2.

6.4.3 Highveld Priority Area

The 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.

6.5 Topography

6.5.1 Data Collection

The topography data was obtained from the Surveyor General's 1:50 000 topo-sheet data for the region, namely 2628 and 2629. Using the latest aerial photography of the area Zitholele was able to develop a digital elevation model of the region as shown in **Figure 6-7**.

6.5.2 Regional Description

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 form part of significant landscape features in the wider area. The altitude ranges between 1 260 – 1 620 metres above mean sea level (mamsl). An illustration of the topography of the region as well as the ridges is shown in **Figure 6-7**.

6.5.3 Sensitivities

Ridges on the Highveld typically constitute areas of high biodiversity. In Mpumalanga these areas have also been significantly transformed over the years. Once transformed, restoration / rehabilitation is difficult or impossible. Thus ridges are deemed to be sensitive features.

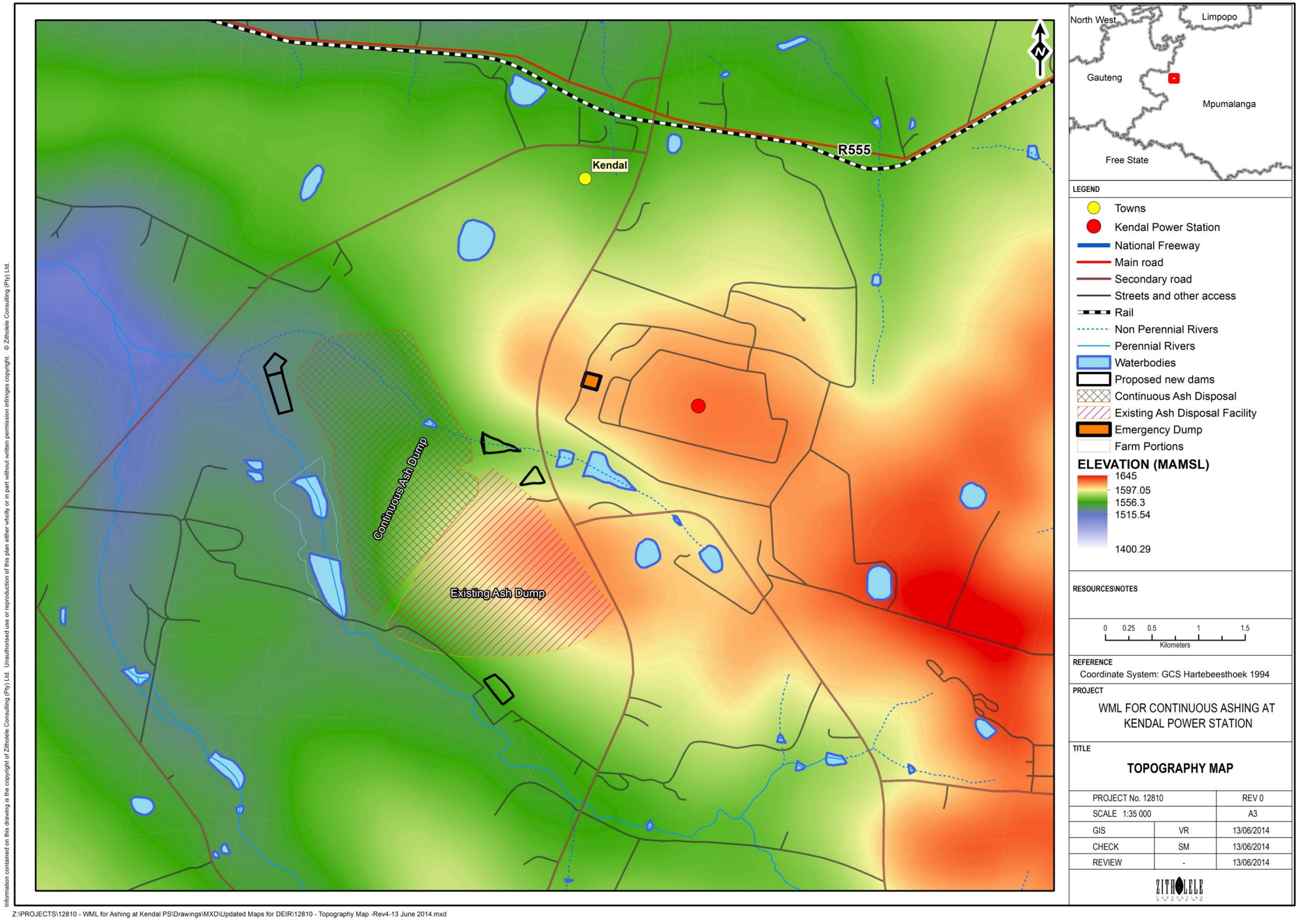

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Figure 6-7: Topography of development area

6.6 Surface Water

The information contained in this section was sourced from the following report:

- Kendal Continuous Ash Disposal - Surface Water Assessment compiled by Golder Associates dated June 2014 (refer to **Appendix E6**).

6.6.1 Data Collection

The surface water data was obtained from the WR90 database from the Water Research Council and the National Freshwater Ecosystem Priority Area (NFEPA) database from DWA. The data used includes pans, dams, wetlands, catchments, river alignments and river names.

6.6.2 Regional Description

The proposed area to the north of the existing ADF falls within the B20E catchments. The main drainage feature of the area is the Wilge River which drains northwards, including several tributaries to the Wilge River situated to the West of the proposed site. The Continuous ADF to the north of the existing ADF will impact on an unnamed drainage line which will require diversion.

6.6.3 Sensitivities

The unnamed drainage line and possible wetland supports a number of faunal and floral species uniquely adapted to these aquatic ecosystems and therefore all surface water bodies are earmarked as sensitive features. The proposed Continuous ADF will require that the unnamed drainage line be negatively impacted upon by the proposed diversion. All surface water and drainage features within the proposed development footprint are shown in **Figure 6- 8**.

6.6.4 Baseline water quality

Historical agricultural and mining practices over the past few decades have had detrimental effects on the surface water environment in the area. This is mainly attributed to fertilizer application, erosion, siltation and point-source discharges by Wastewater Treatment Works to the surrounding watercourses. The presence of several industrial and mining activities within one catchment may have severe effects on the surface water environment.

DWA monitoring point (B20_188173) upstream of the disposal facility on Leeufontein was sampled only once in 2004. Sampling points CSW01, 02 and 03, which are on the Wilge River, indicates high total alkalinity (CaCO3), sodium (Na), magnesium (Mg) and aluminium (Al) concentrations. Samples taken along the Leeufontein Spruit and the unnamed tributary north of the ash disposal facility indicate high pH, electrical conductivity (EC) and total

dissolved solids (TDS) concentrations. These concentrations were above the RWQOs limits for MU 22. It is recommended that sampling be undertaken on a monthly basis. In light of the fact that certain heavy metals such as cadmium, arsenic, mercury, lead, manganese and zinc are thought to have endocrine disrupting properties at very low concentrations, it is important that these are monitored and that sensitive laboratory techniques, such as ICP-MS, are used. This will enable the power station to get a good history of the full spectrum of metals present and changes over time.

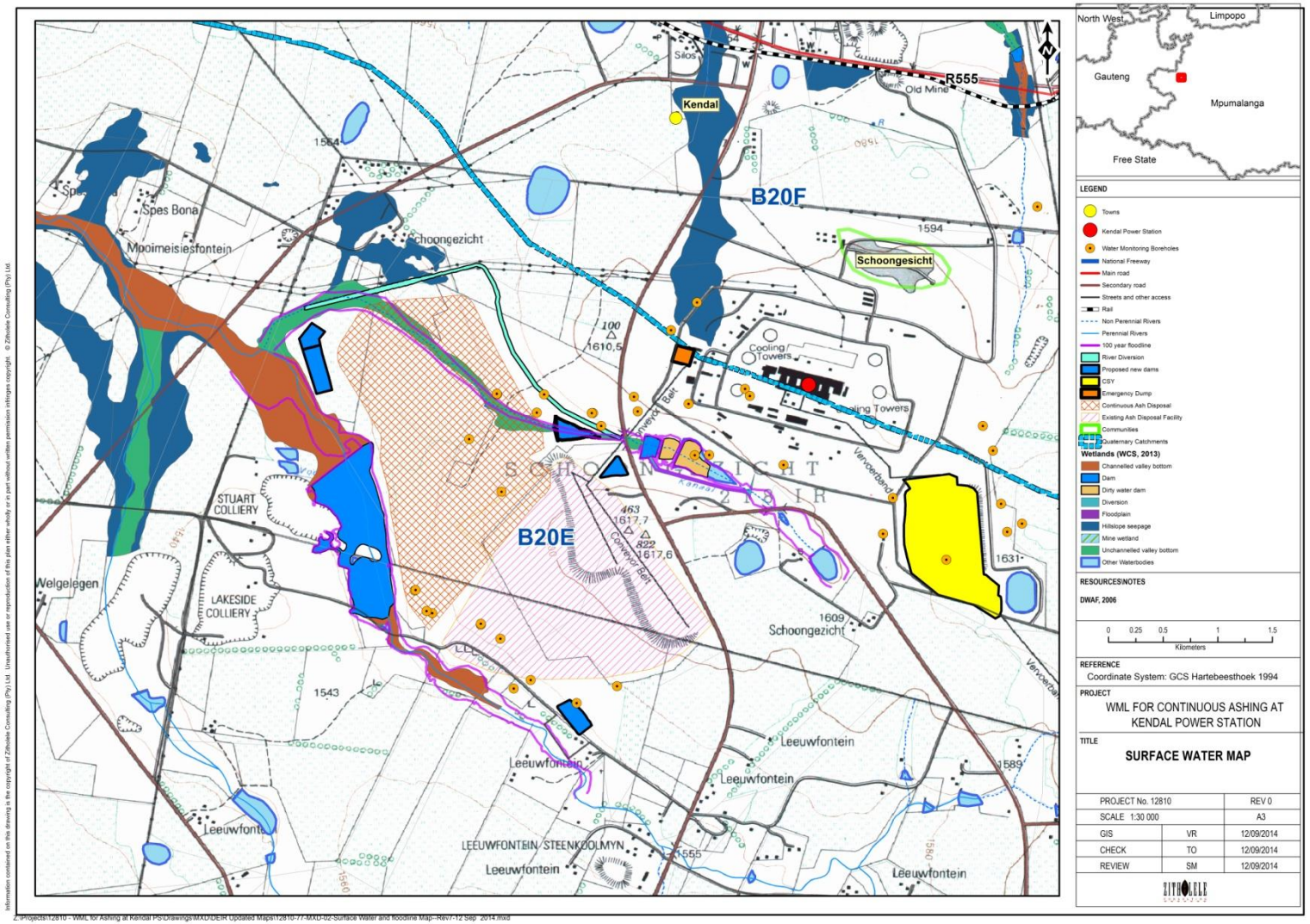

Figure 6-8: Surface water and drainage features

6.7 Land Use

6.7.1 Data Collection

The land use data was obtained from the Council for Scientific and Industrial Research Land Cover database (2006) and supplemented with visual observations on site.

6.7.2 Regional Description

From **Figure 6-9** it can be seen that the site is located on high potential arable land. The land use in the area is dominated by maize cultivation and grazed fields (mostly cattle). The site is leased to a farmer for agricultural use by means of centre pivots and the lease shall be terminated in due course. The rest of the site is undeveloped and natural ground.

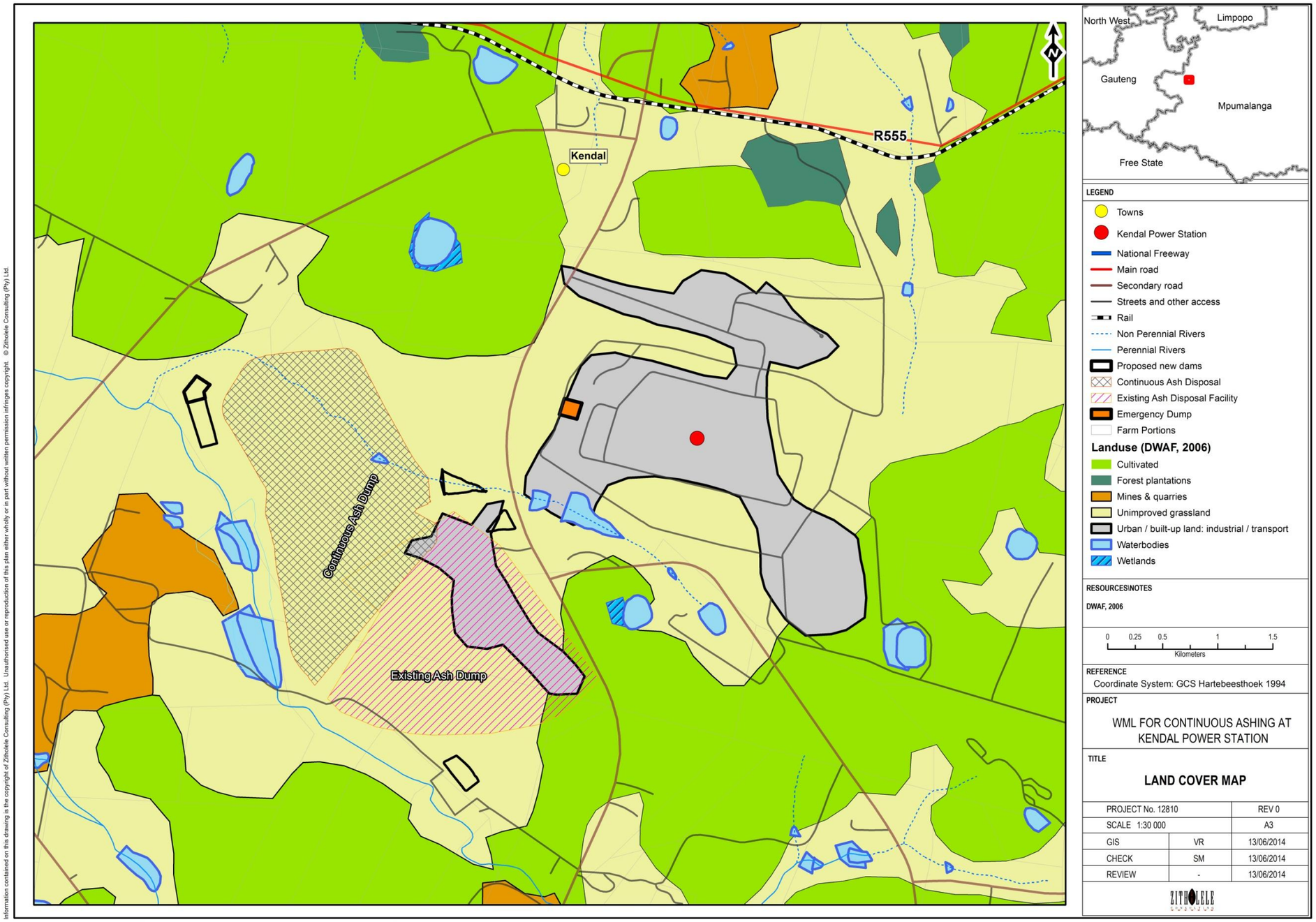

Figure 6-9: Land Use Map of Study Area

6.7.3 Sensitivities

Sensitive land use features include intensive and specialised agricultural activities.

6.8 Faunal Biodiversity

The information contained in this section was sourced from the following report:

- Terrestrial Ecosystems Assessment of proposed Continuous and Emergency Ash Dumps at Kendal Power Station Report Number 13614982-11971-1 prepared by Golder Associates Africa dated June 2014 (refer to **Appendix E8**).

6.8.1 Data Collection

A literature review of the faunal species that could occur in the area was conducted. C-Plan data provided by the Mpumalanga provincial department was used to conduct a desktop study of the area. This data consists of terrestrial components; ratings provide an indication as to the importance of the area with respect to biodiversity. The finding of the Terrestrial Ecology Study has also been used to populate this part of the chapter. The data collection method employed for the Terrestrial Ecology Study comprised literature review and a field survey.

6.8.2 Description of faunal biodiversity

A number of species of conservation importance were recorded in the study area, including the Cape clawless otter (*Aonyx capensis*) and several plant species. The Steenbok (*Raphicerus campestris*) is a relatively common, widespread small antelope (IUCN 2013.3) 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 include in this section.

The Cape clawless otter (*Aonyx capensis*) 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 (*Aonyx capensis*) are found near permanent water where they feed on a mixture of fish, amphibians and crustaceans. Threats to otters 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 are likely to frequent the stream channels and artificial dams in the study area and environs.

Serval (*Leptailurus 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.

6.8.3 Description and Sensitivities

The findings of the Terrestrial Ecology found that a number of Red Data species may be found within the development area (refer to **Chapter 7**).The biodiversity rating for the site (**Figure 6- 10**) is rated from least concern to no natural habitat remaining. These Red Data species are of conservation importance and are species at risk of extinction.

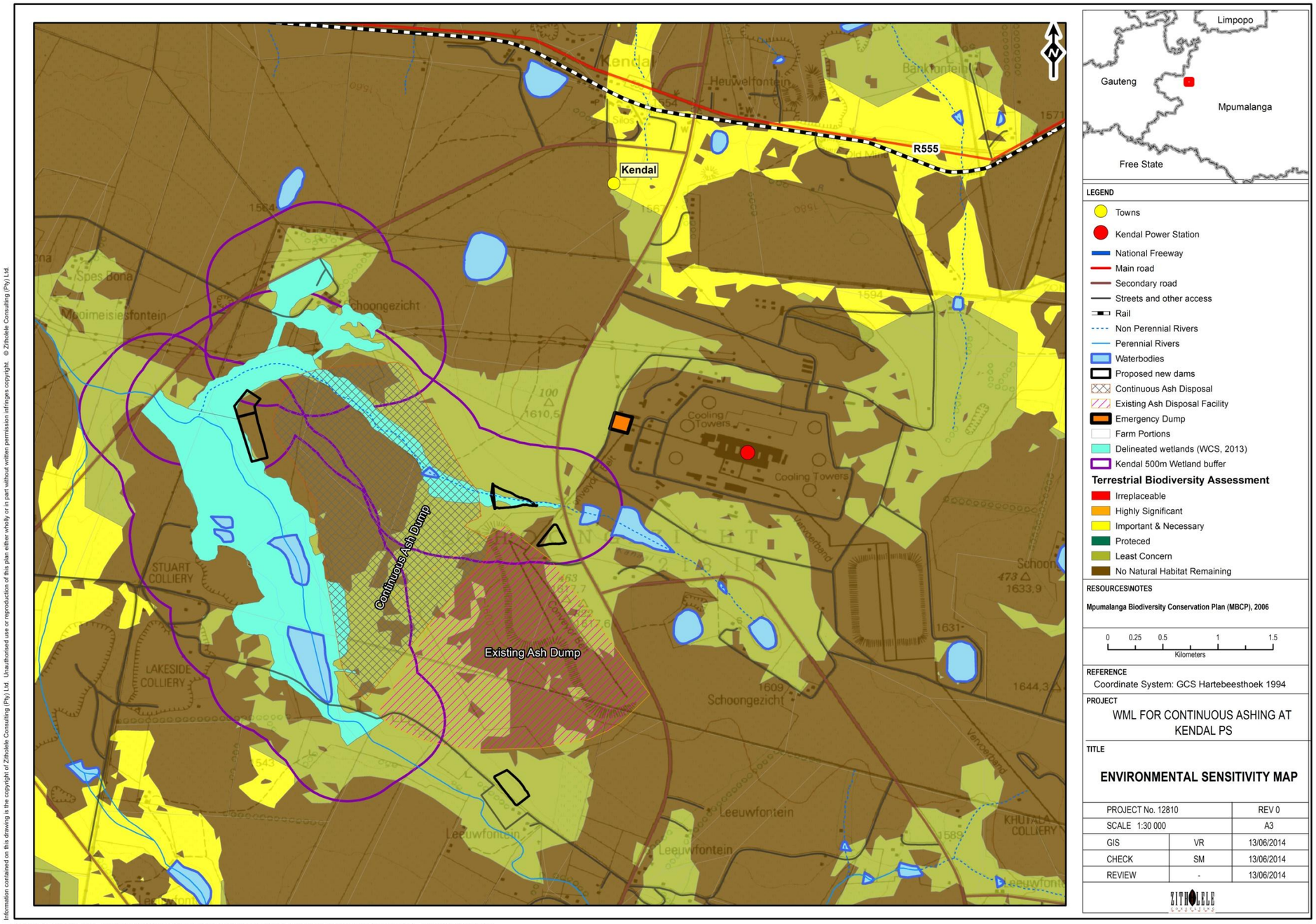

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Figure 6-10: Biodiversity of Study Area

6.9 Floral Biodiversity

6.9.1 Methodology and Data Sources

The information contained in this section was sourced from the following report:

- Terrestrial Ecosystems Assessment of proposed Continuous and Emergency Ash Dumps at Kendal Power Station Report Number 13614982-11971-1 prepared by Golder Associates Africa dated June 2014 (refer to **Appendix E8**).

6.9.2 Regional Description

The study area is located in the Rand Highveld Grassland vegetation type on the border with the Eastern Highveld Grasslands in the grassland biome (Mucina & Rutherford, 2006) (refer to **Figure 6-11**). Rand Highveld Grassland extends in an east-west band from Stoffberg in Mpumalanga to the outskirts of Pretoria in Gauteng. This vegetation is dominated by elements of Acocks's (1953) Bakenveld and Low & Robelo's (1996) Rocky Highveld Grassland and Moist Sandy Highveld Grassland. According to Ferrar & Lötter (2007) this vegetation type originally covered 589 365ha of Mpumalanga Province.

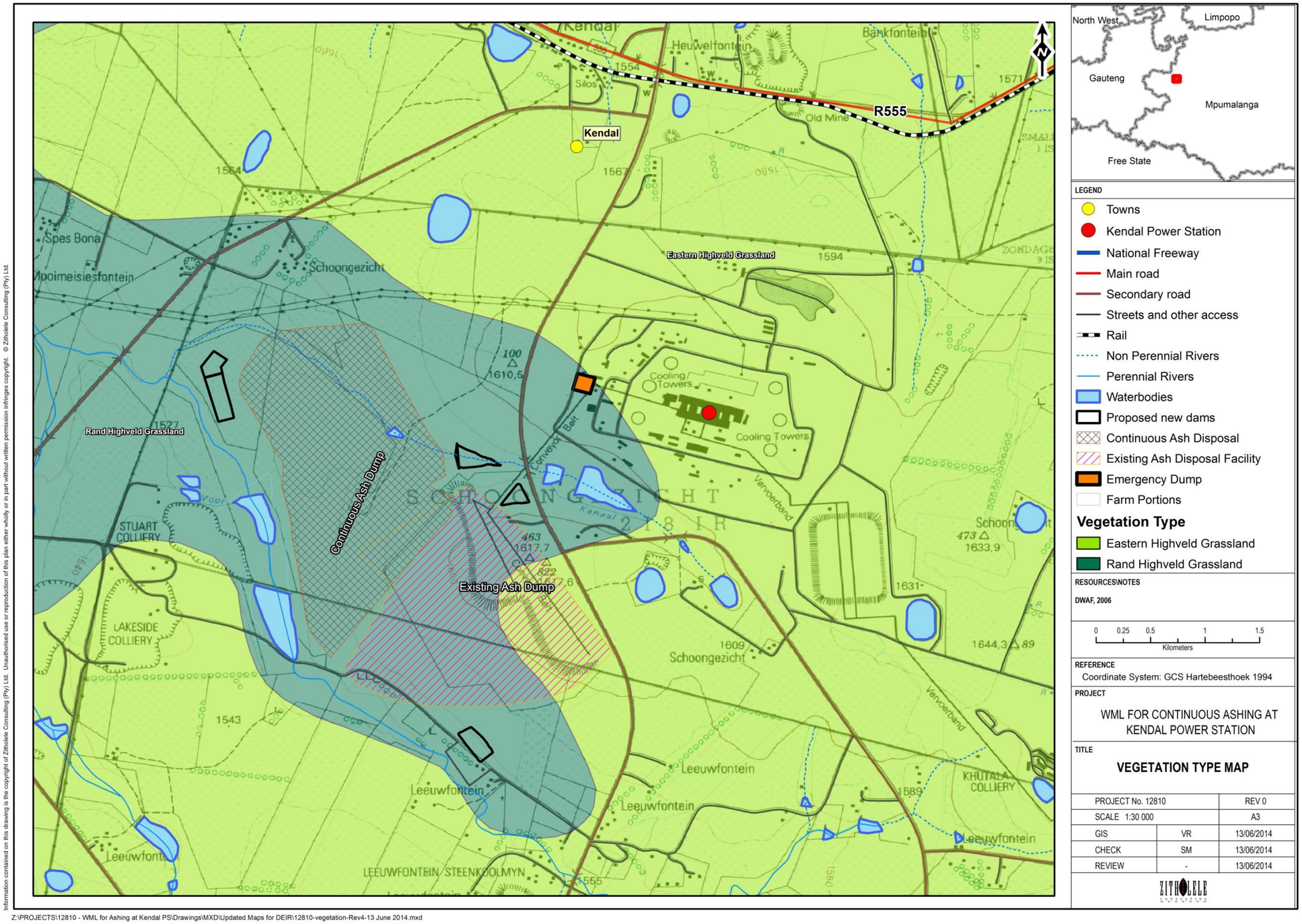

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Figure 6-11: Vegetation Map of Study Area

Rand Highveld Grassland is a highly variable landscape comprising elevated slopes and ridges and undulating grass plains. Vegetation ranges from species-rich sour grassland to sour shrub-land. Common taxa include grass species from the genera *Themeda*, *Eragrostis, Heteropogon* and *Elionurus* and herbs belonging to *Asteraceae*. Rocky areas are dominated by open woodlands of *Protea caffra, Protea welwitschii*, *Acacia caffra*, *Celtis africana* and *Searsia magalismontana* (Mucina & Rutherford, 2006).

6.9.3 Sensitivities

Based on Mucina & Rutherford (2006), regionally Rand Highveld Grassland is classified as Endangered. Within Mpumalanga, Ferrar & Lötter (2007) categorise Rand Highveld Grassland as having an ecological status of Endangered-low. Although the target for conservation is 24%, only 1% of this vegetation type is currently under statutory conservation in reserves such as Kwaggavoetpad, Van Riebeck Park and Boskop Dam Nature Reserves. Cultivation, plantations and urbanisation have resulted in the transformation of large parts of Rand Highveld Grassland. Exotic invasive plants, particularly *Acacia mearnsii* are present. Only about 7% of this vegetation type has been subject to moderate to high erosion (Mucina & Rutherford, 2006).

6.10 Visual

The information contained in this section was sourced from the following report:

- Visual Impact Report compiled by Newtown Landscape Architects dated June 2014 (refer to **Appendix E10**).

6.10.1 Methodology

The Visual Assessment was carried out using the following methods:

- A field survey was undertaken and the study area scrutinized to the extent that the receiving environment could be documented and adequately described;
- The physical characteristics of the project components were described and illustrated;
- General landscape characterization;
- The landscape character of the study area was described;
- The quality of the landscape was described;
- The sense of place of the study area was described as to the uniqueness and distinctiveness of the landscape;
- Illustrations, in very basic simulations, of the proposed project were overlaid onto panoramas of the landscape, as seen from nearby sensitive viewing points to give the reviewer an idea of the scale and location of the proposed project within their landscape context;

- Visual intrusion (contrast) of the proposed project was determined by simulating its physical appearance from sensitive viewing areas;
- The visibility of the proposed project was determined; and
- Describing the impact on the visual environment and sense of place of the proposed project.

6.10.2 Landscape Character

The study area has a gently to moderately undulating topography draped mainly with agricultural croplands with clusters of exotic shrubs and trees where the natural grassland has been disturbed. The visual character of the study area is largely cultivated land or natural grasslands with the KPS and associated infrastructure competing to dominate the scene. Even though the clean and angular lines as well as the light grey colour of the proposed Continuous ADF will create strong contrast with the flowing lines from the undulating topography and season variation between green and brown colours, it is not totally uncharacteristic when set within the attributes of the receiving environment which is mixed industrial – pastoral.

6.10.3 Sensitive Receptors

Sensitive viewers within the study area include residents within, visitors to and travellers through the study area. These sensitive viewers are however already exposed to the existing KPS with associated structures and infrastructure.

6.11 Groundwater

The information contained in this section of the DEIR has been sourced from the following report:

- Groundwater Baseline Study at Kendal Power Station - Continuous Ash Disposal Facility Report Number 12614149-12075-1 dated May 2014 compiled by Golder Associates (refer to **Appendix E4**).

6.11.1 Methodology

For the Groundwater Study the following information and data was utilised during the desk study and information review task:

- National Groundwater Database (NGDB);
- 1:250 000 geological map series;
- 1:2 500 000 Groundwater Resources map of RSA –Sheet 1 (WRC.DWAF 1995).

6.11.2 Overview of study area

The site is mainly underlain by sub–horizontal sediments of the Karoo Sequence comprising of shale, carbonaceous shale, sandstone and coal layers of the Vryheid formation of the Ecca group. The initial regional groundwater conceptual model identify three aquifer zones namely weathered, fractured and deep fractured to fresh aquifer zones, but needs to be confirmed and updated, from future test pumping and borehole logs. The average groundwater levels of the deep monitoring boreholes are 6.1mbgl and for the shallow monitoring boreholes 2.21mbgl. The groundwater flow mimics the topography and the predominant direction is towards the surface streams.

6.12 Wetlands

The information contained in this section of the DEIR has been sourced from the following report:

- Wetland Delineation & Impact Assessment for the Kendal Power Station Continuous Ash Disposal Facility, Mpumalanga Province Reference: 978/2013 dated June 2014 prepared by Wetland Consulting Services (refer to **Appendix E11**).

6.12.1 Methodology

Information relating to the Wetlands associated with the proposed development area was gathered by means of desktop studies, fieldwork and research, wetland delineation and classification.

6.12.2 Overview of identified wetlands

Extensive wetland areas were identified and delineated on site, with the following wetland types encountered (refer to **Figure 6-12**):

- Channelled valley bottom wetlands;
- Hillslope seepage wetlands; and
- Weakly / Unchannelled valley bottom wetlands.

In total, surveyed wetland areas within and around the project area cover approximately 248 hectares. From the functional assessment of the wetlands on site it is clear that the wetlands have the ability to provide various ecosystem services such as biodiversity support, maintenance of water quality, flood attenuation and sediment trapping. The ability of the wetlands to perform these functions has, however, been compromised by disturbances such as alien invasive vegetation encroachment, impoundments, farms dams, road crossings, mining activities and associated mine dumps, cut off trenches along the roads and eroded channels.

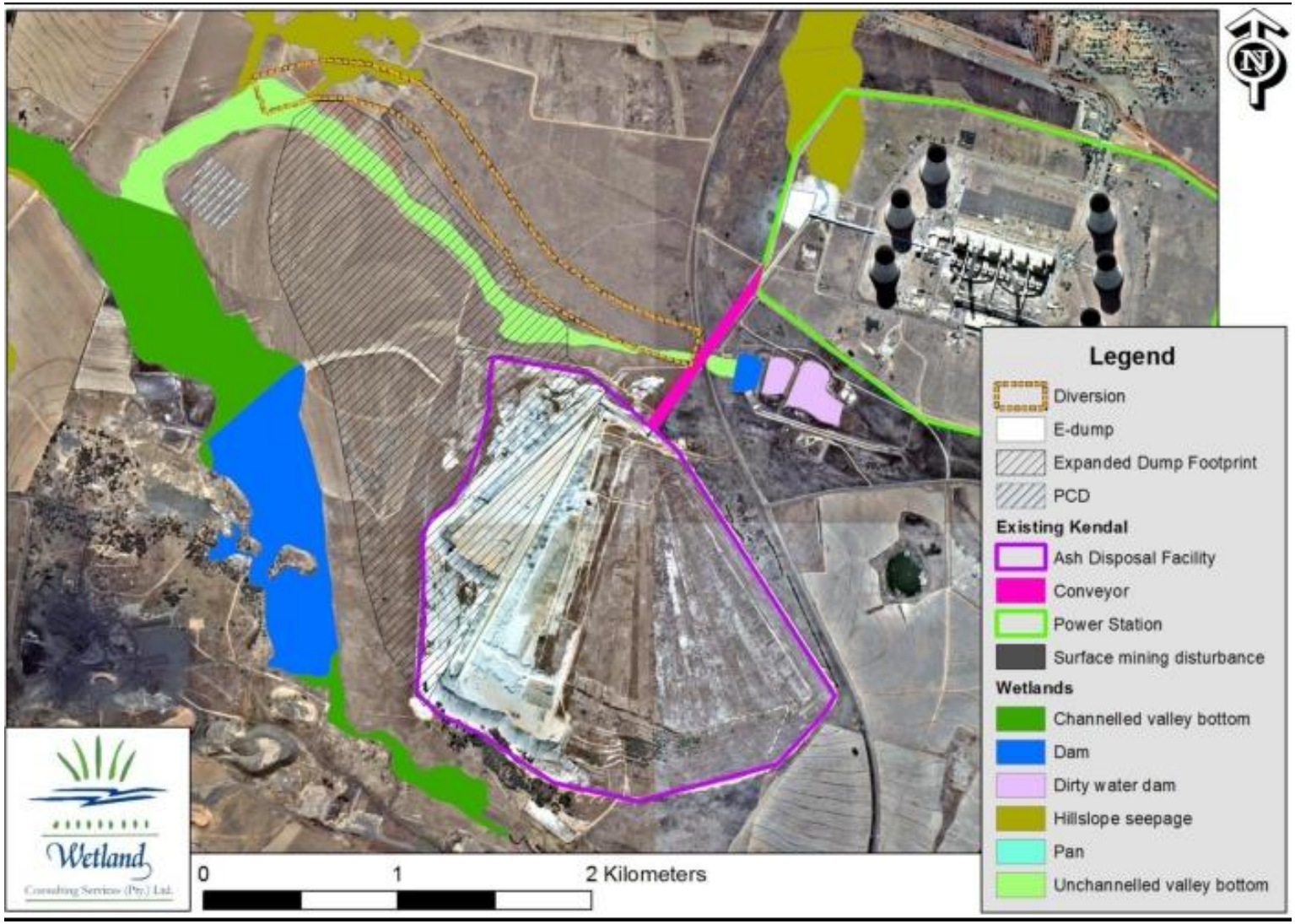

Figure 6-12: Map showing the proposed activities in relation to the delineated wetlands on site

6.12.3 Sensitivity

The ecological integrity of wetland areas on site ranges from moderately to largely modified with PES of C and D respectively (although HGM Unit 2 may be considered critically, although not irreversibly, modified due to the influence of the large dam). All the wetlands on site have moderate or low / marginal ecological sensitivity status.

6.13 Cultural and historical resources

The information contained in this section of the report has been sourced from the following report:

- Proposed Continuous Ash Facility and Expansion of Emergency Ash Dump ("E-Dump") for the Kendal Power Station Kendal, Nkangala District, Mpumalanga Heritage Impact Report Revision 2 dated June 2014 prepared by Professional Grave Solutions (refer to **Appendix E5**).

6.13.1 Methodology

A basic desktop assessment of the topography and geology of the area was made by using 1:250 000 geological maps (2628 East Rand) in conjunction with Google Earth. The known fossil heritage within each rock unit was determined from the published scientific literature and previous paleontological impact studies in the same region.

6.13.2 Palaeontology

The study area is mainly underlain by Vaalian and Mokolian aged igneous rocks of the Transvaal Sequence and Bushveld Complex, with three small outlying areas, including the E-Dump area, underlain by Permian Vryheid Formation sediments of the Karoo Supergroup.

The Permian Balfour Formation (Pub) is well known to contain fossils and is interpreted as a meandering river deposit grading upwards into a lacustrine environment. The Formation is correlated with the Dicynodon Assemblage zone, which is known as a productive fossil bearing strata (Rubidge et al, 1995). The upper part of the Balfour Formation is known as the Palingkloof Member which in turn is associated with the Lystrosaurus Assemblage zone (Groenewald, 1996).The development area is underlain by potential fossiliferous rock units. The footprint of the proposed Continuous ADF and associated infrastructure is underlain by the Vryheid Formation. This geological unit (i.e. Vryheid Formation) is associated with abundant plant fossils of *Glossopteris.* Earthworks and excavations during the Construction Phase may result in the exposure or damage of buried fossils.

6.14 Socio-economic Environment

Equispectives completed a socio-economic baseline assessment for the Kendal Power Station 30 year EIA Project in October 2013. As part of this study they described the baseline socio-economic environment. The findings of the aforementioned study relating to the socio-economic environment associated with the Kendal Power Station is summarised below and focuses on:

6.14.1 Location Description of the area

The Kendal Continuous Site falls within the Emalahleni Local Municipality (ELM) which is situated in the Nkangala District Municipality (NDM) in the Mpumalanga.

Mpumalanga Province

The Mpumalanga Province is located in the north eastern part of South Africa and covers an area of approximately 82 333 km^2. It borders the Limpopo Province, Gauteng, the Free State, KwaZulu Natal and internationally Swaziland and Mozambique. The word Mpumalanga means “place where the sun rises”.

The province consists of three district municipalities, namely Gert Sibande, Nkangala and Ehlanzeni. Nelspruit is the provincial capital and other major towns include Barberton, Delmas, Ermelo, Hazyview, Komatipoort, Malelane, Mashishing (Lydenburg), Middelburg, Piet Retief, Sabie, Secunda, Standerton, Volksrust, White River and Emalahleni (Witbank) (Equispectives, 2013).

Mpumalanga is South Africa’s major forestry production area and is also the world’s largest producer of electrolytic manganese metal. Six major industrial clusters have been identified in Mpumalanga in which numerous investment opportunities exists, namely stainless steel; agri-processing; wood products; chemical industry and chemical products; agri-products and tourism.

Extensive mining is done in the province. Minerals found include: gold, platinum group metals, silica, chromite, vanadiferous magnetite, argentiferous zinc, antimony, cobalt, copper, iron, manganese, tin, coal, andalusite, chrysotile asbestos, kieselguhr, limestone, magnesite, talc and shale.

Mpumalanga also accounts for 83% of South Africa's coal production. Ninety percent of South Africa's coal consumption is used for electricity generation and the synthetic fuel industry. Coal power stations are situated close to the coal deposits.

The province mainly exports primary products from its mining and agricultural activities with little value addition. Mpumalanga will be able to increase its share of export contribution

towards the provincial GDP by adding value to its export products through beneficiation (Mpumalanga Economic Profile).

Nkangala District Municipality

The NDM is one of the three district municipalities in Mpumalanga. Local municipalities forming part of the Nkangala DM are Victor Khanye, Dr JS Moroka, Emalahleni, Emakhazeni, Steve Tshwete, and Thembisile, and the Mdala District Management Area.

The district is approximately 17 000 km^2 and consists of about 165 towns and villages, with Emalahleni and Middelburg being the primary towns. According to the municipality's website, the Nkangala DM is at the economic hub of Mpumalanga and is rich in minerals and natural resources. The district's economy is dominated by electricity, manufacturing and mining. Community services, trade, finance, transport, agriculture and construction (Equispectives, 2013) are also important sectors. Nkangala's Integrated Development Plan (IDP) states that the district has extensive mineral deposits, including chrome and coal. There are six coal-fired power stations in the Nkangala District (Nkangala IPD 2012/2013), with a seventh currently under construction.

Another important economic activity in Nkangala is agriculture. The southern regions of the municipality are suitable for crop farming, specifically for fresh produce such as maize and vegetables, while cattle and game farming occur in the northern regions.

In terms of the population profile of the Nkangala DM, the majority of its inhabitants are extremely poor and do not have access to mainstream economic activities. The main poverty concentration is amongst the communities residing in Dr JS Moroka and Thembisile Local Municipalities. The most important employment centre for these communities is the City of Tshwane, reducing their reliance on NDM. Daily commuting by means of public transport is a necessity (Equispectives; 2013).

Emalahleni Local Municipality

The ELM is one of the six local municipalities forming part of the NDM and borders the Gauteng Province. The ELM is situated strategically within provincial context and in relation to the national transport network. It is situated closely to the City of Johannesburg Metropolitan, City of Tshwane Metropolitan Municipality and the Ekurhuleni Metropolitan Municipality. It is connected to these areas by the N4 and N12 freeways as well as a railway network. The Maputo Corridor runs through the municipality. The southern parts of the municipality forms part of the region referred to as the Energy Mecca (Emalahleni IDP, 2012/13) due to its rich coal reserves and a number of power stations in the area such as Kendal, Matla, Duvha, Ga-Nala and the new Kusile power station.

The main urban centre is the town of Emalahleni with the other towns / activity nodes being Ogies, Phola, Ga-Nala, Thubelihle, Rietspruit, Van Dyksdrift and Wilge. The development

patterns in the area are fragmented, not only because of previous policies of segregation by race, but also due to the fact that large areas are undermined or have mining rights which resulted in further physical separation of areas, and the presence of natural features like flood plains and marshlands (Emalahleni IDP, 2012/13).

The ELM was put under Administration in terms of Section 139 (1)(b) of the Constitution of the Republic of South Africa in April 2013 (Equispectives; 2013).

6.14.2 Description of the population

The baseline description of the population will take place on three levels, namely provincial, district and local. Impacts can only truly be comprehended by understanding the differences and similarities between the different levels. The baseline description will focus on the Victor Khanye Local Municipality (VKLM) and the ELM in the NDM in the Mpumalanga Province (referred to in the text as the study area), as these are the areas that will be most affected by the proposed ash disposal facility. The data used for the socio-economic description was sourced from Census 2011. Census 2011 was a de facto census (a census in which people are enumerated according to where they stay on census night) where the reference night was 9-10 October 2011. The results should be viewed as indicative of the population characteristics in the area and should not be interpreted as absolute. Also bear in mind, this study was done for the Kendal 30 year project which includes the VK LM. However, this LM does not form part of the Kendal Continuous Project area. The entire Kendal Continuous Project is located on the ELM.

6.14.3 Population and household sizes

According to the Census 2011, the population of South Africa is approximately 51,8 million and has shown an increase of about 15.5% since 2001. The household density for the country is estimated on approximately 3.58 people per household, indicating an average household size of 3-4 people (leaning towards 4) for most households, which is down from the 2001 average household size of 4 people per household. Smaller household sizes are in general associated with higher levels of urbanisation.

The estimated growth for the Mpumalanga Province (**Table 6-1**) was greater than the national average while the ELM showed the greatest increase in population since 2001.

The average household size for the Mpumalanga Province is above the national average. The household sizes for all the areas under investigation have decreased since 2001 while the number of households has increased. This can indicate that people tend to have smaller families.

Table 6-1: Census 2011 - Population, growth and household estimates (Equispectives, 2013)

	Approximate population size	Estimated population growth since 2001	Average household size	Estimate growth in households since 2001
Mpumalanga Province	4 039 939	20.04%	3.76	36.93%
Nkangala District Municipality	1 308 129	28.45%	3.67	45.42%
Victor Khanye Local Municipality	75 452	33.93%	3.67	53.02%
Emalahleni Local Municipality	395 466	43.07%	3.30	60.01%

6.14.4 Population composition

In all the areas under investigation, the population majority is the Black population group, but the proportions differ across the wards (**Figure 6-13**). Ward 9 of the VKLM has the lowest proportion of people belonging to the Black population group of all the areas under investigation. Ward 9 has a much greater proportion of people belonging to the White population group than the VKLM as a whole, which make this area culturally different from the rest of the municipality as well as the district and province. The profile for Ward 7 is very similar to that of Ward 9. Ward 30 of the ELM has the highest proportion of Black people of all the areas under investigation, also much higher than on local or district level. The profiles for Wards 28 and 31 are very similar to that of Ward 30.

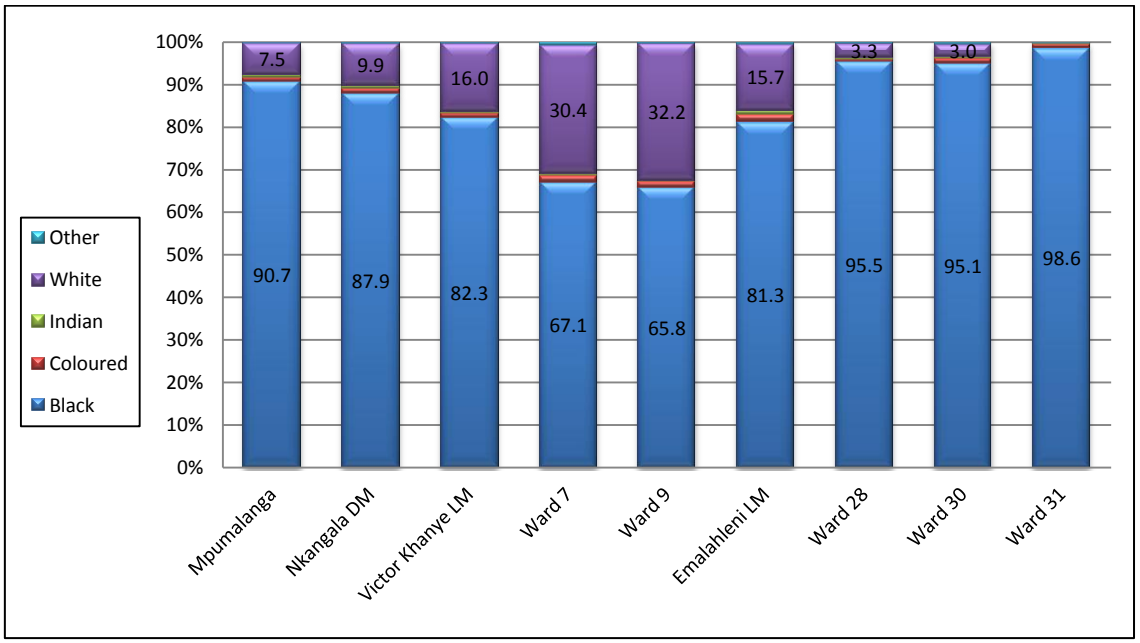

Figure 6-13: Population distribution (shown in percentage, source: Equispectives, 2013)

6.14.5 Age

The age distribution of the areas under investigation shows that Ward 31 of the ELM has a greater proportion of children aged 14 years or younger and a smaller proportion of people older than 65 years of age than the other wards (**Figure 6-14**). Ward 30 of the ELM has a higher proportion of people between the ages of 25-34 years. Ward 7 of the VKLM has the highest total dependency ratio (48.4) compared to 45.4 for Ward 9, 45.0 for Ward 28 of the ELM, 44.7 for Ward 31 and 38.5 for Ward 30. The total dependency ratio refers to the proportion of dependants per 100 working-age population. The youth dependency ratio for Ward 31 (41.1) is much greater than for the other wards, indicating that there is greater pressure on the working-age population in Ward 31 and they can be expected to pursue potential employment opportunities with vigilance. Ward 7 has the highest Aged dependency ratio (10.0). If the dependency ratio is based on only the proportion of the population that is employed, Ward 28 has the highest proportion of dependents per 100 employed people (75.0), while Ward 9 has the lowest proportion (64.1). This suggests that there will be a higher demand for employment in Ward 28, as well as in Wards 30 and 31 (with ratios of 71.1 and 72.4).

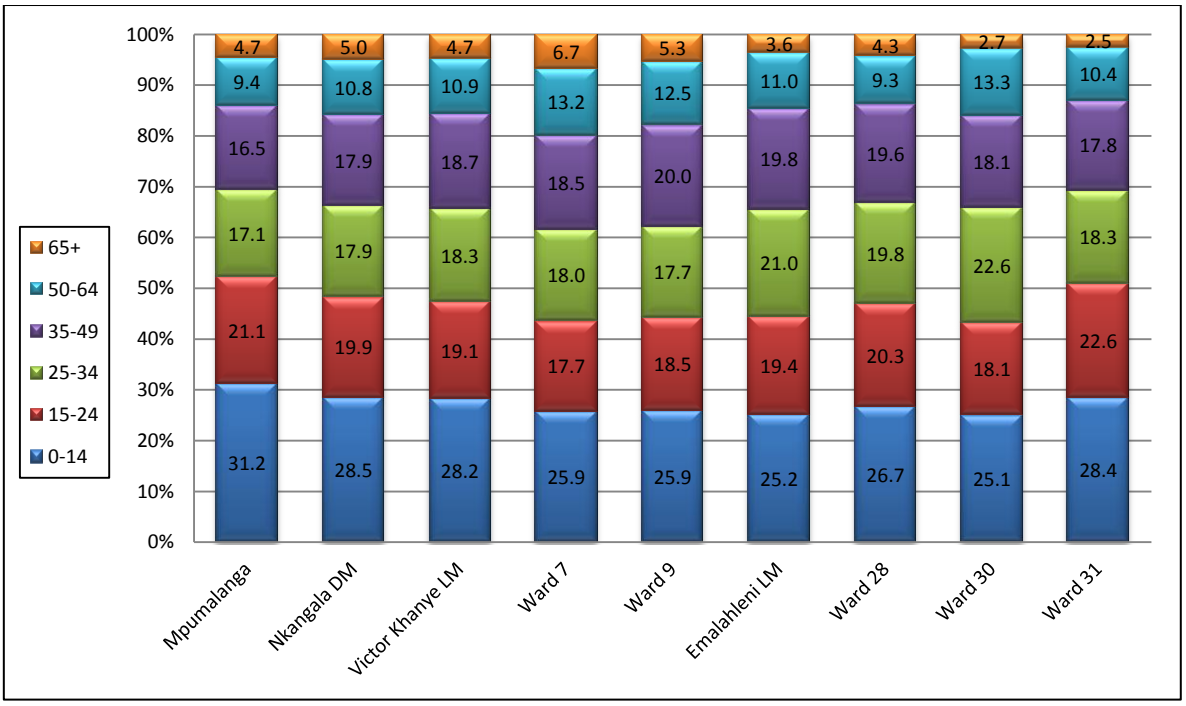

Figure 6-14: Age distribution (shown in percentage, source: Equispectives, 2013)

6.14.6 Gender

The gender distribution for the areas under investigation shows a bias towards males (**Figure 6-15**), especially in Ward 30. This can in all likelihood be ascribed to the presence of mines and construction activities in the area and the resulting migration of male workers to the area.

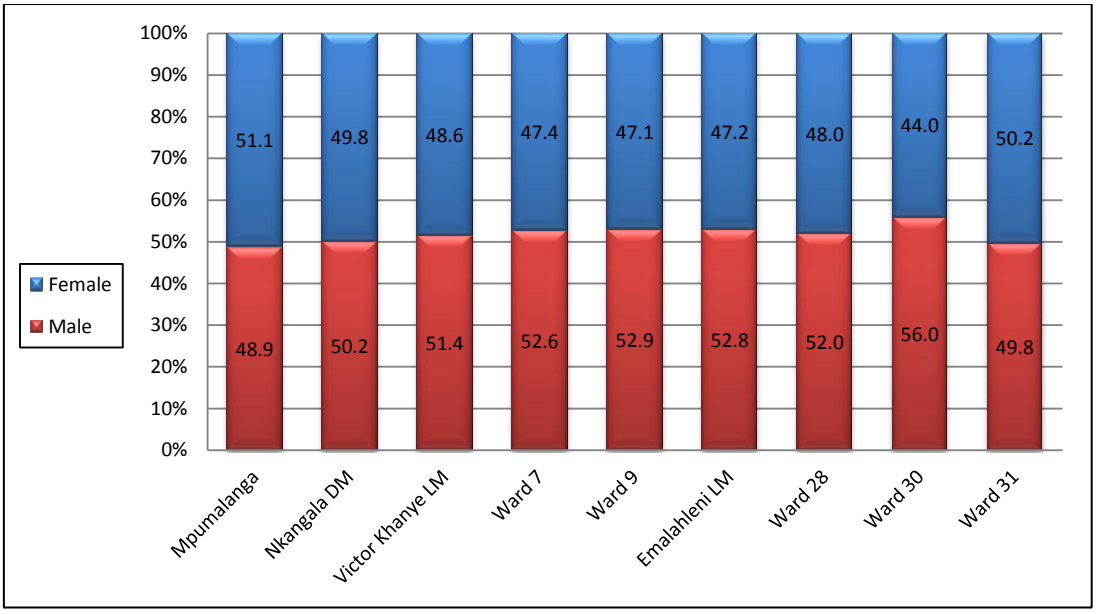

Figure 6-15: Gender distribution (shown in percentage, source: Equispectives, 2013)

6.14.7 Language

The language distribution for the areas under investigation looks very different from one another (**Figure 6-16**). In Wards 28, 30 and 31 of the ELM the predominant home language is IsiZulu, followed by IsiNdebele, while the predominant home languages in Ward 7 & 9 of the VKLM are Afrikaans, IsiNdebele and IsiZulu. As home language relates to culture, it suggests that the areas are culturally different from one another with greater diversity in Wards 7 and 9. Home language should be taken into consideration when choosing languages to communicate in with the local communities.

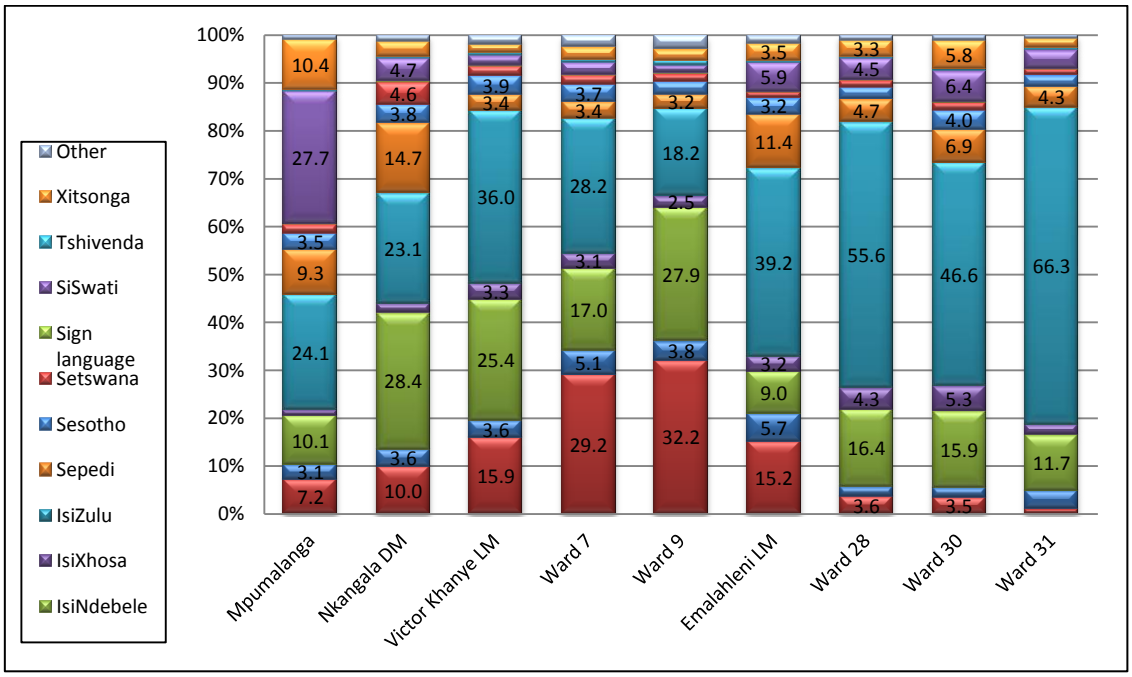

Figure 6-16: Language distribution (shown in percentage, source: Equispectives, 2013)

6.14.8 Education

Figure 6-17**6-17** shows the education profiles for the areas under investigation for those aged 20 years or older. Ward 7 in the VKLM has the highest proportion of people who have no schooling or have only completed some primary school on local level. Ward 28 of the ELM has the highest proportion of people with schooling higher than Grade 12, although this ward also has the lowest proportion of employed people.

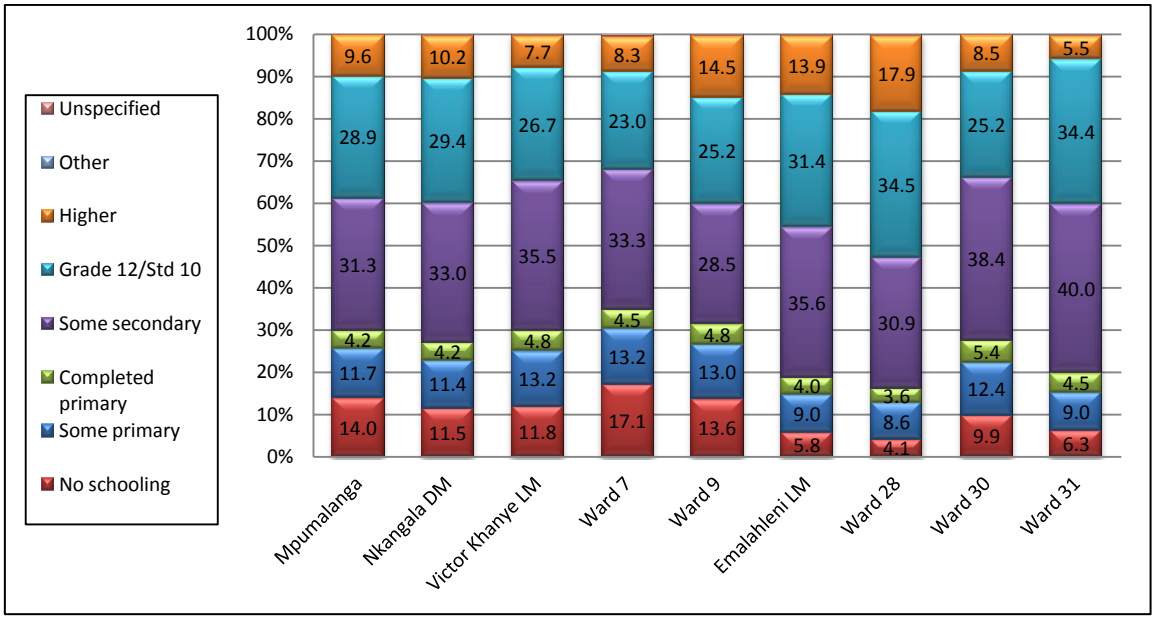

Figure 6-17: Education profiles (those aged 20 years or older, shown in percentage, source: Equispectives, 2013)

6.14.9 Employment

Ward 9 of the Victor Khanye Local Municipality has the highest proportion of people of economically active age (aged between 15 years and 65 years) that are employed **(Figure** 6-18 **6- 18**) of the areas under investigation. Ward 29 of the ELM has the lowest proportion of employed people on a ward level.

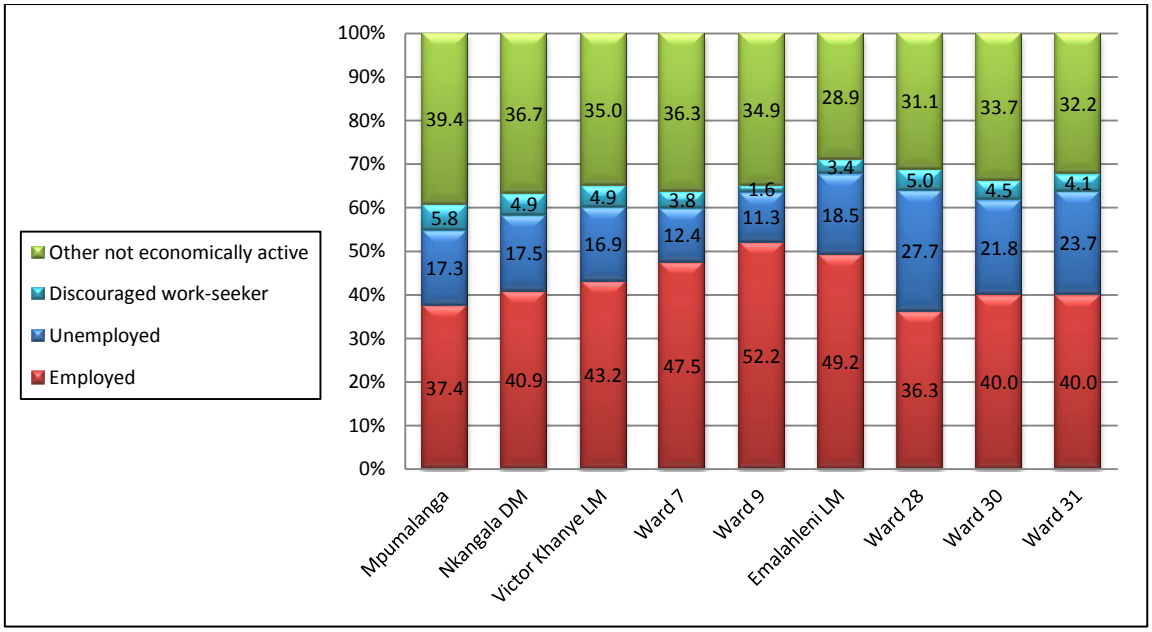

Figure 6-18: Labour status (those aged between 15 - 65 years, shown in percentage, source: Equispectives, 2013)

The majority of the employed people in the areas under investigation work in the formal sector (**Figure 6-19**). Wards 7 and 9 in the VKLM have the highest proportion of people working at private households, while Ward 31 in the ELM has the highest proportion of people working in the informal sector.

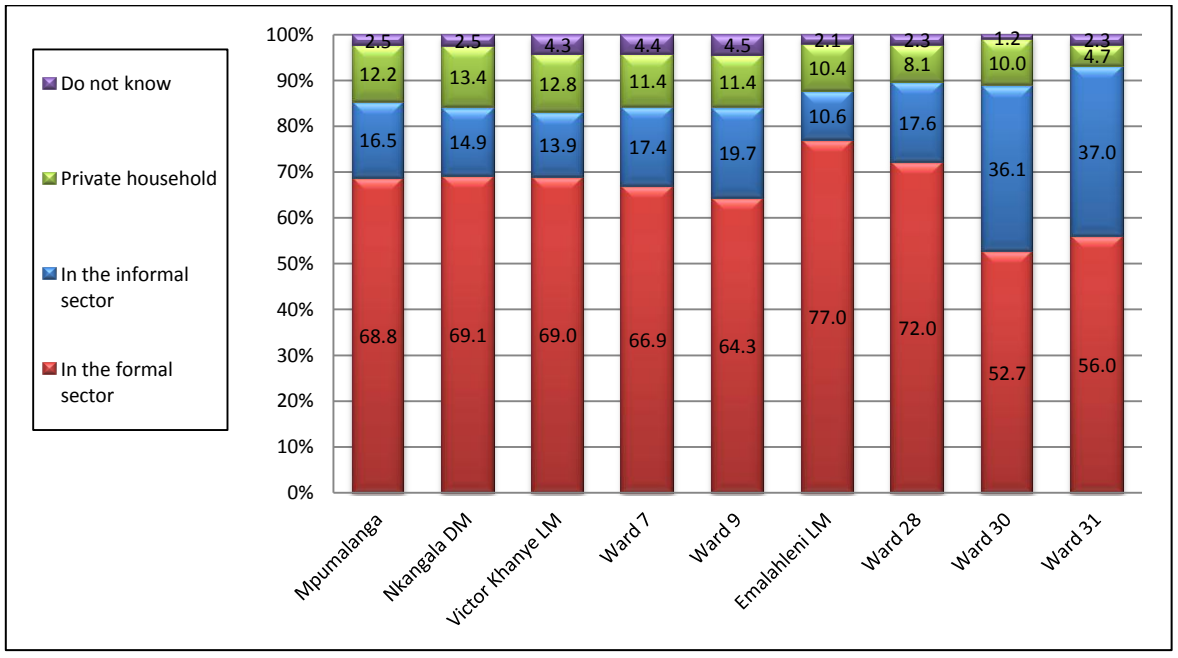

Figure 6-19: Employment sector (those aged between 15 - 65 years, shown in percentage, source: Equispectives, 2013)

6.14.10 Household Income

More than 60% of the households in Ward 7 of the VKLM and Ward 28 of the ELM have a household income of less than R38 201 per annum (**Figure** 6-20**6-20**). This suggests that households in these wards are on average poorer than households in the other areas on a ward level.

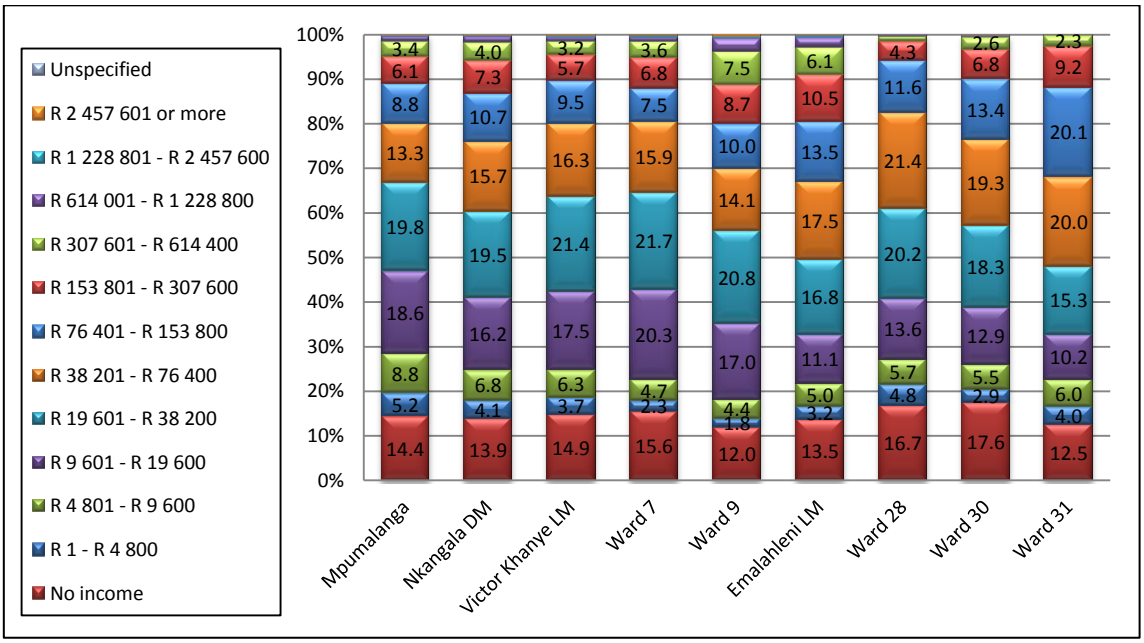

Figure 6-20: Annual household income (shown in percentage, source: Equispectives, 2013)

6.14.11 Housing

Almost half of the households in Ward 9 of the VKLM live on farms and about a third in formal residential areas (**Figure 6-21**). There are also fairly large proportions of the population living on smallholdings or in industrial areas. In Ward 7 of the VKLM about two fifths of the households live on land that is classified as farms and another two fifths live on land classified as small holdings. In Ward 28 and Ward 31 of the ELM the majority of people live on land classified as formal residential, while about half the people in Ward 30 live on land classified as formal residential and a fifth live on land classified as informal residential. The above proportions are based on the number of people and they do not refer to the size of the area type.

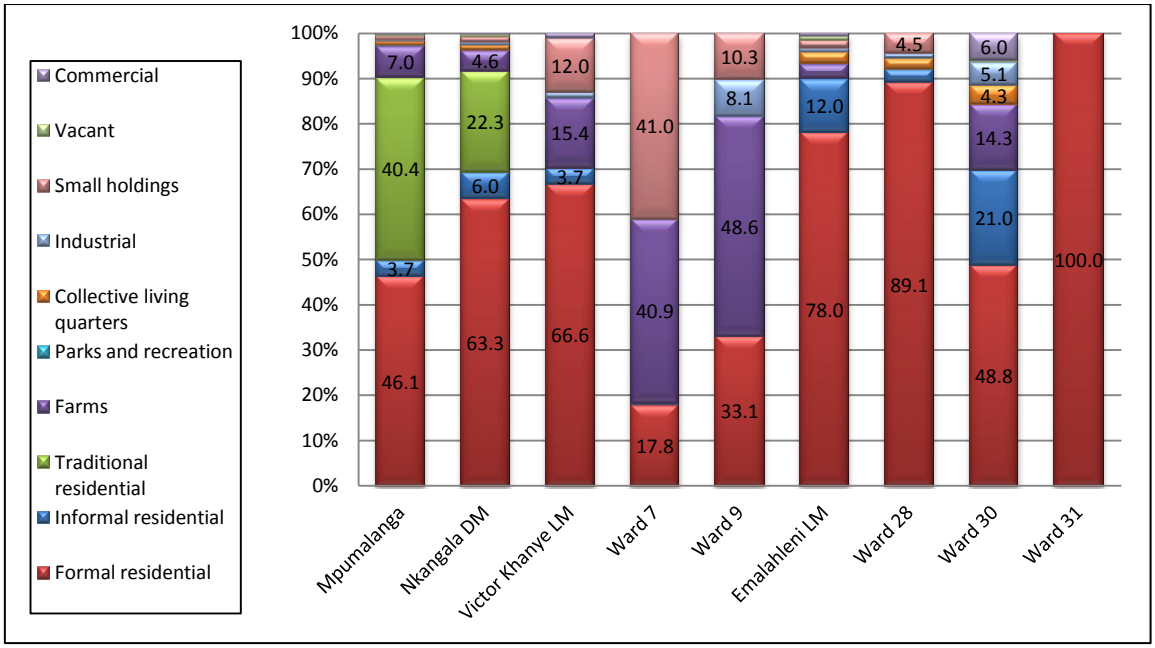

Figure 6-21: Enumeration area types (shown in percentage, source: Equispectives, 2013)

Most of the dwellings in the area are houses or brick/concrete block structures that are on a separate yard, stand or farm (**Figure 6-222**). A large proportion of households in Ward 28 and Ward 30 of the ELM live in informal dwellings. A small proportion of the informal dwellings are in the backyard of another dwelling. In Ward 9 of the VKLM, the second most common dwelling type is dwellings made of traditional materials, although there is no traditional land in the Victor Khanye Municipal area. This can possibly refer to farm worker residences that they have built for themselves on the farms where they stay.

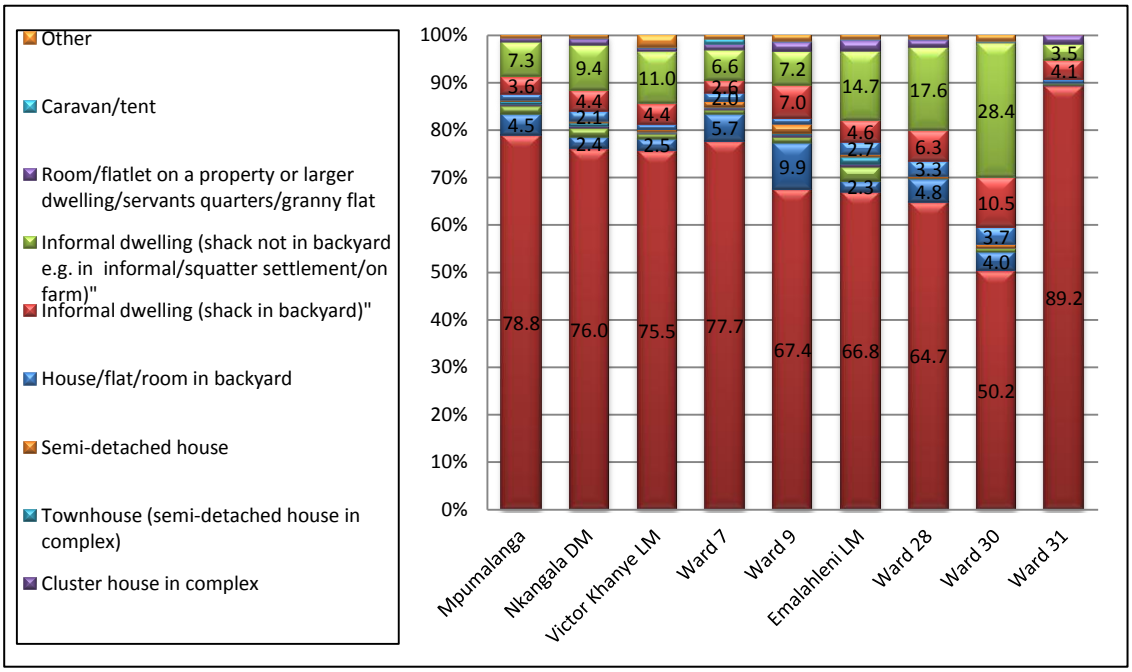

Figure 6-22: Dwelling types (shown in percentage, source: Equispectives, 2013).

In Ward 30 of the ELM more than 60% of households occupy their dwellings rent-free (**Figure** 6-23**3**). Ward 9 of the VKLM has the largest proportion of households that rent their dwellings while Ward 7 has the largest proportion of households that occupy their dwellings rent-free.

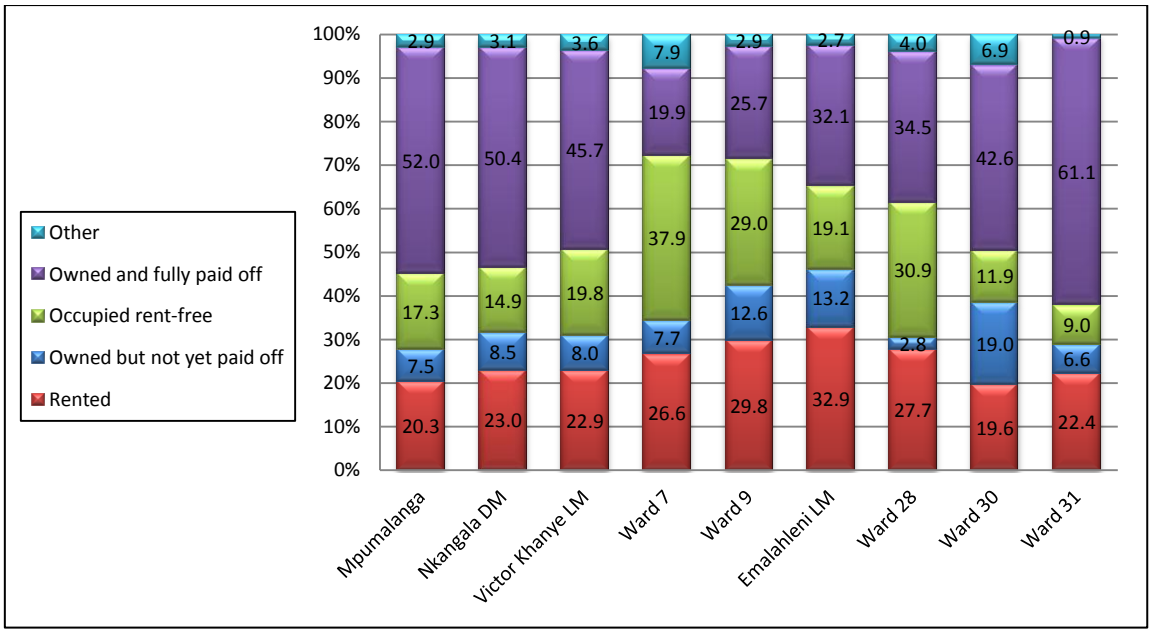

Figure 6-23: Tenure status (shown in percentage, source: Equispectives, 2013)

6.14.12 Household Size

On a ward level, about half of the households consist of one or two members (**Figure 6-244**), expect for Ward 31 of the ELM where less than 40% of households consist of only one or two members. Household sizes in Ward 31 tend to be larger than in the other wards under investigation.

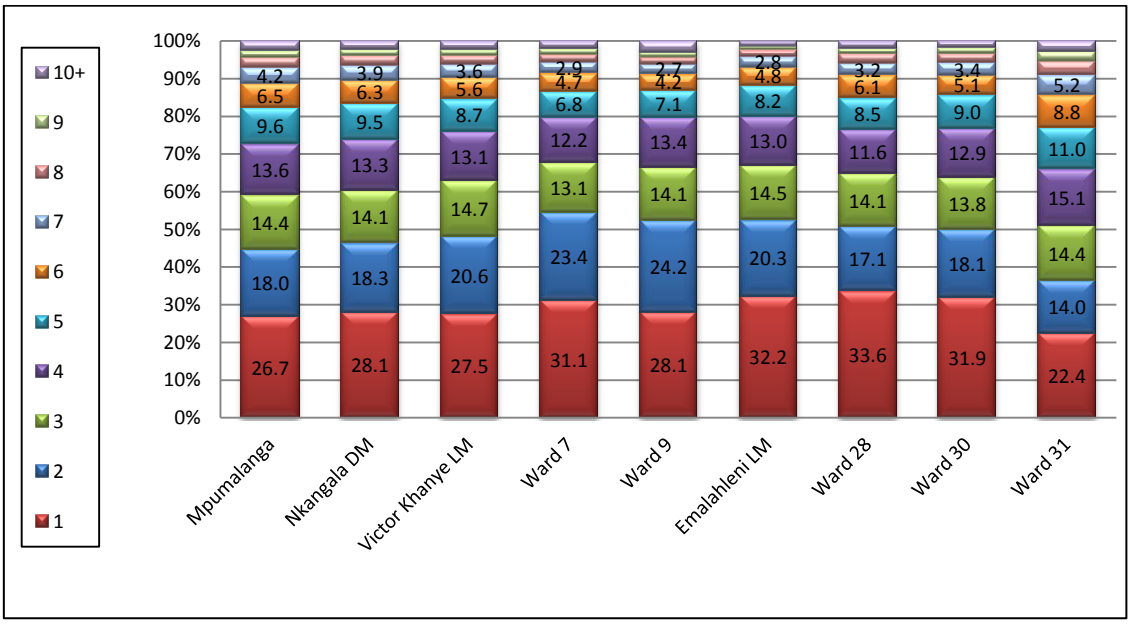

Figure 6-24: Household size (shown in percentage, source: Equispectives, 2013)

6.14.13 Access to water

Most of the households on a ward level in the ELM get water from a regional or local water scheme, compared to half or less of households on a ward level in the VKLM (**Figure 6-255**). In Ward 7 and Ward 9 a large proportion of households get their water from boreholes.

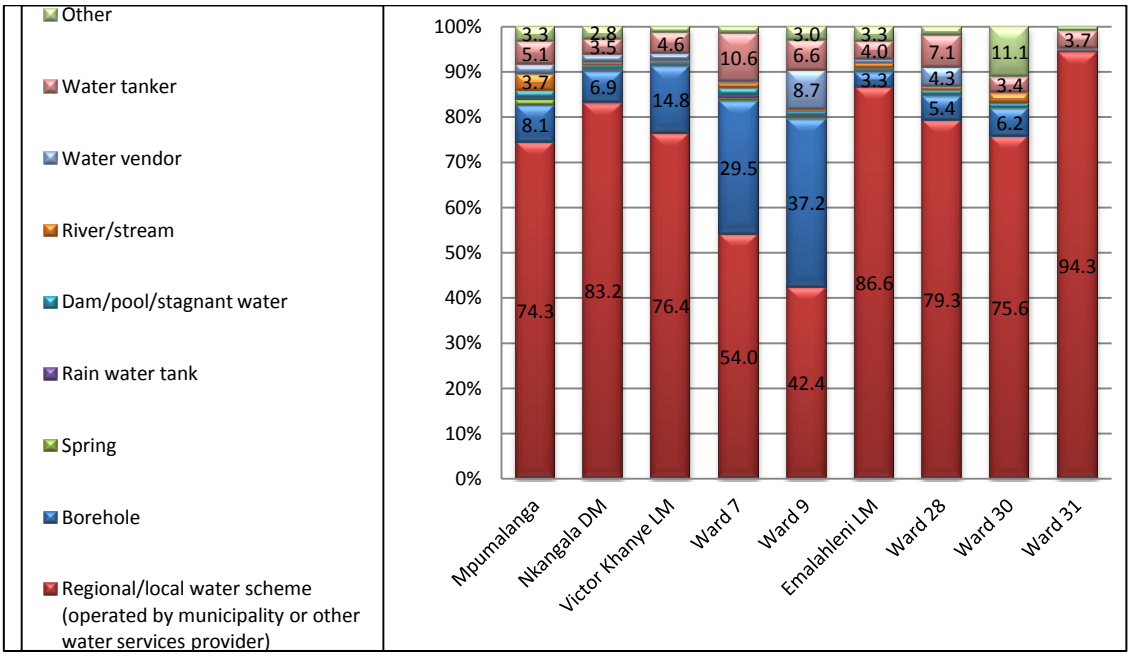

Figure 6-25: Water source (shown in percentage, source: Equispectives, 2013)

Access to piped water, electricity and sanitation relate to the domain of Living Environment Deprivation. On a ward level Ward 31 of the ELM has the highest incidence of households that have access to piped water either inside the dwelling or inside the yard, while Ward 30 has the lowest incidence (**Figure 6-26**). Ward 30 has the highest incidence of people that have no access to piped water. Access to piped water either inside the dwelling or the yard is a challenge in most of the wards.

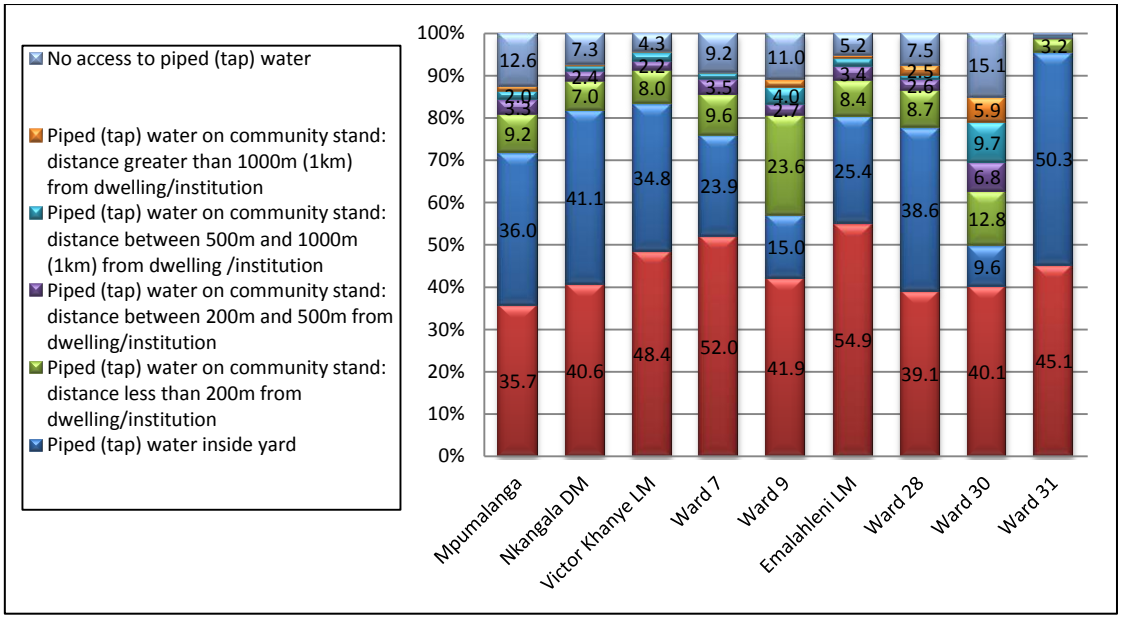

Figure 6-26: Piped water (shown in percentage, source: (Equispectives, 2013))

6.14.14 Energy

Electricity is seen as the preferred source for lighting, and the lack thereof should thus be considered a deprivation. Even though electricity as an energy source may be available, the choice of energy for cooking may depend on other factors such as cost. Ward 31 of the ELM has the highest incidence of households using electricity as a source of energy for lighting **(Figure 6-27**). In Ward 30 almost half of the households use candles as a source of energy for lighting. This suggests that they either can't afford electricity or that their area has not been electrified.

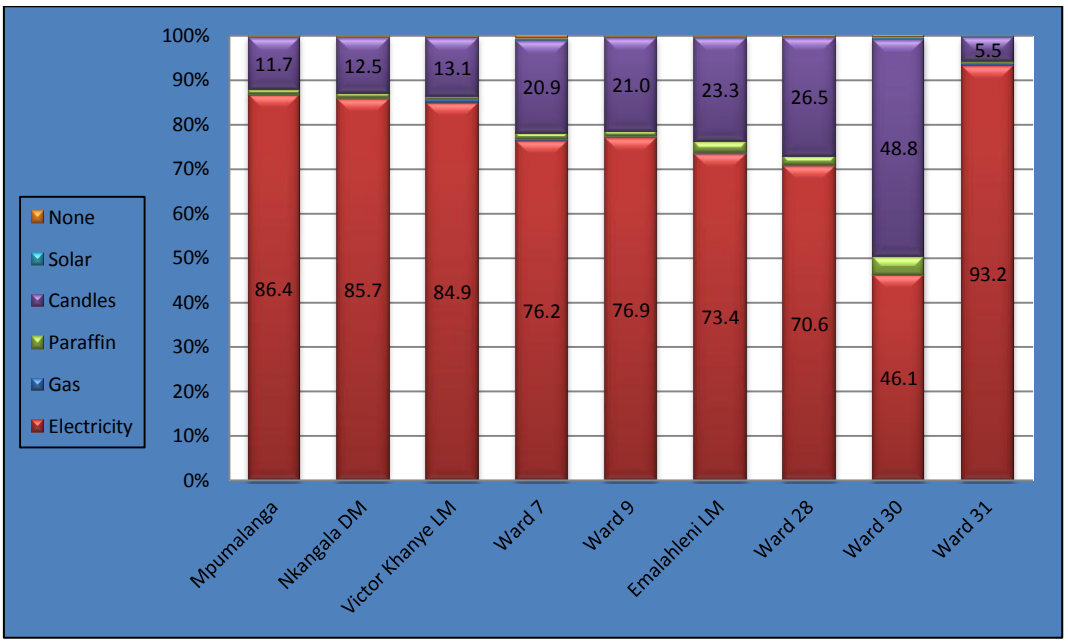

Figure 6-27: Energy source for lighting (shown in percentage, source: (Equispectives, 2013))

6.14.15 Sanitation

Equispectives (2013) states that anyone living in a household with either a chemical toilet, pit toilets without ventilation, bucket latrine, or no toilet facility can be defined as deprived. Most of the households in Ward 31 of the ELM have access to flush toilets that are connected to a sewerage system (**Figure 6-28**). Ward 30 has the highest incidence of households with no access to sanitation as well as the highest incidence of households with pit toilets without ventilation.

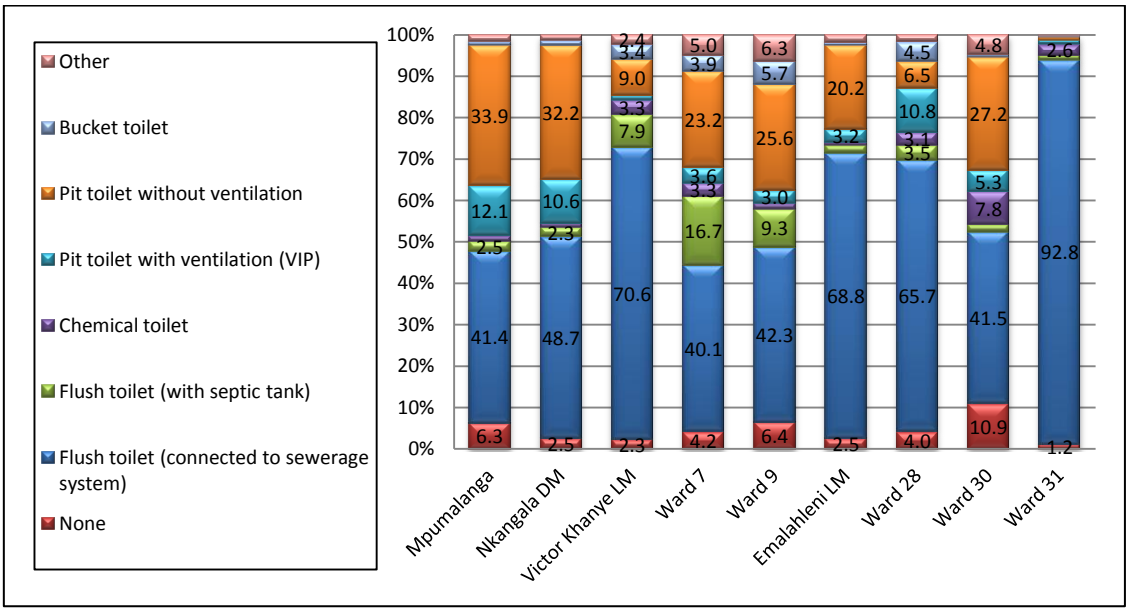

Figure 6-28: Sanitation (shown in percentage, source: Equispectives, 2013)

6.14.16 Refuse removal

In Ward 30 of the ELM and Ward 7 and Ward 9 of the VKLM large proportions of the households have indicated that they have their own refuse dumps. Households with their own refuse dumps rely mostly on backyard dumping, burial and burning. These practices adversely impact on human health and the environment, specifically:

- air pollution from smoke;
- pollution of ground and surface water resources and home grown fruit and vegetables;
- people inhaling smoke from fires at risk of contracting disease (cancer, respiratory related illness); and
- fires can destroy property.
- Ward 30 has the highest incidence of people that have indicated that they have no rubbish disposal, see figure (**Figure 6-299**).

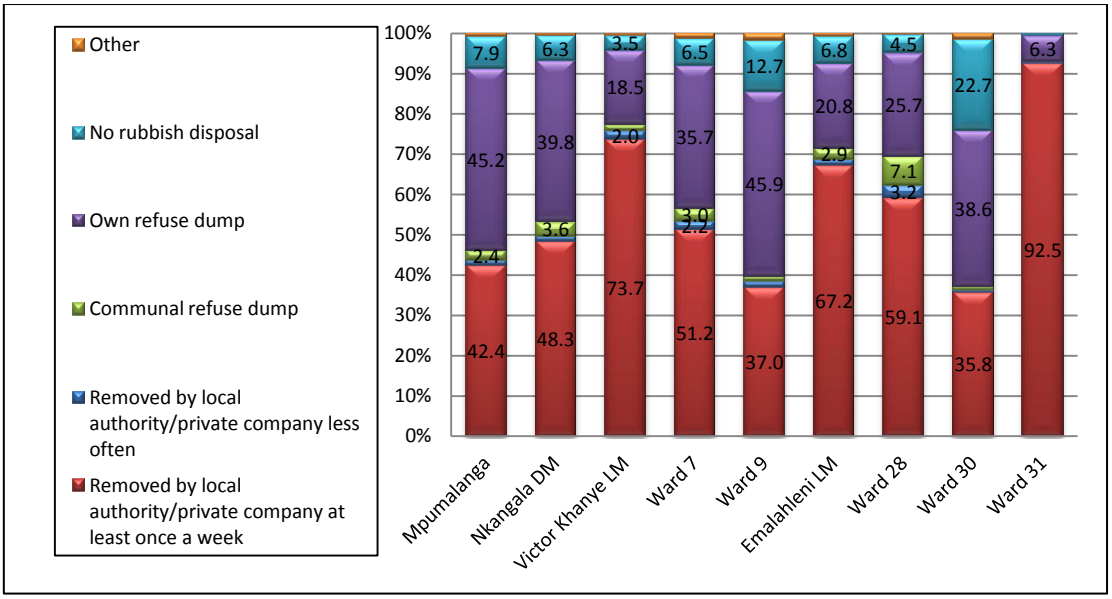

Figure 6-29: Refuse removal (shown in percentage, source: Equispectives, 2013)

7 SPECIALIST STUDIES SUMMARY

A number of specialist studies were undertaken for the proposed KPS Continuous Ash Disposal Facility (ADF) as identified during the preceding Scoping Phase. Determining which specialist studies will be required for the proposed project was driven by the environmental issues and concerns identified during the Scoping Phase. The findings of these specialist studies informed the assessment of the potential environmental impacts associated with the proposed project.

Regulation 32 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment Regulations (Government Notice No. R543[41]) includes provisions specific to the appointment and content of the resultant specialist report. Regulations 32(3) stipulates all information which must be provided in the specialist report. These information requirements served as guidance for the Environmental Assessment Practitioner (EAP) in determining the most pertinent information to include in the specialist studies summary. This chapter of the Environmental Impact Report (EIR) will therefore provide a detailed account of the following:

- Details of the specialist who prepared the report;
- An overview of the scope of the study;
- Overview of the findings and potential implications of such findings on the impact of the proposed activity on the receiving environment; and

Regulation 32(e) requires that a description of any assumptions made and any uncertainties or gaps in knowledge concerning the particular specialist study be provided. A description of all assumptions, uncertainties and gaps in knowledge that were taken into account in the preparation of this EIR are detailed in **Chapter 11**. A summary of the methodology employed by each of the specialists is also provided in **Chapter 11** of this EIR. In an attempt to prevent the repetition of information, the reader is therefore referred to **Chapter 11.**

Regulation 32(h), 32(i) and Regulation 32(j) requires that a summary and copies of any comments that were received during any consultation process and any other information requested by the Competent Authority be provided in the specialist report. All information relating to the Public Participation Process (PPP) that was carried out for the EIA Phase of this project is provided in **Chapter 6**. Therefore in an attempt to prevent the repetition of information, the reader is therefore also referred to **Chapter 6**. Recommendations that have been made by the various specialists are included as mitigation measures in **Chapter 12** of this EIR.

[41] South Africa. 2010. National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations, 2010 (Notice 543). *Government gazette* 33306:3, 18 June

7.1 Amendments made to Specialist Studies

All Specialist Studies which were carried out for the proposed KPS Continuous ADF Project were included as Appendices of the DEIR. During the Public Review period of the DEIR, I&APs were afforded the opportunity to not only review the DEIR but also all supporting documents, including the Specialist Studies. Comments that were provided by I&APs during the Key Stakeholder Workshop (refer to **Part 4.4.13** of this FEIR), relating specifically to the consideration of the anticipated impacts of heavy metals on human health as well as the natural environment, have resulted in amendments being made to the Air Quality Study, Aquatic Study as well as the Surface Water Study. The amendments which have been made to the Air Quality Study and Surface Water Study, prompted by the timeous comments and feasible recommendations provided by I&APs, have contributed to the identification of practical management actions and monitoring programmes associated with the proposed development.

7.2 Wetland Delineation and Assessment Study

Wetland Consulting Services (Pty) Ltd was tasked to conduct a Wetland Delineation and Assessment Study for the proposed KPS Continuous Ash Disposal Facility (ADF) Project. A copy of the Wetland Assessment and Delineation Study is included in **Appendix E11** of this EIR. The primary objectives of the study included identifying the areas within the study area and assessing the important ecological functions performed by the wetlands as well as their likely level of eco-service provision. Furthermore the study was also intended to identify and assess the potential impacts associated with the proposed project activities in relation to the identified wetlands. A number of mitigation measures to avoid or reduce the significance of these impacts were recommended by the specialist.

The Scope of Work Provided to the wetland specialist included the following:

- Delineation and classification of all the wetlands within the study area;
- Determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of all the wetlands identified within the study area;
- Functional Assessment of all the wetlands identified;
- Description of the potential impacts of the development on the wetland ecosystems associated with the site;
- Recommend suitable mitigation and management measures, where applicable, to minimise any potential impacts; and
- Provision of a comprehensive wetland and impact assessment report detailing this information.

7.2.1 Findings of Wetland Assessment and Delineation Study

Wetland areas covering an estimated area of 248 hectares were identified and delineated within the study area. The delineated wetland areas within the study area is shown in **Table 7- 1**.

Three primary wetland types were identified and include channelled valley bottom wetlands, hillslope seepage wetlands and unchannelled valley bottom wetlands. The function assessment of these wetlands indicates that, although the function thereof have been impaired by disturbances including alien invasive vegetation encroachment, impoundments, farms dams, road crossings, mining activities and associated mine dumps, and cut off trenches along the roads and eroded channels, the wetlands still have the ability to provide ecosystem services. Ecosystem services that are associated with wetlands include biodiversity support, maintenance of water quality, flood attenuation and sediment trapping.

Table 7-1: Wetland areas delineated within and Kendal Continuous Ash Disposal Facility project area and surrounding areas

HGM Unit	Wetland Area (ha)	HGM Number
Unchannelled Valley Bottom	43.4 ha	HGM 1
Channelled Valley Bottom	142.6 ha	HGM 2
Hillslope Seepage	38.9 ha	HGM 3
Hillslope Seepage	23.1 ha	HGM 4
Total Wetland Area	248 ha	

A brief description of each HGM Unit in relation to the functionality, PES and EIS is provided below. A visual representation of the location and extent of the each of the HGM Units is shown in **Figure 7-1**.

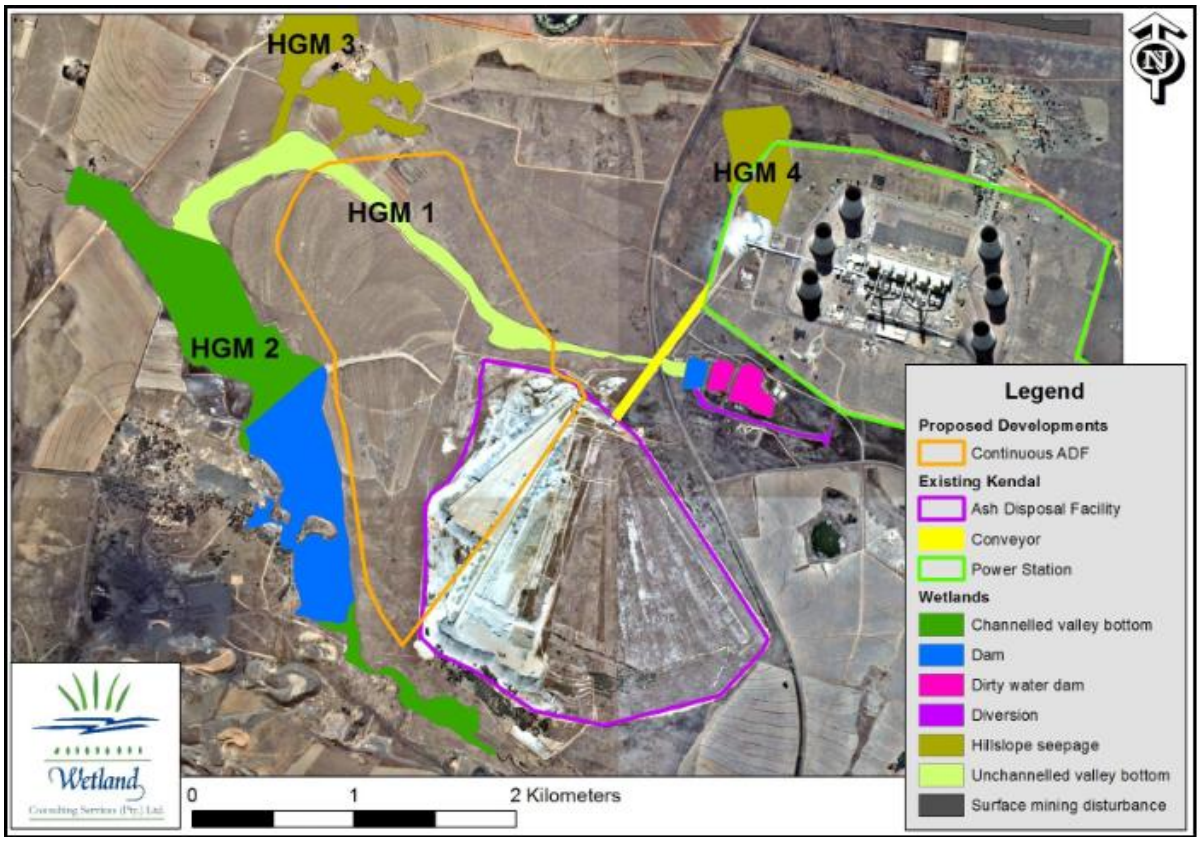

Figure 7-142: Delineated wetlands within and surrounding the Kendal Continuous Ash Disposal Facility area

The ecological integrity of the wetlands within the study area ranged from moderately modified to largely modified. The Present Ecological Status Analysis placed the identified wetlands within Category of C (moderately modified, but with some loss of natural habitats) and Category D (i.e. a large loss of natural habitats and basic ecosystem functions has occurred). All the wetlands within the study area have moderate or low / marginal ecological sensitivity status.

[42] The map included as Figure 7-1 in this EIR was taken from the Wetland Delineation and Assessment Study Report entitled "*Wetland Delineation & Impact Assessment for the Kendal Power Station Continuous Ash Disposal Facility, Mpumalanga Province*" dated June 2014

7.2.2 HGM Unit 1

A weakly channelled to historically unchannelled valley bottom system extending across the proposed development area from the north of the existing ADF was delineated. This system is found downstream of KPS and immediately below several dams within the same drainage system.

Within the wetland systems the following was observed:

- Patches of alien vegetation, mostly *Acacia mearnsii*;
- Conveyor belt crossing;
- Impoundments in the form of farm dams;
- Informal road crossings allowing access to agricultural fields;
- Eroded and excavated channels; and
- Sediment fans.

a) Present Ecological Status and Ecological Importance and Sensitivity

With regards to the PES and EIS of this wetland system, the wetland is considered to be ***moderately modified*** (Category C). The summarised results of the PES Assessment for HGM Unit 1 is shown in **Table 7-2**. The PES Category assigned to this HGM Unit is largely attributable to the land use changes. Prominent land use features surrounding the delineated wetland include:

- Road crossing below KPS,
- Several dams upstream of the road;
- Existing ash disposal facility south of the wetland system; and
- Extensive cultivated croplands adjacent to the wetland.

Table 7-2: Summarised results of the PES assessment

HGM Unit	Hydrology	Geomorphology	Vegetation	Overall Score	PES Category
Unchannelled valley bottom	**4.0**	**1.0**	**1.5**	**2.4**	**C**

b) Functional Assessment

Unchannelled valley bottom wetlands reflect conditions where surface flow velocities are such that they do not, under existing flow conditions, have sufficient energy to transport sediment to the extent that a channel is formed. Unchannelled valley bottom wetlands are likely to play an important role in retaining water in the landscape and slowly releasing this

water to downstream reaches and influencing water quality (e.g. mineralisation of rain water). These wetlands could also be seen to play an important role in nutrient removal, including ammonia through adsorption onto clay particles. Extensive areas of unchannelled valley bottom wetlands are characterised by subsurface flows, which allow these wetlands to 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.

The results of the functional assessment are illustrated in the radial plot as shown in **Figure 7- 2**[2]. The impacts of the existing ADF are likely to be having a negative influence on both the current level of wetland functioning, and the PES. The results of the functional assessment shows the consequence of the negative results of existing impacts on the wetland system functioning. Although important wetland eco-services are identified, the scores obtained are mostly **Intermediate**, as opposed to being rated as **Moderately High** to **High**.

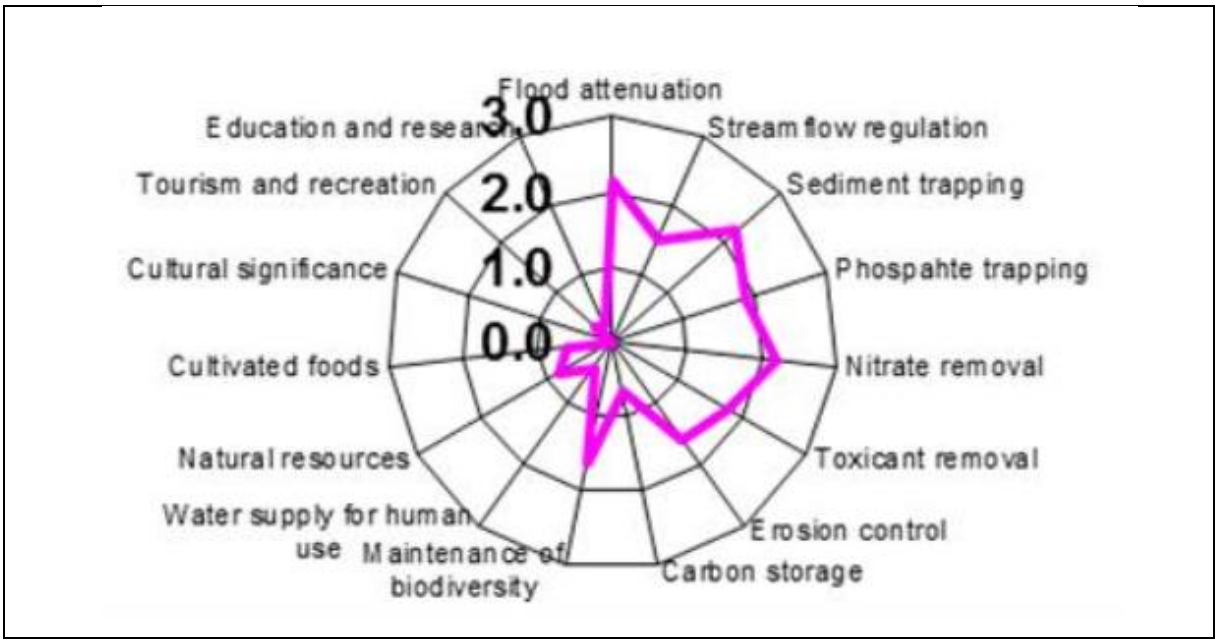

Figure 7-2: Results of the WET-Eco-Services assessment for the HGM Unit 1

7.2.3 HGM Unit 2

Along the southern / western boundary of the study area a channelled valley bottom wetland were delineated. This wetland forms a tributary of the Wilge River downstream and has been severely impacted by mining activities and surrounding land uses including:

- Open cast mining activities within the wetland catchment area;
- Infilling and dumps;

- Alien vegetation invasion in disturbed areas;
- Dams;
- Road crossings;
- Water abstraction points;
- Erosion and channel incision in downstream areas due to culverts and road crossings; and
- Cultivation of crops.

The findings of the wetland study show that existing Farm Dam arguably has the greatest impact on the HGM Unit. It is unlikely to be fed solely by longitudinal flow from the upstream system, with the bulk of the water input coming from the dewatering of underground mining voids. There is little longitudinal seepage downstream of the dam, resulting in substantial desiccation of the wetland habitat and subsequent colonisation by terrestrial plant species. It is likely that the dam has compromised wetland functioning and PES.

Channelled valley bottom wetlands receive water typically from surface run-off in the upslope catchment and convey the run-off via the channel to the downslope catchment. Although peak flows can overtop the channel banks and spread across the wetland, under normal flow conditions water is confined to the channel. Normal flow conditions are favourable for channelled valley bottom wetlands to contribute to flood attenuation and sediment trapping. This is due to flows overtopping the channel banks and spreading out and slowing down through the surface roughness provided by the vegetation, leading to sediment deposition.

In instances where flow is confined to the channel, for example under normal flow conditions or in instances where the deeply incised channel prevents overtopping, sediment transport rather than sediment deposition is the dominant process and is usually evident by the erosion of a channel.

a) Present Ecological Status and Ecological Importance and Sensitivity

With regards to the PES of the valley bottom wetland, this HGM Unit is considered to be in ***largely modified*** (Category D) which is essentially due to the magnitude of the disturbance sustained. The dam has, however, completely disrupted the natural processes driving the wetland, namely overbank topping, and it could be argued that the wetland is in fact ***Critically Modified***. The EIS of the HGM Unit is considered to be Moderate (C) due to its large extent, the presence of species of conservation importance and its contribution to the Wilge River, an important resource. The summarised results of the PES Assessment for HGM Unit 2 is shown in **Table 7- 3**.

Table 7-3: Summarised results of the PES assessment

HGM Unit	Hydrology	Geomorphology	Vegetation	Overall Score	PES Category
Unchannelled valley bottom	**5.0**	**3.5**	**5.5**	**4.67**	**D**

b) Functional Assessment

The channelled valley bottom system provides habitat that differs from the surrounding terrestrial habitats and thus contributes to biodiversity support. The terrestrial habitat provided by the channelled valley bottom wetland is largely attributable to the extent of open water within the valley bottom system on site. A pair of Cape Clawless Otters was recorded at the dam, indicating its provision of suitable habitat for a Red Data species and contributing to the relatively high value for biodiversity maintenance.

The retention of water is high due to multiple impoundments present within the wetland system. This accounts for the system providing flow attenuation during high flow. Water retention is also due to the large lateral footprint of the wetland. The extensive vegetation coverage provides some level of erosion control as part of the attenuation capability of the system. However, little benefit is expected in areas where there is an incised channel further downstream. The results of the functional assessment are illustrated in the radial plot shown in **Figure 7-3**[2].

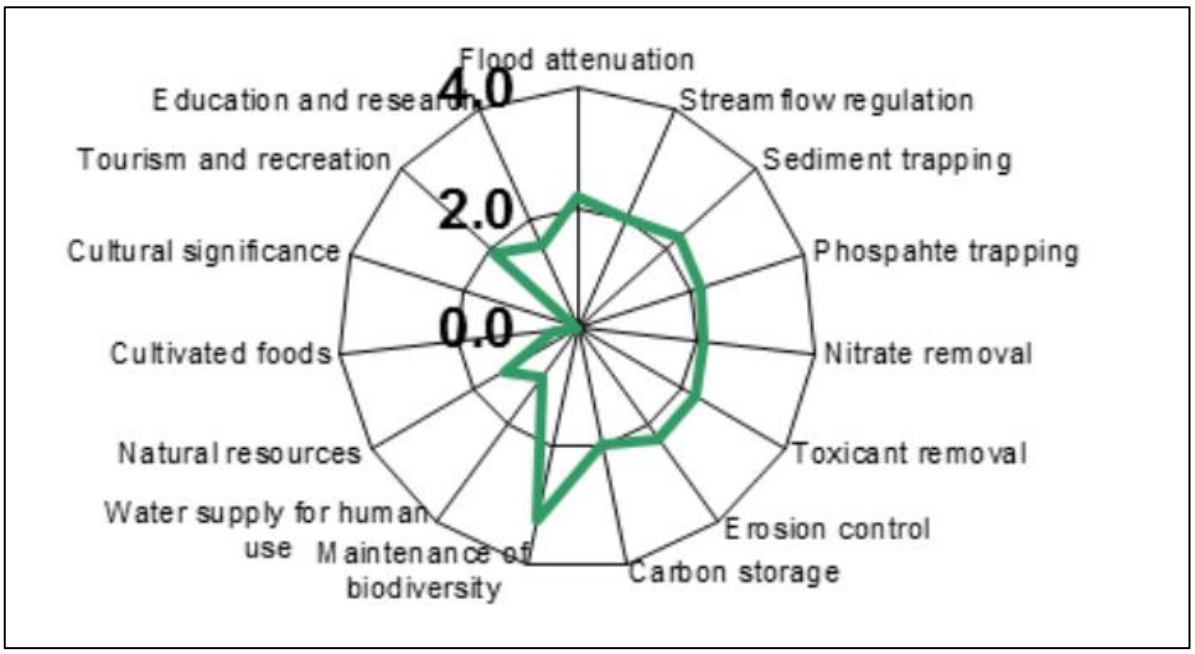

Figure 7-3: Results of the WET-Eco-Services assessment for the HGM Unit 2

7.2.4 HGM Unit 3

A hillslope seepage wetland was delineated to the north of the study area. This hillslope seepage wetland drains into the channelled valley bottom wetland (HGM Unit 1) that traverses the site and which forms part of a tributary of the Wilge River. Hillslope seepage wetlands are generally associated with shallow to deep, well-drained soils associated with an impeding horizon that limits deep infiltration. They typically reflect the presence of seasonal, shallow interflow.

The wetland system is supported by a spring draining from this system directly into the valley bottom wetland area. The presence of ruderal and alien invasive species may be indicative of heavy utilization.

The hillslope seepage wetland is dominated by alien vegetation, predominantly the invasive Grey Poplars. Land use activities that were identified within the seepage wetland area include:

- Impoundment in the form of farm dam;
- Road crossing and trenches along the road;
- Cultivation and maize fields; and
- Livestock grazing.

a) Present Ecological Status and Ecological Importance and Sensitivity

The hillslope seepage wetland is considered to be in a ***largely modified*** state (Category D). This is principally due to recorded existing impacts on the wetland system. Owing to its contribution to the valley bottom system (HGM Unit 4) the EIS of the wetland is considered to be ***moderate*** (Category C). The summarised results of the PES Assessment for HGM Unit 3 are shown in **Table 7- 4**.

Table 7-4: Summarised results of the PES assessment

HGM Unit	Hydrology	Geomorphology	Vegetation	Overall Score	PES Category
Hillslope seepage	**5.5**	**3.2**	**7.0**	**5.5**	**D**

b) Functional Assessment

Fundamental ecological benefits associated with the identified hillslope seepage wetlands include biodiversity support, indicator of high water quality, flood attenuation, groundwater recharge and flow augmentation. The results of the functional assessment are illustrated in the radial plot shown in **Figure 7-4**[2].

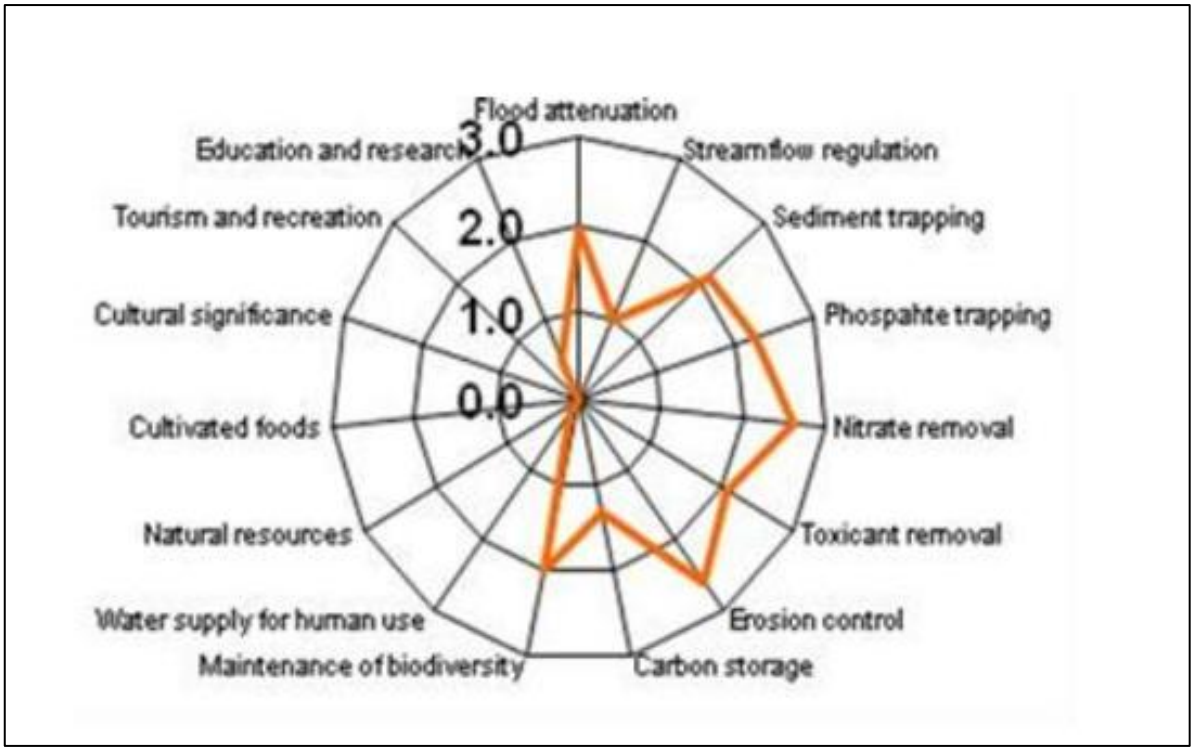

Figure 7-4: Results of the WET-Eco-Services assessment for the HGM Unit 3

7.2.5 HGM Unit 4

HGM Unit 4 consists of a hillslope seepage wetland draining in a northerly direction. This wetland falls partially within the fenced-off security area surrounding KPS and is crossed by the security fence and associated patrol roads. A transfer station situated to the south of the hillslope seepage wetland is located along the existing conveyor, which transports ash from the KPS. To the east of the hillslope seepage wetland mowed grassland extends up to the KPS. The hillslope seepage wetland has been significantly degraded and a number of impacts were apparent and included:

- Alien vegetation within the hillslope seepage wetland, most notably *Acacia mearnsii* (black wattle) and *Solanum mauritianum* (bugweed);
- Excavations within the wetland, although these excavations took place several years ago and are fully vegetated currently;
- Dumping of rock and soil material within the hillslope seepage wetland. Once again these areas are already fully vegetated;
- Excavation of a trench through the northern reaches of the hillslope seepage wetland to encourage flows to drain in a northerly direction through the culverts under the security fence; and
- Aerial imagery appears to indicate inputs of runoff / discharge water into the hillslope seepage wetland from the south.

a) Present Ecological Status and Ecological Importance and Sensitivity

The hillslope seepage wetland is considered to be in a ***largely modified*** state. As a result of the extensive disturbance within the wetland the EIS of the wetland is considered to be low / marginal (Category D). The summarised results of the PES Assessment for HGM Unit 3 are shown in **Table 7- 5**.

Table 7-5: Summarised results of the PES assessment

HGM Unit	Hydrology	Geomorphology	Vegetation	Overall Score	PES Category
Hillslope seepage	**4.5**	**2.2**	**6.3**	**4.4**	**D**

b) Functional Assessment

The results of the WET-Eco Services assessment are provided in a radial plot illustrated in **Figure 7-5**. Key services and functions provided by the HGM Unit include water quality maintenance functions and biodiversity support. The assigned scores were generally only intermediate in nature.

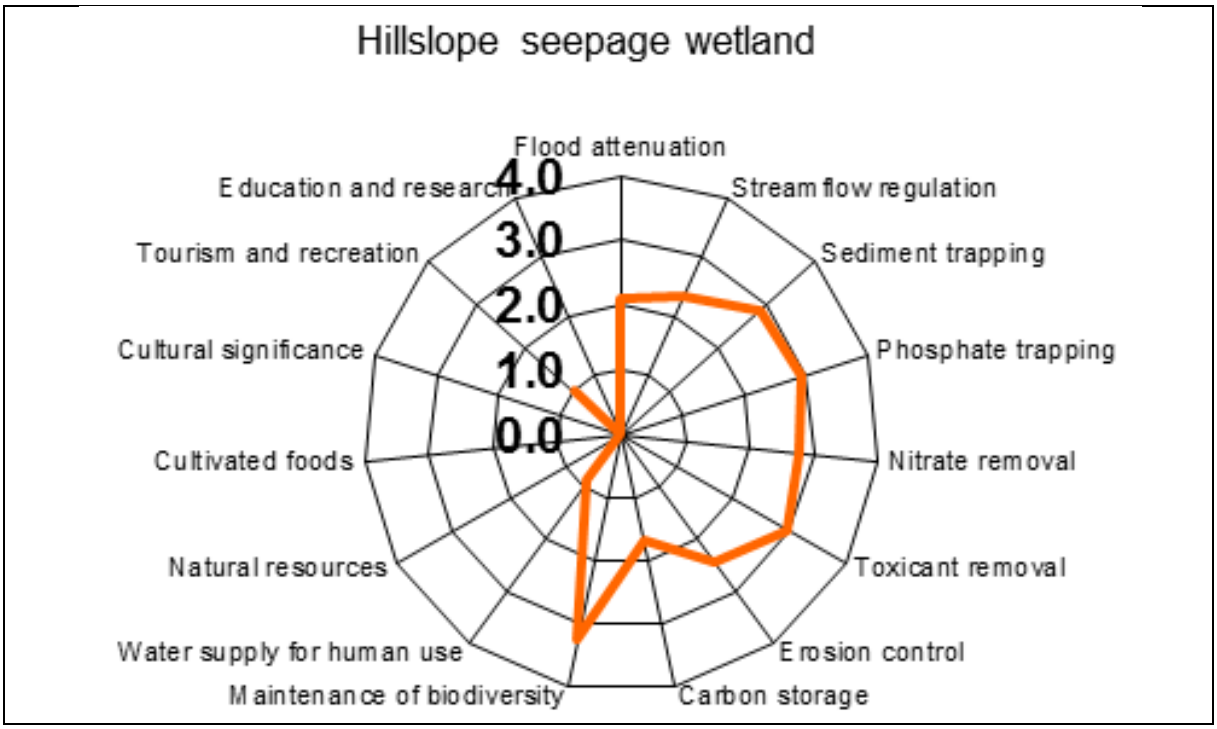

Figure 7-5: Results of the WET-Eco-Services assessment for the HGM Unit

7.3 Surface Water Study

7.3.1 Findings of Surface Water Study

The streams surrounding the existing and proposed ash disposal area are already impacted either by the existing disposal facility or the mining activities within the area. All the selected alternatives would have similar impacts on the surface water quality. Based on the location of the Kendal ash disposal area within the catchment, it is likely that it could have an impact on the Wilge River from the tributaries flowing downstream from the site.

- All samples collected between August 2011 and July 2012 indicate high pH, electrical conductivity (EC), sodium (Na), phosphorus (P), chloride (Cl) and sulphate (SO4) concentrations;
- The water quality of the clean and dirty water dams is similar;
- Of the metals analysed none were detected in any of the samples, except for aluminium (Al), however the laboratory methods used may not have been sensitive enough; and
- There were high faecal coliforms (FC) counts in the clean water dam.

The Wilge River catchment (and associated tributaries) is a priority and will require water use activities in its catchment to be conducted in a safe and responsible manner so as not to increase the existing impacts on water quality:

- Increased surface water monitoring should be instituted to give a better indication of what is happening in the catchment area in relation to surface water contamination as the current sampling is too limited to give a clear picture;
- In light of the fact that certain metals such as cadmium, arsenic, mercury, lead, manganese and zinc are thought to have endocrine disrupting properties at very low concentrations it is important that these are monitored using more sensitive laboratory techniques;
- The functioning of the three dam system should be addressed, so that they function as originally intended;
- The berm around the Station Emergency and Dirty Water Dams should be reinstated so as to avoid mixing of clean and dirty water. This will allow for clean water to be discharged into the environment from the clean water dam; and
- The water quality results indicate a possibility of mixing of farm dam water and water in the mining void. In order to manage the farm dam water quality properly, the two facilities must be separated.

7.3.2 Proposed Stream Diversion

The diversion channel has been sized to accommodate the calculated 1 in 50 year flood peak (79.8 m3/s) as per Government Notice 704 (GOVERNMENT GAZETTE, 4 JUNE 1999, Vol. 408, No. 20119). A vegetated cover will be required to combat the possibility of erosion. To protect the wetlands it is proposed that the following measures are included in the design:

- The main river diversion channel should be split into a number of small canals which will facilitate the diffuse release of water to the downstream wetland; the channels should discharge to the wetland via a permeable engineered structure such as reno-mattresses;
- In-stream baffles should be incorporated in each channel to vary flow direction and slow its rate;
- The river diversion design should also include for the collection of runoff from the hill slope to the north of the river diversion, as lateral (sub-surface) flow will move down the slope. In order to allow for the collection of this runoff, a permeable layer such as a reno-mattress on the upslope-facing side of the diversion channel would need to be incorporated into the design. This will allow runoff from the hill slope to enter the diversion channel through the permeable layer; thereafter being transported downstream in the diversion channel; and

- Appropriate storm water management at the toe of the ash dump should be maintained, in order to prevent sediment/ash-laden runoff entering the river diversion channel in rainfall events.
- The Wilge River has been classified as a Class II river which means that it needs to be protected and maintained in the state that it currently is. In terms of surface water quality it is therefore important that best practise is employed when undertaking ash disposal activities.

7.3.3 Comparative Assessment of Alternatives

The existing ash disposal facility site is indicated in Figure 3. The ash disposal facility is located between two streams. It is slightly north of Leeufontein Spruit, in an area where there are mining activities (Leeufontein Coal Mine and Lakeside Colliery) and extensive agricultural activities. There is a non-perennial stream north of the disposal facility which is a tributary to the Leeufontein Spruit. In relation to the existing and proposed extension of the ash disposal facility site within the catchment, it is likely that the site will have an impact on the two adjacent tributaries and also to the Wilge River from the tributaries running downstream of the ash disposal site.

Option 1: Minimum volume

The minimum volume refers to the proposed minimum footprint of the ash disposal facility with a total footprint of 480ha and a height of 70m. The current ash disposal facility is not lined; however the proposed disposal facility extension will be lined. There is a non-perennial stream that runs to the north-eastern side of the existing and proposed disposal facility extension. This expansion will impact on the unnamed tributary together with the associated wetlands located at the tip of the ash disposal facility. There are two sample points SCH01 and SCH02 located on the unnamed tributary. The water quality at point SCH02 shows high pH, electrical conductivity (EC) and total dissolved solids (TDS), all above the RWQO limits. Sample point LEE02 which is downstream of SCH02 and its associated wetland, shows lower concentrations although still above the RWQOs. LEE01 which is upstream of the existing ash disposal site also shows high levels of EC and TDS. Leeufontein mine is located upstream of this point. It is anticipated that there will be one river crossing for the conveyor.

Option 2: Maximum volume

The maximum volume refers to the proposed maximum footprint of the ash disposal facility with a total footprint of 530ha and a height of 70m. The current ash disposal facility is not lined; however the proposed disposal facility extension will be lined. The impacts anticipated for this option are the same as for options 1 described above. However the disposal facility expansion to the north will impact on the unnamed tributary resulting in the diversion of the stream to the north-east of the ash disposal facility in order to achieve the maximum area of disposal. This diversion could result in increased soil erosion and sediment accumulation. However this can be mitigated with the implementation of correct storm water management measures and channels. Taking the aforementioned into account it is recommended that all storm water management measures that are included in the DEMPr and Storm Water

Management Philosophy be stringently adhered to, as a means of preventing increased soil erosion and sediment accumulation.

7.4 Visual Impact Study

Newtown Landscape Architects was tasked to conduct a Visual Impact Study for the proposed KPS Continuous ADF Project. A copy of the Visual Impact Study is included in **Appendix E10** of this EIR.

The primary objective of the study was to identify and assess the visual impacts which may result from the proposed project activities. To ensure that a comprehensive visual impact study were conducted, the Scope of Work provided to the visual specialist included the following:

- Examining the baseline information;
- Determining the area from which any part of the facility may be visible (i.e. viewshed);
- Identifying the locations from which any part of the facility may be visible (observation sites), which include buildings and roads;
- Analyse the observation sites to determine the potential level of visual impact that may result from the facility; and
- Identifying measures available to mitigate the potential impacts.

7.4.1 Findings of Visual Impact Study

The visual character of the study site is dominated by cultivated land and natural grasslands with the KPS forming a large part of the scene. The main residential component is the scattered farmsteads, Kendal Agricultural holdings as well as the towns of Kendal and Ogies. The power infrastructure and mining activities along with the farming activities and the formal town component add an industrial theme to the landscape character. Typical views of the proposed Continuous ADF and associated infrastructure will be from the local roads, in particular the R555 and N12. These views are, however, temporary and regarded as *'public'*, while views from farmsteads within the study area are permanent and regarded as '*private*'.

7.4.2 Sensitive Viewers

A number of sensitive viewers within the study area were identified and include residents within, visitors to and travellers through the study area. As the KPS is an existing operation and therefore represents an existing visual intrusion it is anticipated that the proposed project will result in only a partial change to the receiving environment.

7.4.3 Landscape Character

All individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings and roads are regarded

as the Landscape Character. The study area has a gently to moderately undulating topography, typical of the Highveld plateau. A number of wetlands and pans are found within the study area. Rocky outcrops and ridges form part of the significant landscape features of the wider area.

7.4.4 Visibility and Visual Exposure

In determining the visibility of the project the 'zone of potential influence' was established and is regarded to be a distance of 15 km. The visual impact of the proposed activities would diminish over a distance of 15 km from the KPS. This is a result of the diminishing effect of distance (the project recedes into the background) and atmospheric conditions (haze) on visibility. At a distance exceeding 15 km from the KPS the features would appear in the background of a view and would therefore begin to be 'absorbed' into the landscape setting. The area from which any part of the proposed project may be visible is illustrated in **Figure 7- 6**.

The proximity of the viewer to the proposed new project activities determines the visual exposure of the project activities. The impact of an object in the foreground (0 – 0.8 km) is greater than the impact of that same object in the middle ground (0.8 km – 3 km) which, in turn is greater than the impact of the object in background (greater than 3 km) of a particular scene. Therefore the visibility and visual exposure for viewers within 0.8 km of the proposed project will be high, for viewers between 0.8km and 3km it will be moderate and beyond 3 km it will be low.

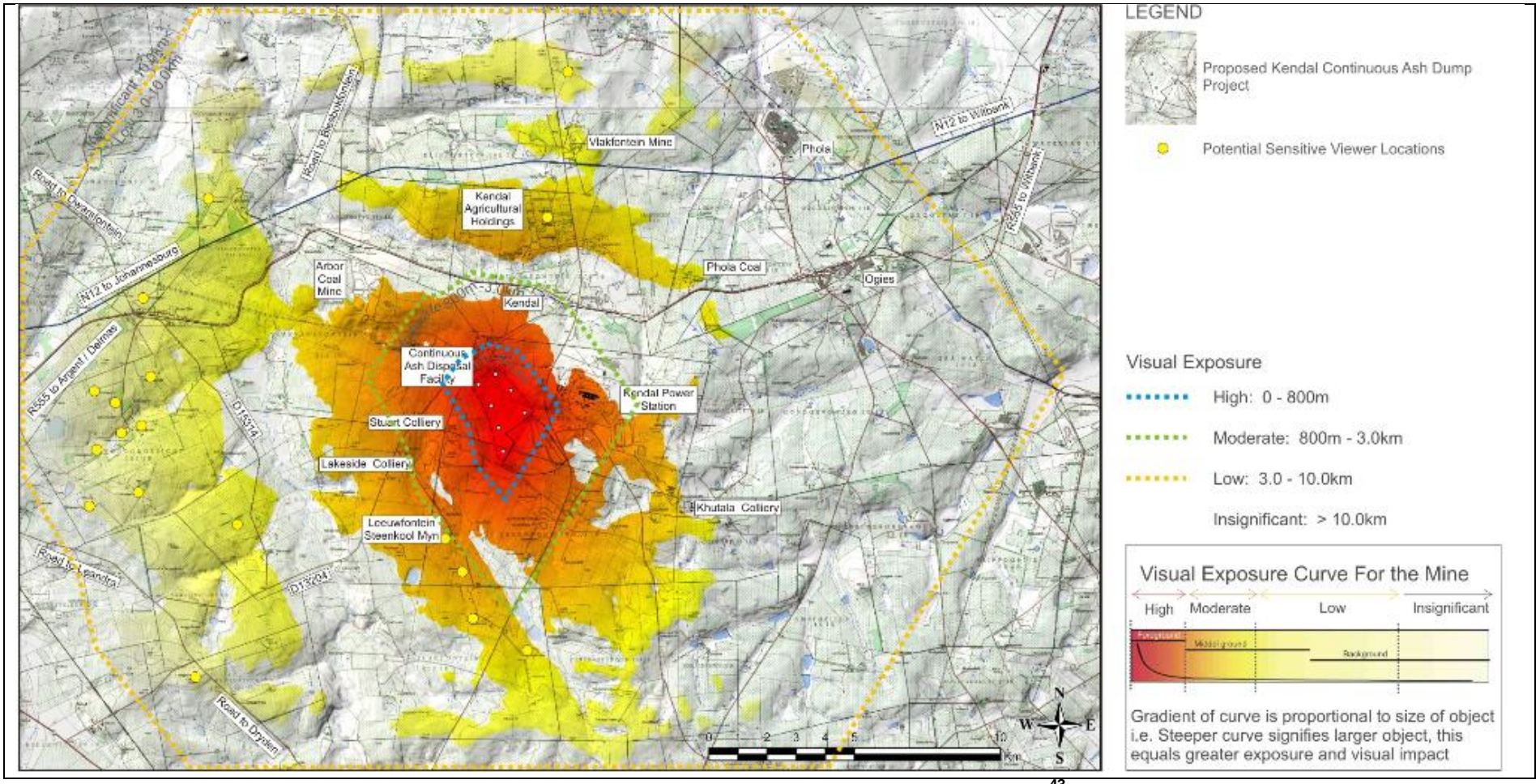

Figure 7-6: Viewshed of proposed KPS Continuous ADF[43]

[43] Figure 7-6 has been taken from the Visual Impact Study Report included in **Appendix E10.**

7.5 Heritage Impact Study

A Heritage Impact Study was carried out by Professional Grave Solutions (Pty) Ltd to determine possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment (HIA) served to provide the proponent with measures managing any heritage resources which are found within the development footprint. A copy of the Heritage Impact Assessment is included in **Appendix E5** of this EIR.

7.5.1 Fieldwork findings

Fieldwork was carried out by an archaeologist within the proposed development area, including the E-Dump. The track logs of the fieldwork was logged and is depicted in **Figure 7- 7.** The findings at each of the three surveyed areas (i.e. Kendal 1, Kendal 2 and Kendal 3) are discussed below.

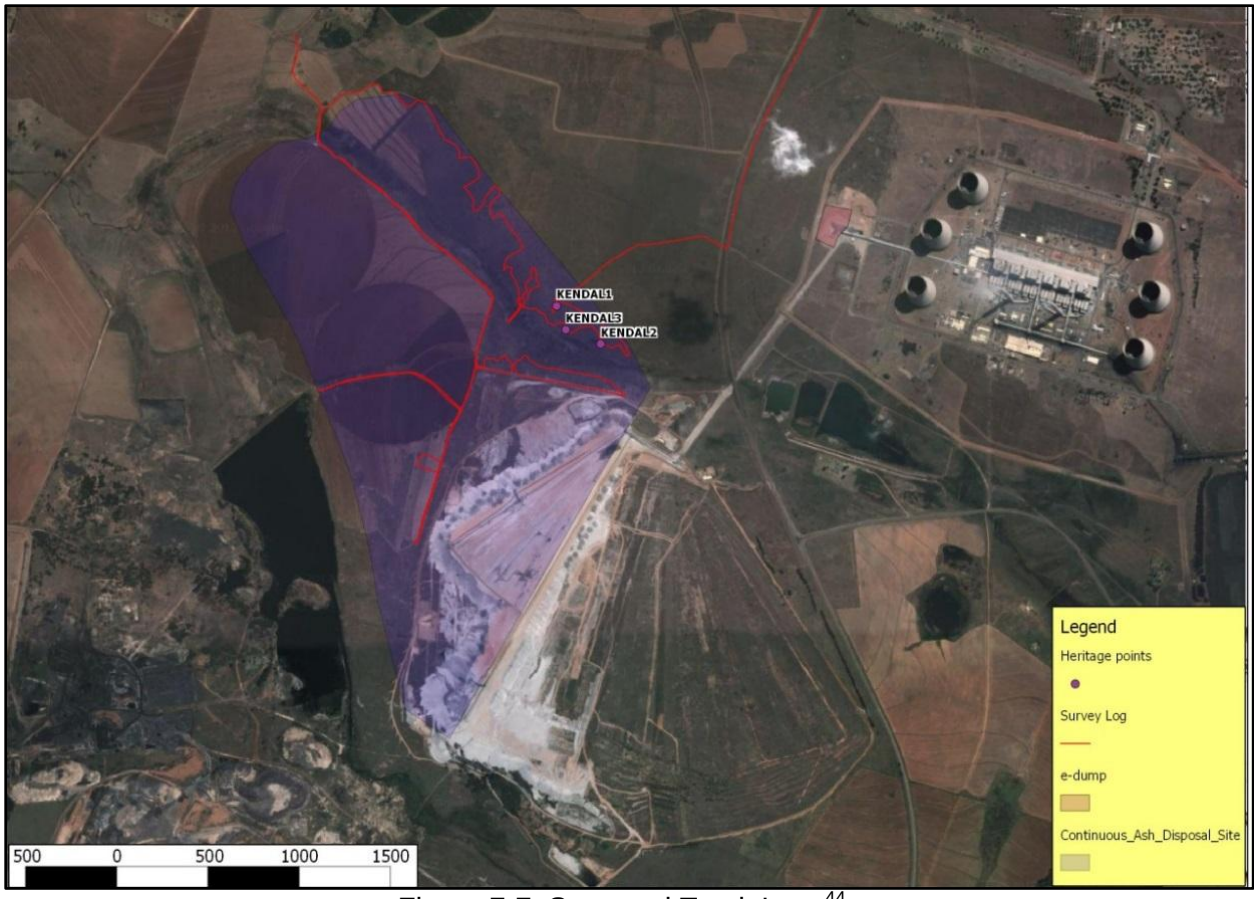

Figure 7-7: Surveyed Track Logs[44]

7.5.2 Kendal 1

A farm worker homestead, constructed with cement bricks and mortar was identified at the survey site (refer to **Figure 7-8**). The structure consists of three rooms, with two entrances to the outside facing east. A low stone build wall forms a courtyard on the east side of the

[44] This figure has been taken from the Heritage Impact Study Report included in **Appendix E5.**

structure. The structure was constructed in the last 20 years and therefore has no heritage significance.

Figure 7-8: Structure as viewed from the east towards the existing ADF[34]

7.5.3 Kendal 2

A single stone packed structure aligned east-west, situated to the western side of a eucalyptus grove was identified at the surveyed site (refer to **Figure 7-9**). The dense vegetation made a thorough evaluation of the site difficult. However the size, shape and alignment indicate that the structure may be a grave. The site is provisionally graded as having a Heritage Significance of Grade 3B Local Significant.

Figure 7-9: Structure as viewed from the east towards the existing ADF[34]

7.5.4 Kendal 3

The site is classified as a find spot and is situated on a low rocky ridge to the eastern side of the eastern tributary running through the study area (refer to **Figure 7-10**).

Figure 7-10: View of find spot from east toward existing ADF[34]

Two Later Stone Age reworked glass shards were found between loose rocks on the outcrop (refer to **Figure 7-11**). No other stone tools were found during the scan of the area. The find spot has a low heritage significance. The structure was constructed in the last 20 years and therefore has no heritage significance.

Figure 7-11: Artefacts manufactured from glass[34]

7.5.5 Palaeontology of the area

The following section is an extract from the Palaeontological Desktop Study, included in **Appendix E5** of the Heritage Impact Study report. "*The study area is mainly underlain by Vaalian and Mokolian aged igneous rocks of the Transvaal Sequence and Bushveld Complex, with three small outlying areas, including the E-Dump area, underlain by Permian Vryheid Formation sediments of the Karoo Supergroup.*

The Permian Balfour Formation (Pub) is well known to contain fossils and is interpreted as a meandering river deposit grading upwards into a lacustrine environment. The Formation is correlated with the Dicynodon Assemblage zone, which is known as a productive fossil bearing strata (Rubidge et al, 1995). The upper part of the Balfour Formation is known as the Palingkloof Member which in turn is associated with the Lystrosaurus Assemblage zone (Groenewald, 1996)."

During the heritage study three heritage sites were identified of which one (Kendal 2) will require further mitigation work. There is a moderate possibility that fossils could be encountered during deep excavation of the Vryheid Formation. The development of an ashing facility will most likely not result in deep excavation of geology. However, if fossils are found, they would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained

undiscovered) to a qualified palaeontologist for excavation, will be a beneficial palaeontological impact.

7.6 Air Quality Study

Airshed Planning Professionals (Pty) Ltd was appointed by Zitholele Consulting to determine the potential for dust impacts on the surrounding environment with specific reference to air quality. A copy of the Air Quality Study is included in **Appendix E1** of this EIR.

7.6.1 Ambient Air Quality

The KPS and the proposed project activities fall within an area in which the ambient air quality has already been severely impacted upon by land uses. The study area falls within the Highveld Priority Area (HPA) as well as in the vicinity of the Emalahleni Hot Spot. These areas have been distinguished due to the poor air quality and elevated concentrations of criteria pollutants resulting from both industrial and non-industrial sources. The Scope of Work provided to the air quality specialist therefore included determining whether the proposed project activities will influence the air quality within the HPA.

Dispersion modelling was undertaken to determine the maximum monthly dust-fall rates as well as second highest daily and annual average incremental ground-level concentrations for PM_{10} and $PM_{2.5}$. The averaging periods were selected to facilitate the comparison of predicted pollutant concentrations with relevant dust-fall guideline and national ambient air quality standards. An overview of the recorded PM_{10} and $PM_{2.5}$ ground-level recording will be provided in the sections below.

7.6.2 Dust fall

With the absence of implemented mitigation measures, the study shows that dust-fall is likely to exceed the residential draft dust-fall regulations over a large area surrounding the development footprint. However, dust-fall under the re-vegetation and combination mitigation strategies is within the residential draft dust-fall regulations (**Figure 7-7**[45]). Exceedances of the dust-fall regulations at identified sensitive receptors are likely to be limited to two identified Sensitive Receptors under the unmitigated scenario only.

[45] This map is taken from the Air Quality Study report entitled "*Continuous Disposal of Ash at Kendal Power Station Air Quality Basic Evaluation Report No.: APP/12/ZIT04 Rev 0.3 Final*" dated 11 June 2014.

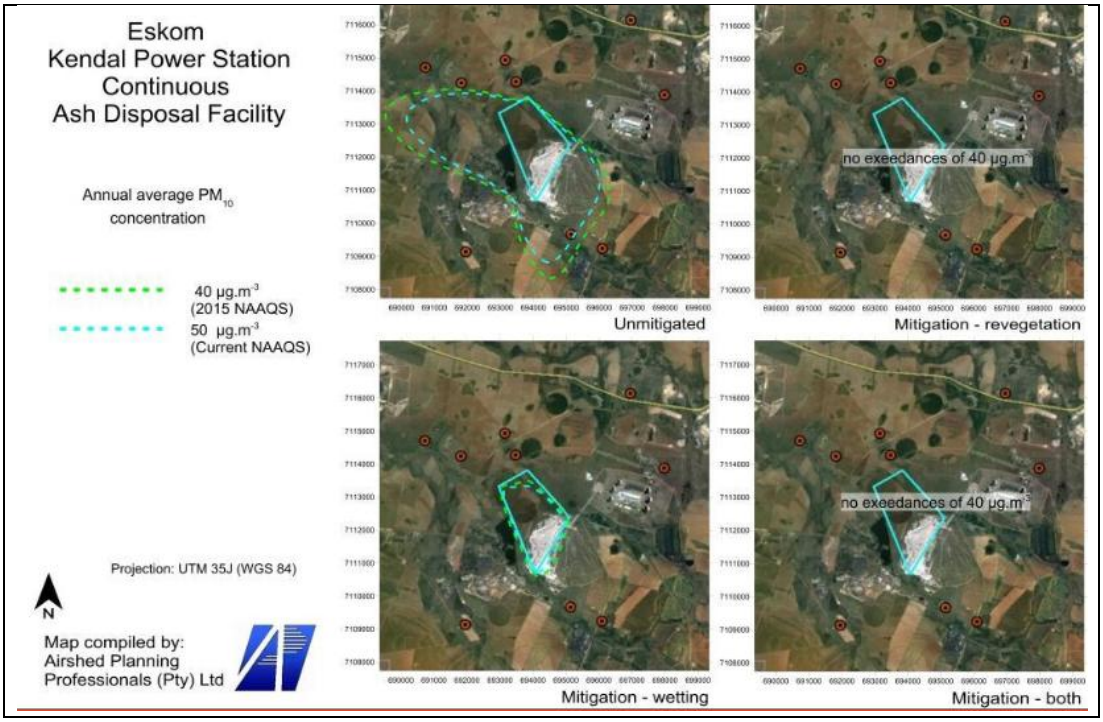

Figure 7-12: Predicted annual average PM10 concentration as a result of the continuous ash disposal at Kendal Power Station[35]

7.6.3 Highveld Priority Area

The areas which fall within the boundaries of the declared HPA are confined to the Mpumalanga Province. The declaration of the HPA in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (39 of 2004) lists all areas that fall within the HPA. The HPA has been declared as the second National Air Quality Priority Area. This requires that an Air Quality Management Plan (AQMP) for the area be developed. The AQMP includes the establishment of emissions reduction strategies and intervention programmes based on the findings of a baseline characterisation of the area. The coming into effect of the AQMP in turn gave rise to the assessment of all contributing sources in the area to determine the emission reduction targets to be achieved over the following few years.

7.6.4 Emalahleni Hot Spot

The foremost contributors to the poor ambient air quality in the Emalahleni Hot Spot include emissions from power generation, metallurgical manufacturing processes, opencast coal mining and residential fuel burning where industrial processes dominate the source contribution. The results of the simulation projected exceedances of the daily Particulate Matter (PM) limit for more than 12 days across the Emalahleni Hot Spot. Monitored daily PM_{10} concentrations within the Emalahleni Hot Spot, at Witbank and Greendale High School show regular exceedances of the daily limit, between 2008 and 2012. The HPA Air Quality

Management Plan (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 for the second monitoring station (Witbank 2).

7.6.5 PM10 Ground-level Concentrations

Non-compliance with the annual average PM_{10} National Air Quality Standards (NAAQS[46]) (current NAAQS of 50 $\mu g.m^{-3}$ and the 2015 NAAQS of 40 $\mu g.m^{-3}$) is expected for large areas around the proposed continuous ADF in the absence of the implementation of mitigation measures. Compliance with the annual NAAQS could be achieved with mitigation by either re-vegetation or with the combination of re-vegetation and watering. The number of exceedances of the daily PM limit are likely to exceed the four allowed days at five of the nine identified sensitive receptors.

7.6.6 PM2.5 Ground-Level Concentrations

Despite the large proportion of Kendal ash being in the finer fraction, impact for $PM_{2.5}$ is more restricted than PM_{10}. However, exceedances of the annual NAAQS (current NAAQS of 25 µg.m 2016 NAAQS of 20 µg.m and 2030 NAAQS of 15 µg.m) are expected in the absence of the implementation of mitigation measures. The area affected by exceedances of the annual NAAQS can be reduced through mitigation via watering and controlled within the annual NAAQS via re-vegetation and a combination mitigation strategy. Non-compliance with daily PM NAAQS is expected at five of the nine sensitive receptors without mitigation of dust emissions. Effective mitigation of dust emissions will result in compliance with daily NAAQS at sensitive receptors.

7.6.7 Sensitive Receptors

The NAAQS referred to in **Section 7.4.1.4** of this chapter are based on human exposure to specific criteria pollutants and, as such, possible sensitive receptors were identified where the public is likely to be unwillingly exposed. NAAQS are enforceable outside of KPS and proposed Continuous ADF boundaries and therefore a number of sensitive receptors have been identified. These sensitive receptors are individual residences and small residential areas in the vicinity of the proposed ash disposal facility. At these sensitive receptors the modelled ground-level concentrations of PM_{10} and $PM_{2.5}$ were compared to the National Standards and dust-fall draft standards. In relation to sensitive receptors, non-compliance with daily PM_{10} and $PM_{2.5}$ NAAQS are expected at five of the nine identified sensitive receptors, when mitigation of emissions is absent.

[46] South Africa. 2009. National Environmental Management: Air Quality Act (29 of 2004) National Ambient Air Quality Standards (Notice 1210). *Government gazette* 32816:6, 24 Dec

7.6.8 Additional Recommendations provided in Air Quality Study

The Air Quality Study has been amended to address the following issues which were raised by an I&AP during a Stakeholder Workshop (refer to **Part 4.4.13** of this FEIR):

- It was requested that elemental analysis be conducted on the dustfall samples to screen for potential health impacts as a result of the ash disposal facility; and
- It was suggested, that a collaborative Environmental Management Forum (EMF) be established including representatives from the relevant mining houses as well as KPS and Kusile Power Station.

The following responses to the comments made by the I&AP have been incorporated in the final Air Quality Study (refer to **Appendix E5** of the FEIR):

- This suggestion to establish a collaborative EMF including representatives from the relevant mining houses as well as KPS and Kusile Power Station is a valuable recommendation, should it be practical to do so. It is suggested that the proposed establishment of such an EMF be included in the KPS Continuous ADF EMPr.
- It is important to note that it is not possible to correlate dustfall rates (mg.m-2.day-1) with inhalable particulate concentrations (µg.m^{-3}). Human health impacts are assessed based on the concentration of particulates. The value in quantifying the levels of metals contained in dustfall is in the change of these levels over time. These values will not assist screening for human health impacts. Should Eskom recognise the value in metal analysis of dustfall it is suggested that, due to the cost associated with the analysis, that only the dustfall sampling bucket with the highest dustfall rate be further analysed for metals. This suggestion can be incorporated into the proposed KPS Continuous ADF EMPr.

7.7 Soil and Land Capability Study

Earth Science Solutions (Pty) Ltd was tasked to conduct a Soil and Land Capability Study for the proposed KPS Continuous ADF Project. A copy of the Soil and Land Capability Study is included in **Appendix E7** of this EIR. The primary objectives of the study included:

- Providing a permanent record of the present soil resources in the area that are potentially going to be affected by the proposed development – receiving environment,
- Assessing the nature of the site in relation to the overall environment and its present and proposed utilization, and determine the capability of the land in terms of agricultural utilization, and

- Providing a base plan from which long-term ecological and environmental decisions can be made, impacts of development can be determined, and mitigation and rehabilitation management plans can be formulated.

7.7.1 Soil Types

The soils types identified within the study area can be broadly categorised into four major groupings, with a number of dominant and sub dominant forms that have been grouped and that characterise the area of concern. The major soil forms are closely related to the lithologies from which the soils are derived (in-situ formation) as well as the general geomorphology of the site. Determining factors of the soil formation and soil forms include the slope and altitude of the land forms as well as pedogenetic processes. The following major soil "groupings" are of importance to the development area (refer to **Figure 7-8**[3]):

- The deeper and sandier soils are considered High Potential materials and are distinguished by the better than average depth of relatively free draining soil to a greater depth (> 700mm). This group are recognisable by the subtleness of the mottling (water within the profile for less than 30% of the season), are noted at greater depths within the profile (>500mm) and the land capability is rated as moderate intensity grazing and/or arable depending on their production potential.

These soils are generally lower in clay than the associated wet based soils and more structured colluvial derived materials, have a distinctly weaker structure and are deeper and better drained (better permeability). The ability for water to permeate through these profiles is significantly better than for the structured and wet based soils. In addition, the more sandy texture of this soil group renders them more easily worked and they are rated as having a lower sensitivity (Deep >500mm).

- In contrast, the shallower and more structured materials are considered to be more sensitive and will require greater management if disturbed. The group of shallower and more sensitive soils (< 500mm) are associated almost exclusively with the sub outcropping of the parent materials (Karoo Sediments) (geology) at surface, and although they constitute a relatively small percentage of the overall area of study, they have a comparatively large and important function in the sustainability of the overall biodiversity of the area.
- The third group of soils comprise those that are associated with the hard pan ferricrete layer and perched soil water. This group of soils has a set of distinctive characteristics and nature that is separated out due to their inherently more difficult management characteristics. These soils are characterised by significantly higher clay contents (often of a swelling nature), poor intake rates, poor drainage, generally poor liberation of soil

water and a restricted depth – often due to the inhibiting barrier within the top 700mm of the soil profile. These soils are generally associated with a wet base.

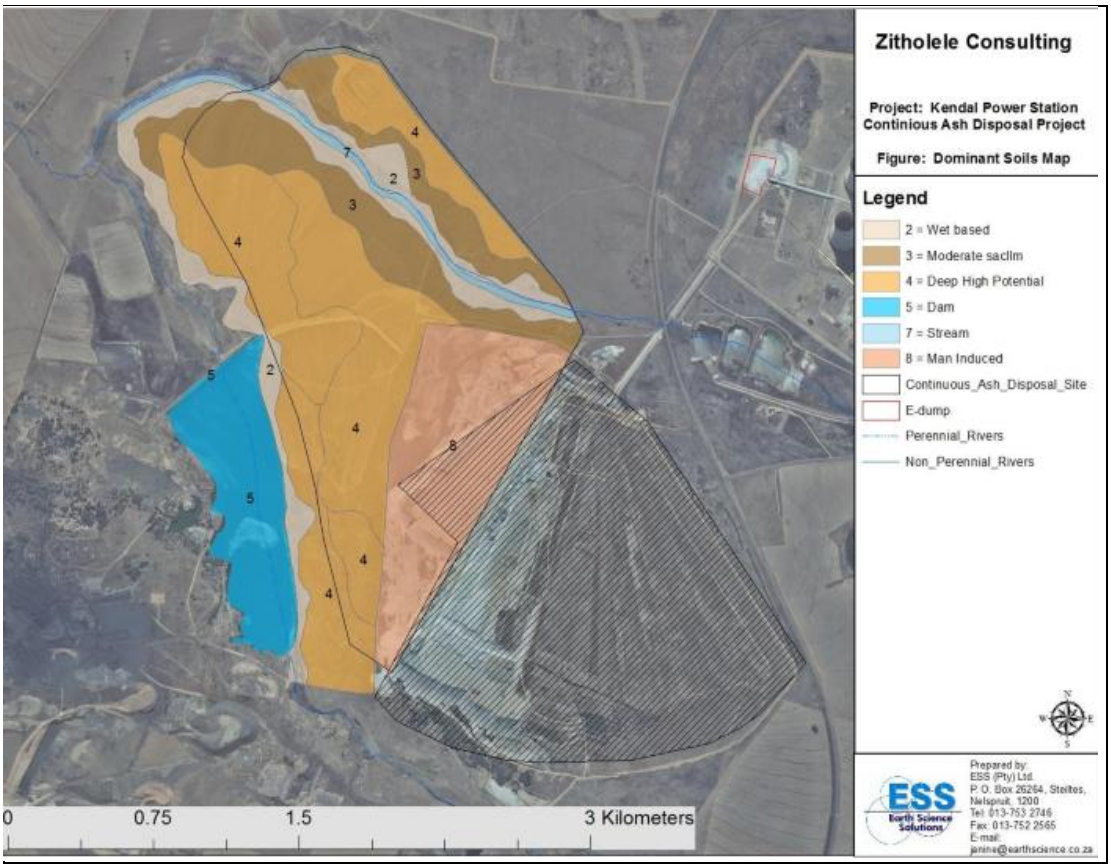

Figure 7-13: Dominant Soil Types

7.7.2 Soil Chemical Characteristics

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 nutrients on the colluvial derived materials, and the extremes of much higher clay and stronger structure that are generally associated with the wet based and wetland soils associated with the alluvial derived and bottom land floodplain wetlands.

The pH level of the various soil types ranges from acid at 5.8 to neutral and slightly alkaline at 7.5. 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 haven 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.

7.7.3 Soil Physical Characteristics

The majority of the mapped soils has a 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. 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 by the undulating to flat terrain to an index of moderate or resistant.

7.7.4 Land Capability

The proposed development covers 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. The distribution of land capability classes within the development area is shown in **Figure 7-9**[3].

The extension to the Ash Disposal Facility and associated developments (Return water dams etc.) will definitely result in a number of negative impacts to both the soils and land capability of the area and its immediate surroundings and will potentially have negative effects for the associated ecology and biodiversity that is dependent on the soils and vadose zone. The activities associated with the deposition and storage of ash will disturb the surface features and alter the soils land use and land capability permanently, albeit that the final operation is planned to be shaped and covered with a soil capping that is capable of sustaining a vegetative cover under natural climatic conditions.

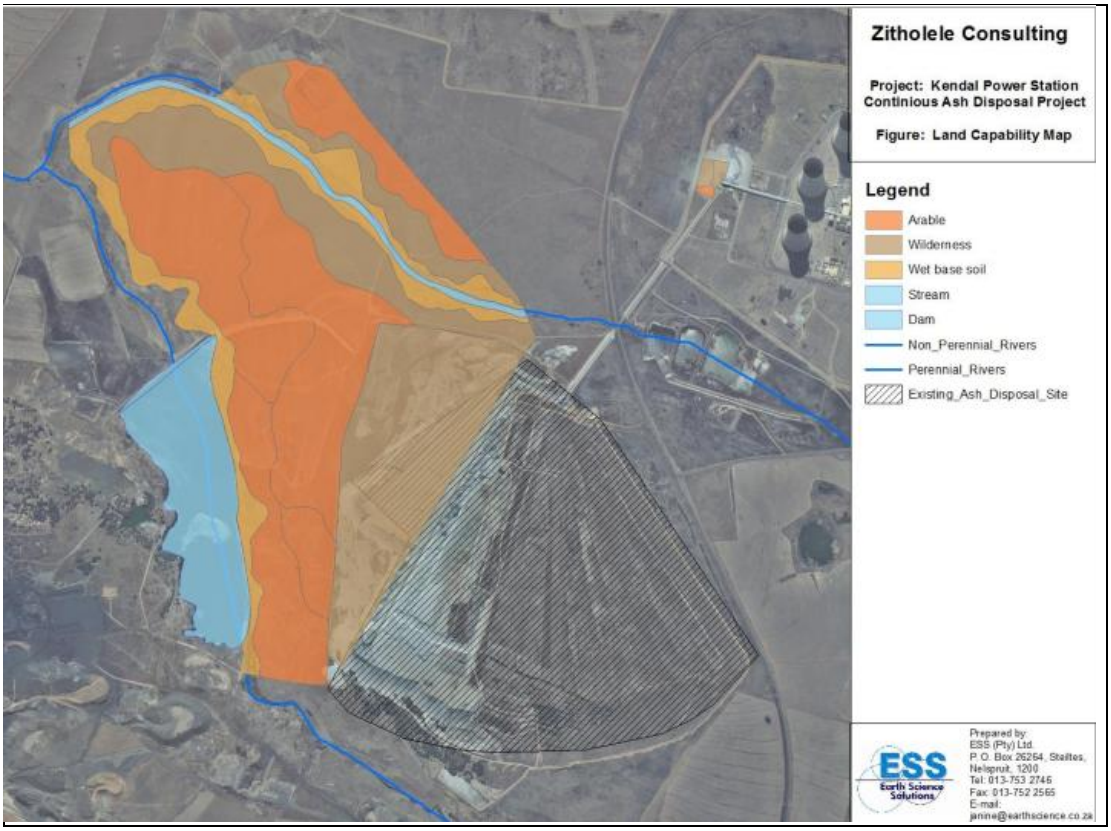

Figure 7-14: Land Capability Map – Development Areas

7.8 Noise Impact Study

A Professional Opinion on the Potential for Environmental Noise Impacts associated with the proposed KPS Continuous ADF Project was collated by Airshed Planning Professionals (Pty) Ltd. The professional opinion includes a baseline study and high level impact screening. A copy of the Professional Opinion is included in **Appendix E2** of this EIR.

7.8.1 Source Noise Level Measurements

Existing significant noise sources within the immediate area of the KPS, which are associated with the proposed project activities include conveyor transfer and ash stacking. The expected increase in ambient noise level over the average measured baseline as a function of distance from the source is shown in **Figure 7-10**.

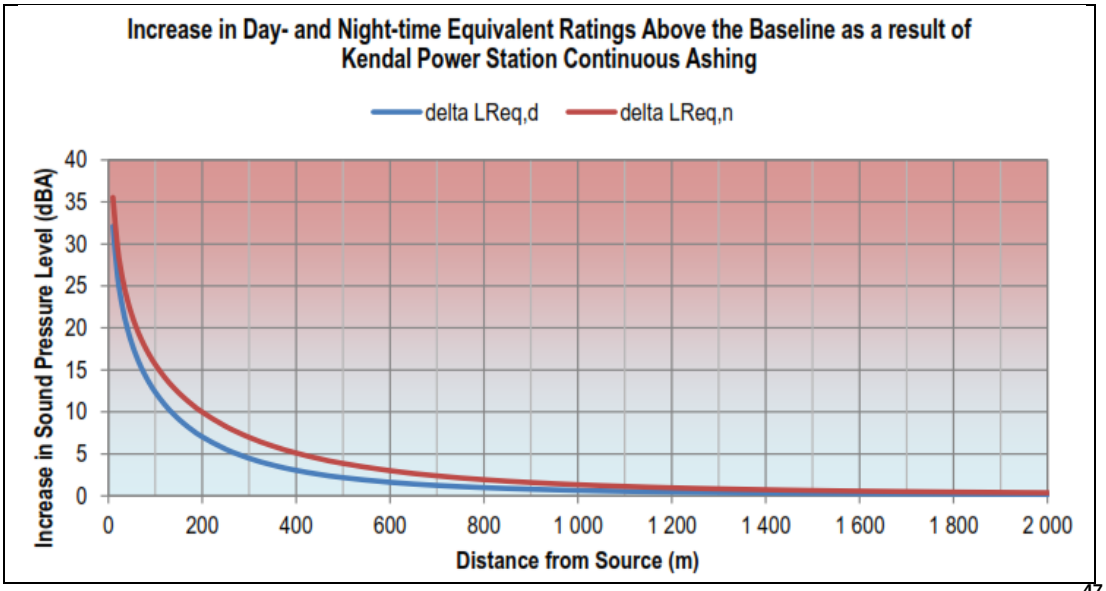

Figure 7-15: Estimated increase in day-and night-time equivalent ratings above the baseline[47]

Noise samples were taken at a distance of 10 m from stacking operations on the existing KPS ADF. The stacker / conveyor system's sound power levels (noise 'emissions') were subsequently calculated and are shown in **Table 7-6**.

Table 7-6: Ash stacking / conveying sound power levels as calculated from source measurements[37]

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	1000 Hz	2000 Hz	4000 Hz	
Conveying and Staking of Ash	108.1	103.4	102.3	103.1	99.9	97.3	89.6	104.9

An increase of 3 dBA is used as the noise impact indicator since it represents the level at which, for a person with average hearing acuity, a change is not detectable. During the day, a 3 dBA increase can be expected up to 400 m from the stacker/conveyor. During the night, a 3 dBA increase can be expected up to 600 m from the stacker/conveyor. Since the nearest residential receptors are located approximately 700 m north-west and 1.5 km south-east of the Continuous ADF footprint, noise impacts are expected to be of low consequence.

7.9 Groundwater Study

Golder Associates Africa conducted a Groundwater Study for the proposed KPS Continuous ADF Project (refer to **Appendix E4**). The Groundwater Study was intended to reach the following objectives:

[47] This figure has been taken from the Noise Impact Study included in Appendix E2.

- Characterise the prevailing groundwater situation;
- Define the water bearing strata in the area;
- Determine current groundwater level distribution and flow directions;
- Determine baseline groundwater quality;
- Conduct a gap analysis; and
- Conduct a *qualitative* assessment of the impact of the continuous utilisation of the existing ADF on the groundwater system.

7.9.1 Geology

The KPS is mainly underlain with Karoo Sequence sediments comprising of shale, carbonaceous shale, sandstone and coal of the Vryheid formation of the Ecca Group. A pre-Karoo diabase sill is present to the west of the site. Medium to coarse grained porphyritic and biotite granite of the Lebowa granite suite, part of the Bushveld Igneous Complex (BIC), together with sediments of the Transvaal Sequence (TS) Rooiberg Group (Selons River Formation) underlie part of the proposed Continuous ADF.

7.9.2 Groundwater Conceptual Model

The initial groundwater conceptual model that was constructed for KPS is based on the 1:250 000 geology map series and the typical stratigraphic section of the area. The conceptual model forms the basis for the understanding of the groundwater occurrence and flow mechanisms in the area of investigation, and is used as a basis for future potential numerical groundwater modelling. An aquifer system consisting out of three main aquifer zones which are commonly present in the Karoo, Bushveld Igneous Complex and Transvaal Sequence are described, namely:

- Upper weathered aquifer zone (Intergranular – DWAF 1996);
- Fractured aquifer zone (Fractured – DWAF 1996); and
- Deep fractured to fresh aquifer zones, controlled by geological structures and/or horizontal coal seams.

An illustration of the groundwater conceptual model for the proposed KPS Continuous ADF Project is shown in **Figure 7-16**.

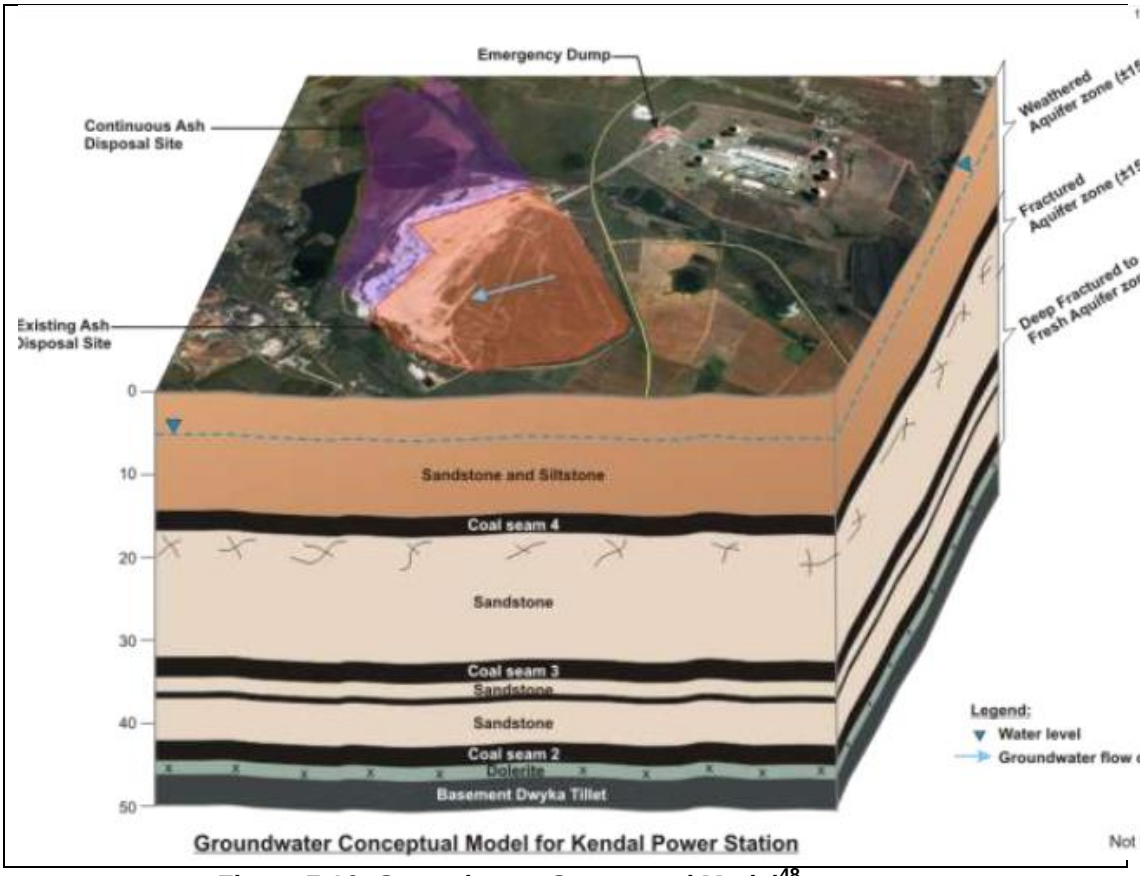

Figure 7-16: Groundwater Conceptual Model[48]

7.9.3 Existing Groundwater Monitoring Network

The existing groundwater monitoring network as confirmed from groundwater database and monitoring reports consists of 45 monitoring boreholes.

7.9.4 Groundwater Quality

The background groundwater quality of the KPS is representative of a calcium, magnesium bicarbonate type of water (Ca, Mg) (HCO_3). The following constituents, however, exceed the South African National Standards 241 (2011) drinking water compliance standards and include manganese, iron, sulphate and fluoride. It is unlikely that the continuous ADF would contribute to these elevated values.

The most recent analytical results confirm that presently the existing ADF and emergency ash disposal facilities have limited impact on the surrounding groundwater quality. Although an increased pH value is noticed downstream of the conveyor belt between the Continuous ADF and the Power Station.

[48] This figure was taken from the Groundwater Study included in Appendix E4.

7.9.5 Groundwater Recharge

From the published hydrogeological maps (DWAF 1996) the average recharge for the study area is shown as between 50mm to 75mm per annum.

7.9.6 Groundwater Vulnerability

Groundwater vulnerability refers to the susceptibility of an aquifer to contamination. Aquifer vulnerability is also used to represent the intrinsic characteristics that determine the sensitivity of various parts of an aquifer to being adversely affected by an imposed contaminant load. Groundwater vulnerability at the Kendal Continuous ADF and E-Dump site is shown on the national groundwater vulnerability map as low to medium (Figure 22). The probability that disposal of ash on the existing, continuous and emergency sites will have an impact on the groundwater is low, but this needs to be monitored.

7.9.7 Recommendations of Groundwater Study

The following recommendations are made following the groundwater base line study at Kendal Power station Continuous ADF:

- Drilling of seven pairs (deep and shallow) of additional monitoring boreholes and these proposed monitoring boreholes positions need to be confirmed with geophysics, in order to optimize the drilling positions and intersecting geological structures like fault zones, dolerite dykes and geological contact zones which could act as preferred groundwater pathways;
- The principle of the shallow and deep boreholes is to confirm for the presence of a shallow (perched) aquifer within the weathered zone, whereas the deep monitoring boreholes target the aquifer in then fracture zones of the host formation. The shallow aquifer zone will be cased and sealed off in the deeper boreholes to minimise the risk of cross contamination. Proposed drilling depths of deep and shallow monitoring boreholes are 40 m and 15m respectively;
- The shallow monitoring boreholes must be drilled at 165 mm diameter to a maximum depth of 15m and cased with 127mm ID UPVC casing through the weathered formation;
- The deep monitoring borehole must be drilled at 215mm diameter to maximum depth of 40m;
- The newly-drilled monitoring boreholes should be incorporated into the existing monitoring programme. The following monitoring tasks should be conducted to be consistent with the existing WUL (Licence no.: 04/B20E/BCEGI/1048):
    - Monthly monitoring of groundwater levels and quality;
    - Purged groundwater sampling; and
    - The analytical suite for groundwater samples should include determinants as listed in Table 7-7.

Table 7-7 Analytical Suite as per existing Water Use License

Variable	Units
pH	pH Units
Electrical Conductivity	mS/m
Total Dissolved Solids	mg/l
Total Alkalinity	mg/l
Major cations (Na, K, Mg, Ca)	mg/l
Major anions (Cl, F, SO_4)	mg/l
Nitrate (NO_3 as NO)	mg/l
Nitrite (NO_2 as N)	mg/l
Chemical Oxygen demand(COD)	mg/l
Orthophosphate	mg/l
Turbidity((as N.T.U)	mg/l
Trace elements by ICP-OES scan including Fe, Mn, Al, Cu, B, Pb, Zn, Hg, Cd and As	mg/l
Total Chromium (as Cr)	mg/l
Cyanides (as CN)	mg/l
Silica (as SIO)	mg/l
Free and saline Ammonia NH_3 (as N)	mg/l
E.coli	In cfu/100ml

7.10 Traffic Impact Study

A Traffic Impact Study for the proposed project was carried out to determine the potential impact of the proposed project activities on the existing road network associated with the KPS. The Traffic Impact Study was carried out by GOBA Consulting Engineers and is included in this EIR as **Appendix E9**.

7.10.1 Existing Road Network

The proposed development site is bounded by road D1390 and D686. Road D1390 is a gravel road which extends in a north-south direction linking local mines onto the D686 which subsequently intersects with the N12 National Road (refer to **Figure 7-17**).

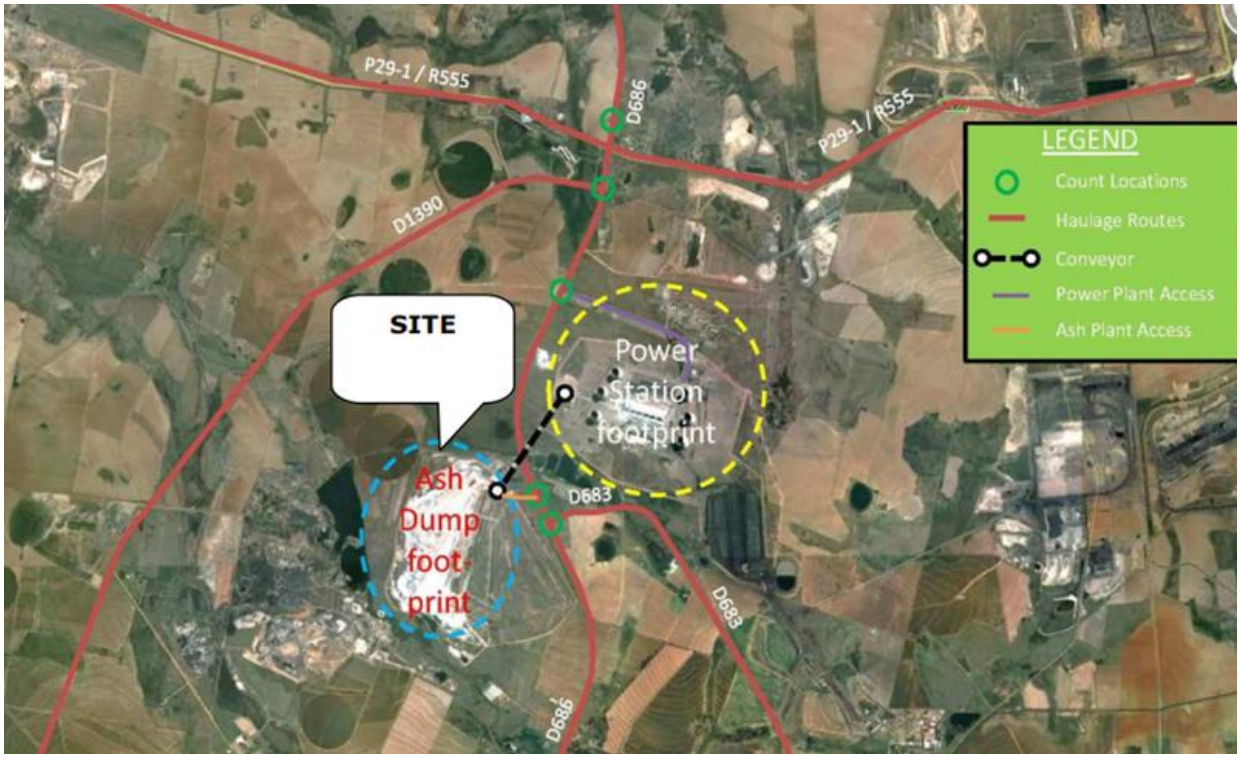

Figure 7-17: Existing road network

7.10.2 Access

The access to the Continuous ADF will remain at the current primary access off road D686. Although no additional access or road either for construction or operational purposes is proposed, it is recommended that a temporal short right turn lane be constructed at the access on the north approach along D686 Road to improve safety for both the turning vehicles and the through traffic on D686 Road. The access intersection configuration is shown in **Figure 7- 18**.

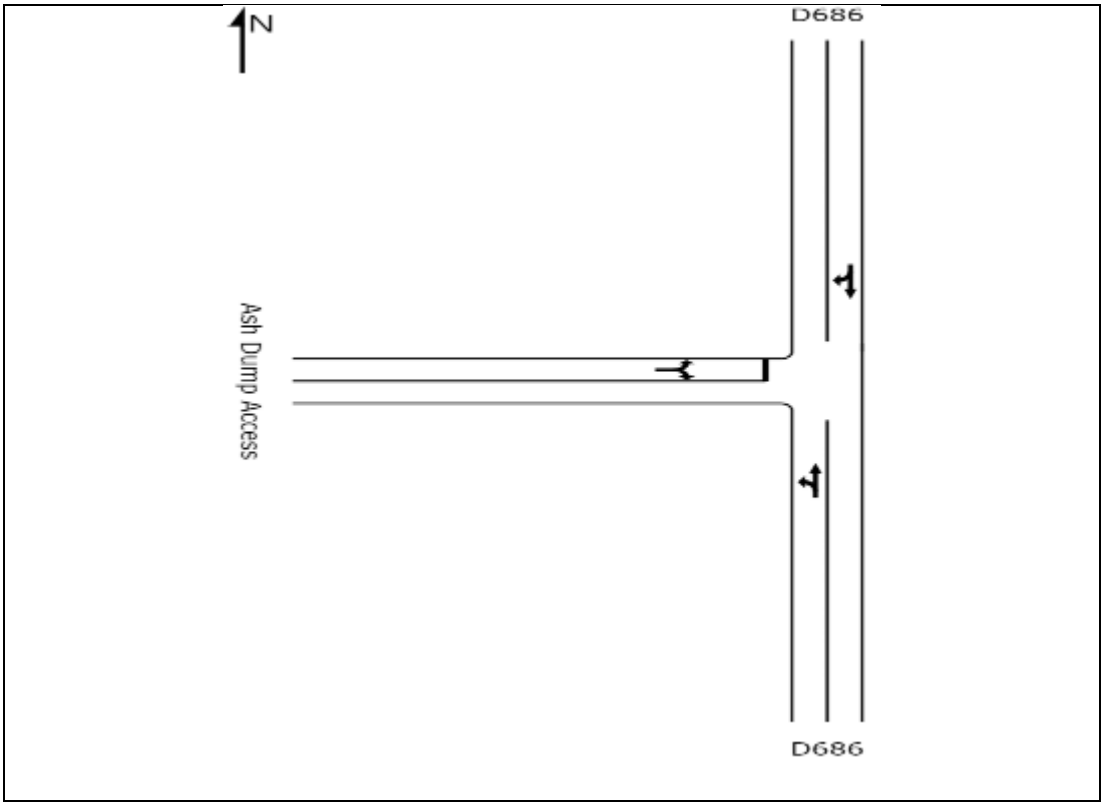

Figure 7-18: Existing road network

7.10.3 Additional Transport Infrastructure

The ash is transported from the Power Station to the ADF by means of overland conveyors. The conveyor currently passes under Road D686 located west of the Power Station. In case of emergencies where conveyors are not in working order, trucks are used to transport ash from the KPS to the ADF.

7.11 Terrestrial Ecology Study

A Terrestrial Ecology Study was conducted by Golder Associates and is included in this EIR as **Appendix E8**. The information contained in the sections below have therefore been taken from the Terrestrial Ecology Study.

7.11.1 General Biophysical Environment

The study area is located in the Rand Highveld Grassland vegetation type on the border with the Eastern Highveld Grasslands in the grassland biome (Mucina & Rutherford, 2006) (Refer to **Figure 7-19**).

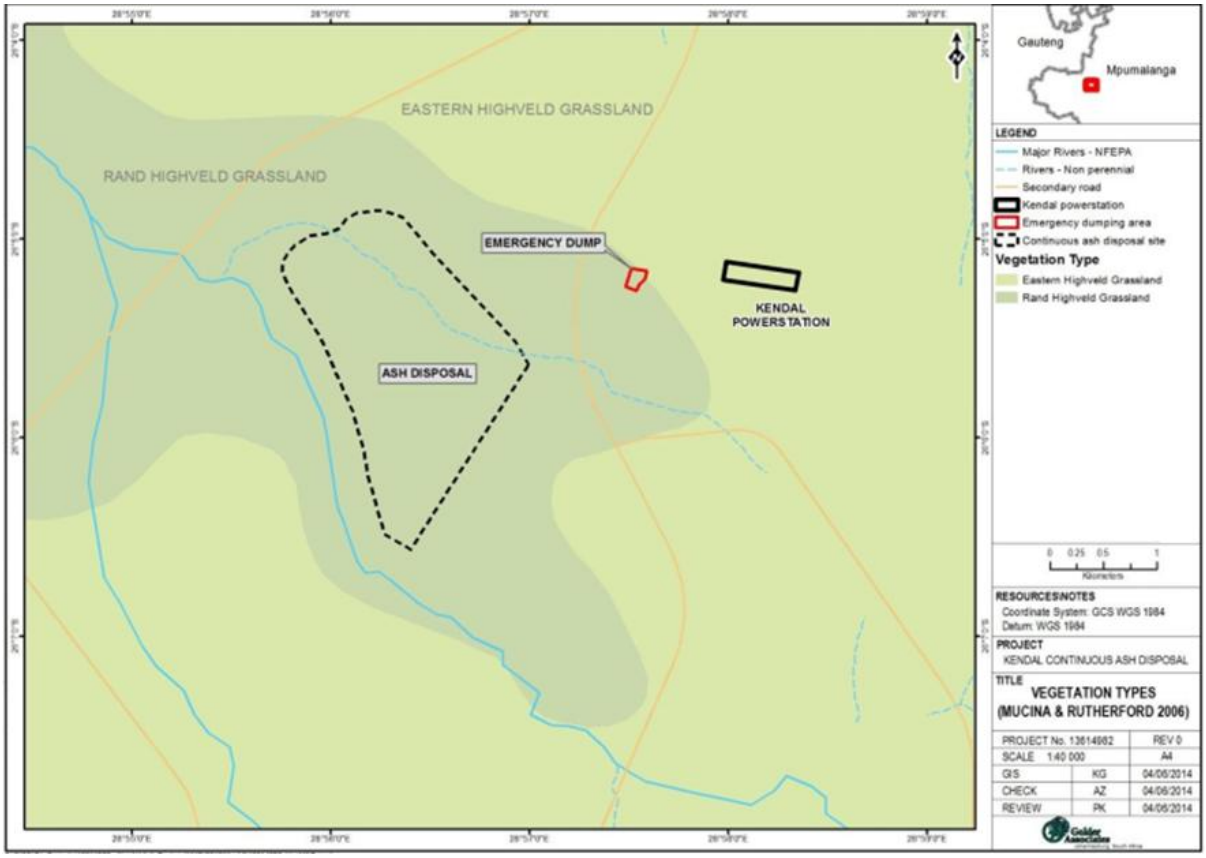

Figure 7-19: Locality of study area in relation to the regional vegetation types, as described by Mucina & Rutherford (2006)

The site of the proposed continuous ash dump is located to the west of the power station, where it extends in a north-west direction, off the existing ash dump and across a small stream. The central portion of the proposed continuous ash dump site is already degraded, primarily through maize cultivation and the spread of exotic, invasive plant species. Semi-natural and natural habitat patches were noted and are typically associated with areas where cultivation is precluded, such as wetland zones and rocky slopes.

The ecological integrity of natural habitat patches ranges from medium (*Hyparrhenia hirta* grasslands & Moist grass and sedge community) to high (*Themeda triandra* grasslands), based on existing disturbance characteristics. This notwithstanding, they do provide important habitat for flora and fauna and some are designated as CBA – Optimal by the MBSP (2013).

A number of species of conservation importance were recorded in the study area, including the Cape clawless otter (*Aonyx capensis*) and several plant species. These warrant careful management and accordingly the conservation importance of the vegetation communities in which they occur are rated medium (*Hyparrhenia hirta* grasslands) and high (Moist grass and sedge community & *Themeda triandra* grasslands).

The principle project related impact concerning terrestrial ecosystems in the study area, is the loss of important natural habitat through the clearing of natural vegetation and earth works. Habitat loss and degradation will occur at most proposed infrastructure sites. Although these impacts are largely inevitable, it is important that measures be implemented for mitigation. Principle mitigation measures include:

- Clearing only the minimum area required for construction purposes;
- Conduct search and rescue operations for plant species of conservation importance;
- Actively rehabilitate disturbed areas, and continue to monitor rehabilitation efforts; and
- A number of other secondary impact, such as dust entrainment, erosions and exotic species encroachment, have also been identified and will also warrant careful management and mitigation.

7.12 Aquatic Study

An Aquatic Study was conducted by Golder Associates and is included in this DEIR as **Appendix E3**. The information contained in the sections below have therefore been taken from the Terrestrial Ecology Study.

7.12.1 Anticipated project consequences on Aquatic Habitat

The aquatic study was intended to primarily assess the anticipated impacts of the proposed Continuous ADF on the biotic ecosystem in the Wilge River and its tributaries. Additional objectives of the Aquatic Study also included:

- Characterization of the biotic integrity of aquatic ecosystems in the project area as per the scope of work;
- Evaluation of the extent of site-related effects in terms of selected ecological indicators;
- Identification of listed aquatic biota based on the latest IUCN rankings, or other pertinent conservation ranking bodies; and
- Identification of sensitive or unique aquatic habitats which could suffer irreplaceable loss; and
- Identification of potential problems and recommendation of suitable mitigation measures.

Changes to the water quality could result in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Water quality deterioration often leads to modification of the species composition where sensitive species are lost and organisms tolerant to environmental changes dominate the community structure. Rainfall is likely to

filter through and flow off the ash storage facility, and may transport some pollutants that pose a risk to the surrounding water courses. Through good surface water management, no polluted water should be allowed to leave the site as this water is often of poor quality due to exposure to various processes and chemicals. This water may end up in river systems due to failure of pipes transporting water, overflow from pollution control dams, accidental discharges, etc. This can have significant impacts as the concentrations of pollutants can be high and can cause acute effects in the aquatic ecosystem.

The habitat availability and the quality thereof, are major determinants of the aquatic community structure. Changes in the biological community in a river may be linked to changes in water quality, habitat or both. When naturally vegetated landscapes are transformed to industrial uses, physical and biological relationships with adjacent streams are affected, usually resulting in stream bank erosion, increased sedimentation and a change in biotic community structure.

Clearance of existing vegetation will expose the upper layers of the soil horizon to soil erosion. Runoff after rain can give rise to erosion and sedimentation. The disturbed areas of land or ash storage facility are typically susceptible to erosion if not managed correctly. A variety of other pollutants may also be transported into water courses by runoff. The extent of the impact would likely be confined to the *local* study area and would remain.

The alteration of flow regimes is often claimed to be the most serious and continuing threat to ecological sustainability of rivers and their associated floodplain. Flow modifications within a river may have several effects on the aquatic biota found within these systems. Firstly, flow is a major determinant of physical habitat, which in turn is a major determinant of biotic community structure. Secondly, aquatic species have evolved life history strategies primarily in direct response to the natural flow regimes; thirdly, the invasion and success of exotic species in rivers is facilitated by the alteration of flow regimes (Poff and Ward, 1990; Bunn and Arthington, 2002).

There are several impacts related to the change in the hydrological regime. These impacts include: reduced surface runoff and changes in groundwater recharge. Surface runoff is reduced as rainfall collects in collapsed areas after heavy summer rains. However, the increased speed of runoff due to impermeable structures and drains could cause extensive erosion and scouring of the aquatic ecosystems if not designed adequately. Changes in the hydrological regime can cause an increase in erosion as water will have to be diverted around structures. These diversions often cause extensive erosion as the areas are not the natural drainage lines. This erosion will then in turn cause sedimentation in the aquatic ecosystem. Due to the nature and location of the proposed ash storage facility, the hydrological regime of the surrounding aquatic environments will be changed.

Construction of the Kendal ash storage facility extension may impact the water quality, sedimentation and natural flow regime of the downstream aquatic ecosystems. Changes to

the water quality could result in changes to the ecosystem structure and function and contribute to a loss of biodiversity. Rainfall is likely to filter through and flow off the ash storage facility, and may transport some pollutants that pose a risk to the surrounding water courses. The risk of a decrease in biotic integrity as a result of a modification in water quality was rated as LOW after mitigation due to the reduced probability and significance. It is expected that this impact would operate for the duration of the facilities life and as elevated TDS levels have already been recorded it is considered likely to occur. The habitat availability and the quality thereof, are major determinants of the aquatic community structure. Clearance of existing vegetation will expose the upper layers of the soil horizon to soil erosion. Runoff after rain can give rise to erosion and sedimentation. The disturbed areas of land or ash storage facility are typically susceptible to erosion if not managed correctly. The extent of the impact (habitat smothering) would likely be confined to the local study area and would remain present for the duration of the life of the facility. As there is already an ash storage facility present and no excessive siltation was noted, the likelihood (could happen) of serious sedimentation would be confined to mismanagement. Based on the assessment the overall impact risk of the ash storage facility was considered LOW with the correct mitigation measures in place.

8 KNOWLEDGE GAPS AND LIMITATIONS

The mandatory contents of an Environmental Impact Report is stipulated in Regulation 31 of the EIA Regulations (2010) (Government Notice No. R543[49]). In terms of Regulation 31(2)(m) of the EIA Regulations (2010) (Government Notice No. 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 Environmental Impact Report have been obtained from various sources. 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 Environmental Impact Assessment 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 Wetland Delineation and Assessment Study

The assumptions and limitation to the Wetland Delineation and Assessment Study included the adequacy of predictive methods and underlying assumptions as well as uncertainties relating to the information provided. A brief overview of the aforementioned assumptions and limitation is provided below.

8.1.1 Adequacy of predictive methods

Various generally accepted assessment methods were employed to assess the wetland and aquatic habitats within the development footprint. Reference was made to WET-Eco-Services (Kotze et al., 2009) and 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 environmental impact assessments in South Africa and are deemed adequate for the purpose of the study.

[49] Government Notice No. R543: National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations published under Government Notice No. R543 in Government Gazette 33306, dated 18 June 2010.

8.1.2 Adequacy of underlying assumptions

As the reference conditions are unknown, the confidence with which the present ecological category (i.e. Present Ecological Status) is assigned is limited.

8.1.3 Uncertainty of information provided

Given that the probability exists for the wetland boundaries to come into contact with the development, these areas were delineated in detail. Furthermore where deemed appropriate the wetland boundaries that are unlikely to be affected directly by the development were verified, which entailed a lower sampling density.

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 Global Position Satellite unit used to delineated wetlands in the field, the delineated wetland boundaries cannot be guaranteed beyond an accuracy of an estimated 5m 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.

8.2 Visual Impact 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.

8.3 Terrestrial Ecology Study, Aquatic Study, Surface Water and Groundwater Study

In the preparation of the Terrestrial Ecology Study Report the following limitations were identified:

- A complete assessment of all possible conditions or circumstances that may exist at the development was not performed.
- Conditions may exist which were undetectable given the scope of work provided to the specialist. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the study. Accordingly, additional studies and actions may be required.
- The passage of time affects the information and assessment provided in the study. The specialist's opinions are based on information that existed at the time of the collation of the report. The study also provides a specialist's opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any

subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

- Any assessments that have been made in the Terrestrial Ecology Study are based on the conditions indicated from published sources and the investigation described.
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated).

8.4 Soil and Land Capability Study

An assumption was made that the total area of possible disturbance was included in the study area. It has furthermore also been assumed that the development plan included in the Land Capability Study 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 “composite” samples taken from the dominant soil types mapped in the study area. The study area 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.).

8.5 Heritage Impact Assessment

Although comprehensive fieldwork undertaken was undertaken as part of the Heritage Impact Assessment, the heritage resources that were located during the fieldwork do not necessarily represent all possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the dense vegetation cover at the time that the fieldwork was carried out.

8.6 Geotechnical Study

The following assumptions were made to set up and investigate the geotechnical slope stability models during the analyses:

- A seasonal perched water table at a depth of m, as observed during the surface investigations in some test pits.

- Apparent cohesions values report by Eskom, on the basis of information available to Eskom prior (and comparative) studies that were not included in the specialist's portfolio or reference data were also considered. Effective apparent cohesion values ranging between 0kPa and 10kPa for the ash were considered in performing the sensitivity analyses.
- The composite liner configuration, is currently conceptual only, and details have not been conclusively finalised, at the time of conducting the stability analyses. Liner interface residual friction values, assumed to range between10° and 16° on the basis of prior liner studies conducted by the specialist were considered in the stability analyses.
- Buttressing of exposed slopes was considered as preliminary measures to enhance the stability. Bench widths ranging between 0m and 40m were considered. Bench heights of 10m were assumed. Appropriate operational plans for ash deposition would need to be verified in due course, where necessary modified, to demonstrate the validity of such options.
- Permanent (rehabilitated) as well as temporary (operational) slopes were considered.
- A 1:1.15 (V: H) slope (i.e.approx.41° from horizontal) was adopted for operational slopes, where as an overall slope of 1:5 was adopted for permanent slopes.
- Deep seated failures (i.e. extending through the ash, and into the underlying (founding) residual soil strata were considered, along with slope failure residing entirely in the ash only.
- A 28m buffer zone, between the stacker and the ash dump crest, as stipulated in the Eskom operations manual, was considered for all analyses of temporary slopes.
- Interactions between front- slopes, with varying bench width separation between 10m and 36m, were modelled in the analyses.
- The analysis was conducted using Roc Science Slide 6.0, a 2Dimensional limit equilibrium slope stability program for soil and rock slopes.
- Slip surface analyses using Morgenstern-Price's method of slices were carried on selected "worst case" sections of the various dumps. Circular and non-circular failures surfaces were considered.

8.7 Air Quality Study

- The following assumptions and limitations have been taken into account and should be considered when interpreting the findings of the air quality assessment:
- Meteorological data was acquired from the Eskom operated monitoring station at the KPS, for January 2009 to October 2012. Due to the proximity between the Power Station

and its ash disposal facility, it was assumed that the meteorological data are representative of the site.

- A comprehensive list of sensitive receptors was not available. As such, individual residences and small residential complexes were identified via aerial photography (using Google Earth™) and used as identified sensitive receptors around the ash disposal facility alternatives.
- The dispersion model cannot compute real-time processes. The end-of-life, worst-case, area footprint for the maximum extent of the continuous ash disposal was used in the model. The range of uncertainty of the model predictions could to be 50% to 200%. There will always be some error in any geophysical model, but it is desirable to structure the model in such a way to minimise the total error. A model represents the most likely outcome of an ensemble of experimental results. The total uncertainty can be thought of as the sum of three components: the uncertainty due to errors in the model physics; the uncertainty due to data errors; and the uncertainty due to stochastic processes (turbulence) in the atmosphere.
- 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 dust-fall rates in the unmitigated scenario however exceedance of the guideline outside of the modelling domain is not expected to cover a substantial area.
- Increased life-time cancer risk was calculated at the identified sensitive receptors for arsenic, nickel and chromium.
- Carcinogenic trivalent arsenic (As3+) was assumed to account for 10% of the total arsenic in the ash sample.
- The US-EPA (United States Environmental Protection Agency) unit risk factor (URF), 4.3 x 10-3, was used to calculate the increased cancer risk, due to the fact that it is more conservative than the WHO unit risk factor.
- There is much uncertainty in the literature regarding the species and the mechanisms through which nickel is toxic. A conservative estimate of increased life-time cancer risk was calculated assuming:
- All forms of nickel present in the ash sample are carcinogenic.
- The US-EPA IRIS unit risk factor (URF) of cancer as a result of exposure to nickel used was 2.4 x 10-4 (µg.m-3)-1.
- The following important assumptions were made with regards to Cr6+ (hexavalent chromium) emissions and impacts:
    - All forms of Cr^{6+} were assumed to be carcinogenic. Known carcinogenic Cr^{6+} compounds include chromium trioxide, lead chromate, strontium chromate and zinc

chromate. Cr^{6+} was assumed to represent only 1.1% of the total Cr in the PM_{10} fraction, as per literature.

- Uncertainty regarding the unit risk factor (URF) for Cr^{6+} is evident in the range of 1.1×10^{-2} $(\mu g.m^{-3})^{-1}$ to 13×10^{-2} $(\mu g.m^{-3})^{-1}$ as specified by the WHO (World Health Organisation). The US-EPA URF of 1.2×10^{-3} $(\mu g.m^{-3})^{-1}$ was used in the estimation of increased life-time cancer risk compensating for conservative approach followed in the estimation of Cr6+ emissions and impacts.

8.8 Impact Assessment

An assessment of the anticipated impacts on the respective environmental components associated with each of the specialist studies were carried out. The rating assigned to each of these impacts were included in the Environmental Impact Assessment carried out by the Environmental Assessment Practitioner (EAP). As was explained in **Chapter 10** a qualitative approach was adopted in determining the significant rating of the anticipated environmental impacts. The ratings that were therefore assigned to each of the impacts is based on the EAP[50]'s interpretation of the variables in relation to the anticipated impacts. As such the assigned ratings and significance of the anticipated impacts are based on the EAP's interpretation and knowledge of the aspects associated with the proposed project.

[50] EAP: Environmental Assessment Practitioner

9 ENVIRONMENTAL IMPACT ASSESSMENT

In accordance with Regulations 31(2)(h), 31(2)(k) and 31(2)(l) of the Environmental Impact Assessment Regulations[51] 2010 this chapter is aimed at providing the Competent Authority with a comprehensive account of the methodology that was applied for the Environmental Impact Assessment (EIA) and as well as the rating and significance rating assigned to each evaluated impact.

The assessment of the anticipated impacts associated with each of the project activities forms the cornerstone of the Scoping and Environmental Reporting Process (S&EIR). The overarching purpose of the EIA process is therefore to determine, assess and evaluate the consequences (positive and negative) of a proposed development activity or project (Department of Environmental Affairs[52], 2010:4). The objectives of the EIA can therefore be summarised as:

- Determining the significance of all anticipated environmental impacts identified during the Scoping Phase and by the findings of the various specialists.
- Developing mitigation measures which will either prevent the adverse impact from transpiring or reduce the significance of the impact. In the case of positive impacts the mitigation measure will be aimed at enhancing the impact.
- Providing the Competent Authority with sufficient information relating to the anticipated environmental impacts to make an informed decision with regards to granting or refusal of Environmental Authorisation.

All information that has been gathered by the EAP and through the specialist studies and engagement with Interested and Affected Parties (I&APs) have been done so with the intention of gathering sufficient information to adequately assess the anticipated impacts and develop mitigation measures aimed at either preventing the impact from transpiring or reducing the significance thereof.

9.1 Approach to Environmental Impact Assessment

The following approach has been adopted in assessing the anticipated environmental impacts:

- Impacts are assessed separately for the Construction, Operational, Closure, and Post-Closure Phases of the project;
- Impacts to each environmental element documented in the baseline description above are considered in the impact assessment;

[51] South Africa. 2010. National Environmental Management Act, 1998 (Act No.107 of 1998) Environmental Impact Assessment Regulations, 2010 (Notice 543). *Government gazette*, 33306:3, 18 June.

[52] South Africa. 2010. Department of Environmental Affairs National Environmental Management Act, 1998 (Act No.107 of 1998, as amended) publication of Implementation Guidelines for comment, 2010. (Notice 654). *Government gazette*, 33333:3, 29 June.

- Impacts are described according to the project impact, cumulative impact, mitigation measures and residual impact as follows:
- The project impact assesses the potential impact of the development on an environmental element;
- The cumulative impact on an environmental element is the description of the project impact combined with any initial baseline impacts that occur;
- Mitigation measures that could reduce the impact risk are then prescribed; and
- The residual impact describes the cumulative impact after the implementation of mitigation measures.
- Impacts are rated against a predetermined set of criteria including (magnitude, duration, spatial scale, probability, and direction of impact);
- Identified impacts are combined by weighting to produce a combined impact rating for each environmental element;
- Each impact is rated with and without mitigation measures; and
- A rating matrix is provided for each environmental element per project phase summarising all the aforementioned in a single table and giving a full breakdown of how the impact risk rating was calculated to produce the Environmental Impact Statement (EIS).

9.2 Impact Assessment Methodology

A qualitative approach was adopted in rating each of the anticipated / predicted environmental impacts and assigning a significance score. The criteria which is used to determine the Impact Risk include the magnitude, duration and temporal scale of the impact as well as the degree of certainty and degree of probability. The scoring which is assigned to each of the aforementioned rating factors is used to calculate Impact Risk. Below follows an overview for each of the rating factors.

9.2.1 Magnitude Assessment

Significance rating (importance) of the associated impacts embraces the notion of 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 (1000 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 9-1** below.

Table 9-1: Description of the significance rating scale

Rating	Symbol	Score	Description
No Impact	No	0	There is no impact at all - not even a very low impact on a party or system.
Very Low	VL	1	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, 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.
Low	L	2	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
Moderate	M	3	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
High	H	4	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, 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, time-consuming or some combination of these.
Very High	VH	5	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.

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 global scale. The spatial assessment scale is described in more detail in **Table 9- 2.**

Table 9-2: Description of the spatial rating scale

Rating	Symbol	Score	Description
Isolated Sites / proposed site	S	1	The impact will affect specific areas within the development footprint.
Study Area	SA	2	The impact will affect the area within the development footprint not exceeding the boundary of the development footprint.
Local	L	3	The impact will affect an area up to 5 km from the boundary of the development footprint.
Regional/Provincial	R	4	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
Global/National	N	5	The maximum extent of any impact.

9.2.3 Duration / Temporal Scale

In order to accurately describe the impact 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 9-3**.

Table 9-3: Description of the temporal rating scale.

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

9.2.4 Degree of Probability

The probability or likelihood of an impact occurring will be described as shown in **Table 9-4**.

Table 9-4: Description of the degree of probability of an impact accruing

Rating	Symbol	Score	Description
Practically Impossible	IMP	1	Practically Impossible
Unlikely	UN	2	Unlikely
Could Happen	CH	3	Could Happen
Very Likely	VL	4	Very Likely
Is going to happen / Will Happen	WH	5	Is 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 “degree of certainty” scale is used as discussed in **Table 9-5**. 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 9-5: Description of the degree of certainty rating scale

Rating	Symbol	Description
Can’t know	CN	The consultant believes an assessment is not possible even with additional research.
Unsure	UN	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Possible	PO	Between 40 and 70% sure of a particular fact or of the likelihood

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

9.2.6 Impact Risk Calculation

To allow for impacts to be described in a quantitative manner in addition to the qualitative description, 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 a risk and can be expressed as the function of the consequence and the probability of the impact occurring. Consequence is the average of the MAGNITUDE, Spatial, and Temporal Scale Ratings; whilst probability is seen as a fraction of 1 on a scale of 1 to 5 as described above. The Impact Risk formula can be expressed mathematically as:

$$\text{Impact Risk} = \frac{\text{Magnitude} + \text{Spatial} + \text{Temporal}}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 9-6**.

Table 9-6: Example of rating scale

Impact	Magnitude	Spatial Scale	Temporal Scale	Probability	Rating
Greenhouse gas emissions	2	*3*	3	3	1.6
	LOW	*Local*	Medium Term	*Could Happen*	

***Note**: The magnitude, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a consequence rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The consequence rating of 2.67 is then multiplied by the probability rating (0.6) to give the final rating of 1.6.*

The impact risk is classified according to 5 classes as described in **Table 9-7**.

Table 9-7: Impact Risk Classes

Rating	Impact Class	Description
0.1 – 1.0	1	**Very Low**
1.1 – 2.0	2	**Low**
2.1 – 3.0	3	**Moderate**
3.1 – 4.0	4	**High**
4.1 – 5.0	5	**Very High**

Therefore with reference to the example used for greenhouse gas emissions above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a Low impact.

9.2.7 Weighting and Combining Impacts

In most cases there are numerous impacts to each environmental element. Each environmental impact is not necessarily equally important, thus it becomes necessary to give a weight to each impact when combining the impact rating into a single score that can be used in the EIS. Impact weightings are also made on a scale of 1 to 5. Where 1 is of least importance and 5 is the most importance. It is important to note that impact weightings are not like impact rankings i.e. two impacts may have the same score, which simply means the impacts are equally important.

9.2.8 Notation of Impacts

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

Significance or magnitude- IN CAPITALS
Duration – in underline
Probability – *in italics and underlined.*
Degree of certainty - **in bold**
Spatial Scale – *in italics*

9.2.9 Mitigation Measures

Mitigation measures aimed at preventing adverse impacts from happening and to keep those that do occur within an acceptable level. The primary objectives of mitigation measures can be summarised as:

- Identifying better alternatives and ways of doing things;
- Enhancing the environmental and social benefits of a proposal;
- Avoiding, minimising or remedying adverse impacts; and
- Ensure that residual adverse impacts are kept within acceptable levels.

9.3 Listed Activities

Each of the project activities which are associated with the proposed triggers an activity listed in the EIA Regulations Listing Notice 153 or Listing Notice 254. This in turn means that the implementation of each of these activities may have a substantial detrimental effect on the receiving environment. As was mentioned previously the overarching principle of Environmental Impact Assessment in centred on assessing the anticipated environmental impacts and determining whether the impact can be mitigated to an acceptable level. The EIA Regulations 2010 serves as a tool to ensure that the impacts of activities for which Environmental Authorisation are necessary are properly assessed. Therefore impacts which have been identified are related to either direct or indirect impacts which may result from the project activities which triggers listed activities defined in Government Notice R.544, 545 and R546.

The identified impacts have furthermore been grouped according to the project lifecycle phase during which these impacts are likely to transpire (i.e. Construction Phase, Operational Phase, Decommissioning Phase and Post-Closure Phase). No impacts during the Planning Phase of the proposed Continuous ADF are anticipated.

9.4 Cumulative Impacts

All efforts have been made to consider the cumulative impacts of surrounding land uses and other known and planned developments. The EAP (Zitholele Consulting (Pty) Ltd) as well as the specialists who carried out the various studies for the proposed KPS Continuous ADF Project have conducted similar studies or have to some extent been involved with the following projects:

- Proposed 30 Year ADF for KPS Project (NEAS Reference: DEA/EIA/0001624/2013 DEA Reference: 14/12/16/3/3/3/68);
- Anglo American Inyosi Coal the New Largo Colliery (MDEDET Reference: 17/2/3N-41, DMR Reference: 30/5/1/2/2/511MR F/2011/04/14/002 and DWA Reference: 16/2/7/B200/C528); and
- Proposed Extension for the Ash Disposal Facility at Kusile Power Station (DEA Reference: 12/12/20/2412 NEAS Reference: DEA/EIA/0000514/2011).

[53] South Africa. 2010. National Environmental Management Act, 1998 (Act No.107 of 1998) Environmental Impact Assessment Regulations Listing Notice 1 of 2010 (Notice 544). *Government gazette*, 33306:80, 18 June.

[54] South Africa. 2010. National Environmental Management Act, 1998 (Act No.107 of 1998) Environmental Impact Assessment Regulations Listing Notice 2 of 2010 (Notice 545). *Government gazette*, 33306:105, 18 June.

Taking the aforementioned into account, the bearing of the impacts associated with the projects listed above were considered when determining the baseline environmental description as well as the anticipated direct, indirect and cumulative impacts for the proposed KPS Continuous ADF Project. The EIA Process for the proposed KPS Continuous ADF Project and that of the proposed 30 Year ADF for KPS Project (NEAS Reference: DEA/EIA/0001624/2013; DEA Reference: 14/12/16/3/3/3/68) constitute two separate processes. The Scoping Phase for the proposed 30 Year ADF for KPS Project has been completed. However due to further project planning and required amendments to the technical project components, the EIA Phase has not progressed as far as that of the proposed KPS Continuous ADF Project. Due to the nature of the proposed 30 Year ADF for KPS Project it is anticipated that the impacts for the project would be similar to the anticipated impacts of the KPS Continuous ADF Project. However, no site has yet been identified for the 30 year ADF and therefore the receiving environment is, as yet, not confirmed.

9.5 Environmental Impact Assessment – Operational Phase Impacts

9.5.1 Surface Water Impacts

a) Description of impact

Pollution Control Dams and Clean Water Dams

Sediment deposition in the channels conveying dirty water to the PCD (i.e. dirty water toe drainage collection system) may occur if the desired flow velocity of run-off from the Continuous ADF is not achieved by the toe paddock. This may in turn result in an increased sediment load of run-off that is discharged into the PCD and siltation of the containment structure.

Siltation of the channels and PCD will ultimately reduce the capacity of the infrastructure to convey and contain the dirty water respectively. An overflow of dirty water into the adjacent clean water toe drainage system will result in the contamination of clean water. Similarly an overflow of dirty water from the PCD (e.g. Dam 1) into the Clean Water Dam (e.g. Dam 2) will result in the contamination of clean water. Water that is released from the Clean Water Dam into the watercourse which do not meet the required discharge standards, may adversely impact the water quality of the receiving surface water resource.

Stream Diversion

The diversion of the perennial stream will alter the natural flow regime of the watercourse. As the proposed stream diversion do not constitute a natural drainage line, water will be diverted around structure which may lead to erosion, scouring and sedimentation of the aquatic habitat.

Emergency-Dump

The increased storage capacity of the E-Dump will have sufficient capacity to temporarily store ash for up to seven days. In an instance where ash is stored at the E-Dump for longer than seven days, there will be no capacity for emergency storage in the facility will be exceeded.

Lowering of dam wall

Water from the final mine voids decanting into the farm dam will increase the sulphate and chloride concentrations of water in the dam. This will, in turn, reduce the water quality of the farm dam as well as down-stream watercourses.

Indirect Impact

The ecosystem functioning as well as the ecosystem structure and therefore also the biotic integrity is largely determined by the water quality. Therefore changes to the water quality could result in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Furthermore water quality deterioration often leads to modification of the species composition where sensitive species are lost and organisms tolerant to environmental changes dominate the community structure. Rainfall is likely to filter through and flow off the ash storage facility, and may transport some pollutants that pose a risk to the surrounding water courses.

Cumulative Impacts

Contaminated run-off and discharge by industrial and mining activities within the Wilge River sub-catchment have adversely impacted on the water quality of the sub-catchment. Adverse impacts on the water quality of surface water resources within the sub-catchment resulting from the project activities will contribute to the poor water quality of the Wilge River.

b) Impact Assessment

Direct Impact

The combined weighted project impact to surface water (**prior to mitigation**) as a result of the operational activities will *very likely* be of MODERATE negative significance. The impact is expected to act over a medium term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

Table 9-8: Surface Water Impact Assessment - Direct Impact

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Deterioration of surface water resource quality.	3	*4*	3	4	Probable	2.6
	MODERATE	*Regional*	Medium Term	Very Likely		

Post-Mitigation Impact

The combined weighted project impact to surface water (**after mitigation**) as a result of the operational activities will *very likely* be of LOW negative significance. The impact is expected to act over a Medium Term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

Table 9-9: Surface Water Impact Assessment - Direct Impact (Post Mitigation)

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Deterioration of surface water resource quality.	2	*4*	3	4	Probable	2.4
	LOW	*Regional*	Medium Term	Very Likely		

Cumulative Impact Assessment

The combined weighted project cumulative impact to surface water (**prior to mitigation**) as a result of the operational activities *could happen* and be of HIGH negative significance. The impact is expected to act over a Medium Term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

The combined weighted project cumulative impact to surface water (**post mitigation**) as a result of the operational activities *could happen* and be of MODERATE negative significance. The impact is expected to act over a Medium Term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

Table 9-10: Surface Water Impact Assessment – Cumulative Impact

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Deterioration of surface water resource quality.	4	*4*	3	3	Probable	2.2
	HIGH	*Regional*	Medium Term	Could Happen		

Post-Mitigation Cumulative Impact

The combined weighted project cumulative impact to surface water (**post mitigation**) as a result of the operational activities *could happen* and be of MODERATE negative

significance. The impact is expected to act over a Medium Term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

Table 9-11: Surface Water Impact Assessment – Cumulative Impact

Impact	Magnitude (before mitigation)	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating	Post Mitigation Rating
Deterioration of surface water resource quality.	4	3	*4*	3	3	Probable	2.2	2.0
	HIGH	MODERATE	*Regional*	Medium Term	Could Happen			

9.5.2 Air Quality Impacts

a) Description

Continuous Ash Disposal Facility

Under conditions of high wind speeds exceeding 5.4 $m.s^{-1}$ windblown particles may be generated from the Continuous ADF. As the footprint of the Continuous ADF progresses, the exposed ash surface vulnerable to dust generation increases. Dust-fall may substantially increase the PM_{10} and $PM_{2.5}$ concentrations to levels exceeding the National Ambient Air Quality Standards (NAAQS). Although concurrent rehabilitation of the ADF will take place, areas where vegetation have not yet been established, will remain prone to dust generation.

Gaseous Pollutants

Gaseous pollutants (such as sulphur dioxide, oxides of nitrogen, carbon monoxide, etc.) from vehicle exhausts emissions and other combustion sources will contribute to reducing air quality. In addition to the emission of gaseous pollutants the movement of vehicles across exposed soil or ash, will also result in particulate emissions.

Emergency-Dump

During high wind speeds exceeding 5.4 $m.s^{-1}$ the ash which is temporarily stored at the E-Dump will be prone to dust generation and the emission of particulate matter, unless appropriate air quality mitigation is implemented. In relation to the surface area of the proposed Continuous ADF, the E-Dump will cover a considerably small area.

Cumulative Impacts

The proposed Continuous ADF, current and expanded footprint, fall within the Highveld Priority Area (HPA). Therefore the particulate emissions from the facility are likely to contribute to the air quality of the HPA. The ash disposal facility is also located in the vicinity of the Emalahleni Hot Spot (HPA, 2011). The poor ambient air quality in the Emalahleni Hot

Spot is the 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).

b) Impact Assessment

Direct Impact

The combined weighted project impact on air quality (**prior to mitigation**) as a result of the operational activities will *very likely* be of a HIGH negative significance. The impact is expected to act over a medium term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

Table 9-12: Air Quality Impact Assessment – Direct Impact

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Elevated concentrations of particulates will reduce the air quality.	4	4	3	4	**Probable**	3.0
	HIGH	*Regional*	Medium Term	*Very Likely*		

Post-Mitigation Impact

The combined weighted project impact on air quality (**post mitigation**) as a result of the operational activities will *very likely* be of a LOW negative significance. The impact is expected to act over a medium term and will impact on a *regional scale*. The impact risk class is thus MODERATE.

Table 9-13: Air Quality Impact Assessment – Direct Impact

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Elevated concentrations of particulates will reduce the air quality.	3	4	3	4	**Probable**	2.7
	LOW	*Regional*	Medium Term	*Very Likely*		

Cumulative Impact Assessment

The cumulative impact on air quality **(prior to mitigation**) resulting from the continuous disposal of ash is regarded as a HIGH significance impact and will impact on a *regional scale*. The impact will cease once disposal of ash and the operation of the KPS ceases and in terms of duration of the impact is therefore categorised as medium term. It is *very likely* that the impact will transpire. Based on the ratings assigned to all determining categories the impact risk class is therefore MODERATE.

Table 9-14: Air Quality Impact Assessment – Cumulative Impact

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Particulate emissions from the Continuous ADF will contribute to the poor air quality within the HPA.	4	4	3	4	**Probable**	2.9
	HIGH	*Regional*	Medium Term	*Very Likely*		

Post-Mitigation Cumulative Impact

The cumulative impact on air quality (**post mitigation**) resulting from the continuous disposal of ash is regarded as a HIGH significance impact and will impact on a *regional scale*. The impact will cease once disposal of ash and the operation of the KPS ceases and in terms of duration of the impact is therefore categorised as medium term. It is *very likely* that the impact will transpire. Based on the ratings assigned to all determining categories the impact risk class is therefore MODERATE.

Table 9-15: Air Quality Impact Assessment – Cumulative Impact (Post-Mitigation)

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Particulate emissions from the Continuous ADF will contribute to the poor air quality within the HPA.	2	4	3	4	**Probable**	2.4
	LOW	*Regional*	Medium Term	*Very Likely*		

9.5.3 Noise

a) Description

The sound generated by the conveyor belts and ash stacking activities are expected to increase the sound pressure level by 3 decibels during both day and night time. Although identical sound pressure level increases are anticipated for day and night time the noise generated by the ashing and stacking activities will travel further during the evening as opposed to during the day. During the day the ashing and stacking activities will be heard up to a distance of 400 m from the Continuous ADF, versus a distance of 600 m in the evening. As the nearest residential receptors are located approximately 700 m north-west and 1.5 km south-east of the Continuous ADF the increased sound pressure level will not be perceived by those residing in these areas.

b) Impact Assessment

Direct Impact

The combined weighted project impact on ambient noise levels (**prior to mitigation**) as a result of the operational activities associated with the Continuous ADF *will happen*, but will be of LOW significance. The increased sound level pressures will not be audible from distances exceeding 600 m and is therefore confined to the *local area*. The impact is expected to act over a medium term. The impact risk class is thus MODERATE.

Table 9-16: Noise Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Ash stacking activities as well as the operation of the conveyor will result in increased sound pressure levels.	2	2	3	5	**Definitely**	2.3
	LOW	*Study Area*	Medium Term	*Will Happen*		

Post-Mitigation Impact

The combined weighted project impact on ambient noise levels (**post mitigation**) as a result of the operational activities associated with the Continuous ADF *will happen*, but will be of LOW significance. The increased sound level pressures will not be audible from distances exceeding 600 m and is therefore confined to the *local area*. The impact is expected to act over a medium term. The impact risk class is thus MODERATE.

Table 9-17: Noise Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Ash stacking activities as well as the operation of the conveyor will result in increased sound pressure levels.	1	2	3	5	**Definitely**	2.0
	VERY LOW	*Study Area*	Medium Term	*Will Happen*		

Cumulative Impact

The increased noise levels that will be generated by the operation of the stacker and conveyer is not expected to be heard by receptors for distances further than 600m from the continuous ADF. Given that the nearest residential receptors are located approximately 700 m north-west and 1.5 km south-east of the proposed continuous ADF footprint, noise impacts are expected to be of low consequence and is not anticipated to contribute significantly to existing noise generating activities.

9.5.4 Aquatic Habitat

a) Description

Direct Impact

Contaminated run-off from the Continuous ADF and supporting infrastructure entering tributaries which are associated with the development area (e.g. Leeufontein Spruit), may result in an increased concentration of Total Dissolved Solids in these watercourses. Changes to the water quality of surface water resources in particular with regards to pH, concentration of Total Dissolved Solids and fluctuations of the water temperature may result in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Sensitive aquatic species can often not tolerate significant changes in their habitat (e.g. fluctuations of the water quality). This may in turn lead to the modification of the species composition where sensitive species are lost and organisms tolerant to changes dominate the community structure.

Cumulative Impact

Modification to the water quality of tributaries draining into the Wilge River will impact the quality of water downstream. Existing land uses within the Wilge River sub-catchment including mining and agricultural activities contribute to the modification of water quality through the release of run-off and discharge. Therefore any modification to the water quality of tributaries draining into the Wilge River resulting from the proposed KPS Continuous ADF Project will contribute the deterioration of water quality within the Wilge River sub-catchment.

b) Impact Assessment

Direct Impact

The combined weighted project impact on aquatic habitat (**prior to mitigation**) as a result of the operational activities associated with the Continuous ADF is *very likely* to happen and is anticipated to be of a HIGH significance. Modification to the water quality will largely impact on the biotic integrity of the tributaries associated with the development area and is therefore anticipated that the impact will transpire on a *local* spatial scale. The impact is expected to act over a medium term. The impact risk class is thus MODERATE.

Table 9-18: Aquatic Biota Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Degradation of biotic integrity due to modification of water quality.	4	3	3	4	**Probable**	2.6
	HIGH	*Local*	Medium Term	*Very Likely*		

Post-Mitigation Impact

The combined weighted project impact on aquatic habitat (**post mitigation**) as a result of the operational activities associated with the Continuous ADF is *very likely* to happen and is anticipated to be of a MODERATE significance. Modification to the water quality will largely impact on the biotic integrity of the tributaries associated with the development area and is therefore anticipated that the impact will transpire on a *local* spatial scale. The impact is expected to act over a medium term. The impact risk class is thus MODERATE.

Table 9-19: Aquatic Biota Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Degradation of biotic integrity due to modification of water quality.	3	3	3	4	**Probable**	2.4
	MODERATE	*Local*	Medium Term	*Very Likely*		

Cumulative Impact

The combined weighted cumulative impact of the operational activities associated with the Continuous ADF on aquatic habitat (**prior to mitigation**) *could happen*, and will be of HIGH significance. However when taking into account the *regional nature* as well as the medium-term duration of the impact likely, the impact risk class is however considered as MODERATE.

Table 9-20: Aquatic Biota Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Modification of water quality within the Wilge River sub-catchment.	4	4	3	3	**Possible**	2.2
	HIGH	*Regional*	Medium Term	*Could Happen*		

Post-Mitigation Cumulative Impact

The combined weighted cumulative impact of the operational activities associated with the Continuous ADF on aquatic habitat (**post mitigation**) *could happen*, and will be of MODERATE significance. However when taking into account the *regional nature* as well as the medium-term duration of the impact likely, the impact risk class is however considered as MODERATE.

Table 9-21: Aquatic Biota Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Modification of water quality within the Wilge River sub-catchment.	3	4	3	3	**Possible**	2.0
	MODERATE	*Regional*	Medium Term	*Could Happen*		

9.5.5 Impacts on groundwater resources

a) Description

Although the Continuous ADF will be lined, run-off from the facility during high rainfall events may result in the ponding of contaminated water. ~~This may in turn result in the infiltration of contaminated water to shallow groundwater resources.~~ Although leachate collection system will be installed, in the event of blockages in the system, the blockages will prevent the optimal functioning of the system to collect leachate. With regards to the operation of the access road, the surface area covered by the pavement of the road will become impermeable reducing the infiltration of run-off and thereby the recharging of shallow underlying groundwater resources.

b) Impact Assessment

Direct Impact

The combined weighted project impact on groundwater quality (prior to mitigation) as a result of the operational activities associated with the Continuous ADF *could happen* and will be of MEDIUM significance. The impact on groundwater quality will however not exceed beyond the *Study Area* and will occur over a medium-term. The impact risk class is thus LOW.

Table 9-22: Groundwater Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Impact on groundwater quality.	3	2	4	3	**Possible**	1.8
	MODERATE	*Study Area*	Long Term	*Could Happen*		

Post-Mitigation Impact

The combined weighted project impact on groundwater quality (prior to mitigation) as a result of the operational activities associated with the Continuous ADF *could happen* and will be of LOW significance. The impact on groundwater quality will however not exceed beyond the *Study Area* and will occur over a medium-term. The impact risk class is thus LOW

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Table 9-23: Groundwater Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Impact on groundwater quality.	2	2	4	3	**Possible**	1.6
	LOW	*Study Area*	Long Term	*Could Happen*		

Cumulative Impacts

Based on the low risk class of the potential groundwater impact, it is improbable that the operation of Continuous ADF and associates activities would contribute to the existing sources of groundwater contamination in the surrounding area.

9.5.6 Impacts on Heritage Resources

a) Description

Paleontological Resources

The development area is underlain by potential fossiliferous rock units. The footprint of the proposed Continuous ADF and associated infrastructure is underlain by the Vryheid Formation. This geological unit (i.e. Vryheid Formation) is associated with abundant plant fossils of *Glossopteris.* It is not anticipated that the activities to be undertaken during the Operational Phase of the proposed project will result in the exposure or damage of buried fossils.

Disturbance to graves

Although stone formation indicative of graves, these graves may be concealed by dense vegetation. As the activities associated with the Operational Phase of the proposed project is **unlikely to entail excavations, disturbances to both marked and unmarked graves are not anticipated**.

9.5.7 Impacts on Terrestrial Ecology

a) Description

During the concurrent rehabilitation of the Continuous ADF will essentially entail placing of topsoil on the ADF followed by hydro-seeding (i.e. Capping System). This will in turn result in the re-vegetation of the Continuous ADF. The period following the seeding of the Continuous ADF, but preceding the re-establishment of vegetation may create favourable conditions for the establishment and colonisation of exotic and / or invader species. The establishment of

these species may replace indigenous plants leading to a reduction in fauna species diversity and abundance.

b) Impact Assessment

Direct Impact

The combined weighted project impact on terrestrial ecology (**prior to mitigation**) as a result of the re-vegetation of the Continuous ADF *could happen* and will be of MEDIUM significance. The establishment of exotic and / or invader species will be specific to the *Study Area* and will occur over a medium-term. The reduction in habitat available for fauna as a result of the encroachment of exotic and / or invader species is however considered to be a long-term impact. The impact risk class is thus LOW.

Table 9-24: Terrestrial Ecology Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Establishment of exotic and / or invader species.	3	2	3	3	**Possible**	1.6
	MODERATE	*Study Area*	Medium Term	*Could Happen*		
Exotic and / or replacing indigenous vegetation will reduce the habitat available for fauna.	3	2	4	3	**Possible**	1.8
	MODERATE	*Study Area*	Long Term	*Could Happen*		

Post-Mitigation Impact

The combined weighted project impact on terrestrial ecology (**post mitigation**) as a result of the re-vegetation of the Continuous ADF *could happen* and will be of LOW significance. The establishment of exotic and / or invader species will be specific to the *Study Area* and will occur over a medium-term. The reduction in habitat available for fauna as a result of the encroachment of exotic and / or invader species is however considered to be a long-term impact. The impact risk class is thus LOW.

Table 9-25: Terrestrial Ecology Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Establishment of exotic and / or invader species.	2	2	3	3	**Possible**	1.4
	LOW	*Study Area*	Medium Term	*Could Happen*		
Exotic and / or replacing indigenous vegetation will reduce the habitat available for fauna.	2	2	4	3	**Possible**	1.6

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
	LOW	*Study Area*	Long Term	*Could Happen*		

Cumulative Impact

The anticipated impacts on the ecology of the development footprint will not extend beyond the boundaries of the KPS. Taking the aforementioned into account as well as the existing land uses surrounding the KPS, the anticipated ecological impacts is unlikely to contribute cumulatively to similar existing impacts associated within the areas immediately surrounding the power station.

9.5.8 Soil and Land Capability Impacts

a) Description of impact

Although the intended capping of the proposed Continuous ADF will entail shaping and re-vegetation, the disturbance to the soil profile during the Construction Phase will permanently alter the soils and capability of the land to support land uses other than the Continuous ADF. All exposed areas will be prone to erosion as well as compaction. Soil erosion is also likely to occur along unpaved roads, at soil stockpile areas, and exposed soils placed along the face of the ash body during capping and consecutive rehabilitation activities.

b) Impact Assessment

Direct Impact

The combined weighted project impact to the soil and land capability (**prior to mitigation**) will **definitely** be of a MODERATE negative significance affecting the *development site*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus LOW**.**

Table 9-26: Soil and Land Use Capability Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Exposed surfaces will be eroded and compacted.	3	2	3	3	**Possible**	1.6
	MODERATE	*Study Area*	Medium Term	*Could Happen*		

Post-Mitigation Impact

The combined weighted project impact to the soil and land capability (**post mitigation**) will **definitely** be of a LOW negative significance affecting the *development site*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus LOW**.**

Table 9-27: Soil and Land Use Capability Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Exposed surfaces will be eroded and compacted.	2	2	3	3	**Possible**	1.4
	LOW	*Study Area*	Medium Term	*Could Happen*		

Cumulative Impacts

The implementation of the proposed mitigation measures will facilitate the prevention of soil erosion and compaction. The anticipated impacts on soil and land use capability falls within the LOW impact risk class. Taking the aforementioned into account, it is unlikely that impacts on soil and land use capability will contribute towards existing similar impacts in the areas surrounding the KPS.

9.5.9 Visual Impact

a) Description of impact

The visual landscape of the development area and surrounding areas is dominated by the existing KPS, grassland and / or cultivated land. Seasonal variations of the landscape colour between brown and green will amplify the visual prominence of the proposed Continuous ADF. Therefore, although the clean and angular lines as well as the light grey colour of the proposed Continuous ADF will create strong contrast with the flowing lines from the undulating topography, it is not unusual when set within the attributes of the receiving environment which is mixed industrial – pastoral. The proposed Continuous ADF will be visible for a distance of up to 15 km. The visibility of the Continuous ADF will become less visible from distances further than 15 km from the facility due to the diminishing effect of distance and atmospheric conditions (haze) on visibility of the Continuous ADF.

b) Impact Assessment

Direct Impact

The combined weighted project visual impact (**prior to mitigation**) will **definitely** be of a HIGH negative significance affecting the *regional area*. The impact will act in the long term and *will happen*. The impact risk class is thus HIGH.

Table 9-28: Visual Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
The Continuous ADF will result in a change to the landscape as well as the addition of a visual intrusion.	4	4	4	5	**Definite**	4
	HIGH	*Regional*	Long Term	*Will Happen*		

Post-Mitigation Impact

The combined weighted project visual impact (**post mitigation**) will **definitely** be of a MODERATE negative significance affecting the *regional area*. The impact will act in the long term and *will happen*. The impact risk class is thus HIGH.

Table 9-29: Visual Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
The Continuous ADF will result in a change to the landscape as well as the addition of a visual intrusion.	3	4	4	5	**Definite**	3.7
	MODERATE	*Regional*	Long Term	*Will Happen*		

Cumulative Impact

The visual impact associated with the proposed continuous ADF and associated infrastructure is likely to contribute to the visual intrusion of existing structures within the surrounding area. However taking into account the existing visual impact associated with the KPS and surrounding land uses it is not anticipated that the proposed continuous ADF and associated infrastructure is likely to contribute significantly cumulatively to the existing visual impact of the immediate area.

9.5.10 Impacts on Wetlands

a) Description

Direct Impact

A number of impacts on delineated wetlands within or adjacent to the development area will transpire throughout the operational life of the proposed Continuous ADF. Anticipated impacts are most related to water quality deterioration as well as alterations to the flow regime of the wetlands. Contaminated surface water runoff from the Continuous ADF or water seepage from both the PCD and Continuous ADF is likely to result in the deterioration

of water in the receiving watercourses. Furthermore, the overflow of the PCDs will also impact on water quality within receiving watercourses.

Additional impacts on the wetlands during the Operational Phase also include an increase of the amount of ash dust that is ~~deposited within~~ blown to the wetlands. The expected increase in the amount of ash dust being ~~deposited~~ blown to ~~within~~ the wetlands will be largely attributable to the increase in the size of the ash disposal facility and its proposed extension closer to a number of wetland systems.

The lowering of the Farm Dam as well as the resultant reduced attenuation capacity of the dam, will likely alter flow characteristics within the downstream the Channelled Valley Bottom Wetland (Hydro-geomorphic Unit 2). The proposed stream diversion will alter the flow characteristics of the remaining wetland on site. While flow velocities could increase thereby increasing erosion risk in the remaining wetland area and changing flow retention and distribution patterns within the wetland, flow concentration is likely to occur within the stream diversion.

Cumulative Impacts

The delineated Weakly Channelled Valley Bottom Wetland (Hydro-geomorphic Unit 1) as well as the Channelled Valley Bottom Wetland drains into the Leeufontein Spruit, which in turn drains into the Wilge River. Therefore any water quality impacts to the Leeufontein Spruit are likely to also affect the Wilge River.

b) Impact Assessment

Direct Impact Assessment

Based on the ratings assigned to each of the impact criteria ~~for~~ the anticipated consequences to the wetlands is classed as **probable** LOW Risk Impacts (**prior to mitigation**) in the case of the decreased flows and ash dust deposition. Anticipated consequences to the wetlands resulting from the altered flow regime or water quality deterioration is classed as **probable** MODERATE Risk Impacts. The impacts associated with the lowering of the Farm Dam wall, alteration of flow characteristics as well as seepage and runoff from the Continuous ADF are *very likely to occur*. Refer to **Table 9.18** for the ratings assigned to each of the impact criteria for the identified wetland impacts.

Table 9-30: Wetland Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Water quality deterioration due to seepage and runoff from the Continuous ADF.	4	3	4	4	**Probable**	2.9
	HIGH	*Local*	Long Term	*Very Likely*		
Decreased flows within adjacent wetlands.	3	2	3	3	**Probable**	1.6
	MODERATE	*Study Area*	Medium Term	*Could Happen*		
Altered flow characteristics within HGM Unit 1 as a result of the stream diversion.	4	2	4	4	**Probable**	2.7
	HIGH	*Study Area*	Long Term	*Very Likely*		
Ash dust deposition in wetlands.	3	2	3	3	**Probable**	1.6
	MODERATE	*Study Area*	Medium Term	*Could Happen*		
Altered flow characteristics within HGM Unit 2 as a result of lowering the Farm Dam wall.	4	3	4	4	**Probable**	3.0
	HIGH	*Local*	Long Term	*Very Likely*		

Post-Mitigation Impact Assessment

Based on the ratings assigned to each of the impact criteria ~~for~~ the anticipated consequences to the wetlands is classed as **probable** LOW Risk Impacts (**post mitigation**) in the case of the decreased flows and ash dust deposition. Anticipated consequences to the wetlands resulting from the altered flow regime or water quality deterioration is classed as **probable** MODERATE Risk Impacts. The impacts associated with the lowering of the Farm Dam wall, alteration of flow characteristics as well as seepage and runoff from the Continuous ADF are *very likely to occur*. Refer to **Table 9.31** for the ratings assigned to each of the impact criteria for the identified wetland impacts.

Table 9-31: Wetland Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Water quality deterioration due to seepage and runoff from the Continuous ADF.	3	3	4	4	**Probable**	2.6
	MODERATE	*Local*	Long Term	*Very Likely*		
Decreased flows	2	2	3	3	**Probable**	1.4

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
within adjacent wetlands.	LOW	*Study Area*	Medium Term	*Could Happen*		
Altered flow characteristics within HGM Unit 1 as a result of the stream diversion.	3	2	4	4	**Probable**	2.4
	MODERATE	*Study Area*	Long Term	*Very Likely*		
Ash dust deposition in wetlands.	2	2	3	3	**Probable**	1.4
	LOW	*Study Area*	Medium Term	*Could Happen*		
Altered flow characteristics within HGM Unit 2 as a result of lowering the Farm Dam wall.	3	3	4	4	**Probable**	2.7
	MODERATE	*Local*	Long Term	*Very Likely*		

Cumulative Impact Assessment

Based on the ratings assigned to each of the impact criteria, the anticipated **probable** cumulative impact (**prior to mitigation**) is classed as a MODERATE Risk Impact. The anticipated cumulative impact on the water quality of the Wilge River *could happen* and will take place over a long-term.

Table 9-32: Cumulative Wetland Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Water of a low quality draining into the Wilge River from the Leeufontein Spruit will adversely impact on the water quality of the former.	4	4	4	3	**Probable**	2.4
	HIGH	*Regional*	Long Term	*Could Happen*		

Cumulative Impact Assessment – Post-Mitigation

Based on the ratings assigned to each of the impact criteria, the anticipated **probable** cumulative impact (**post mitigation**) is classed as a MODERATE Risk Impact. The anticipated cumulative impact on the water quality of the Wilge River *could happen* and will take place over a long-term.

Table 9-33: Cumulative Wetland Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Water of a low quality draining into the Wilge River from the Leeufontein Spruit will adversely impact on the water quality of the former.	3	4	4	3	**Probable**	2.2
	MODERATE	*Regional*	Long Term	*Could Happen*		

9.6 Environment Impact Assessment – Construction Phase

9.6.1 Impacts on wetlands

a) Description of Impact

Loss of Wetland Habitat

The earthworks and construction activities associated with the Continuous ADF will result in the loss of wetland habitat which falls within the footprint of the proposed facility. As the diversion of the stream extends through a hillslope seepage wetland, it is foreseen that the construction of the stream diversion channel will result in the loss of the wetland area. An estimated 28 hectares of the surface area valley bottom wetland will be lost to the proposed Continuous ADF, while only 4 hectares of hillslope seepage wetland will be lost to the stream diversion.

The loss of wetlands will also lead to the loss of wetland functioning and eco-system functions associated with the respective wetlands. This will in turn result in the following:

- Increased sediment transport into wetlands;
- Altered flow characteristics within wetlands;
- Water quality deterioration within wetlands due to leaks and spills; and
- Water quality deterioration due to mobilisation of contaminated sediments.

Construction activities are likely to increase the disturbance footprint beyond the boundaries of the actual project activities through the placement of temporary stockpiles, site establishment, laydown areas and the movement of construction vehicles. The risk of erosion in these areas will be increased due to the loss of vegetation cover. Ruts and vehicle tracks could also result in the formation of preferential flow paths that concentrate flow and exacerbate the erosion risk. Bare soil areas resulting from vegetation clearing and soil stripping will provide extensive sediment sources delivering increased sediment loads to

downslope wetlands. Transported sediments are likely to deposit in the receiving wetlands, leading to changes in vegetation and habitat.

Altered flow characteristics within wetlands

Site clearing and vegetation removal may result in increased surface runoff volumes and velocity thereby increasing erosion risk within downslope wetlands. Soil compaction due to movement of machinery during construction will further increase runoff, while vehicle ruts and tracks resulting from construction activity could provide preferential flow paths that lead to flow concentration, again increasing erosion risk.

Water Quality Deterioration

Any spills and leakage of hazardous substances, or any other potentially polluting substances, which are used during the Construction Activities could enter adjacent wetlands by means of surface run-off. Any hazardous substance which enters the adjacent wetland will result in the deterioration of the water quality within the wetlands. Potentially polluting substances including cement and hydrocarbons are likely to be regularly used and temporarily stored on the construction site. The incorrect handling and disposal of hazardous substances and waste, could also result in water quality deterioration.

The Construction activities required for the lowering of the farm dam wall in particular the removal of the old dam wall and the construction of the lower dam wall, could lead to the mobilisation of pollutants that have potentially been trapped over time within the dam sediments. Given the proximity of the Farm Dam to both the adjacent mining area and the Continuous ADF, as well as its intermittent connection to the old mine workings depending on water level, it is possible that contaminants have entered the dam overtime and become trapped in the dam sediments. The mobilisation of these sediments could lead to water quality deterioration within the downstream wetland system through increased turbidity and suspended solids, as well as possibly mobilisation of pollutants.

b) Impact Assessment

Direct Impact

The significance of the anticipated impacts on wetlands during the Construction Phase varies from HIGH to LOW **prior to the implementation of mitigation measures**. The *definite* loss and disturbance of wetland habitat is anticipated expected to be of HIGH significance in comparison to the water quality deterioration which is anticipated to be of LOW significance. Despite the loss of wetland habitat which will be a Permanent impact, the remaining impacts will be Short Term occurring only during the Construction Phase. Refer to **Table 9.34** for the ratings assigned to each of the impact criteria for the identified wetland impacts.

Table 9-34: Construction Phase Wetland Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Loss and disturbance of wetland habitat.	4	2	5	5	**Definite**	3.7
	HIGH	*Study Area*	Permanent	*Definite*		
Altered flow characteristics within wetlands.	3	*3*	2	4	**Probable**	2.2
	MODERATE	*Local*	Short Term	*Very Likely*		
Water quality deterioration.	3	*3*	2	3	**Probable**	1.6
	MODERATE	*Local*	Short Term	*Could Happen*		

Post-Mitigation Impact

The significance of the anticipated impacts on wetlands during the Construction Phase varies from HIGH to LOW **subsequent to the implementation of mitigation measures**. The *definite* loss and disturbance of wetland habitat is anticipated expected to be of HIGH significance in comparison to the water quality deterioration and altered flow characteristics within wetlands which is anticipated to be of LOW significance. Despite the loss of wetland habitat which will be a Permanent impact, the remaining impacts will be Short Term occurring only during the Construction Phase. Refer to **Table 9.35** for the ratings assigned to each of the impact criteria for the identified wetland impacts.

Table 9-35: Construction Phase Wetland Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Loss and disturbance of wetland habitat.	3	2	5	5	**Definite**	3.3
	MODERATE	*Study Area*	Permanent	*Definite*		
Altered flow characteristics within wetlands.	2	*3*	2	4	**Probable**	1.8
	LOW	*Local*	Short Term	*Very Likely*		
Water quality deterioration.	2	*3*	2	3	**Probable**	1.4
	LOW	*Local*	Short Term	*Could Happen*		

Cumulative Impacts

The impacts on the aquatic environment and wetlands during the construction phase may contribute cumulative to the existing wetland impacts associated with the surrounding land users. All reasonable measures will however be implemented to ensure that the anticipated wetland impacts are confined to the development footprint.

9.6.2 Visual Impact

a) Description

Direct Impact

The earthworks and activities that will be undertaken during the Construction Phase will be visible from a distance less than 7.5 km (i.e. less than half the zone of potential influence) from the development area. Although the construction activities are expected to contrast marginally with the surrounding landscape, a moderate change in the key views defining the landscape characteristics is expected.

Cumulative Impact

Taking into account the existing visual disturbance of the existing Continuous ADF and E-dump along with the surrounding land uses, the construction activities will add to the cumulative negative effect on the visual quality of the landscape.

b) Impact Assessment

Direct Impact Assessment

The combined weighted project impact to the existing visual environment (**prior to mitigation**) will definitely be of a MODERATE negative significance affecting the *local area*. The visual impacts associated with the earthworks and required impacts will only occur for the duration of the Construction Phase and will therefore be short term. The impact risk class is thus MODERATE (refer to **Table 9-36**)**.**

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
The earthworks and construction of the Continuous ADF and supporting infrastructure will cause a visual disturbance.	3	3	2	5	**Definite**	2.7
	MODERATE	*Local*	Short Term	*Definite*		

Post-Mitigation Impact Assessment

The combined weighted project impact to the existing visual environment (**post mitigation**) will definitely be of a MODERATE negative significance affecting the *local area*. The visual impacts associated with the earthworks and required impacts will only occur for the duration

of the Construction Phase and will therefore be short term. The impact risk class is thus MODERATE (refer to **Table 9-36**).

Table 9-36: Construction Phase Visual Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
The earthworks and construction of the Continuous ADF and supporting infrastructure will cause a visual disturbance.	2	3	2	5	**Definite**	2.3
	LOW	*Local*	Short Term	*Definite*		

Cumulative Impact Assessment

Taking into account the existing visual disturbances to the landscape including the existing ADF, KPS and surrounding mining activities the significance of the cumulative visual impact is regarded as MODERATE. The visual impacts associated with the earthworks and required impacts will only occur for the duration of the Construction Phase and will therefore be short term affecting the *local area*. The impact risk class is thus MODERATE (refer to **Table 9-37**).

Table 9-37: Construction Phase Visual Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Cumulative impact of existing visual disturbance in addition to those that will be caused by construction activities.	3	3	2	5	**Definite**	2.7
	MODERATE	*Local*	Short Term	*Definite*		

Cumulative Impact Assessment – Post-Mitigation

Taking into account the existing visual disturbances to the landscape including the existing ADF, KPS and surrounding mining activities the significance of the cumulative visual impact is regarded as MODERATE. The visual impacts associated with the earthworks and required impacts will only occur for the duration of the Construction Phase and will therefore be short term affecting the *local area*. The impact risk class is thus MODERATE (refer to **Table 9-38**).

Table 9-38: Construction Phase Visual Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Cumulative impact of existing visual disturbance in addition to those that will be caused by construction activities.	2	3	2	5	**Definite**	2.3
	LOW	*Local*	Short Term	*Definite*		

9.6.3 Traffic Impact

a) Description

Direct Impact

It estimated that 38 trips per hour will be undertaken by construction vehicles transporting material to and from the development area. Construction vehicles will travel on existing roads thereby increasing traffic volume in the area for the duration of the Construction Phase.

Cumulative Impact

The accumulative additional axle loading on the road resulting from heavy construction vehicles travelling on the roads will increase the frequency of pavement rehabilitation. This will also adversely impact on the pavement conditions of the regional road network.

b) Impact Assessment

Direct Impact Assessment

Construction material may be sourced from areas outside of the Mpumalanga Province and as such will have a *regional* impact. Excavated material may also have to be stored in areas outside the development footprint. Construction vehicles travelling to and from the development area will only occur for the duration of the Construction Phase and is therefore a short tem impact. The significance of the anticipated traffic impact is expected to be MODERATE **prior to the implementation of mitigation measures**.

Table 9-39: Construction Phase Traffic Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Increased traffic volume due to construction vehicles travelling to and from the development area.	3	4	2	4	**Probable**	2.4
	MODERATE	*Regional*	Short Term	*Very Likely*		

Post-Mitigation Impact Assessment

Construction material may be sourced from areas outside of the Mpumalanga Province and as such will have a *regional* impact. Excavated material may also have to be stored in areas outside the development footprint. Construction vehicles travelling to and from the development area will only occur for the duration of the Construction Phase and is therefore

a short tem impact. The significance of the anticipated traffic impact is expected to be MODERATE **subsequent to the implementation of mitigation measures**.

Table 9-40: Construction Phase Traffic Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Increased traffic volume due to construction vehicles travelling to and from the development area.	2	4	2	4	**Probable**	2.1
	LOW	*Regional*	Short Term	*Very Likely*		

Cumulative Impact Assessment

The cumulative traffic impact will be confined to the Construction Phase and is therefore short term. The impact of the increased traffic volume and associated pressure on the structural integrity of the road pavement is *very likely* to have a *regional* impact. The significance of the anticipated cumulative traffic impact is expected to be MODERATE **prior to the implementation of mitigation measures**.

Table 9-41: Construction Phase Traffic Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Cumulative impact of increased traffic volume will place additional pressure on the structural integrity of the regional road network.	3	4	3	4	**Probable**	2.4
	MODERATE	*Regional*	Medium Term	*Very Likely*		

Cumulative Impact Assessment – Post-Mitigation

The cumulative traffic impact will be confined to the Construction Phase and is therefore short term. The impact of the increased traffic volume and associated pressure on the structural integrity of the road pavement is *very likely* to have a *regional* impact. The significance of the anticipated cumulative traffic impact is expected to be LOW **subsequent to the implementation of mitigation measures.**

Table 9-42: Construction Phase Traffic Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Cumulative impact of increased traffic volume will place additional pressure on the structural integrity of the regional road network.	2	4	3	4	**Probable**	2.4
	LOW	*Regional*	Medium Term	*Very Likely*		

9.6.4 Terrestrial Ecology

a) Description

Habitat loss and degradation associated with vegetation clearing

All vegetation within the footprint of the proposed Continuous ADF and associated infrastructure. Vegetation clearing in areas of cultivated land is unlikely to result in significant adverse impacts as these areas are already highly degraded. However, vegetation clearing in natural / semi-natural areas comprising of *Themeda triandra* grassland, the moist grass and sedge vegetation community and *Hyparrhenia hirta* grasslands, will result in the loss and degradation of important natural habitat. Vegetation clearing will commence during the construction phase and will progress as the proposed ADF continues.

Exotic invasive species were identified throughout much of the development area. Of particular concern is the presence of *Acacia mearnsii, Campuloclinium macrocephalum, Xanthium strumarium* and *Cirsium vulgare* invasive species. These species are highly invasive and will spread rapidly in response to disturbances of natural vegetation. The clearing of natural vegetation may create conditions conducive to the establishment and colonisation of exotic and /or invader plants. Typically invasive species if left uncontrolled suppresses or replaces indigenous plants leading to a concomitant reduction in fauna species diversity and abundance.

Killing or injury of fauna

A number of fauna species were recorded within the footprint of the KPS during a survey conducted in 2013. It is therefore likely that many species will be disturbed during the Construction Phase. Vegetation clearing and earthworks carried out during the Construction Phase Particularly may result in the injury of or trapping of species. This impact will be particularly acute in the moist grass and sedge vegetation community, where various birds nest and where aquatic species, such as amphibians reside.

Loss of species of conservation importance

During vegetation clearing and earth works, flora and fauna of conservation importance such as Red Data and protected species may be killed, injured or damaged. Moreover, habitat loss and degradation may result in sensitive species being disturbed.

Cumulative Impact

The impact to terrestrial ecology described above continues outside of the study area as mining and agricultural activities are systematically impacting on the vegetation and

consequently habitat of the region. The grassland biome prevalent in the area is widespread across the South African Highveld, but is poorly conserved, and is through systematic transformation is becoming more threatened.

b) Impact Assessment

Direct Impact Assessment

All **probable** impacts on the terrestrial ecology within the development area are expected to be of MODERATE significance **prior to mitigation**. The loss of species of conservation importance will be of a permanent nature, while habitat loss is considered as a medium-term impact. Refer to **Table 9.43** for the ratings assigned to each of the impact criteria for identified impacts on terrestrial ecology.

Table 9-43: Construction Phase Terrestrial Ecology Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Habitat loss and degradation.	3	2	3	4	**Probable**	2.2
	MODERATE	*Study Area*	Medium Term	*Very Likely*		
Killing or injury of fauna.	4	2	4	3	**Probable**	2.0
	HIGH	*Study Area*	Long Term	*Could Happen*		
Loss of species of conservation importance.	4	2	5	4	**Probable**	3.0
	HIGH	*Study Area*	Permanent	*Very Likely*		

Post-Mitigation Impact Assessment

All **probable** impacts on the terrestrial ecology within the development area are expected to be of LOW significance, except for the anticipated loss of species of conservation importance which have been classed as MODERATE significance impact (**post mitigation**). The loss of species of conservation importance will be of a permanent nature, while habitat loss is considered as a medium-term impact. Refer to **Table 9.44** for the ratings assigned to each of the impact criteria for identified impacts on terrestrial ecology.

Table 9-44: Construction Phase Terrestrial Ecology Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Habitat loss and degradation.	2	2	3	4	**Probable**	1.8
	LOW	*Study Area*	Medium Term	*Very Likely*		
Killing or injury of fauna.	3	2	4	3	**Probable**	1.0
	MODERATE	*Study Area*	Long Term	*Could Happen*		
Loss of species of	3	2	5	4	**Probable**	2.6

conservation importance.	MODERATE	*Study Area*	Permanent	*Very Likely*		

Cumulative Impact Assessment

The cumulative (**prior to mitigation**) impact of the project on the terrestrial ecology within context of its surroundings is considered **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and is *very likely* to happen. The impact risk class is thus MODERATE.

Table 9-45: Construction Phase Cumulative Terrestrial Ecology Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Cumulative impact of construction activities on the terrestrial ecology.	3	4	4	4	**Probable**	3.0
	MODERATE	*Regional*	Long Term	*Very Likely*		

Cumulative Impact Assessment – Post-Mitigation

The cumulative (**post mitigation**) impact of the project on the terrestrial ecology within context of its surroundings is considered **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and is *very likely* to happen. The impact risk class is thus MODERATE.

Table 9-46: Construction Phase Cumulative Terrestrial Ecology Impact Assessment - Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Cumulative impact of construction activities on the terrestrial ecology.	2	4	4	4	**Probable**	2.6
	LOW	*Regional*	Long Term	*Very Likely*		

9.6.5 Surface Water Impacts

a) Description

Direct Impact

Site preparation for the proposed Continuous ADF and supporting infrastructure will require vegetation clearing resulting in extensive patches of bare soil surfaces. During high rainfall events surface water run-off across the bare soil surfaces may result in erosion and sediment laden run-off entering nearby watercourses. Hydrocarbon spillages or leakages from construction vehicles moving onsite or storage facilities enter nearby watercourses. Without mitigation measures exposed soils will be mobilised during rainfall events which will result in increased sedimentation and turbidity in surface water.

The proposed stream diversion will result in disturbance to the stream bank increasing the vulnerability of river morphology to erosion and increased sedimentation. It is therefore anticipated that the construction of the stream diversion will result in increased soil erosion and sediment accumulation. Taking the aforementioned into account foreseen surface water impacts will mostly relate to a decrease in water quality due to the ingress of contaminants and sediment.

Cumulative Impact

Historical agricultural and mining practices over the past few decades have had detrimental effects on the surface water environment in the area. This is mainly attributed to fertilizer application, erosion, siltation and point-source discharges by Wastewater Treatment Works into the surrounding watercourses. The presence of several industrial and mining activities within one catchment may have severe effects on the surface water environment. The receiving water resource within the area is the Wilge River, which will soon experience significant water quality concerns. The Wilge River, a tributary of the Olifants River, flows 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 upstream of the Loskop Dam. Given the fact that the Olifants River feeds into several water supply storage facilities utilised by local settlements, the impact of deteriorating water quality, which makes the water less fit for use, has significant environmental as well as social and economic implications.

b) Impact Assessment

Direct Impact

All **possible** surface water impacts during the Construction Phase are expected to be of MODERATE significance (**prior to mitigation**). The Construction Phase surface water impacts will cease after the completion of construction and is therefore short term. The surface water impacts will however not extend beyond the watercourse associated with the development area is therefore regarded as *local*. Refer to **Table 9.47** for the ratings assigned to each of the impact criteria for identified surface water impacts.

Table 9-47: Construction Phase Surface Water Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Deterioration of water quality in the resource.	3	3	2	4	**Possible**	2.2
	MODERATE	*Local*	Short Term	*Very likely*		

Post-Mitigation Impact

All **possible** surface water impacts during the Construction Phase are expected to be of MODERATE significance (**post mitigation**). The Construction Phase surface water impacts

will cease after the completion of construction and is therefore short term. The surface water impacts will however not extend beyond the watercourse associated with the development area is therefore regarded as *local*. Refer to **Table 9.48** for the ratings assigned to each of the impact criteria for identified surface water impacts.

Table 9-48: Construction Phase Surface Water Impact Assessment – Post Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Deterioration of water quality in the resource.	2	3	2	4	**Possible**	2.2
	LOW	*Local*	Short Term	*Very likely*		

Cumulative Impact

As was explained the Wilge River which is associated with the proposed KPS Continuous ADF, is a tributary of the Olifants River. The cumulative impact is regarded as a MODERATE significance impact (**prior to mitigation**), largely due to the significant environmental as well as social and economic implications associated with the poor water quality. It is *very likely* that the impact will transpire in which case it will have *regional* implications.

Table 9-49: Construction Phase Cumulative Surface Water Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Deterioration of water quality in the resource.	4	4	3	4	**Possible**	3.0
	HIGH	*Regional*	Medium Term	*Very likely*		

Cumulative Impact – Post-Mitigation

As was explained the Wilge River which is associated with the proposed KPS Continuous ADF, is a tributary of the Olifants River. The cumulative impact is regarded as a MODERATE significance impact (**post mitigation**), largely due to the significant environmental as well as social and economic implications associated with the poor water quality. It is *very likely* that the impact will transpire in which case it will have *regional* implications.

Table 9-50: Construction Phase Cumulative Surface Water Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Deterioration of water quality in the resource.	3	4	3	4	**Possible**	2.6
	MODERATE	*Regional*	Medium Term	*Very likely*		

9.6.6 Impacts on Heritage Resources

a) Description

Paleontological Resources

The development area is underlain by potential fossiliferous rock units. The footprint of the proposed Continuous ADF and associated infrastructure is underlain by the Vryheid Formation. This geological unit (i.e. Vryheid Formation) is associated with abundant plant fossils of Glossopteris. As the Construction Activities will entail earthworks and excavating these activities may result in the exposure or damage of buried fossils.

Disturbance to graves

Although stone formation indicative of graves may be concealed by dense vegetation. As the activities associated with the Construction Phase of the proposed project is likely to entail excavations, disturbances to both marked and unmarked graves may transpire.

b) Impact Assessment

Direct Impact

The irreparable damage or loss of heritage and paleontological resources will be a permanent impact and specific to the *study area*. The anticipated heritage resources *could happen* and will have a MODERATE significance **prior to mitigation**.

Table 9-51: Construction Phase Cumulative Heritage Resources Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Loss and damage of heritage and paleontological resources.	4	2	5	3	**Probable**	2.2
	HIGH	*Study Area*	Permanent	*Could Happen*		

Post-Mitigation Impact

The irreparable damage or loss of heritage and paleontological resources will be a permanent impact and specific to the *study area*. The anticipated heritage resources *could happen* and will have a MODERATE significance.

Table 9-52: Construction Phase Cumulative Heritage Resources Impact Assessment – Post Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Loss and damage of heritage and paleontological resources.	3	2	5	3	**Probable**	2.2
	MODERATE	*Study Area*	Permanent	*Could Happen*		

Cumulative Impact Assessment

The loss and damage of heritage and paleontological resources due to the Construction Phase activities of the proposed KPS Continuous ADF Project may impact on heritage resource "wealth" of the area.

9.6.7 Groundwater Impacts

a) Description

The findings of the groundwater study concluded that the existing ADF and E-Dump have limited impact on the surrounding groundwater quality. The initial regional groundwater conceptual model identified three aquifer zones namely weathered, fractured and deep fractured to fresh aquifer zones.

An additional study is however required to confirm and update the hydraulic parameters. Additionally survey monitoring boreholes will also be required to confirm the presence of shallow (perched) aquifer within the weathered zone, whereas the deep monitoring boreholes target the aquifer in the fracture zones of the host formation. Additional information specific to the aquifer zones is critical for understanding the possible contamination impacts on the different zones. Taking the aforementioned into account the excavation activities required for the installation of the Continuous ADF liner may breach shallow perched aquifers. In the event of such occurrence the shallow aquifer zones will be cased and sealed off in the deeper boreholes to minimise the risk of cross contamination.

In addition, significant spills of hazardous substances that will be used during the construction phase solvents and hydrocarbons introduces an environmental risk. Spills which may occur during the storage, handling, and use of such dangerous chemicals could infiltrate shallow aquifers leading to groundwater contamination.

b) Impact Assessment

Direct Impact

The contamination of groundwater resources (i.e. aquifers) will be confined to the Study Area. As additional information specific to the aquifer zones is still required to thrash out the possible contamination impacts on the different zones, this groundwater impact *could happen*. The contamination of groundwater resources will be a permanent impact and is regarded as a HIGH significance impact (prior to mitigation). The anticipated heritage resources *could happen* and will have a MODERATE significance **prior to mitigation**.

Table 9-53: Construction Phase Groundwater Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Contamination of groundwater resources.	4	2	5	3	**Possible**	3.0
	HIGH	*Study Area*	Permanent	*Could Happen*		

Post-Mitigation Impact Assessment

The contamination of groundwater resources (i.e. aquifers) will be confined to the Study Area. As additional information specific to the aquifer zones is still required to thrash out the possible contamination impacts on the different zones, this groundwater impact *could happen*. The contamination of groundwater resources will be a permanent impact and is regarded as a HIGH significance impact (prior to mitigation). The anticipated heritage resources *could happen* and will have a LOW significance (**post mitigation**).

Table 9-54: Construction Phase Groundwater Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Contamination of groundwater resources.	3	2	5	3	**Possible**	2.0
	MODERATE	*Study Area*	Permanent	*Could Happen*		

Cumulative Impact Assessment

Based on the low risk class (**post mitigation**) of the potential groundwater impact, it is improbable that the operation of Continuous ADF and associates activities would contribute to the existing sources of groundwater contamination in the surrounding area.

9.6.8 Soil and Land Capability

a) Description

The site preparation for the proposed Continuous ADF and associated infrastructure will entail the removal of all utilisable soil. Deeper excavation that are carried out during the Construction Phase will require the stockpiling of topsoil and soft overburden. The stockpiles will however result in the modification of the surface topography and will permanently change the land capability and land use. These changes in the landscape will therefore affect the hydrological flow patterns on surface and will potentially result in areas of "ponding".

Ponding of surface water and the un-managed increased in infiltration of surface water into the vadose zone will have significant negative implications for the utilisation potential and land capability. These are high negative significance impacts that are difficult to mitigate.

b) Impact Assessment

Direct Impact

The loss of soil resource and land capability as a result of construction activities will be of a permanent natured and confined to the *study area*. The impacts emanating from soil stockpiling is regarded as a HIGH significance impact as limited mitigation measures can be applied. The impact *will happen* and therefore the impact risk class is thus HIGH **prior to mitigation**.

Table 9-55: Construction Phase Soil and Land Capability Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Loss of soil and land capability.	4	2	5	5	**Possible**	3.7
	HIGH	*Study Area*	Permanent	*Will Happen*		

Post-Mitigation Impact

The loss of soil resource and land capability as a result of construction activities will be of a permanent natured and confined to the *study area*. The impacts emanating from soil stockpiling is regarded as a HIGH significance impact as limited mitigation measures can be applied. The impact *will happen* and therefore the impact risk class is thus HIGH (**post mitigation**).

Table 9-56: Construction Phase Soil and Land Capability Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Loss of soil and land capability.	3	2	5	5	**Possible**	3.3
	MODERATE	*Study Area*	Permanent	*Will Happen*		

Cumulative Impact

The implementation of the proposed mitigation measures will facilitate the prevention of soil erosion and compaction. The anticipated impacts on soil and land use capability falls within the HIGH impact risk class. Taking the aforementioned into account, it is likely that impacts on soil and land use capability will contribute towards existing similar impacts in the areas surrounding the KPS.

9.6.9 Air Quality

a) Description

Activities that will be undertaken during the Construction Phase including site clearing, topsoil removal, road grading, material loading and hauling, stockpiling, compaction has the potential to generate dust. It is anticipated that the extent of dust 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.

b) Impact Assessment

Direct Impact

The anticipated air quality impacts will be of MODERATE (**prior to mitigation**) significance and will be short term limited to the duration of Construction Phase. Although it is very likely that the air quality impacts will transpire the impact risk class is LOW.

Table 9-57: Construction Phase Air Quality Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Dust generation resulting from construction activities.	3	2	2	4	**Probable**	1.9
	MODERATE	*Study Area*	Short Term	*Very Likely*		

Post Mitigation Impact

The anticipated air quality impacts will be of MODERATE **(post mitigation**) significance and will be short term limited to the duration of Construction Phase. Although it is very likely that the air quality impacts will transpire the impact risk class is LOW.

Table 9-58: Construction Phase Air Quality Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Dust generation resulting from construction activities.	2	2	2	4	**Probable**	1.6
	LOW	*Study Area*	Short Term	*Very Likely*		

Cumulative Impact Assessment

The proposed Continuous ADF, current and expanded footprint, fall within the Highveld Priority Area (HPA). Therefore the particulate emissions from the facility are likely to contribute to the air quality of the HPA. The ash disposal facility is also located in the vicinity of the Emalahleni Hot Spot (HPA, 2011). The poor ambient air quality in the Emalahleni Hot Spot is the 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).

9.6.10 Noise Impacts

a) Description

Noise will be generated by the movement of construction vehicles and to a lesser extent by construction activities. Noise generated during the Construction Phase will be less noticeable over other background noise already experienced in the area, however during the night time construction noise can carry over vast distances.

b) Impact Assessment

Direct Impact Assessment

Anticipated elevated sound pressure levels resulting from construction activities will **probably** going to be of a LOW negative significance (**prior to mitigation**), affecting the *study area* in extent, and acting in the short term. The impact is very likely to occur. The impact risk class is **LOW.**

Table 9-59: Construction Phase Noise Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Elevated noised levels caused by construction activities.	2	2	2	5	**Probable**	2.0
	LOW	*Study Area*	Short Term	*Will Happen*		

Post-Mitigation Impact

Anticipated elevated sound pressure levels resulting from construction activities will **probably** going to be of a LOW negative significance (**post mitigation**), affecting the *study area* in extent, and acting in the short term. The impact is very likely to occur. The impact risk class is **LOW.**

Table 9-60: Construction Phase Noise Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Elevated noised levels caused by construction activities.	1	2	2	5	**Probable**	1.7
	VERY LOW	*Study Area*	Short Term	*Will Happen*		

Cumulative Impact

Given that the nearest residential receptors are located approximately 700 m north-west and 1.5 km south-east of the proposed continuous ADF footprint, noise impacts are expected to be of low consequence and is not anticipated to contribute significantly to existing noise generating activities.

9.6.11 Aquatic Habitat

a) Description

It is very likely that degradation of aquatic ecosystems due the Construction Phase will result in increased sedimentation of instream habitats. With the construction of the Continuous ADF and associated infrastructure, vegetation and soil removal may result in run-off into rivers and the sedimentation of instream habitats. The habitat availability and the quality thereof, are key contributing factor to the aquatic community structure. Clearance of existing vegetation will expose the upper layers of the soil horizon to soil erosion. Runoff after rain can give rise to erosion and sedimentation.

b) Impact Assessment

Direct Impact Assessment

Anticipated impacts on the aquatic habitat resulting from construction activities will **probably** be of a LOW negative significance, affecting the *local area*. It is also expected that the impact will continue over a medium-term. The impact risk class is LOW **prior to mitigation**.

Table 9-61: Construction Phase Aquatic Habitat Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Degradation of aquatic ecosystems due to increased sedimentation.	4	3	3	3	**Probable**	2.0
	HIGH	*Local*	Medium Term	*Could Happen*		

Post-Mitigation

Anticipated impacts on the aquatic habitat resulting from construction activities will **probably** be of a LOW negative significance, affecting the *local area*. It is also expected that the impact will continue over a medium-term. **Following the implementation of mitigation measures** the impact risk class is LOW.

Table 9-62: Construction Phase Aquatic Habitat Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Degradation of aquatic ecosystems due to increased sedimentation.	3	3	3	3	**Probable**	1.8
	MODERATE	*Local*	Medium Term	*Could Happen*		

Cumulative Impact Assessment

The degradation of aquatic ecosystems due to increased sedimentation may impact downstream water quality of associated watercourses.

9.7 Environment Impact Assessment – Closure Phase

9.7.1 Air Quality Impact

a) Description of Impact

The rehabilitation of the proposed Continuous ADF will entail a ~~capping~~ system whereby topsoil and grassing will be placed on the exposed surface. The successful establishment of vegetation on the Continuous ADF will decrease the susceptibility of the facility to erosional forces and the generation of dust. Therefore once vegetation is established the potential for

dust generation will be reduced significantly. However during the rehabilitation activities the tipping of topsoil and vehicle entrainment on associated unpaved roads will also result in dust generation. The successful rehabilitation of the Continuous ADF thereby eliminating a source of dust will however constitute as a positive impact

Cumulative Impact

The current ash disposal facility will be ~~capped and~~ rehabilitated during the operational phase of this project, and there will certainly be a cumulative positive impact on the air quality by ~~capping and~~ rehabilitating both facilities.

b) Impact Assessment

Direct Impact

The combined weighted project impact to air quality (prior to mitigation) during the closure phase will **probably** be of a LOW negative significance, affecting the *local area*. The impact will act in the short term and *could happen*. The impact risk class is thus LOW**.**

Table 9-63: Closure Phase Air Quality Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Dust generation due to poor vegetation establishment and rehabilitation activities.	2	3	2	3	**Probable**	1.4
	LOW	*Local*	Short Term	*Could Happen*		

Post Mitigation

The combined weighted project impact to air quality (**post mitigation**) during the closure phase will **probably** be of a LOW negative significance, affecting the *local area*. The impact will act in the short term and *could happen*. The impact risk class is thus LOW**.**

Table 9-64: Closure Phase Air Quality Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Dust generation due to poor vegetation establishment and rehabilitation activities.	1	3	2	3	**Probable**	1.2
	VERY LOW	*Local*	Short Term	*Could Happen*		

Cumulative Impact Assessment

The cumulative air quality impacts during the closure phase will **probably** be of a HIGH negative significance, affecting the *regional area* **prior to mitigation**. The current impacts will act for as long as the KPS is operational; and should thus be viewed as operating in the medium term and is *very likely* to happen. The impact risk class is thus MODERATE**.**

Table 9-65: Closure Phase Cumulative Air Quality Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
The air quality impacts associated with the Continuous ADF Project will remain until the completion of the closure phase.	4	4	3	4	**Probable**	2.9
	HIGH	*Regional*	Medium-Term	*Very Likely*		

Cumulative Impact Assessment – Post Mitigation

The cumulative air quality impacts during the closure phase will **probably** be of a HIGH negative significance (**post mitigation**), affecting the *regional area*. The current impacts will act for as long as the KPS is operational; and should thus be viewed as operating in the medium term and is *very likely* to happen. The impact risk class is thus MODERATE**.**

Table 9-66: Closure Phase Cumulative Air Quality Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
The air quality impacts associated with the Continuous ADF Project will remain until the completion of the closure phase.	3	4	3	4	**Probable**	2.7
	MODERATE	*Regional*	Medium-Term	*Very Likely*		

9.7.2 Noise Impact

a) Description of impact

The activities associated with the Closure Phase are not anticipated to exceed the sound pressure levels associated with the Operational Phase. The operational activities will largely entail the decommissioning of the infrastructure associated with the Continuous ADF as well as the construction vehicles moving to and from the site. As is the case for the Operational Phase it is unlikely the Closure Phase activities will be heard from a distance further than 600 m from the KPS. Given that the nearest residential receptors are located approximately

700 m north-west and 1.5 km south-east the Closure Phase activities will not be perceived by those residing in these areas.

b) Impact Assessment

Direct Impact

The combined weighted project impact on ambient noise levels (**prior to mitigation**) as a result of the closure activities associated with the Continuous ADF *will happen*, but will be of LOW significance. The increased sound level pressures will not be audible from distances exceeding 600 m and is therefore confined to the *study area*. The impact is expected to act over a short term. The impact risk class is thus MODERATE.

Table 9-67: Closure Phase Noise Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
The activities associated with the Closure Phase including the movement of construction vehicles will generate noise.	2	2	2	5	**Definitely**	2.0
	LOW	*Study Area*	Short Term	*Will Happen*		

Post-Mitigation Impact

The combined weighted project impact on ambient noise levels (**post mitigation**) as a result of the closure activities associated with the Continuous ADF *will happen*, but will be of LOW significance. The increased sound level pressures will not be audible from distances exceeding 600 m and is therefore confined to the *study area*. The impact is expected to act over a short term. The impact risk class is thus LOW.

Table 9-68: Closure Phase Noise Impact Assessment – Post-Mitigation Impact

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
The activities associated with the Closure Phase including the movement of construction vehicles will generate noise.	1	2	2	5	**Definitely**	1.7
	VERY LOW	*Study Area*	Short Term	*Will Happen*		

Cumulative Impact

Due to the LOW risk class of the anticipated noise impacts during the Closure Phase it is unlikely that the impact will contribute significantly to existing noise generating activities surrounding the KPS.

9.7.3 Visual Impact

a) Description of impact

The proposed Continuous ADF will remain a prominent feature during the Closure Phase. The proposed Continuous ADF will be visible for a distance of up to 15 km. The establishment of indigenous vegetation on the Continuous ADF surface may reduce the prominence of the facility during seasonal variations of the landscape colour between brown and green.

b) Impact Assessment

Direct Impact Assessment

The combined weighted project impact to the existing visual environment (**prior to mitigation**) as a result of the closure activities listed above will **probably** be of a MODERATE positive significance affecting the *regional area*. The impact will act in the long term and is *very likely* to occur. The impact risk class is thus MODERATE.

Table 9-69: Closure Phase Visual Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
The establishment of indigenous vegetation on the Continuous ADF surface may reduce the prominence of the facility during seasonal variations of the landscape colour between brown and green.	3	4	4	4	**Probable**	2.9
	MODERATE (Positive)	*Regional Area*	Long Term	*Very Likely*		

Post-Mitigation Impact

The combined weighted project impact to the existing visual environment (**post mitigation**) as a result of the closure activities listed above will **probably** be of a MODERATE positive significance affecting the *regional area*. The impact will act in the long term and is *very likely* to occur. The impact risk class is thus MODERATE.

Table 9-70: Closure Phase Visual Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
The establishment of indigenous vegetation on the Continuous ADF surface may reduce the prominence of the facility during seasonal variations of the landscape colour between brown and green.	4	4	4	4	**Probable**	3.2
	HIGH (Positive)	*Regional Area*	Long Term	*Very Likely*		

Cumulative Impact

The rehabilitation and capping of the continuous ADF as well as the rehabilitation of the disturbed areas will contribute towards lessening the visual impact associated with the continuous ADF and associated infrastructure.

9.7.4 Impact on Heritage Resources

a) Description

Any impacts to the cultural or heritage aspects of the environment will occur during the construction phase and there is **definitely** expected to be NO ADDITIONAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area as a result of closure activities.

9.7.5 Impact on Soil and Land Capability

a) Description

During the closure phase the activities that will impact on soils will primarily be the excavation, transportation, and placement of soils that will be undertaken during the removal of associated infrastructure and the capping of the Continuous ADF. The primary additional impact to soil and land capability during the closure phase will be the pollution of soil resources from vehicles using hydrocarbons, the compaction of soils, and the erosion of exposed soils.

b) Impact Assessment

Direct Impact

The combined weighted project impact to the soil and land capability (**prior to mitigation**) will **probably** be of a MODERATE negative significance affecting the *study area*. The

impact will act in the medium term and will *very likely occur*. The impact risk class is thus MODERATE**.**

Table 9-71: Closure Phase Soil and Land Capability Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
The activities associated with the closure phase will result in soil compaction and disturbance as well as hydrocarbon contamination.	3	2	3	4	**Probable**	2.2
	MODERATE	*Study Area*	Medium Term	*Very Likely*		

Post Mitigation Impact

The combined weighted project impact to the soil and land capability (**post mitigation**) will **probably** be of a MODERATE negative significance affecting the *study area*. The impact will act in the medium term and will *very likely occur*. The impact risk class is thus LOW**.**

Table 9-72: Closure Phase Soil and Land Capability Impact Assessment

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
The activities associated with the closure phase will result in soil compaction and disturbance as well as hydrocarbon contamination.	2	2	3	4	**Probable**	1.8
	LOW	*Study Area*	Medium Term	*Very Likely*		

Cumulative Impacts

Due to the LOW risk class associated with anticipated soil and land capability impacts, it is not foreseen that the impact will contribute significantly to exiting impacts.

9.7.6 Impacts on Surface Water and Wetlands

a) Description

It is expected that the stream diversion around the Continuous ADF will remain post closure. The E-Dump will however be decommissioned and the area rehabilitated during the closure phase. Impacts relating to water quality deterioration resulting from seepage from the Continuous ADF, increased sediment transport into adjacent wetlands and surface watercourses from replaced topsoil as well as spills, leaks and incorrect waste disposal.

b) Impact Assessment

Direct Impact Assessment

The significance (prior to mitigation) of the anticipated (negative) impacts on the wetlands associated with the proposed KPS Continuous ADF Project ranges from MODERATE in the case of seepage and leakage from the ADF to LOW significance for hydrocarbon spills (prior to mitigation). All anticipated wetland impacts will be confined to the *local area* and *could happen*. Increased sediment transport into wetlands is however *very likely* to transpire. The impact risk class is MODERATE except for hydrocarbon spills and leakages which is LOW.

Table 9-73: Closure Phase Wetland Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Water quality deterioration due to seepage from Continuous ADF and PCDs.	4	3	3	3	**Possible**	2.0
	HIGH	*Local Area*	Medium Term	*Could Happen*		
Increased sediment transport into watercourses.	3	3	3	4	**Possible**	2.4
	MODERATE	*Local Area*	Medium Term	*Very Likely*		
Spill and leakages of hazardous substances and improper waste management.	2	3	2	3	**Possible**	1.4
	LOW	*Local Area*	Short Term	*Could Happen*		

Post-Mitigation Impact

The significance (**post mitigation**) of the anticipated (negative) impacts on the wetlands associated with the proposed KPS Continuous ADF Project ranges from MODERATE in the case of increased sediment transport into watercourses. to LOW significance for hydrocarbon spills (**post mitigation**). All anticipated wetland impacts will be confined to the *local area* and *could happen*. Increased sediment transport into wetlands is however *very likely* to transpire. The impact risk class is MODERATE except for hydrocarbon spills and leakages which is LOW.

Table 9-74: Closure Phase Wetland Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Water quality deterioration due to seepage from Continuous ADF and PCDs.	3	3	3	3	**Possible**	1.8
	MODERATE	*Local Area*	Medium Term	*Could Happen*		
Increased	2	3	3	4	**Possible**	2.16

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
sediment transport into watercourses.	LOW	*Local Area*	Medium Term	*Very Likely*		
Spill and leakages of hazardous substances and improper waste management.	1	3	2	3	**Possible**	1.2
	VERY LOW	*Local Area*	Short Term	*Could Happen*		

Cumulative Impacts

Historical agricultural and mining practices over the past few decades have had detrimental effects on the surface water environment in the area. This is mainly attributed to fertilizer application, erosion, siltation and point-source discharges by Wastewater Treatment Works into the surrounding watercourses. The presence of several industrial and mining activities within one catchment may have severe effects on the surface water environment. The receiving water resource within the area is the Wilge River, which will soon experience significant water quality concerns. The Wilge River, a tributary of the Olifants River, flows 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 upstream of the Loskop Dam. Given the fact that the Olifants River feeds into several water supply storage facilities utilised by local settlements, the impact of deteriorating water quality, which makes the water less fit for use, has significant environmental as well as social and economic implications.

Due to the fact that the impacts are already happening the significance rating for cumulative impacts will not change considerably. However, should mitigation be put in place then the local cumulative impacts would reduce the significance rating for the local dams but may not have much of a positive impact on the broader catchment. This would need to be assessed based on all other users in the catchment.

9.7.7 Terrestrial Ecology

a) Description

Although habitat loss and degradation are normally associated with the immediate vegetation clearing and earth works that precede construction activities, the impacts can be long term, persisting throughout the operational and closure phases. In certain instances, these impacts can be ameliorated by successful rehabilitation of the site. Bare soil surfaces which have not yet been re-vegetated will pose a risk of causing erosion, dust and sedimentation of drainage features. Disturbance to soil also provides opportunity for the establishment of exotic and/or declared Category 1, 2 and Class 3 invader species.

b) Impact Assessment

Direct Impact

All impacts which *could happen* during the Closure Phase range from HIGH to MODERATE significance and will be confined to the *local area*. The establishment of exotic and invader flora species is considered a long term impact as opposed to dust generation which may continue for a medium-term.

Table 9-75: Closure Phase Terrestrial Ecology Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Increase in erosion and possible sedimentation of drainage features.	3	3	3	3	**Possible**	1.8
	MODERATE	*Local Area*	Medium Term	*Could Happen*		
Increased dust generation.	3	3	3	3	**Possible**	1.8
	MODERATE	*Local Area*	Medium Term	*Could Happen*		
Increased exotic and/or declared Category 1, 2 & 3 invader species.	4	3	4	3	**Possible**	2.2
	HIGH	*Local Area*	Long Term	*Could Happen*		

Post Mitigation Impact

All impacts which *could happen* during the Closure Phase range from HIGH to MODERATE significance (**post mitigation**) and will be confined to the *local area*. The establishment of exotic and invader flora species is considered a long term impact as opposed to dust generation which may continue for a medium-term.

Table 9-76: Closure Phase Terrestrial Ecology Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Increase in erosion and possible sedimentation of drainage features.	2	3	3	3	**Possible**	1.6
	LOW	*Local Area*	Medium Term	*Could Happen*		
Increased dust generation.	2	3	3	3	**Possible**	1.6
	LOW	*Local Area*	Medium Term	*Could Happen*		
Increased exotic and/or declared Category 1, 2 & 3 invader species.	3	3	4	3	**Possible**	2.0
	MODERATE	*Local Area*	Long Term	*Could Happen*		

Cumulative Impacts

Given the local extent of the anticipated impacts on the Terrestrial Ecology during the Closure Phase may contribute to existing impacts of similar nature in the surrounding area.

9.7.8 Traffic Impact

a) Description

All potential traffic impacts that may occur have been identified and assessed during the Construction Phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL as a result of closure activities.

9.7.9 Groundwater Impact

a) Description

During the closure phase the use of dangerous chemicals such as paints, thinners, solvents and hydrocarbons introduces an environmental risk. Spills occur during the storage, handling, and use of hazardous substances. If not contained and remediated such spills may enter the groundwater and cause pollution. In most cases even a small amount of these chemicals entering the environment can cause damage to ecological systems and even pose human health risks.

Decommissioning and closure activities will be undertaken over the majority of the development site, however such spills will be very small and isolated in extent. The probability of spills occurring is considered very high, however the risk of such spills entering the groundwater environment is considered to be quite remote.

b) Impact Assessment

Direct Impact

The combined weighted project impact to the groundwater environment (**prior to mitigation**), as a result of closure activities will **possibly** be of a LOW negative significance, affecting only the *study area* and acting in the long term. The impact will *could happen*. The impact risk class is thus **Low**.

Table 9-77: Closure Phase Terrestrial Ecology Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Hydrocarbon spillage may contaminate groundwater resources.	2	2	3	3	**Possible**	1.4
	LOW	*Study Area*	Long Term	*Could Happen*		

Post-Mitigation Impact

The combined weighted project impact to the groundwater environment (**post mitigation**), as a result of closure activities will **possibly** be of a LOW negative significance, affecting only the *study area* and acting in the long term. The impact will *could happen*. The impact risk class is thus LOW.

Table 9-78: Closure Phase Terrestrial Ecology Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Hydrocarbon spillage may contaminate groundwater resources.	1	2	3	3	**Possible**	1.2
	VERY LOW	*Study Area*	Long Term	*Could Happen*		

Cumulative Impacts

Taking into account that the anticipated groundwater impacts during the Closure Phase falls within a low risk class and will be confined to the study area, it is not though that the impacts will contribute significantly to existing groundwater contamination sources in the surrounding area.

9.7.10 Impacts on Aquatic Biota

a) Description

Due to the similar nature of the decommissioning of the infrastructure to the Construction Phase activities, it is anticipated that similar impacts may transpire during the Closure Phase. Impacts that may therefore transpire include changes to the water quality of surface water resources in particular with regards to pH, concentration of Total Dissolved Solids and fluctuations of the water temperature. This may in turn result in the in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Sensitive aquatic species can often not as tolerate to significant changes of their habitat (e.g. fluctuations of the water quality). This may in turn lead to the modification of the species composition where

sensitive species are lost and organisms tolerant to changes dominate the community structure.

b) Impact Assessment

Direct Impact

The combined weighted project impact on aquatic habitat (**prior to mitigation**) as a result of the Closure Phase activities *could happen* and is anticipated to be of a HIGH significance. The **probable** modification to the water quality will largely impact on the biotic integrity of the tributaries associated with the development area and is therefore anticipated that the impact will transpire on a *local* spatial scale. The impact is expected to act over a medium term. The impact risk class is thus MODERATE.

Table 9-79: Closure Phase Aquatic Biota Impact Assessment

Impact	Magnitude (before mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Rating
Degradation of biotic integrity due to modification of water quality.	4	3	3	3	**Probable**	2.0
	HIGH	*Local*	Medium Term	*Could Happen*		

Post-Mitigation Impact

The combined weighted project impact on aquatic habitat (**post mitigation**) as a result of the Closure Phase activities *could happen* and is anticipated to be of a MODERATE significance. The **probable** modification to the water quality will largely impact on the biotic integrity of the tributaries associated with the development area and is therefore anticipated that the impact will transpire on a *local* spatial scale. The impact is expected to act over a medium term. The impact risk class is thus LOW.

Table 9-80: Closure Phase Aquatic Biota Impact Assessment – Post-Mitigation

Impact	Magnitude (after mitigation)	Spatial Scale	Temporal Scale	Probability	Degree of Certainty	Post Mitigation Rating
Degradation of biotic integrity due to modification of water quality.	3	3	3	3	**Probable**	1.8
	MODERATE	*Local*	Medium Term	*Could Happen*		

Cumulative Impacts

With the existing land-use in the Wilge River catchment, agriculture, mining and Waste Water Treatment Works, the river already is under pressure from nutrients and sulphate inputs. This being said, sites within the Wilge River catchment show relatively good water quality in comparison to those in the Olifants River catchment (CSIR, 2010). It is therefore important to maintain the ecological integrity of the Wilge River and strive to improve it. A concern is that the rivers and streams in the area already contain high sediment loads (turbidity). This is due to the land use in the area. Any further increase 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.

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 Environmental Impact Report provides a detailed account of the Need and Desirability of the proposed Kendal Power Station (KPS) Continuous Ash Disposal Facility (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[55], 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.

[55] Department of Environmental Affairs (2010), Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 9, Department of Environmental Affairs, Pretoria

Table 10-1: Assessment of the Need of the proposed KPS Continuous 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 Kendal Power Station 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) occurs 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 supplied by the nearby Khuthala Mine. South Africa's coal reserves are estimated at 53 billion tonnes[56], and with our present production rate there should be almost 200 years of coal supply left.	Yes

[56] Eskom 2014 http://www.eskom.co.za/AboutElectricity/ElectricityTechnologies/Pages/Coal_Power.aspx

Need ('timing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
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 Ash Disposal Facility of the KPS to create sufficient capacity for the storage of ash for the remaining operating life of the KPS.	Yes
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[57]. 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

[57] Eskom 2014 http://www.eskom.co.za/OurCompany/CompanyInformation/Pages/Business_Vision.aspx

Table 10-2: Assessment of the Desirability of the proposed KPS Continuous 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?	Although alternatives to the type of activity (i.e. continued disposal of ash) were not considered, alternatives with regards to the design and location of the proposed KPS Continuous ADF were identified and evaluated. 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 5) as well as from the Trade-Off Study (refer to Chapter 5). Taking the aforementioned into account the Environmental Assessment Practitioner (EAP) is confident that the BPEO have been selected for the proposed KPS Continuous 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 12-1.	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 Environmental Assessment Practitioner (EAP). A Terrestrial Ecology Study was however carried out for the proposed KPS Continuous Project (refer to Chapter 7 and Appendix E8). 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 Environmental Management Programme (EMPr).	No

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
10.	Do location factors favour the land use associated with the activity applied for at this place?	All activities that form part of the proposed KPS Continuous ADF Project fall within the boundary of the KPS. To facilitate the centralisation of impacts associated with the ash disposal, the continuation of the ADF is largely dependent of the location of the existing ADF. Furthermore the proposed project activities stem from the operation of the KPS, and the location thereof is determined by the location of the power station. As was explained in the answer provided to Question 2 (refer to Table 12-1) the location of coal fired power stations are largely determined by 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 Chapter 9 for details surrounding the manner in which the proposed activities will impact on the receiving environment.	-
12.	How will the development impact on people's 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 Chapter 9 for details surrounding the manner in which the proposed activities will impact on the receiving environment.	-

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
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 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 comparative analysis of all identified alternatives in terms of design and technology is provided in Chapter 5 of this EIR. The option of not implementing the project activities (i.e. no-go option) has also been included in the comparative analysis. The comparative analysis provides an indication of the risks, disadvantages, advantages and opportunities that are associated with each of the alternatives.	No

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Answer**	**Yes / No**
14.	Will the proposed land use result in unacceptable cumulative impacts?	A cumulative impact is defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations (2010) published in Government Notice No. R 543 as meaning "*the 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 area*". It is anticipated that the most significant Cumulative Impact associated with the proposed Ash Disposal Facility 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 footprint KPS and associated infrastructure 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 ash disposal facility on the surrounding ambient air quality. It is therefore the opinion of the EAP that the proposed ash disposal facility 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 Environmental Impact Assessment (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 KPS Continuous ADF Project include impacts on water quality, soils and vegetation and sensitive landscapes.

11.1 Key findings of Impact Assessment

The results of the impact assessment (refer to **Chapter 9**) showed that the most significant impacts on the receiving environment would include impacts on the ambient air quality, terrestrial ecology and sensitive landscapes, during the Construction and Operational Phases of the project lifecycle. Taking into account that the proposed Continuous ADF and E-Dump will be a continuation of the existing footprint thereof anticipated impacts on the landscape were deemed to be of moderate significance. However anticipated impacts on watercourses (e.g. Loss of wetland habitat) associated with the proposed Continuous ADF were rated as HIGH significance, prior to the implementation of mitigation measures, mostly due to the associated Cumulative Impacts.

The implementation of the proposed mitigation measures will however 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 KPS Continuous ADF Project will not lead to unacceptable environmental costs.

11.2 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.

As was explained in **Part 2.1.2** of this Final EIR there are numerous phases for design and construction of the continuous ADF barrier system. Due to the processes that need to be followed and the timeframes required for preparation of the footprint and construction of the barrier system, there will necessarily be a transition period from current operations to disposal on the barrier system. It is expected that the transition period will be approximately 3 years. The transition period is practically inevitable as the barrier design must first be approved before work can commence on ground preparation and construction. During this time, it is in national best interests that the KPS continue to operate in the current manner, requiring that ash disposal continue as at present. This will mean continued ashing on an unlined surface and Storm Water Management which are provided for in the current Water Use License, during the transition period. Mitigation measures will be implemented during

the Transition Period to prevent any adverse impacts on the receiving environment which may result from the operation of the existing ADF. The findings of the specialist studies (e.g. groundwater study) have showed that the continued operation of the existing ADF leading up to the construction and operation of the lined continuous ADF is unlikely to result in significant unacceptable impacts on the receiving environment.

It is the opinion of the EAP that the continued operation of the existing ADF and E-Dump leading up to the construction and operation of the lined continuous ADF and extended E-Dump is unlikely to cause significant adverse environmental impacts, provided that the proposed mitigation measures are implemented. 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.

11.3 Proposed Conditions of Authorisation

Taking into account the outcome of the Scoping and Environmental Impact Reporting Process, and in particular the EIA Phase, it is proposed that the Competent Authority include the following conditions, intended to ensure that the Best Practicable Environmental Option for all proposed activities associated with the KPS Continuous ADF Project is implemented:

- All feasible mitigation measures included in the specialist studies carried out for the proposed project are implemented during the project lifecycle;
- All mitigation measures as indicated for the transition period, must be implemented in order to reduce the risk of impact during the period that ashing will continue as at present, while the barrier system is being designed and constructed;
- 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 KPS Continuous ADF Project life cycle.

11.4 Recommendations emanating from PPP

The following recommendations were brought forward I&APs during the PPP for the EIA Phase of the proposed KPS Continuous ADF Project:

- The project activities of both the KPS and Kusile Power Station which may result in adverse cumulative impacts should be represented, monitored and managed at a collective Environmental Monitoring Committee level.
- The “stakeholders” typically referred to in each of the separate activities linked to the coal fired power stations of KPS and Kusile Power Station include not only the adjacent land owners, but the respective applicants / responsible entities for these activities; and

- Wetland Offsets to prevent the proposed project activities from adversely impacting on the downstream water users and receiving environment should be collectively considered, formulated and implemented for the key Eskom projects in the area.

12 CONCLUSION AND RECOMMENDATIONS

The EIA Phase of the proposed Kendal Power Station (KPS) Continuous Ash Disposal Facility (ADF) Project served to investigate, assess and communicate potential environmental consequences associated with the implementation of the project activities which require Environmental Authorisation. The Scoping and Environmental Impact Reporting Processes have been carried out in accordance with all applicable provisions of the National Environmental Management Act (107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (Government Notice No. R543[58]).

The National Environmental Management Act (107 of 1998) (NEMA) Publication of Implementation Guidelines[59] proposes that the following questions be addressed during the EIA Phase:

- What are the potential positive and negative environmental effects of this proposed development?
- How can any significantly harmful impacts be avoided or reduced (i.e. mitigated) and positive impacts be enhanced?, and
- What is the level of certainty that mitigation measures will be implemented and that they will be effective?

Preliminary anticipated environmental impacts which are likely to result from the implementation of the proposed project activities were identified during the Scoping Phase. These impacts were subsequently taken forward to the EIA Phase. At this stage environmental concerns and issues were flagged for specialist investigation. The potential environmental impacts associated with the project activities and their expected significance is assessed in **Chapter 9** of this EIR. The degree of certainty for the rating/risk class calculated for each of the impacts is provided in **Chapter 9** of this document.

A summary of the findings for each of the specialist studies is provided in **Chapter 7** of this EIR. Means (i.e. mitigation measures) of preventing the anticipated environmental impacts from transpiring or reducing the significance / severity thereof have been formulated for each of the anticipated impacts. The recommendations provided by the respective specialists culminated in feasible mitigation measures.

The details and activities relating to the proposed KPS Continuous ADF Project are described in **Chapter 2** of this EIR. A description of the receiving environment is provided in **Chapter 6** of this document, serving as the baseline for assessing the anticipated impacts.

[58] South Africa. 2010. National Environmental Management Act (107 of 1998) Environmental Impact Assessment Regulations (Notice 543). *Government gazette* 33306:3. 18 June

[59] South Africa. 2010. National Environmental Management Act (107 of 1998) Publication of Implementation Guidelines for Comment. (Notice 654). *Government gazette* 33333:13. 29 June

The transition period has been discussed and motivated within **Chapter 2** of the report. It is technically impossible for the liner system to be implemented immediately on authorisation, as the system will require design, construction and preparation before it is ready for use. As explained in **Chapter 2** this requires that there be a transition period between authorisation and implementation of the liner system. This transition period will mean operation by the power station as per the current ashing. There is no indication by the groundwater study that the current ashing process is having negative effects on the local groundwater resources. Therefore, it is accepted for the purposes of this application, that a transition period is necessary, and that the KPS will be required to monitor groundwater and surface water rigorously during this period. Any indication of impact to water resources must be mitigated as quickly as possible, as per the EMPr, with a cut-off trench, for example. The transition period has been taken cognisance of for the purposes of this EIR and supporting EMPr.

In keeping with the provisions included in Regulation 54 of the NEMA EIA Regulations (Government Notice No. R543) a comprehensive Public Participation Process has been carried out, leading up to placing this EIR for public review. Interested and Affected Parties (I&APs) that were identified during Scoping Process will also be provided the opportunity to submit their input with regards to the EIR. All comments that are received from I&APs during the EIA Phase PPP, as well as the response provided by the Environmental Assessment Practitioner will be included in the Final EIR.

The Environmental Impact Statement included in **Chapter 11** of this report summarises key findings of the EIA Phase. The EAP opinion regarding authorisation of the project activities as well as proposed condition of authorisations is also provided in **Chapter 11** of the EIR. The information documented in this EIR is deemed to be sufficient and comprehensive to allow the Competent Authority (i.e. Department of Environmental Affairs) to make an informed decision with regards to granting or refusal of Environmental Authorisation.

Taking all activities of this application into account, including the E dump expansion and the transition period for the liner system, it must be reiterated that the EAP supports the authorisation of this application. This is with the expectation that all mitigation measures and recommendations within this FEIR and the supporting documentation, including the specialist studies and EMPr, are adhered to and implemented effectively. An independent ECO is expected to be responsible for the monitoring of the EMPr, during construction, to support rigorous effecting of the mitigation measures and monitoring regimes. During operational phase, Kendal Power Station must include elements of the EMPr in its certifified ISO 14001 EMS (Environmental Management Systems), which will still ensure that requirements of the EMPr are complied with thoroughly

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Appendix A: EAP CV

Appendix B: Engineering Design Report

Appendix C: Water Use License

Appendix D: Authority Correspondence

Appendix E: Specialist Studies

Appendix F: Public Participation Documentation

Appendix G: Environmental Management Plan

Appendix H: Impact Table

Appendix I: Specialist Declaration