Working Together

Project Applicant: **ESKOM HOLDINGS SOC LIMITED**

Project: **Operation of Ash Dam Extension 3 At Komati Power Station**

Report Name: **ENVIRONMENTAL IMPACT REPORT**

Report Status: **(Final for Submission)**

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COMPETENT AUTHORITY:
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Directorate: Authorisation and Waste Disposal Management
Waste Management Licence Application Ref: DEA: 12/9/11/L1010/6

PROJECT:
Operation of Ash Dam Extension 3 at the at Komati Power Station, Mpumalanga

REPORT DETAILS:

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SO611/EIR01 **March 2013**

ESKOM HOLDINGS SOC LIMITED

Operation of Ash Dam Extension 3 at Komati Power Station, Mpumalanga Province Environmental Impact Report (Final)

EXECUTIVE SUMMARY

Introduction to the Project

Eskom Holdings SOC Ltd re-commissioned the Komati Power Station in Mpumalanga Province. The combustion of coal at Komati Power Station produces ash, which is deposited as slurry in engineered ash disposal facilities. The existing ash disposal facilities at Komati did not have sufficient capacity for the planned life of the station and it was therefore necessary to develop an additional ash disposal facility.

Eskom identified Ash Dam Extension 3 as a feasible solution to provide ash disposal capacity until the end of life of the power station. After a scoping and environmental impact assessment (EIA) process Eskom was granted a positive Record of Decision (RoD) for the construction and operation of Ash Dam Extension 3 by the Department of Environmental Affairs (12/12/20/1007). Ash Dam Extension 3 was constructed between February 2009 and November 2010. Ash disposal in the ash dam has not yet commenced.

In July 2009 the National Environmental Management: Waste Act, No. 59 of 2008 (NEM:WA) was enacted. The NEM:WA introduced new legal requirements for waste disposal, including ash generated from electricity generation. The Department of Environmental Affairs advised Eskom that a waste management licence is required for the operation of Ash Dam Extension 3 as the facility was not operational at the time that the NEM:WA was enacted.

This report presents the results of the EIA undertaken for the operation of Ash Dam Extension 3 at the Komati Power Station in Mpumalanga. The draft environmental management programme (EMPr) presents the management and mitigation measures that have been identified to address the potential environmental impacts from this phase.

Environmental Legal Requirements

The requirements of the National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA) came into effect on 1 July 2009. A waste management activity identified in terms of the Act (GN R 718) may not commence, be undertaken or conducted except in accordance with published standards or a Waste Management Licence. Activities identified in Category B require an Environmental Impact Assessment process, as stipulated in the Environmental Impact Assessment Regulations (GN R543) of the NEMA, in order to inform an application for a waste management licence.

The two NEM:WA waste management activities that are triggered by Ash Dam Extension 3 are the 'construction of facilities' and the 'disposal' of waste. Ash Dam Extension 3 has been lawfully constructed. The Department of Water Affairs: Engineering Services has indicated that additional measures will be required in order to ensure that facility complies with the current pollution prevention requirements. It is therefore necessary to obtain a WML for the 'construction of facilities'.

As ash is identified as a waste under the NEM:WA it is necessary for Eskom to obtain a WML for the 'disposal of waste'. Ash from the Komati Power Station has been subject to the waste classification processes (see Section 3.7.1 of the main report).

Assessment and Licensing Process

Eskom submitted an application to the Department of Environmental Affairs for a waste management licence (Ref: 12/9/11/L1010/6). A scoping and environmental impact assessment process, as stipulated in the Environmental Impact Assessment Regulations (GN R543, 18 June 2010) made under section 24(5) of the National Environmental Management Act, 1998 (No 107 of 1998), is required to support the application. Synergistics Environmental Services was appointed as the independent environmental assessment practitioner.

Eskom applied to the Department of Environmental Affairs for exemption from provisions of the 2010 EIA Regulations. The Department of Environmental Affairs granted exemption from the scoping process and approved a 21-day public commenting period on the EIA report.

Study Approach and Methodology

This EIR forms the final phase of the EIA process, it presents the results of the environmental assessment of the project and the environmental management measures. The EIR report is structured in accordance with GNR 543 and includes the consolidated results of the public participation and authority consultation processes conducted to date. Table 2 (see main report) provides a summary of the requirements of GNR 543, with cross references to the report sections where these requirements have been addressed.

Study Objectives

The specific objectives for the EIA are to:

- *Address issues and concerns raised by IAPs during the public participation process;*
- *Assess the key environmental impacts of operation that were identified in the current and previous assessment processes;*
- *Identify mitigation measures to enhance positive impacts and reduce negative operational impacts identified during the EIA;*
- *Develop actions that can be implemented during operation to address impacts for inclusion in the EMP;*
- *Provide feedback to stakeholders; interested and affected parties as to how their concerns have been addressed; and*
- *Provide sufficient information to the environmental authorities in order that they can make an informed decision regarding the waste management licence.*

Public Participation Process

The current public participation process has been conducted in terms of the 2010 EIA Regulations Sections 54 – 59 The exceptions to this process are as per the exemptions granted by the DEA (see Appendix A). As there was no scoping phase a 'plan of study for EIA' is not presented.

Press advertisements, informing the public of the ash disposal facility project and requesting participation in the public consultation process were placed on 1 February 2013 Die Beeld (in Afrikaans) and the Middelburg Observer (in English). Site notices were placed on 31 January 2013 at the site and at various locations in Komati Village.

A notification letter with background information on the project was circulated to potential interested and affected parties. All parties on the IAP Register from the previous scoping and EIA process were sent the notification. In addition, the notification letter was delivered by Synergistics to ~ 50 of the residences in Komati Village that are adjacent to the Ash Dam complex. The document included a response sheet which provided persons with the opportunity to register as IAPs and provide comment and raise issues or concerns on the project.

Persons who have returned the response form or contacted the public participation office have been registered as IAPs and will receive further information regarding the project. Registered IAPs were notified of the review of the EIR. The draft environmental impact report was made available for review to all registered IAPs for a period of 21 days (22 February until 14 March 2013).

Comments received from IAPs on the environmental impact assessment report were used to update the report and produce the Final EIR for submission to the DEA. The final EIR has also been published on the website and made available for comment.

Authority Consultation Process

Notification of the project was posted and or faxed to the officials at the following government departments:

- *Steve Tshwete Local Municipality (Ward 4 Councillor, Municipal Manager),*
- *Nkangala District Municipality (Municipal Manager),*
- *Department of Water Affairs (National and Provincial), and*
- *Mpumalanga Department of Economic Development, Environment & Tourism (Director).*

The draft environmental impact report was submitted directly to these Departments for a 21 calendar-day review period. No comments were received.

A meeting was held between Synergistics, Eskom and the DEA to discuss the application requirements for Ash Dam Extension 3. A number of points were discussed and it was agreed that:

- *The DEA would consider an application for exemption from certain provisions of the EIA Regulations. A motivation for exemption should be submitted.*
- *The EIA and EMP reports must be updated to meet the requirements of the 2010 EIA Regulations and to reflect the current environmental circumstances.*
- *The DEA advised that the EAP should meet with the DWA: Engineering Services as the DEA will require that the DWA engineers issue an ROD for the ash dam extension designs.*
- *The DEA committed to fast tracking their review process without committing to specific timelines.*

Eskom, Synergistics and the design engineers met with the DWA: Engineering Services. Mr Legge of the DWA indicated that in his opinion the current design (unlined and having only a blanket drain) could not be approved by the DWA as it does fulfil the basic requirements of Section 19 of the National Water Act nor the principles set out in Section 2 of the NEMA. Mr Legge agreed that the design (as-built) could be amended to increase the protection provided to the water resource. The revised design should be motivated in terms of the new draft Standard for Assessment of Waste for Landfill Disposal. Assuming that the ash classified as Type 3 waste, a single composite liner compliant with a Type C barrier over Ash Dam Extension 3's footprint would suffice as a practical mitigation measure. If the design was improved to include a single composite liner, Mr Legge indicated that he would be prepared to support water use and waste management licences. (see Appendix A).

Specialist Studies

A number of specialist studies were previously undertaken to inform the EIA, these included:

- *Heritage Impact Assessment, completed by Dr J van Schalkwyk;*
- *Groundwater Impact Assessment, by Rison Groundwater Consulting;*
- *Air Quality Impact Assessment, conducted by Airshed Planning Professionals; and*
- *Ecological Impact Assessment, completed by Synergistics.*

Since the positive RoD was obtained for Ash Dam Extension 3 in 2008, the only significant change that has taken place at the site has been the construction of Ash Dam Extension 3 itself. No other significant changes have taken place in the areas immediately around the site. It is therefore expected that the findings of the investigations remain valid. No further specialist work is required for understanding of the site or the assessment of environmental impacts. Additional surface and groundwater monitoring data is available and this will be considered.

Assessment Methodology

The identification and assessment of environmental impacts is a multi-faceted process, which combines quantitative and qualitative descriptions and evaluations. For each environmental component (i.e. air quality, groundwater, ecology), impacts were identified and described in terms of the nature of the impact, compliance with legislation and accepted standards and the significance of the predicted environmental change. The significance of each impact was calculated as follows:

Impact significance = (extent + severity + duration + frequency) x probability

The impact assessment took into consideration the current status of the local environment. The direct impacts of the project as well as the cumulative impacts of the project were assessed. The assessment also considered the different phases of the project. Where possible, mitigation measures to reduce the significance of negative impacts and enhance positive impacts are recommended in the draft EMP. The EMP includes measures for the management of activities, the avoidance of impacts, monitoring of change and the rehabilitation of environmental degradation.

Project Description

Jones and Wagener Consulting Civil Engineers completed the design of Ash Dam Extension 3. The design called for the dam to be under drained to improve both the stability as well as reduce the volume of water seeping into the subsoils. A 4m deep sub-soil drain system was included to intercept groundwater and seepage from Ash Dam Extension 3 as well as from the existing dams.

Ash Dam Extension 3 was constructed during 2009 and 2010. The facility has a footprint of 47 ha and provides capacity for the deposition of 13 500 000 m3 of ash. Ash Dam Extension 3 is linked with the existing ash dams in that Ash Dam Extension 1 & 2 will be used as retaining walls for ash deposited on Ash Dam Extension 3.

After discussions with the DWA: Engineering Services (see Section 3.5.2) it was agreed to increase the protection provided to the water resource by upgrading the facility to include a single composite barrier liner system. The DWA indicated that the revised design should be motivated in terms of the new draft Waste Classification and Management Regulations (GN 614 of 2012) and ensure that the facility has a liner that complies with at least a Type C barrier. The DWA further indicated that if the design was improved sufficiently, they would be prepared to motivate for and support design approval to the DEA (see Appendix A).

The revised design was prepared by JAWS, with the following proposed:

- *Retain the existing herringbone drainage system in the ash dam basin,*
- *Add a Geo-composite clay liner (GCL) system inside of the perimeter drainage system.*
- *Install a second herringbone drainage system on top of the liner*
- *Place a 500 mm deep drainage layer of coarse bottom ash on the GCL.*

The revised conceptual design was presented to and approved by the DWA: Engineering Services on 18 February 2013. Eskom will be requesting permission from the DEA to commence with the immediate retrofit construction of the revised design in parallel to the DEA's review of the waste management licence for operation of Ash Dam Extension 3.

Description of the Affected Environment

Information on the baseline environment presented in the report represents the current environmental conditions of the Komati Ash Dam Complex area. It is indicative of pollution and degradation due to electrical generation and ash disposal operations, mining, and agricultural activities in the area and naturally occurring phenomena. Baseline information was sourced from desktop studies, site inspections and from on-going monitoring completed at the site. The baseline information serves as a reference point to scientifically measure or professionally judge future changes to the environment that may occur with the operation of Ash Dam Extension 3. See Section 5 of the main report for full details.

Groundwater

The monitoring of boreholes around the Komati Power Station and ash dam complex (up to November 2012) has recorded groundwater with quality above the recommended standard limits. Mg and SO_4 are generally the main ions of concern although Ca, Fe, Mn and Na are sometimes recorded above the recommended reference limits. The boreholes downstream the ash dam complex that exhibit clear signs of contamination are AB04, AB07 and AB55. AB06 shows limited contamination. A time series evaluation of the concentrations of these ions indicates a spike in concentrations in 2009, with decreasing trends since then. The current explanation for this observed trend is likely the high level of surface disturbances and the relative lack of surface water drains during the refurbishment of the ash dam complex. Various ash, coal discard and waste piles were disturbed in this period. High volumes of water were stored on and seeped from the ash dams. It is possible that this contamination influenced the groundwater quality.

With the construction of surface water drains and the sub-soil seepage trench in 2009 much of the surface and shallow groundwater flow from the ash dams has been captured and is prevented from reaching groundwater. Since then the recorded water quality in the boreholes has improved to levels recorded between 2002 and 2006.

Limited impacts on groundwater quality are visible when water quality is examined in boreholes away from the pollution source (ash dam area). Virtually no impacts are visible at AB53, AB54, AB 56 and AB57. These boreholes also monitor the deeper aquifer and the water qualities recorded indicate that the contamination has not reached the deeper aquifer.

Surface Water

The monitoring of surface water (up to November 2012) has recorded water quality above the recommended standard limits. Na and $S0_4$ are generally the main ions of concern although Na, F, Mn and Ca are sometimes recorded above the recommended reference limits. The points downstream of the ash dam complex that exhibit contamination are AC05, AP02 and AP03. AC05 is a dirty water canal while AP03 is a seepage recovery dam. Water quality at these points is expected to be poor. AP02 is clean water dam (Gras Dam) and the water qualities recorded here are a concern. The electrical conductivity and levels of Na, Mg and $S0_4$ exceed the recommended reference limits. The water qualities in the Gras Dam have declined significantly since 2010. This indicates that Gras Dam continues to receive contaminated water either in surface runoff or from sub-soil seepage in the shallow groundwater. Further investigation is required to understand this.

Issues Raised During Consultation with Interested and Affected Parties

To date no persons have registered with the public participation office and no comments have been received from stakeholders.

Environmental Impact Assessment

Environmental Impact Assessment		Without Mitigation	With Mitigation	
Impact	**Design and Operations Measures for Impact Control**	**Impact Significance**	**Impact Significance**	
Retrofit Construction Activities				
Disturbance of natural or relatively undisturbed areas beyond the ash dam footprint (construction/stockpiling etc)	Restrict working areas to within footprint of ADE3. Construction personnel to only access areas approved for construction. Stockpiles to be placed on disturbed areas.	Neg Moderate	-19	Neg Low
Disruption to existing management systems (blocking of drains etc)	Construction personnel to be informed of existing systems. Functionality of existing systems should not be compromised. Construction personnel to only access areas approved for construction.	Neg Moderate	-17	Neg Low

Environmental Impact Assessment		Without Mitigation	With Mitigation	
Impact	**Design and Operations Measures for Impact Control**	**Impact Significance**	**Impact Significance**	
Occupational Health Risks to contractors during construction.	Employee induction and training Use of appropriate PPE Medical surveillance	Neg Moderate	-17	Neg Low
OPERATIONS				
Topography				
Change in natural topography with rise of ash dam	Restrict ADE3 to final height equivalent to existing dams.	Neg Moderate	-35	Neg Moderate
Groundwater				
Contamination of groundwater from disposed ash	Sub-soil seepage trench and sump downstream of ash dam complex. Herringbone drainage system in basin of ADE3. GCL liner in basin of ADE3. Second herringbone drainage system in fist ash layer.	Neg Very High	-20	Neg Low
Surface Water				
Dirty water run-off from ash disposal areas contaminating surface water resources.	Ash to only be disposed within the ash dam footprint. Maintain seepage drainage systems and perimeter drains. All dirty water collected to be pumped to the ash water return dam. Manage sump and dams to prevent spillages.	Neg Very High	-20	Neg Low
Loss of surface water run-off to the catchment	Divert clean water around the ADE3 and return to the environment.	Neg Moderate	-31	Neg Moderate
Ecology and Biodiversity				
Decline in aquatic habitat quality and species composition.	Maintain seepage drainage systems and perimeter drains. All dirty water collected to be pumped to the ash water return dam. Manage sump and dams to prevent spillages.	Neg High	-20	Neg Low
Air Quality				
Generation of PM10 emissions that could result in exceedance of standards for PM10 concentrations.	Vegetate ash dam walls and completed areas as soon as possible. Minimise the size of exposed, dry surfaces.	Neg Moderate	-19	Neg Low
Generation of dust that could result in exceedance of standards for dustfall rates.	Vegetate ash dam walls and completed areas as soon as possible. Minimise the size of exposed, dry surfaces. Restrict vehicle speed on site to 30 km/h	Neg Moderate	-19	Neg Low
Noise				

Environmental Impact Assessment		Without Mitigation	With Mitigation	
Impact	**Design and Operations Measures for Impact Control**	**Impact Significance**	**Impact Significance**	
Increase in noise levels from site	Maintain machinery to manufacturer's specifications	Neg Moderate	-20	Neg Low
Visual Environment				
Change in and disruption of natural views	Construct dam to height of existing dams. Vegetate slopes as soon as possible.	Neg High	-32	Neg Moderate
Social and Economic				
Economic benefits through employment	Employment preference to local persons	Pos Moderate	31	Pos Moderate
Continued generation of electricity at Komati and reduced risk of load shedding.	Operate Komati Power Station to provide base load electrical supply as required. Utilise ADE3 for disposal of ash.	Pos Very High	65.5	Pos Very High
Occupational health risk from worker exposure.	Frequent ash sampling and analysis to identify contaminants of concern. Employee induction and training Appropriate PPE Medical surveillance	Neg Moderate	-20	Neg Low
Public health risk from PM10 from site emissions.	Vegetate ash dam walls and completed areas as soon as possible. Minimise the size of exposed, dry surfaces. On-going monitoring in Komati Village to quantify the risk. Implement additional measures if monitoring indicates exceedances of reference standards.	Neg Moderate	-20	Neg Low
Nuisance from dustfall.		Neg Moderate	-20	Neg Low
Health risk to local groundwater users from reduced water quality.	Sub-soil seepage trench and sump downstream of ash dam complex. Herringbone drainage system in basin of ADE3. GCL liner in basin of ADE3. Second herringbone drainage system in first ash layer to drain seepage. Implement additional measures if monitoring indicates exceedances of reference standards	Neg High	-29	Neg Moderate
No-go Alternative				
Elimination of potential operational impacts from ADE3		Pos High		
Lost employment for personnel at ADE3 and Komati Power Station		Neg Moderate		
Loss of electrical output from Komati Power Station and increased risk of load shedding		Neg Very High		

Conclusions and Key Findings

The EIA concluded that operation of Ash Dam Extension 3, with the retrofit improvements to engineered design, is not subject to any fatal flaws. The majority of operational impacts that may affect the site or local receptors are of moderate to low significance and no impacts of high significance that cannot be mitigated will result. Ash Dam Extension 3 is not expected to contribute substantially to the cumulative impacts.

Construction of Ash Dam Extension 3 resulted in the complete transformation of the site. The soils, land use land capability and ecology of the site were permanently altered. Operation of Ash Dam Extension 3 will not have any further direct impact on these aspects. No heritage resources were found in the footprint of Ash Dam Extension 3. The retrofit construction of the DWA approved liner system to Ash Dam Extension 3 will not have any significant negative impacts.

The operation of Ash Dam Extension 3 will result in a number of impacts with direct effects on the site. These include significant changes to topography and the visual environment. However, in context with the existing ash dam complex the cumulative impact of these changes will not be significant. Operations will generate occasional noise, but the site is sufficiently distant from receptors that no disturbance will occur.

Contamination of groundwater was identified as the most important issue relating to the operation of Ash Dam Extension 3. Groundwater contamination from existing sources at Komati Power Station is being detected in monitoring boreholes and is currently an impact of concern. Pollution of the groundwater from sources at Komati Power Station could continue over the long term and cause widespread changes to groundwater chemistry that would impact on surface and groundwater quality. The ash dams are one potential source of contamination and the addition of Ash Dam Extension 3 will enlarge the source area for contaminants. This could increase the groundwater pollution risk from Komati Power Station.

Groundwater modelling for an unlined Ash Dam Extension 3 predicted a marginal, westerly increase in the extent of the groundwater contamination plume when compared to the current plume. However, with the inclusion of the remedial measures at the power station and the improved seepage controls downstream of the whole ash dam complex, the magnitude and rate of spread of the contamination plume was expected to reduce from current levels. While the direct impact of groundwater contamination from Ash Dam Extension 3 was of moderate significance, the new ash dam did not contribute substantially to the existing groundwater contamination risk. Recent monitoring results have indicated an improvement in groundwater quality since 2009 that is consistent with the implementation of the remedial measures (although this is without Ash Dam Extension 3). This could be an indication of the effectiveness of the seepage cut-off trench in containing seepage from the ash dam complex.

With the addition of a single composite liner across the basin of Ash Dam Extension 3 the hydraulic head in the ash pile will be separated from the underlying shallow groundwater. The double herring bone drainage systems will further facilitate the separation of shallow groundwater from seepage water. This will significantly reduce the contribution of Ash Dam Extension 3 to both contaminant concentrations and the rate of spread of any existing or future contaminant plume. The direct impact of a lined Ash Dam Extension 3 on groundwater quality is anticipated to be of low significance. Ash Dam Extension 3 will not contribute significantly to the existing groundwater contamination risk nor will it worsen the current or future levels of groundwater pollution resulting from Komati Power Station.

The contamination of surface water at the ash dam complex is an impact of concern. Storm water management systems are in place to contain dirty runoff from Ash Dam Extension 3 and the existing ash dams. Ash Dam Extension 3 is not anticipated to result in surface water contamination beyond the footprint of the ash dam. Monitoring at the Gras Dam has however recorded a decline in water quality since 2009. This indicates that Gras Dam is receiving contaminated water either in surface runoff or from sub-soil seepage in the shallow groundwater. Water from the Gras Dam flows to the environment and is thus contaminating these watercourses. The impact is of growing concern could become very significant if the water quality declines further. At this point in time there is no connection between the declining water quality at AP02 and Ash Dam Extension 3.

The implementation of design and mitigation measures for Ash Dam Extension 3 will be important to ensure that the identified impacts remain of low significance. The effective implementation of the remedial measures at the ash dam complex, as well as improved control of all water at the Komati Power Station, are expected to reduce the significance of the cumulative groundwater contamination impacts. Ground and surface water monitoring will be vital to detect contamination plumes.

In addition, it must be considered that operation of Ash Dam Extension 3 is required as an essential development to facilitate the continued operation of and power generation from the Komati Power Station. Without Komati Power Station the base-load electrical power supply in Southern Africa will be reduced by nearly 1 MW. This will result in supply risks that could increase the chance of load shedding.

It is recommended that Ash Dam Extension 3 be granted a waste management licence by the competent authority in terms of the National Environmental Management: Waste Act, 2008. The recommendations set out in the draft EMPr should be included as a condition of project implementation.

SO611/EIR01 **March 2013**

ESKOM HOLDINGS SOC LIMITED

Operation of Ash Dam Extension 3 at Komati Power Station, Mpumalanga Province Environmental Impact Report (Final)

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TERMS AND ABBREVIATIONS

~	Approximately
BID	Background Information Document
CoC	Contaminant of Concern
DEA	Department of Environmental Affairs (formerly DEAT)
DWA	Department of Water Affairs (formerly DWAF)
EAL	Environment Assessment Level
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act 73 of 1989
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EPA	United States Environmental Protection Agency
G	General Waste
GCL	Geo-composite clay liner
GN	Government Notice
H	Hazardous, in relation to waste
IAP	Interested and Affected Parties
JAWS	Jones & Wagener Consulting Civil Engineers
kl	Kilo-litres
km	Kilometre
m	Metre
m^3	cubic metre
mamsl	Metres above mean sea level
MDEDET	Mpumalanga Department of Economic Development, Environment & Tourism
NEMA	National Environment Management Act 107 of 1998
NEM:WA	National Environment Management: Waste Act 59 of 2008
PM_{10}	PM_{10} are inhalable particulates with an aerodynamic diameter < 10 µm
R	Regulation
RoD	Record of Decision
Site	Refers to the Ash Dam Extension 3
SOC	State Owned Company
TSP	Total Suspended Particulates
UK EAL	UK-Environmental Assessment Levels

SO611/EIR01 **February 2013**

ESKOM HOLDINGS SOC LIMITED

Operation of Ash Dam Extension 3 at Komati Power Station, Mpumalanga Province Environmental Impact Report (Draft)

1. Introduction to the Project

1.1 Project Motivation

Eskom Holdings SOC Ltd re-commissioned the Komati Power Station in Mpumalanga Province which now produces up to 970 MW of electricity (Figure 1). The combustion of coal at power stations produces ash that requires disposal. At Komati Power Station a wet-ashing system is used and the ash is deposited as slurry in engineered ash disposal facilities. The existing ash disposal facilities at Komati did not have sufficient capacity for the planned life of the station and it was therefore necessary to develop an additional ash disposal facility.

Eskom identified Ash Dam Extension 3 as a feasible solution to provide ash disposal capacity until the end of life of the power station. In 2007 Eskom appointed Synergistics Environmental Services (Pty) Ltd to undertake a scoping and environmental impact assessment (EIA) process for Ash Dam Extension 3. An application for environmental authorisation was made in terms of the National Environmental Management Act, No. 107 of 1998 (NEMA) and the 2006 Environmental Impact Assessment (EIA) Regulations. In August 2008 Eskom was granted a positive Record of Decision (RoD) for the construction and operation of Ash Dam Extension 3 by the Department of Environmental Affairs (12/12/20/1007). Ash Dam Extension 3 was constructed between February 2009 and November 2010. Ash disposal in the ash dam has not yet commenced.

In July 2009 the National Environmental Management: Waste Act, No. 59 of 2008 (NEM:WA) was enacted. The NEM:WA introduced new legal requirements for waste disposal, including ash generated from electricity generation. The disposal of waste to land requires a waste management licence in terms of the NEM:WA (GNR 718, 3 July 2009). The Department of Environmental Affairs advised Eskom that a waste management licence is required for the operation of Ash Dam Extension 3 as the facility was not operational at the time that the NEM:WA was enacted.

Eskom has submitted an application to the Department of Environmental Affairs for a waste management licence (Ref: 12/9/11/L1010/6). A scoping and environmental impact assessment process, as stipulated in the Environmental Impact Assessment Regulations (GN R543, 18 June 2010) made under section 24(5) of the National Environmental Management Act, 1998 (No 107 of 1998), is required to support the waste management licence application. Synergistics Environmental Services was appointed as the independent environmental assessment practitioner and will undertake the work required to inform the waste management licence in terms of the NEM:WA.

Eskom applied to the Department of Environmental Affairs for exemption from some provisions of the 2010 EIA Regulations on the basis that Ash Dam Extension 3 was previously subjected to a scoping and EIA process, that a positive RoD was obtained and that the ash disposal facility has been constructed since the receipt of the RoD. On 23 January 2013 the Department of Environmental Affairs granted exemption from the scoping process and approved a 21-day public commenting period. Thus a scoping report will not be produced, but the Environmental Impact Assessment report for Ash Dam Extension 3 will be updated (this report) to be compliant with the 2010 EIA Regulations.

This report presents the results of the EIA undertaken for the operation of Ash Dam Extension 3 at the Komati Power Station in Mpumalanga. The draft environmental management programme (EMPr) presents the management and mitigation measures that have been identified to address the potential environmental impacts from this phase. These documents will be submitted to the competent authority as the environmental impact report (EIR) in support of the waste management licence application.

1.2 Background

Komati Power Station was originally commissioned in 1961 and operated until 1990 when it was mothballed. Eskom decided to re-commission the power station in order to meet the growing demand for base-load electricity generation capacity. Upgrading and refurbishment of the power station took place through a return-to-service (RTS) programme that took place between 2007 and 2012. The first generation unit was re-commissioned in January 2009 and an additional 5 units were re-commissioned over the subsequent months. The final units will be commissioned in 2013. It is anticipated that the operational life of the Komati Power Station will be 20 years from re-commissioning.

As part of RTS operations the existing ash dams were upgraded and re-commissioned. This activity was allowed in terms of the Record of Decision that was issued in December 2005. The consulting engineers recommended that the ash dams were restructured. Ash Dam 1 is operated as a compartment and its Extensions, 1 and 2, operate as a second compartment. The northern compartment of Extension 2 was converted to an ash water return dam. Ash Dams 2 and 3 have been closed as it was not financially viable to re-commission them (Jones & Wagener, 2007a).

The existing ash dams at Komati did not have sufficient deposition capacity for the planned life of the station and it was therefore necessary to develop an additional ash disposal facility. Eskom identified Ash Dam Extension 3 as a feasible solution to provide ash disposal capacity until the end of life of the power station. Eskom thus commissioned the work required to design, authorise and construct Ash Dam Extension 3. Design of Ash Dam Extension 3 commenced in 2007 and the facility was constructed by the end of 2010. Eskom notified the DEA of the intent to commence with ash disposal operations in June 2011. The DEA responded that, in spite of any NEMA authorisation, such disposal may not commence without a waste management licence in terms of the NEM:WA.

The NEM:WA states that "no person may commence, undertake or conduct a waste management activity except in accordance with published standards or a Waste Management Licence". The 'disposal' of waste is a listed waste management activity. Eskom was not undertaking the disposal of ash at the time of enactment of the NEM:WA and thus may not commence with ash disposal without a waste management licence. Eskom maintains the view that the August 2008 RoD issued to Eskom remains valid and covers the disposal of ash on Ash Dam Extension 3. Nevertheless, in the interests of co-operation between organs of state, Eskom agreed to submit an application for a WML. In terms of Section 49(2) of the NEM:WA a waste management licence for a waste disposal facility is subject to the concurrence of the Minister of Water Affairs. On the advice of the Department of Water Affairs, the design of Ash Dam Extension 3 has been improved to include a single composite liner.

1.3 Project Need and Desirability

Eskom's core business is the generation, transmission and distribution of electricity and Eskom currently generate approximately 95% of the electricity used in South Africa. The reliable provision of electricity by Eskom is critical for industrial development and employment creation in the region and Eskom's performance is therefore a contributing factor to the overall challenge of poverty alleviation and sustainable development in South Africa. If Eskom is to meet its mandate and commitment to supply the ever-increasing needs of end-users in South Africa, it has to continually expand its generation capacity and transmission infrastructure. Current energy and electricity demands within the country are projected to continue increasing. The decision to expand Eskom's electricity generation capacity is based on national policy and informed by on-going strategic planning.

The return-to-service of the Komati Power Station was identified as an important component in the generation of base-load capacity. At full capacity the Komati Power Station can provide nearly 1000MW. Such generation capacity is of particular strategic importance in the period up until new power stations are brought on line.

The operation of a coal fired power station, such as Komati, produces ash as a by-product of the power generation process. The ash is disposed of in specially designed ash disposal facilities. Komati Power Station is fitted with wet-ashing equipment and the ash is deposited as slurry in engineered ash dams. The existing ash dams at Komati did not have sufficient deposition capacity for the life of the power station. It was therefore necessary to develop a new ash disposal facility to provide capacity for future ash deposition at Komati Power Station. Ash Dam Extension 3 was identified and constructed between February 2009 and November 2010. Eskom had planned production at Komati Power Station to commence with ash disposal in Ash Dam Extension 3 by June 2011.

The electrical generation capacity of a power station is constrained by, among other requirements, the available capacity of the ash disposal facilities. Each ash disposal facility has a maximum total capacity that is related to the facilities' footprint, side slopes angle and height. In addition, a wet ash dam also has limits on the rate of ash disposal and the total ash that can be deposited in a particular time period. These limits are constrained by the available surface area and the safe rate of rise of the side walls of the dam. If too much ash is deposited on an ash dam in too short a period of time the dam could become unstable and unsafe. Such limits can restrict the electrical generation capacity of the power station.

Komati Power Station is currently operating up to 6 units and producing 670 MW of electricity. The volume of ash produced from this generation is dependent on the ash content of the coal that is combusted. In the previous year of operation at Komati, an average of 48 000 kT per month of ash for disposal was generated. The existing ash disposal facilities had a certain amount of capacity to receive this ash. Eskom had planned operations to alternate ash disposal between the current ash disposal facilities and Ash Dam Extension 3. However, as a result of the non-availability of Ash Dam Extension 3 all of the ash produced has been deposited onto ash dam 1 with extensions 1 & 2. The limited surface area on the existing ash dams means that the current rate of rise on these dams is above the safe limit of 3.5 m/year which increases the risk of dam failure (collapse) and could ultimately result in a Merriespruit type disaster with major consequential safety and environmental impacts.

It is therefore essential to commence with disposal operations in Ash Dam Extension 3 as soon as possible in order to avoid the risk of dam failure at Komati Power Station and reduce the potential for load shedding that would significantly affect the Republic of South Africa and other international customers.

In spite of the urgent need for the facility, it is also required that such facilities cause the least environmental degradation or pollution of a water resource as possible. In terms of the Principles set out in Section 2 of the NEMA and the practices required by Section 19 of the National Water Act, 1998, the design of Ash Dam Extension 3 must ensure that pollution and degradation of the environment are avoided, or at least minimised and remedied.

Figure 1: Locality of the Komati Power Station and Ash Dam Extension 3

1.4 Terms of Reference

Synergistics Environmental Services (Pty) Ltd was appointed by Eskom as the independent environmental assessment practitioner (EAP) to undertake the necessary work to meet the requirements of informing an application for a Waste Management Licence from the Department of Environmental Affairs (DEA) for the operation of Ash Dam Extension 3 at the Komati Power Station.

Synergistics had managed the EIA process for Ash Dam Extension 3 in support of the application for a record of decision from the Department of Environmental Affairs and Tourism in 2007/08.

1.5 Environmental Authorisation Requirements

1.5.1 History of the Environmental Authorisation Processes

The Komati Power Station RTS project was granted exemption from environmental authorisation (Ref: 17/2/1 NK 40) in 2005 by the Mpumalanga Department of Agriculture and Land Administration in terms of Section 22 of the Environment Conservation Act (No. 73 of 1989). The authorisation included the return to service of the Komati Power Station and the refurbishment of the existing plant without any capacity increase. A condition of the decision was that separate applications for authorisation must be lodged for any other development or activity at or near Komati Power Station. Development of Ash Dam Extension 3 to increase the ash deposition capacity thus required further authorisation from the authorities.

At the time of the application in 2007 the National Environmental Management Act (No. 107 of 1998) and the 2006 EIA Regulations (GNR 385-387, April 2006) had replaced Section 22 of the Environment Conservation Act. NEMA makes provision for the authorisation of controlled activities by a competent authority. In terms of Section 24 (1) of NEMA the potential environmental impact associated with these controlled (or 'listed activities') must be considered, investigated, assessed and reported on to the competent authority for the granting of a relevant environmental authorisation. Project activities for Ash Dam Extension 3 triggered activities that were listed in GNR 387 of the EIA Regulations. Thus a scoping and EIA were required for the proposed development and operation of the ash dam facility and its associated infrastructure at Komati Power Station. As Eskom is a State Owned Company (SOC), the competent authority for this project was the National Department of Environmental Affairs and Tourism (DEAT).

An application for authorisation was made to the DEAT (Ref: 12/12/20/1007) and a scoping and EIA process was completed. The assessment included a public participation process and the completion of various specialist reports. The final EIA report was submitted to the DEAT in May 2008. The DEAT issued a positive record of decision for Ash Dam Extension 3 and its associated infrastructure at Komati Power Station in August 2008.

1.5.2 Waste or Not

Waste disposal in South Africa was previously regulated in terms Section 20 of the Environment Conservation Act (No. 73 of 1989). Although most Sections of the ECA were replaced by NEMA and the 2006 EIA Regulations, Section 20 of the ECA remained in force. Waste management and the establishment, provision or operation of a disposal site required a permit issued by the Minister of Water Affairs in terms of Section 20 of the ECA.

However, ash produced from the generation of electricity was not recognised as a waste under the scope of the ECA. Regulations made under the ECA (refer to GN R 1986, August 1990 as amended by GN R 292 of February 2003) expressly exempted ash produced from the generation of electricity under the provision of the Electricity Act (No 41 of 1987) as a waste. Thus Eskom did not historically need to make applications for waste permits under Section 20 of the ECA for their ash disposal facilities. Similarly, the document series Minimum Requirements for Waste Disposal (2ndEd, DWAF, 1998) which provided guidelines on waste classification and the design of waste disposal facilities was not typically applicable to ash from power stations. Ash disposal facilities were thus not subject to the classification and design requirements set out in the Minimum Requirements.

The requirements of the National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA) came into effect on 1 July 2009. Section 20 of the ECA and the Regulations made thereunder were repealed by the NEM:WA. The NEM:WA introduced a revised and more comprehensive definition of waste, which clarified that ash from a power station is considered as a waste under the ambit of the NEM:WA.

However, the NEM:WA (Section 80(3)) is very clear that "*anything done lawfully under a provision repealed by subsection (1) remains valid until anything done under this Act overrides it*". Furthermore the transitional provisions in the schedule of listed waste management activities (GNR 718) also set out that "*Persons who lawfully conducted waste management activities listed in this Schedule on the date of coming into effect of this Notice may continue with those activities until such time that the Minister by notice in the Gazette calls upon those persons to apply for waste management licences*". As such any construction of ash disposal facilities and the ash disposal activity that was undertaken lawfully in terms of the ECA remains lawful under the NEM:WA.

1.5.3 Current Legislation

Komati Ash Dam Extension 3 was constructed between February 2009 and November 2010. Ash disposal in the ash dam has not yet commenced.

In July 2009 the National Environmental Management: Waste Act, No. 59 of 2008 (NEM:WA) was enacted. The NEM:WA makes provision for the identification of various waste management activities which may have a detrimental effect on the environment and NEM:WA introduced new law requirements for waste disposal, including ash disposal facilities. A waste management activity identified in terms of the NEM:WA may not commence, be undertaken or conducted except in accordance with published standards or a Waste Management Licence. The disposal of waste to land requires a waste management licence in terms of the NEM:WA (GNR 718, 3 July 2009).

The transitional provisions in the Schedule (Section 5 of GNR 718) allow for the continuation of waste management activities that were lawfully conducted on the date of the notice. However, the Department of Environmental Affairs is of the opinion, and has advised Eskom, that a waste management licence is required for the operation of Ash Dam Extension 3 as the facility was not operational at the time that the NEM:WA was enacted. Eskom has agreed to submit an application for a waste management licence. In terms of Section 49(2) of the NEM:WA a waste management licence for a waste disposal facility is subject to the concurrence of the Minister of Water Affairs.

Listed waste management activities are divided into Category A and Category B in the schedule (GN R 718, July 2009). Activities identified in Category B require an Environmental Impact Assessment (EIA) process, as stipulated in the Environmental Impact Assessment Regulations (GN R543) of the NEMA, in order to inform an application for a waste management licence.

1.5.4 Current Authorisation Process

The undertaking of a scoping and environmental impact assessment (EIA) process in support of an application for a waste management licence for the operation of Ash Dam Extension 3 at the Komati Power Station commenced in August 2012 with the submission of a waste management licence application to the DEA. The DEA acknowledged receipt on 30 August 2012 and provided a reference number **12/9/11/L1010/6**.

The initial application for a waste management licence to the DEA included copies of RoD and all of the reports compiled for the previous EIA process. In this submission an application was made for exemption from all provisions of the EIA Regulations and it was requested that the DEA issue the waste management licence on the basis of the previous EIA process. The DEA declined to grant the exemption on the basis that:

- the previous EIA was conducted more than 3 years prior and the information may be out dated, and
- an application for a WML is required to be supported by an EIA undertaken in terms of the 2010 EIA Regulations, not the 2006 EIA Regulations as was the case with the documents submitted.

A meeting was held between Synergistics, Eskom and the DEA on 29 November 2012 (see notes in Appendix A) where it was agreed that the following be applied in terms of the application:

- The current WML application has to be supported by documents that comply with the 2010 EIA Regulations.
- The EAP should identify processes from which Eskom should be exempted and motivate these with good reasons and with reference to the 2010 EIA Regulations. One of the processes which Eskom could be exempted from was the ‘scoping phase’. This was agreed by both parties.
- The decision on the exemption application has to be signed by the Deputy Director-General (DDG).

- Public participation as required in the EIA Regulations (including advertisements) will be undertaken. The PPP documents will include notice of the exemptions granted even though public meetings might not be conducted due to previous experience where the general public did not register or participate.
- The EAP will also continue to accept the registration of any interested and affected parties and document any issues and concerns raised.
- The EIR and EMP will be updated to meet the requirements of the 2010 EIA Regulations and to reflect the current environmental circumstances. In the EIR it will be emphasised that the structure has already been constructed based on the Environmental Authorisation received under NEMA.
- An update of the current environmental status, impacts and mitigation measures for Ash Dam Extension 3 will be required, more especially for the operation phase of the project.
- The DEA advised that the EAP should meet with the DWA: Engineering Services to get their opinion around a disposal structure with a drainage system but without a liner. The DEA will require that the DWA engineers issue an ROD for the ash dam extension designs.
- The DEA committed to fast tracking their review process without committing to specific timelines.

A revised application for exemption from certain provisions of the 2010 EIA Regulations was submitted to the DEA on 6 December 2012. The DEA granted approval of the exemption on 23 January 2013 with the requirement that interested and affected parties be notified of the exemption (see Appendix A). The approval granted the following exemptions:

- Requirement to conduct scoping and produce a scoping report
- Require for public review of the draft and final scoping; and
- Approved a 21-day public commenting period for the EIA report.

This EIR forms the final phase of the EIA process and documents the assessment of the environmental issues associated with the project and the management measures required to ensure an acceptable level of environmental risk. The environmental impact assessment report and draft environmental management programme have been compiled in accordance with the EIA Regulations (GNR 543) published in June 2010. The EIR report is hereby submitted to DEA for approval and granting of a waste management licence in terms of the National Environmental Management: Waste Act, 2008.

In terms of Section 49(2) of the NEM:WA a waste management licence for a waste disposal facility is subject to the concurrence of the Minister of Water Affairs. A RoD on the designs of the ash disposal facility is required from the Department of Water Affairs.

1.6 Authorisation of Listed Activities

Waste management activities which may not be undertaken without a waste management licence are set out in GNR 718 to the NEM:WA. The waste management activities, which are applicable to the operation of Ash Dam Extension 3 at the Komati Power Station are described in Table 1.

Table 1: Waste Management Activities Applicable to the operation of Ash Dam Extension 3 at the Komati Power Station (GNR 718)

Government Notice	ACTIVITY NUMBERS (AS LISTED IN THE WASTE MANAGEMENT ACTIVITY LIST)	Applicability of the listed activity
GN 718, 3 July 2009	Category B, (8) and (9)	The disposal of ash from the Komati Power Station to the already constructed Ash Dam Extension 3 at the Komati Power Station. (see Section 3.7.1 for a discussion on Ash classification)
	Category B, (11)	Ash Dam Extension 3 was lawfully authorised under the ambit of the NEMA and has already been constructed. Further construction may be required to bring Ash Dam Extension 3 into compliance with the DWA design requirements.

1.7 Competent Authority for a Waste Management Licence

The Directorate: Authorisation and Waste Disposal at the Department of Environmental Affairs (DEA) is the competent authority in terms of the NEM:WA, NEMA and 2010 EIA Regulations. The assigned case officer at the DEA is:

Ms Malepo Phoshoko
Tel: 012 310 3741
Fax: 012 310 3753
Email: MSPhoshoko@environment.gov.za

1.8 Structure of the Environmental Impact Report

The EIR has been structured in accordance with GNR 543 and includes the consolidated results of the public participation and authority consultation processes conducted to date. Table 2 provides a summary of the requirements of GNR 543 for an environmental impact assessment report, with cross references to the report sections where these requirements have been addressed. Table 3 provides the same information for the draft environmental management programme.

Table 2: Structure of the EIA in terms of GNR 543 Requirements

Legal and Regulatory Requirement	Cross Reference to Report Section
GNR 543 Section 31(1)	
If a competent authority accepts a scoping report and advises the EAP in terms of with regulation 30(1) to proceed with the tasks contemplated in the plan of study for environmental impact assessment, the EAP must proceed with those tasks, including the public participation process for environmental impact assessment referred to in Regulation 28(1)(g)(i)-(iv) and **prepare an environmental impact assessment report** in respect of the proposed activity.	This Report.

Legal and Regulatory Requirement	Cross Reference to Report Section
GNR 543 Section 31(2)	
An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in Regulation 35 and must include:	
(a) Details of: (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment;	See Project Information Sheet inside front cover of the report.
(b) A detailed description of the proposed activity;	See Section **Error! Reference source not found.**.
(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;	See Section 3.2.1.
(d) A description of the environment that may be affected by the activity and the manner in which activity may be affected by the proposed activity;	See Section 4. (entire chapter)
(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 all persons or organisations that were registered as interested and affected parties; (iii) A summary of the comments from, and a summary of issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues; and (iv) Copies of any representations and comments received from interested and affected parties	See Section 3.4 (steps taken and process followed), Section 5.2 (summary of issues raised), as well as Appendix A (copies of all relevant documentation and correspondence).
(f) A description of the need and desirability of the proposed activity;	See Section 1.3.
(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;	Within Sections 3.4, 3.5, 3.6 and 3.7
(h) An indication of the methodology used in determining the significance of potential environmental impacts	See Section 2.8
(i) A description and comparative assessment of all alternatives identified during the environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a process;	For each technology, in Section **Error! Reference source not found.**
(j) A summary of the findings and recommendations of any specialist report or report on a specialised process;	See text within Section 7.2
(k) A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of which issue and indication of the extent to which the issue could be addressed by the adoption of mitigation measures.	See Section 7.2

Legal and Regulatory Requirement	Cross Reference to Report Section
(l) An assessment of each identified potentially significant impact, including – cumulative impacts; (i) the nature of the impact; (ii) the extent and duration of the impact; (iii) the probability of the impact occurring; (iv) the degree to which the impact can be reversed; (v) the degree to which the impact may cause irreplaceable loss of resources; and (vi) the degree to which the impact can be mitigated;	See Section 7.2
(m) A description of any assumptions, uncertainties and gaps in the knowledge	Section 3.8.5
(n) A reasoned opinion as to whether the activity should or should not be authorised, and id the opinion is that the activity should be authorised, any conditions that should be made in respect of that authorisation	Section 7
(o) An environmental impact statement which contains – (i) A summary of the findings of the EIA; and (ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives	Section 7
(p) A draft environmental management programme containing the aspects contemplated in regulation 33	See Section 10
(q) Copies of any specialist reports and reports on specialised processes complying with regulation 32	See Appendices
(r) Any specific information required by the competent authority; and	No request received to date.
(s) Any other matters required in terms of sections 24(4)(a) and (b) of the Act.	None identified.
GNR 543 Section 32 (3):	
A specialist report or a report on a specialised process prepared in terms of these Regulations must contain-	
(a) details of- (i) the person who prepared the report; and (ii) the expertise of that person to carry out the specialist study or specialised process;	See Specialist reports in Appendices
(b) a declaration that the person is independent in a form as may be specified by the competent authority;	
(c) an indication of the scope of, and the purpose for which, the report was prepared;	
(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;	
(e) a description of any assumptions made and any uncertainties or gaps in knowledge;	
(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;	
(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;	
(h) a description of any consultation process that was undertaken during the course of carrying out the study;	
(i) a summary and copies of any comments that were received during any consultation process; and	
(j) any other information requested by the competent authority.	

Table 3: Structure of the EMPr in terms of GNR 543 Requirements

GNR 543 Section 33:	
A draft environmental management programme must comply with section 24N of the Act and include	
(a) Details of – (i)The person who prepared the EMP; and (ii)The expertise of that person to prepare and EMP.	See Project Information Sheet in front of the report.
(b) Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of – (i) Planning and design (ii) Pre-construction and construction activities; (iii) Operation or undertaking of the activity; (iv) Rehabilitation of the environment; (v) Closure; where relevant	See EMP Table
(c) A detailed description of the aspects of the activity that are covered by the draft EMP.	See Section 5 of the EIA
(d) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);	See EMP Table
(e) proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;	See EMP Table
(f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;	See EMP Table
(g) a description of the manner in which it intends to- (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; (iii) comply with any prescribed environmental management standards or practices; (iv) comply with any applicable provisions of the Act regarding closure, where applicable; (v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	See EMP Table
(h) time periods within which the measures contemplated in the environmental management programme must be implemented;	See EMP Table
(i) the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;	See EMP Table
(j) an environmental awareness plan describing the manner in which- i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;	See Section 10.4
(k) where appropriate, closure plans, including closure objectives	See Section 10.2.3.1

2. Environmental Legal Requirements

In accordance with EIA sub regulation 28(1f) of GN R 543, all legislation and guidelines that have been considered in the preparation of this report are documented. This section lists environmental legislation that has been identified as being pertinent to the OPERATION of Ash Dam Extension 3 at the Komati Power Station.

2.1 National Environmental Management Act, 1998

The National Environmental Management Act, 1998 (107 of 1998) (NEMA) and Environmental Impact Assessment Regulations published there under, set out a schedule of listed activities that may not be undertaken without environmental authorisation from a competent authority. In terms of Section 24 (1) of NEMA the potential environmental impact associated with these controlled (or 'listed activities') must be considered, investigated, assessed and reported on to the competent authority for the granting of a relevant environmental authorisation.

In August 2008 the construction and operation of Ash Dam Extension 3 was approved by the Department of Environmental Affairs and Tourism in terms of NEMA and Environmental Impact Assessment Regulations. The RoD granted approval for activity 1(a) of GNR 387 (April, 2006) for facilities and infrastructure, including associated structures or infrastructure for the generation of electricity where the electrical output is 20 MW or more or the elements of the facility cover a combined are in excess of 1 hectare. Ash Dam Extension 3 being 'associated structures or infrastructure' for electricity generation at Komati Power Station. The RoD did not include 'waste disposal activities' listed in the 2006 EIA Regulations because these were not applied for as ash derived from electricity generation was not considered as a waste at that time.

2.1.1 2010 EIA Regulations

The Environmental Impact Assessment Regulations define the requirements for the submission, processing, consideration and decision of applications for environmental authorisation of listed activities. The EIA Regulations have been revised twice in the last 10 years and the current Regulations are of June 2010. Any activity that is captured in the lists requires environmental authorisation from the competent authority. Three lists were published (GN R 544 - 546) to define activities that require either a Basic Assessment or an Environmental Impact Assessment process in order to inform a decision from the competent authority.

All waste related activities were omitted from the lists published in the 2010 EIA Regulations as they were replaced by waste management activities listed under the NEM:WA (see Section 2.1.3). However, other non-waste related activities listed in terms of the EIA Regulations may still be triggered by the ash dam. In this case environmental authorisation would then also be required in terms of NEMA.

No activities listed in the EIA Regulations will be triggered by the operation of Ash Dam Extension 3 at the Komati Power Station. Thus the operation Ash Dam Extension 3 at the Komati Power Station does not require an environmental authorisation in terms of the NEMA and EIA Regulations.

The procedural requirements of the scoping and EIA process, as set out in the 2010 EIA Regulations, are also applicable to the assessment process required to support an application for a waste management licences made under the National Environmental Management: Waste Act, 2008.

2.1.2 EIA Guidelines

The EIA Regulations provide clear instructions on the required content of EIA reports and this report has been prepared in accordance with these regulations. In addition, a number of draft guidelines to NEMA and the EIA Regulations have been published to assist in the scoping and EIA process. Guidelines that have been considered include:

- Integrated Environmental Management Guideline Series (5): Companion to the Environmental Impact Assessment Regulations, 2010 (DEA, 2012).
- Integrated Environmental Management Guideline Series (7): Public Participation 2010 (DEA, 2010).
- Integrated Environmental Management Guideline Series (9): Draft Guideline on Need and Desirability in terms of the Environmental Impact Assessment Regulations, 2010 (DEA, 2012).

2.2 National Environmental Management: Waste Act, 2008

The requirements of the National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA) came into effect on 1 July 2009. The Act makes provision for the identification of various waste management activities which may have a detrimental effect on the environment. A waste management activity identified in terms of the Act may not commence, be undertaken or conducted except in accordance with published standards or a Waste Management Licence.

On 3 July 2009 the list of waste management activities requiring a Waste Management Licence from a competent authority were published (GN R 718). Listed waste management activities are divided into Category A and Category B in the schedule. Activities identified in Category B require an Environmental Impact Assessment process, as stipulated in the Environmental Impact Assessment Regulations (GN R543) of the NEMA, in order to inform an application for a waste management licence. Waste management activities that relate to the operation of Ash Dam Extension 3 are presented in **Error! Reference source not found.**.

The two NEM:WA waste management activities that are triggered by Ash Dam Extension 3 are the ‘construction of facilities’ and the ‘disposal’ of waste. As Ash Dam Extension 3 was lawfully constructed and the structure is already on the ground, there is no legal requirement to obtain a waste management licence for the construction of the facility. However, the Department of Water Affairs: Engineering Services has indicated that additional measures will require to be implemented at Ash Dam Extension 3 in order to ensure that facility complies with the current design requirements for pollution prevention. In this case the addition of the pollution prevention measures as was recommended by the DWA will constitute such construction. It is therefore necessary to obtain a WML for the ‘construction of facilities’.

Eskom will undertake the disposal of ash to land. As ash is identified as a waste under the NEM:WA it is required to obtain a WML for the 'disposal of waste'. The currently endorsed system for classifying wastes is as set out in the Minimum Requirements (DWAF, 1998). The DWA also supports the draft Waste Classification and Management Regulations (WCMR) (GN 614 of August 2012) which set out different methods for classifying wastes. Ash from the Komati Power Station has been subject to the classification processes (see Section 3.7.1)

As required by the schedule (GN R 718), the assessment and reporting process in support of the waste management licence is being undertaken in accordance with the 2010 EIA Regulations (GN R543). These Regulations define the requirements for the submission, processing, consideration and decision of applications for environmental authorisation of listed activities.

2.3 Other Applicable Legislation

2.3.1 National Water Act, 1998

Section 21 of the National Water Act, 1998 (No. 36 of 1998) (NWA) lists water uses for which a water use licence must be obtained. An Integrated Water Use Licence Application (IWULA) for water uses at Komati Power Station was compiled in 2007 and submitted to the Department of Water Affairs and Forestry (DWAF) for approval. This submission did not include water uses at Ash Dam Extension 3.

A further submission was made to the DWAF in August 2008 in support of a Water Use Licence Application for the Construction and Operation of Ash Dam Extension 3 at Komati Power Station. The submission included the water use licence forms in terms of section 21(g) of the NWA and a Technical Report. It is understood that the DWAF and Eskom discussed and agreed that the water use licensing of Ash Dam Extension 3 would be combined with the IWULA to be issued for the Komati Power Station.

Progress with the IWULA for Komati Power Station has been extremely slow and it is understood that the DWA is yet to issue the licence. Recent comments (January 2013) from the DWA have requested that an application for 21 (c) and (i) water uses be added to the Ash Dam Extension 3 application. This is due to the apparent 'wetland' within the site occupied by Ash Dam Extension 3. It was previously presented that the 'wetland' is in fact artificial and is present due to uncontained seepage emanating from the existing ash dams.

2.3.2 National Environmental Management: Air Quality Act, 2004

This National Environmental Management: Air Quality Act, 2004 (No 39 of 2004) has been promulgated with the objective of reforming the law regulating air quality in order to protect the environment. It also aims to comply with general environmental policies and to bring legislation in line with local and international good air quality management practices. All outstanding sections of the Act came into effect on the 1st of April 2010 (Government Gazette, 26 March 2010). The Act has established a National Management Framework with standards for dust and noise emissions. Current emissions standards for dust are considered in terms of SANS 1929.

A schedule of Listed Activities and Minimum National Emission Standards was published on the 31st of March 2010 (GN 248 of March 2010). Listed activities may only be undertaken after an Atmospheric Emissions Licence has been obtained. In terms of the Act the responsibility for the management of air quality has been delegated down to district and metropolitan municipality level with the Air Quality Officer responsible for issuing Atmospheric Emissions Licenses.

Waste disposal does not trigger any of the listed activities and an Atmospheric Emissions Licence is not required for the operation of the Ash Dam Extension 3.

The Highveld Airshed was declared the second priority area by the Minister in November 2007, requiring that an Air Quality Management Plan be developed for the area. The plan will include 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.

Komati Power Station falls within the Highveld priority area. Emission reduction strategies will be included for all significant sources of pollution in the area with specific targets associated with it. In September 2011 the DEA published the management plan for the Highveld Priority Area. Included in this management plan are 7 goals, each of which has a further list of objectives that has to be met. Goal 2 of the plan applies directly to the Komati Power Station

- Goal 2: By 2020, industrial emissions are equitably reduced to achieve compliance with ambient air quality standards and dust fallout limit values

The objectives associated with this goal include:

- Emissions are quantified from all sources.
- Gaseous and particulate emissions are reduced.
- Fugitive emissions are minimised.
- Emissions from dust generating activities are reduced.
- Incidences of spontaneous combustion are reduced.
- Abatement technology is appropriate and operational.
- Industrial Air Quality Management (AQM) decision making is robust and well-informed, with necessary information available.
- Clean technologies and processes are implemented.
- Adequate resources are available for AQM in industry.
- Ambient air quality standard and dust fallout limit value exceedances as a result of industrial emissions are assessed.
- A line of communication exists between industry and communities.

Each of these objectives is further divided into activities, each of which has a timeframe, responsibility and indicator. Refer to the DEA (2011) Highveld Priority Management Plan for further details.

2.3.3 Conservation of Agricultural Resources, 1983

The Conservation of Agricultural Resources, 1983 (No 43 of 1983) defines a list of registered

weeds and invader plants, categorises them into different classes and introduces restrictions where these plants may occur. The act prohibits the spread of weeds and requires that listed weeds be controlled.

An alien and invasive plant control programme in terms of the Act should be in place for all property owned by Eskom.

2.3.4 Regulations and Standards for Waste Classification and Management

The Minister of Water and Environmental Affairs has published draft documents (August 2012) as part of the Standards and Regulations provided for in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008). When finalised, the Standards and Regulations will replace the current 'Minimum Requirements' series published by the DWAF in 1998. The draft Standards and Regulations currently available for review include:

- DRAFT WASTE CLASSIFICATION AND MANAGEMENT REGULATIONS
- DRAFT STANDARD FOR DISPOSAL OF WASTE TO LANDFILL
- DRAFT STANDARD FOR ASSESSMENT OF WASTE FOR LANDFILL DISPOSAL

The new Standards and Regulations will alter the methods used to classify waste and provide an updated set of specifications for waste disposal site liners that are suited for the different classes of waste. These new Standards and Regulations will also place restrictions on the nature of wastes disposed to landfill.

3. Study Approach and Methodology

This Environmental Impact Report presents the Environmental Impact Assessment and Environmental Management Programme for the OPERATION of Ash Dam Extension 3 at the Komati Power Station. Given the previous scoping and EIA process completed for the Ash Dam and the exemption granted by the DEA in terms of the 2010 EIA Regulations, no scoping assessment was undertaken and a scoping report was not produced (see Exemption approval in Appendix A).

This EIA report has been compiled from information contained in the previous EIA report (Synergistics 2008) but has been updated with consideration for:

- The requirements of the 2010 EIA Regulations;
- Issues identified in the current public participation process;
- New design requirements for ash disposal facilities, and
- Current environmental status of the site and surrounds.

3.1 Study Objectives

The specific objectives of the EIA process are to:

- Address issues and concerns raised by IAPs during the public participation process;
- Assess the key environmental impacts of operation that were identified in the current and previous assessment processes;
- Identify mitigation measures to enhance positive impacts and reduce negative operational impacts identified during the EIA;
- Develop actions that can be implemented during operation to address impacts for inclusion in the EMP;
- Provide feedback to stakeholders; interested and affected parties as to how their concerns have been addressed; and
- Provide sufficient information to the environmental authorities in order that they can make an informed decision regarding the waste management licence.

3.2 Study Area

The study area is defined as the Ash Dam Complex at Komati Power Station, as illustrated in Figure 1. The Ash Dam Complex is contained by the R 35 to the east, the R 542 to the South, the Komati Power Station to the North and Komati Village to the west. Of particular relevance to surface and groundwater are the areas downstream of the Ash Dam Complex up to the unnamed of the Koornfontein River.

3.3 Baseline Environmental Description

The baseline environment represents the current (January 2013) prevailing environmental conditions at the Komati Ash Dam Complex prior to the operation of Ash Dam Extension 3. It is indicative of the level of environmental degradation due to naturally occurring phenomena and existing human activities such as power generation, ash disposal, mining, agriculture and existing infrastructure such as roads, powerlines and pipelines.

Environmental baseline information for the area was collated from a number of reports, national and regional databases, literature and a site visit to the Komati Ash Dam Complex. Information compiled for the previous scoping and EIA process was assessed and updated as required. Information obtained from the specialist reports has been summarised. The full reports from each of the specialists are included in the Appendices.

Environmental baseline information has also been drawn from recent monitoring conducted at Komati.

3.3.1 Existing Reports

- Komati Power Station, Ash Disposal System, Feasibility Study for the Future Operating Philosophy and Site Selection of a Surface Ash Disposal Facility, Report K120, June 1990.
- Jones & Wagener, Komati Power Station, Re-commissioning of Ash Dams, Feasibility Study, Report JW44/06/A542, January 2007.
- Jones & Wagener, Komati Power Station, Re-commissioning of Ash Dams, Report JW49/07/A784 – Rev A, April 2007.
- Komati Ash Dam Deviation: Final Design Document. Trans-Africa Projects, October 2007.
- Airshed Planning Professionals, Air Quality Impact Assessment of for the proposed for Komati Power Station Ash Dam Extension, APP/08/Sy ES-01, January 2008.
- Rison Groundwater Consulting, Geohydrological Investigation, Komati Ash Dam Extension, February 2008.
- Synergistics Environmental Services, Final Environmental Impact Report for Komati Ash Dam Extension 3, S0194/02, May 2008.
- GHT Consulting Scientists, Hydrological & Geohydrological Baseline Study for Komati Power Station, December 2008.
- GHT Consulting Scientists, Draft Hydrocensus report for Komati Power Station, February 2009.
- GHT Consulting Scientists, Komati Groundwater Qualities – Feedback. L137-12-09. September 2012

3.3.2 Monitoring Data

Current monitoring undertaken at the Komati Power Station includes

- Surface and groundwater quality.
- Ambient air quality.

3.4 Public Participation Process

The public participation process for the previous EIA was conducted in terms of the requirements of the 2006 EIA Regulations.

The current public participation process has been conducted in terms of the 2010 EIA Regulations 54 – 59 and Guideline 4: Public Participation in support of the Environmental Impact Regulations (DEAT, 2006) published in terms of the EIA Regulations. The exceptions to this process are as per the exemptions granted by the DEA (see Appendix A). As there was no scoping phase a 'plan of study for EIA' is not presented.

3.4.1 Advertisements and Site Notices

Press advertisements, informing the public of the ash disposal facility project and requesting participation in the public consultation process were placed on 1 February 2013 in the following regional and local newspapers:

- Die Beeld (in Afrikaans); and
- The Middelburg Observer (in English).

Copies of these advertisements are provided in Appendix B.

Site notices providing notification of the ash disposal facility project and requesting participation in the public consultation process were placed on 31 January 2013. These were placed at the site and at various locations in Komati Village. "A2-sized" posters were placed on site at the main entrance to the Komati Ash Dam complex and on the boundary fence in Komati Village. Additional A3 posters were placed in Komati Village at the Igwababa Shop, the Igwababa Recreation Club, the Municipal Offices and at the general dealer shop in Blinkpan. A copy of the site notice and proof of placement are included in Appendix B.

3.4.2 Notification to Authorities and IAPs

A notification letter with background information on the project was compiled for circulation to all interested and affected parties. The document included a response sheet which provided persons with the opportunity to:

- register as IAPs,
- provide comment and raise issues or concerns, and
- list additional persons that would be interested in and/or affected by the project.

The notification requested written response from IAPs on or before 22 February 2013. The notification is attached in Appendix B.

All parties on the IAP Register from the previous scoping and EIA process were sent the notification. Where possible the contact details of these parties were updated. The proof of distribution is provided in Appendix B. In addition, the notification letter was delivered by Synergistics to ~ 50 of the residences in Komati Village that are adjacent to the Ash Dam complex.

The notification will be further circulated to any additional persons who register as an IAP or make enquiries with the public participation office.

3.4.3 Registration of IAPs

Persons who have returned the response form or contacted the public participation office have been registered as IAPs and will receive further information regarding the project. The database of registered IAPs is included in Appendix B.

The register of interested and affected parties for the project was maintained throughout the EIA process and all stakeholder comments were recorded. The register was used to notify IAPs of project activities and opportunities for further involvement such as review of the EIR.

3.4.4 IAP Responses

A summary of the comments received from and the issues raised by IAPs is included in Section 6.2. Copies of the responses received from IAPs during the public participation process are provided in Appendix B.

3.4.5 Review of EIR

The draft environmental impact report was made available for review to all IAPs at the Komati Power Station security office from 22 February until 14 March 2013. This was as per the 21 day comment period agreed with the DEA. The report was also published on the Synergistics website at www.synergistics.co.za and the Eskom website www.eskom.co.za/eia from where it could be downloaded. All registered and affected parties were notified by fax, email or telephone of the report's availability.

Comments received from IAPs on the environmental impact assessment report will be used to update the report and produce the Final EIR for submission to the DEA. No comments on the draft EIR were received from IAPs. The final EIR will also be published on the website and made available.

3.5 Authority Consultation

Notification of the project was posted and or faxed to the relevant officials at the following government departments:

- Steve Tshwete Local Municipality (Ward 4 Councillor, Municipal Manager),
- Nkangala District Municipality (Municipal Manager),
- Department of Water Affairs (National and Provincial), and
- Mpumalanga Department of Economic Development, Environment & Tourism (Director).

The draft environmental impact report was submitted directly to these Departments for a 21 calendar-day review period. The report was couriered on 22 February 2013. No comments on the draft EIR were received from authorities. The final EIR will also be provided to these Departments.

3.5.1 Meeting with DEA

See section 1.6 for details of the introductory meeting that was held between the DEA, Eskom and Synergistics.

3.5.2 Meeting with the DWA

After the initial meeting with the DEA it was evident that guidance was required from the DWA: Engineering Services to ensure that the designs for Ash Dam Extension 3 could be approved. Eskom, Synergistics and JAWS met with the DWA in Pretoria on 18 January 2013. The history of Ash Dam Extension 3 and the enviro-legal context was presented to the DWA. JAWS presented a background on the technical designs and construction of Ash Dam Extension 3.

Mr Legge of the DWA: Engineering Services indicated that in his opinion the current design (unlined and having only a blanket drain) could not be approved by the DWA as it does fulfil the basic requirements of Section 19 of the National Water Act relating to the protection of water resources, nor the principles set out in Section 2 of the NEMA. Although the design did not have to meet the liner requirements set out in the Minimum Requirements. Mr Legge was of the opinion that the designs would not have been approved by the DWA in the adjudication of a water use licence.

A discussion ensued and Mr Legge agreed that the design (as-built) could be amended to increase the protection provided to the water resource. The main hydrostatic head is likely to develop beneath the pond of the hydraulically placed tailings and any water impoundments on the ash dams. It was noted that this is the critical area for a containment barrier system in order to limit contamination.

The revised design should be motivated in terms of the new draft Standard for Assessment of Waste for Landfill Disposal. Depending on the classification of the waste, it was acknowledged that a single composite liner compliant with a Type C barrier over Ash Dam Extension 3's footprint would suffice as a practical mitigation measure. If the design was improved to include a single composite liner, Mr Legge indicated that he would be prepared to support water use and waste management licences. In this regard, he advised the project team to revise the design to include a type C liner as per the draft Waste Classification & Management Regulations (see Appendix A).

The DWA: Engineering Services reviewed the amended design drawings that were presented by JAWS on 18 February 2013. The DWA acknowledged that the design had been amended to include a single composite liner over the area of Ash Dam Extension 3 that incorporated a geotextile protection layer and a 500 mm coarse ash drainage layer, with a perimeter blanket drain. The DWA conclude that the design fully meets the accepted norms and standards set by the Minimum Requirements (2nd ed) and the superior draft Waste Classification and Management Regulations (GN 614 of 2012). The DWA thus recommend the acceptance of the amended designs for Ash Dam Extension 3 for both the waste management and water us licences (Appendix A).

3.6 Validity of Previous Specialist Studies

To inform the environmental assessment conducted previously a number of specialist studies were undertaken between October 2007 and January 2008. These included:

- Heritage Impact Assessment, completed by Dr J van Schalkwyk;
- Groundwater Impact Assessment, by Rison Groundwater Consulting;
- Air Quality Impact Assessment, conducted by Airshed Planning Professionals; and
- Ecological Impact Assessment, completed by Synergistics.

Since the positive RoD was obtained for Ash Dam Extension 3 in 2008, the only significant change that has taken place at the site has been the construction of Ash Dam Extension 3 itself. The entire surface of the site was disturbed during construction. Such activities altered the site with the result that the ecology was completely transformed and the potential for heritage resource discoveries was reduced. No heritage resources were identified during the construction. No further ecological or heritage work is required for understanding of the site or the assessment of environmental impacts.

The air quality impact assessment modelled potential dust fallout and related health impacts for the construction and operations phases. Construction of the original design for Ash Dam Extension 3 has been completed. Future operations are still planned as per the methods set out in the assessment. It is therefore expected that the findings of the air quality impact assessment remain valid and no further work is required for the assessment of air quality impacts.

Since the groundwater investigation was completed, ash disposal to the existing ash dams has been on-going. Recovered water continues to be stored in the ash water return dam located on the existing ash dams. The existing ash dams have a hydraulic head that potentially drives the flow of contamination to the groundwater resource. The construction of Ash Dam Extension 3 included the installation of a 4m deep sub-soil drain system on the downstream side of the extension. The sub-soil drain system extends around the existing ash disposal facilities. The trench was installed as a mitigation measure to reduce the seepage of water from the ash dam complex to groundwater. The sub-soil drain and sump have been functional since they were installed in 2009. An average of 15 500 m^3 of water has been captured in the drain and pumped to the return water dam per month. The sub-soil drain system has successfully prevented this water from entering the environment. The groundwater model included consideration of ash disposal to the existing ash dams and the use of the sub-soil trench as mitigation. Except for the delay in ash disposal to Ash Dam Extension 3, operations of the existing ash dams have been as per the information used in the groundwater investigation. It is therefore expected that the findings of the groundwater investigation remain valid and no further work is required for the assessment of groundwater impacts. Additional surface and groundwater monitoring data is available and this will be considered.

3.6.1 Groundwater Impact Assessment

A comprehensive groundwater investigation was carried out by Rison Groundwater Consulting (Rison) for the purposes of assessing the impacts of Ash Dam Extension 3 on groundwater resources (see Appendix C). Baseline investigations included the measurements of static water levels and groundwater quality, as well as basic aquifer parameter testing. Samples were taken at six (6) monitoring boreholes at Komati Power Station and information from various historical monitoring sources was also utilised. Aquifer testing was carried out on three (3) of the monitoring boreholes and included constant rate pump tests and recovery times.

Rison developed a numerical groundwater flow model and a contaminant transport model to provide an understanding of groundwater conditions at Komati Power Station. A conceptual model was developed for the study area, based on the geological setting, the hydrogeological parameters and groundwater flow patterns. The model included both the weathered and fractured aquifers. The model was constructed in MODFLOW Pro and was simulated with a series of defined assumptions. The model boundaries were set at the water divide south of the ash dams and the Koringspruit tributary north of the power station. The eastern and western boundaries were set at >1000 m from the ash dam area. The model was calibrated in both the steady state and transient state to quantify aquifer parameters.

The numerical model was used to understand the current baseline conditions and predict the likely impacts of the Ash Dam Extension 3 on groundwater quality. Two simulations were run over a 100 year time period. These included the current baseline situation (status quo) and the future situation with the addition Ash Dam Extension 3. The effectiveness of remedial measures being implemented at the site was also examined during the second simulation.

3.6.2 Air Quality Impact Assessment

In order to better understand the emissions from and air quality impacts of the proposed ash dam extension on the surrounding environment and human health an air quality impact study was undertaken by Airshed Planning Professionals (see Appendix D). The assessment comprised two components viz. a baseline characterisation and compliance assessment.

The baseline characterisation included the review of the site-specific atmospheric dispersion potential, relevant air quality limits and existing ambient air quality in the region. Use was made of site specific meteorological data and air quality data recorded for the region in the characterisation of the baseline conditions.

The air quality impact assessment comprised the identification and quantification of all sources of atmospheric emissions associated with the ash dam extension project. An emissions inventory was compiled, atmospheric dispersion simulations undertaken and the predicted concentrations evaluated. This included the simulation of ground level inhalable particulates (PM10) concentrations and dust fallout (TSP) that may arise from the ash dam.

The dispersion modeling results were analyzed to determine zones of maximum incremental ground level impacts (concentrations and dust fallout from each source) and the zones of maximum predicted cumulative ground level impacts (concentrations and dust fallout from all sources). The potential for human health and environmental impacts was evaluated in terms of pertinent local ambient air quality limits viz. the Department of Environmental Affairs and Tourism (DEAT) standards, recently included in the National Environmental Management: Air Quality Act and limits published by the South African Bureau of Standards (SABS). A series of mitigation measures were recommended in a Dust Management Plan (DMP) for the Power Station dust sources.

Air Quality Guidelines and Standards

In order to assess the impacts of TSP and PM10 emissions and ensure effective management of air quality, emissions need to be compared to standards and guidelines. Ambient, air quality guideline values indicate safe daily exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. Air quality guidelines and standards are given for specific averaging periods (the time-span over which the air concentration of a pollutant was monitored at a location). Generally the 24-hour average and annual average are considered as reference conditions. In South Africa, ambient air quality guidelines were published in terms of the National Environmental Management –Air Quality Act in 2004. However, updated ambient air quality limits (SANS 1929: 2006) have been published for public comment and it is likely that these limits will become applicable shortly. The application of these standards has not been defined, but it is likely that a certain number of exceedances of each of the standards will be allowed per year, and that offenders will be given a time period within which to improve emissions to the standards. The proposed SANS 1929 limits were used as reference points during the air quality impact assessment (Table 2).

Table 4: SANS Ambient Air Quality Limits

	PM10		TSP	
Standards	**Maximum 24 hr concentrations µg/m²/day**	**Annual average Concentrations µg/m²/day**	**Maximum Monthly dust deposition mg/m²/day**	**Annual average dust deposition mg/m²/day**
SANS 1929 (proposed limits)	75	40	600 (residential)	300

3.6.3 Heritage Impact Assessment

A phase 1 heritage impact assessment of the area proposed for the ash dam extension was carried out by Dr J van Schalkwyk (see Appendix E). The aim of the survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the area proposed for the development of the ash dam. The assessment involved a desktop review of available records for the area, as well as field survey of the proposed project area.

3.6.4 Ecological Impact Assessment

Synergistics completed an ecological assessment of the preferred ash dam site as the ash dam site has experienced significant historical disturbance, the investigation only comprised a site walk-over with the aim of identifying potentially sensitive sites that might require additional management. No natural, undisturbed habitats or sites of significance were located and thus no field sampling of fauna or flora was completed.

3.7 Subsequent and Recent Investigations

3.7.1 Water Quality Monitoring and Data Review

Surface and groundwater monitoring is undertaken on a monthly or quarterly basis for the entire monitoring network at Komati Power Station. Such monitoring has been undertaken since 1990 with relatively few gaps in data collation and few changes in the monitoring locations. In recent years (since 2008) the monitoring as well as additional water quality investigation has been undertaken by GHT Consulting Scientists. GHT have undertaken a hydrological & geohydrological baseline assessment, completed a hydro-census and updated the monitoring network to replace lost data points and add new points to inform monitoring (See Appendix F).

3.7.2 Ash Classification

Ash from the Komati Power Station was subjected to chemical analysis in order to undertake a waste classification. The study, completed in October 2012, was undertaken by Golder Associates. Ash samples were subject to acid rain leach procedure extraction, deionised water extraction and aqua-regia digestion at an accredited laboratory. The waste classification was undertaken in terms of:

- Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Second Edition, 1998; Department of Water Affairs and Forestry) (MRs), and
- the draft Waste Classification and Management Regulations (WCMR) (GN 614 of 2012) published for comment in August 2012.

In terms of the Minimum Requirements the ash was assigned to a Hazard Rating level based on the comparison of the analytical results to the Acceptable Risk Levels for specific Contaminants of Concern. The ash exceeded the ARL for Chromium (Cr), Magnesium (Mg) and Strontium (Sr). The ash is classified to hazard rating level 1 due to the elevated levels of Cr. In terms of the Minimum Requirements the Ash should thus be disposed on a H:H designed landfill, except when the monthly load is less than 2.8 tonnes when it can be disposed on a correctly engineered and authorised G:L:B+ landfill site with a leachate collection system.

Under the draft WCMR the analyses are compared to thresholds for leachable and total concentrations of potential Contaminants of Concern (CoC), which in combination, determines the Risk Profile of the waste. Under the total concentrations Arsenic (As), Barium (Ba) and Lead (Pb) exceeded the thresholds. For the leachable concentrations (B), Barium (Ba) and Chromium (Cr) exceeded the thresholds. Based on the total and leachable concentrations of CoCs in the Fly Ash, according to the methodology detailed in the WCMR, the Fly Ash is a Type 3 waste and can be disposed on a landfill site with a Class C liner. This is the equivalent of a G:L:B+ landfill site.

Currently, the Minimum Requirements are still enforceable while the WCMR is in draft and not promulgated yet. Therefore, at this point in time, the Fly Ash should be disposed of on a facility designed at H:H standards or correctly engineered and authorised G:L:B+ landfill site with a leachate collection system (provided that the total load for the CoC's are not exceeded) until such time that the WCMR has been promulgated. From the date of promulgation of the WCMR (in its current form) onwards Fly Ash can be disposed of on a G:L:B+ implying that if G:L:B+ facility could be identified at this point in time for acceptance of Fly Ash, this practice could proceed and will be fully compliant also in terms of the WCMR once promulgated.

It is important to note that the DWA: Engineering Services currently support liner designs that comply with the draft WCMR. In discussions regarding Ash Dam Extension 3, the DWA: Engineering Services has indicated that they would support approval of the facility design if this was revised to include a single composite liner barrier system (Appendix A).

It is also noteworthy that very few of the ions recorded at elevated levels in the groundwater (see previous Section) are identified as Contaminants of Concern in ash by the classification process. This provides further support to the theory that many of the contaminants recorded in the groundwater are not derived from the ash, but from other sources.

3.8 Environmental Impact Assessment Methodology

The identification and assessment of environmental impacts is a multi-faceted process, which combines quantitative and qualitative descriptions and evaluations. It involves the application of scientific measurements and professional judgement to determine the significance of environmental impacts associated with the proposed project. The process involves consideration of, *inter alia*: the purpose and need for the project; views and concerns of interested and affected parties; environmental legislation and guidelines; and general public interest. The generic criteria and systematic approach that will be used to identify, describe and assess impacts are outlined below.

3.8.1 Identification and Description of Impacts

For each environmental component (i.e. visual, air quality, ecology), impacts will be identified and described in terms of the nature of the impact, compliance with legislation and accepted standards and the significance of the predicted environmental change.

3.8.1.1 Current Impacts

Existing infrastructure and activities at and around the Komati Ash Dam Complex have, in many cases, altered the baseline environment to a less than natural state. In order to explain the environmental context of the Komati Power Station a general assessment of the current impacts arising from the site will be provided. The EIA will consider the current levels of environmental degradation as at February 2013.

3.8.1.2 Direct or Incremental Impacts

A detailed assessment of the impacts arising directly from the operation of Ash Dam Extension 3 is undertaken in this report. The impacts directly attributable to the project are the incremental impacts and will either constitute a new impact at the Ash Dam Complex or may alter an existing impact.

3.8.1.3 Cumulative Impacts

In assessing the potential impacts arising from the Ash Dam Complex cognisance will be given to the total cumulative impacts, i.e. the sum of the existing impacts from current operations and those anticipated from Ash Dam Extension 3.

3.8.2 Evaluation of Impacts and Mitigation Measures

The criteria that have been systematically applied throughout the impact assessment process to determine the significance of the impacts are given in Tables 4 to 6. The impact assessment method has taken into account the current environment and the details of the proposed project. Cognisance was given to both positive and negative impacts that may arise from Ash Dam Extension 3. The significance of the impact is calculated as follows:

Impact significance = consequence (intensity + frequency + extent + duration)* x *probability

Although the criteria used for the assessment of impacts attempts to quantify the significance, it is important to note that the assessment is generally a qualitative process and therefore the application of these criteria is open to interpretation. The process adopted will involve the application of scientific measurements and professional judgment to determine the significance of environmental impacts associated with the project. The assessment thus largely relies on experience of the environmental assessment practitioner (EAP) and the information provided by the specialists appointed to undertake studies for the EIA.

Where the consequence of an event is not known or cannot be determined, the “precautionary principle” is adhered to and the worst-case scenario assumed. Where possible, mitigation measures to reduce the significance of negative impacts and enhance positive impacts will be recommended. The detailed actions, which are required to ensure that mitigation is successful, will be given in the EMP which will form part of the EIA report.

Table 5: Criteria for assessing significance of impacts

EXTENT = SPATIAL SCOPE OF IMPACT	RATING
Site: limited to the impact site	1

Immediate area: affects the whole ash dam complex	2
Local area: impact affects neighbouring properties with 500m	3
Regional: impact extends beyond the neighbouring properties	4
Provincial: impact affects the Province	5
SEVERITY = MAGNITUDE OF IMPACT	**RATING**
Insignificant: impact is of a very low magnitude.	1
Low: impact is of low magnitude	2
Medium: impact is of medium magnitude	3
High: impact is of high magnitude	4
Very high: impact is of highest order possible	5
DURATION = HOW LONG THE IMPACT LASTS	**RATING**
Very short-term: impact lasts for a very short time (days or less)	1
Short-term: impact lasts for a short time (wee33ks or months)	2
Medium-term: impact lasts for the first few years of operation	3
Long-term: impact occurs over the operational life of the ash dam	4
Residual: impact is permanent (remains after closure)	5
FREQUENCY = HOW OFTEN THE IMPACT CAUSE OCCURS	**RATING**
Seldom: impact cause occurs once or twice	1
Occasional: impact cause occurs every now and then	2
Regular: impact cause is intermittent but does not occur often	3
Often: impact cause is intermittent but occurs often	4
Continuous: the cause of the impact occurs all the time	5
PROBABILITY = LIKELIHOOD THAT THE IMPACT WILL OCCUR	**RATING**
Highly unlikely: the impact is highly unlikely to occur	1
Unlikely: the impact is unlikely to occur	2
Possible: the impact could possibly occur	3
Probable: the impact will probably occur	4
Definite: the impact will occur	5

Table 6: Significance rating matrix

	Consequence (extent + severity + duration + frequency)																
Probability	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	

Table 7: Impact significance ratings

	Very high	>45	impact is of the highest order possible /potential fatal flaw
	High	35-44	impact is substantial
	Moderate	21-34	impact is real but not substantial in relation to other impacts
	Low	5 - 20	Impact is of a low order
	neutral	0 – 4	Impact is negligible

3.8.3 Assessment with Mitigation Only

In a typical EIA process the impact assessment considers the significance of impacts without mitigation, followed by the assessment of the same impacts with mitigation. This results in two significance ratings for each impact, one 'without mitigation' and the other 'with mitigation'. Such an approach aims to provide an indication of the effectiveness of the mitigation measures and results in an understanding of the residual impact.

However, in the case of a waste disposal site, this approach is not practical as the landfill site can only be legally operated with the prescribed design features and operating conditions in place. These conditions are required in terms of the Minimum Requirements for Waste Disposal by Landfill (DWAF, 1998) and are a permit/licence condition. Thus mitigation measures are effectively incorporated into a permitted landfill site as standard features and it is pointless to assess the significance of impacts without these mitigation measures. The assessment of impacts in the EIA has therefore considered the landfill site with the design and standard operating conditions or 'mitigation' in place.

However, if all the design and management measures were effectively implemented on a continuous basis then no impacts would be expected. The reality is that the ash disposal site may not always be operated at 100% of the design efficiency and hence impacts do result. These occur as result of technical failures, operational errors and environmental variables. Thus the impact assessment has considered the impacts '**with mitigation, but including occasional technical failures and operational lapses**'. This makes allowance for the normal operational and technical errors that typically occur at a landfill site.

3.8.4 Project Phases

Consideration will be given to the timing of each impact. Impacts may occur in one, multiple or all of the following project phases:

- Planning and design: Completed and not considered here;
- Construction; Completed and not considered here.
- Operation; Ash Dam Extension 3 will be operated in conjunction with on-going ash disposal at the Ash Dam Complex. The impacts of ash disposal to the facility will be considered.
- Closure and rehabilitation. Impacts during this phase of the project were assessed to a limited degree. The ash dam will be in operation for the life of the power station which could potentially be for a further 20+ years. There is a limitation in considering impacts of decommissioning as the status of the environment may have changed significantly at that stage. The aim of the assessment was thus to provide an initial input into the project in terms of measures that could be implemented during the initial phases to facilitate rehabilitation in the future.

3.8.5 Assumptions and Limitations

The key assumptions and limitations of this EIR are detailed below.

- Details of the site operations and design information used to describe the project and identify impacts were provided by the design engineers.

- It is assumed that this information is accurate and that Ash Dam Extension 3 will be implemented and operated as described.
- Monitoring data and the results of specialist studies formed the basis for the assessment of impact significance. It was assumed that the information from these sources is relevant and accurate.
- The identification of environmental impacts, the rating of impact significance and the recommendation of mitigation measures assumed that the design parameters and standard operating conditions at the Komati Ash Dam Complex are implemented with an acceptable level of management and maintenance efficiency. Occasional non-compliances or limited failures are an accepted part of operations and were thus included in the impact assessment.
- This study does not, and cannot assess the environmental risks associated with fires, accidents, very poor site management or maintenance and acts of nature. A full risk assessment would be required to deal with these issues.
- The assumptions and limitations of any specialist study or opinion are detailed in the individual reports.

3.9 Draft Environmental Management Programme

The draft environmental management programme for the Ash Dam Extension 3 was compiled in terms of the requirements of Section 33 of GN R 543 (June 2010), to address:

- Management of activities undertaken during ash disposal;
- Avoidance of environmental impacts;
- Monitoring to measure environmental change; and
- Rehabilitation of environmental degradation.

Note that Ash Dam Extension 3 has a positive RoD and an approved EMPr. Environmental management at the current facility is undertaken in terms of the conditions of the existing approval. The EMPr presented here only provides for the environmental management measures required for the OPERATION of Ash Dam Extension 3 as assessed in this EIA. This EMP should be implemented in conjunction with management measures set out in any other valid authorisations.

4. Description of Ash Dam Extension 3

4.1 Overview

Eskom Holdings Limited re-commissioned the Komati Power Station. The combustion of coal at the power station produces ash that s disposed of in engineered ash disposal facilities. At Komati Power Station a wet-ashing system is used through which ash is deposited as slurry in ash dams. The existing ash dam complex at Komati did not have sufficient capacity for the planned life of the station and it was therefore necessary to develop an additional ash disposal facility. A site adjacent to the existing ash dam complex, located on Farm Komati Power Station 56 IS, was selected as the preferred site for Ash Dam Extension 3.

4.1.1 Design of the Ash Disposal Facility

Jones and Wagener Consulting Civil Engineers completed the design of Ash Dam Extension 3. An operations report and detailed designs were produced and included in the EIA and IWUL submissions. The design of the facility did not include a liner as the facility was not designed in terms of the Minimum Requirements as ash was not a waste. The design called for the dam to be under drained to improve both the stability as well as reduce the volume of water seeping into the subsoils. A deep sub-soil drain system was included to intercept groundwater and seepage from Ash Dam Extension 3 as well as from the existing dams flowing below Extension 3.

Ash Dam Extension 3 has a footprint of 47 ha and provides capacity for the deposition of 13 500 000 m^3 of ash. Ash Dam Extension 3 is linked with the existing ash dams in that Ash Dam Extension 1 & 2 will be used as retaining walls for ash deposited on Ash Dam Extension 3. Approximately 5-10% of the southern portion of Ash Dam Extension 3 already has consolidated ash which was disposed before the station was moth-balled. The lowest point of Ash Dam Extension 3 is 1635 masl (natural ground level) and the highest point is 1642 masl (top of the consolidated ash). A penstock will be provided to decant storm and ash water off the dam.

4.2 Construction

Construction of Ash Dam Extension 3 was undertaken between February 2009 and November 2010. The site was cleared of vegetation and the topsoil was stripped and salvaged for use in rehabilitation. A starter wall was constructed of available in-situ soil on the outer perimeter of the ash dam footprint.

Ash Dam Extension 3 was constructed with a herring-bone under-drain system. A 4m deep sub-soil drain system was installed downstream of the dam to collect seepage water. All water drained off the ash dam is collected in ash water return drains and stored in the ash water return dam. Some of this water is recycled to the power station. Trenches are in place to divert clean water around the entire ash dam complex.

4.3 Operations and Life of Facility

Ash Dam Extension 3 is designed with a footprint of 42 ha, a maximum rise of 47 m from the natural topographical low and an ash deposition capacity of 13.5 Mm^3 (Figure 9). The design has maximised the capacity and hence operational life of the ash dam facility within the available space (J&W, 2007b).

Operation of Ash Dam Extension 3 has not yet commenced. The ash disposal facility will be operated as a traditional ring dyke using the daywall method. Daywalls will be constructed on the dam perimeter using fine ash. The outer walls are constructed during the day, hence the term 'daywall'. A 20 m wide daywall is to be constructed inside of the starter wall and will enclose the entire ash dam footprint. The daywall will be formed by constructing 1m high compacted bund walls on either edge of the daywall and filling the centre with the initial ash slurry. Only fine ash is to be used in the daywalls. The centre of the dam, created by the daywalls, will be filled with both coarse and fine ash slurry, with deposition taking place largely at night. The ash slurry is disposed of in the dam where the ash settles and the water is recovered. As a portion of the ash disposal facility gets filled from disposing of the ash for a specific period at one location the disposal point is shifted to a new location. Once the initial dam is filled to the appropriate level then a new daywall, covering a slightly smaller footprint will be constructed on the filled dam and the process repeated. The width of the daywall will be adjusted by the operator as necessitated by the gradual increase in deposition rate over time. The completed outer walls of the ash dam will be rehabilitated by covering them with a layer of topsoil and vegetating them.

Ash Dam Extension 3 will be operated in combination with the existing dams whereby ash is alternately disposed on either of the ash dams. Alternating the disposal provides time for the daywalls on the unused facility to stabilise and for the ash to dry out somewhat. Ash is delivered from the power station as slurry via a series of pumps and pipelines. Ash delivery pipes were installed in a ring feed around the ash dam footprint and connect to the ash delivery infrastructure at the north western corner of Ash Dam Extension 1. Two new pairs of 250 mm steel pipelines were installed in a ring around the ash dam, the first is the fine ash pipeline and the second the coarse ash pipeline. One pipe from each pair will be an operational line and the other a standby line.

Although Ash Dam Extension 3 has not been operated the drain and sump have been functional since they were installed. An average of 15 500 m^3 of water per month has been captured in the subsoil drain and pumped to the return water dam. This is water that would previously have been released to the environment.

4.3.1 Infrastructure and Services

The ash dam is accessed via a road around the perimeter of the ash dam footprint. Two pairs of 250 mm steel pipelines were installed around Extension 3 as operational and standby ash delivery pipes. These pipes connect to the ash delivery pipe and pump systems used for ash dam 1 and its extensions.

4.3.2 Storm Water and Seepage Water Management

Provisions are in place for storm water diversion around the existing ash dam area. Clean storm water is diverted around the ash dam complex to the Gras Dam. The up-stream cut off drains were extended to include the area upstream of Ash Dam Extension 3. Until the construction of Ash Dam Extension 3, Gras Dam was receiving both clean and dirty storm water. The remedial measures implemented for Ash Dam Extension 3 restored Gras Dam to a clean water dam. The dirty water system at the ash dam complex was upgraded as part of the Ash Dam Extension 3 construction. This included the construction of a new, larger capacity, dirty water dam and the development of sub-soil seepage trenches, a sump and a pump system. The new dirty water dam has a capacity of 120 000 m^3 (whilst allowing for a dry free board of 800 mm).

Dirty storm water running off the ash dams and ash dam slopes is collected in cut-off trenches at the base of each dam and drained to the sumps from where it is pumped to the dirty water dam. This water then decants to the power station for re-use.

Seepage water from Ash Dam Extension 3 that is intercepted by the sub-soil drain and under-drains is collected in a sump and pumped to the ash water return dam. This water is then recycled to the power station for reuse.

Figure 2: Layout of Ash Dam Extension 3

4.4 Amendments to the As-Built Design

Following a meeting with the DWA: Engineering Services (see Section 3.5.2) it was agreed to increase the protection provided to the water resource by upgrading the facility to include a single composite barrier liner system. The DWA indicated that the revised design should be motivated in terms of the new draft Waste Classification and Management Regulations (GN 614 of 2012) and ensure that the facility has a liner that complies with at least a Type C barrier. The DWA further indicated that if the design was improved sufficiently, they would be prepared to motivate for and support design approval to the DEA (see Appendix A).

The revised design was prepared by JAWS, with the following proposed:

- Retain the existing herringbone drainage system in the ash dam basin in order to:
    - provide preferential drainage paths to manage the shallow groundwater so that this remains below the liner, and
    - act as a leakage detection system below the liner.
- Add a Geo-composite clay liner (GCL) system on the dam basin, inside of the perimeter drainage system. The composite lining system comprising will include the scarification and compaction of the in situ soil material with a 2mm HDPE geo-membrane installed on the top.
- Install a second herringbone drainage system on top of the liner to ensure efficient removal of seepage water and leachate from the ash pile. The drains will comprise 110 mm HDPE collector pipes, which will be blanketed off with a geotextile and stone (13 and 6 mm).
- Place a 500 mm deep drainage layer of coarse bottom ash on the GCL to allow effective drainage from the overlying wet ash to the herringbone drainage system.

The revised conceptual design was presented to DWA: Engineering Services on 18 February. The DWA acknowledged that the design had been amended to include a single composite liner over the area of Ash Dam Extension 3 that incorporated a geotextile protection layer and a 500 mm coarse ash drainage layer, with a perimeter blanket drain. The DWA conclude that the design fully meets the accepted norms and standards set by the Minimum Requirements (2nd ed) and the superior draft Waste Classification and Management Regulations (GN 614 of 2012). The DWA thus recommend the acceptance of the amended designs for Ash Dam Extension 3 for both the waste management and water us licences (Appendix A).

Eskom will be requesting permission from the DEA to commence with retrofit construction of the revised design in parallel to the DEA's review and decision on the waste management licence for operation of Ash Dam Extension 3.

Figure 3: Revised Design Drawings for Ash Dam Extension 3

4.5 Financing of Environmental Control

Eskom is ultimately responsible for the financing of all control measures to ensure the protection of the environment as required in terms of local authority by-laws, Provincial and National legislation and the EMP for this project and all operations at Komati Power Station.

Where contractors are required to undertake work for this project, the control measures, objectives and requirements specified in the EMP must be set out in the tender and contract documents.

4.6 Environmental Reporting

The approved EMPr sets out the auditing and reporting requirements for Ash Dam Extension 3. This includes quarterly internal audits and an annual external audit.

4.7 Project Implementation Schedule

The proposed implementation schedule for Ash Dam Extension 3 is provided in Table 10. The table also outlines opportunities for consultation and participation over the life of the project.

Table 8: Project Implementation Schedule

Previous application for Environmental Authorisation				
Phase	**Applicant/EAP**	**Opportunities for Consultation and Participation**		**Schedule**
		Competent Authority	**IAPs, State Departments**	
Scoping		Acceptance of final scoping report		August 2007
EIA		Submission/Acceptance of Final EIR		May 2008
Authorisation		Positive ROD issued		August 2008
Construction		Notification of intent to construct submitted to DEA		November 2008 to December 2010
Operation		Notification of intent to operate submitted to DEA		**June 2011. Not started**
Current application for Waste Management Licence				
Phase	**Applicant/EAP**	**Opportunities for Consultation and Participation**		**Schedule**
		Competent Authority	**IAPs, State Departments**	
Application	Application for WML made to the DEA. DEA accepted application and issued reference 12/9/11/L1010/6			August 2012
Exemption	Application for exemption from provisions of the EIA Regulations made to the DEA. DEA granted exemption from Scoping and a reduced public review period for EIA			December 2012 January 2013
Scoping	DEA has granted exemption and no Scoping Report will be produced.			-
EIA phase EMP and Development	Specialist studies – previously completed. Additional design work done by Engineers			January 2013
	Complete environmental impact			February

	assessment. Compile EIA and EMP			2013
	Submit draft EIA report to DEA	Comments on draft EIA report	IAP review of draft EIA report (21 days). State Department review (21 days). Comments to EAP	February 2013
	Finalise EIA report Final EIA report to DEA.		Review of final EIA report (21 days) Comments to DEA	March 2013
Retrofit Construction	To be undertaken in parallel with DEA review and decision on the waste management licence. Awaiting DEA approval for construction.			
Authorisation		DEA Acceptance of Final EIA report (60 days)		???
		Waste Management Licence Granted / Refused (45 days)		???
	Notifications to IAPs regarding licence.			???
Appeal		.	10 days to lodge notice of intent to appeal	
			20 days to submit appeal	
		DEA to consider content of appeal		
Operation	To commence immediately on receipt of waste management licence			
Closure	Not currently planned			

It is hoped that the Department will undertake the administrative actions required to authorise the waste management licence for Ash Dam Extension 3 in the shortest possible time period.

4.8 Decommissioning and Closure

Eskom intends to operate Ash Dam Extension 3 for the life of the Komati Power Station which is estimated to be 20+ years. The decommissioning of the ash dam can only occur after the decommissioning of the Komati Power Station. At the time when the power station is closed the local environment may have changed significantly from the current state. It is therefore not feasible to undertake a comprehensive assessment of the closure related impacts. However, the basic impacts of decommissioning and closure are anticipated as follows:

- Health and Safety risks from:
  - Heavy equipment or machinery on site;
  - Working on steep or unstable surfaces
  - Hazardous waste materials on site;

- Environmental degradation from:
  - Contamination of surface and groundwater resources;
  - Hazardous waste materials on site;

- Waste residues on surfaces, drains and equipment.

Eskom will embark on the development of a plan for closure of the ash disposal facility at least two years prior to the planned closure of the Komati Power Station. Closure planning will be undertaken in terms of the Minimum Requirements and/or other relevant legislation as endorsed by the Department, and appropriate authorisation will be obtained.

4.9 Site Alternatives

The current location was identified as the preferred site for Ash Dam Extension 3 through a site screening process undertaken during the previous EIA. The site for Ash Dam Extension 3 has been transformed through the construction of the infrastructure for development of the site as an ash dam. It is therefore not prudent to consider site alternatives.

4.10 Technology Alternatives

The main alternative in the disposal of ash is the use of wet or dry ash disposal systems. The Komati Power Station is equipped with a wet ash system. The system is integrated with the existing infrastructure of the power station. It is therefore not prudent to consider alternative disposal systems.

4.11 No-go Development Alternative

If Ash Dam Extension 3 is not brought into operation this will significantly reduced the electrical output from and the overall life of Komati Power Station which would greatly increase the risk of load shedding that would significantly affect the Republic of South Africa and other international customers. It is therefore not prudent to consider the no-go alternative.

5. Description of the Affected Environment

The baseline environment described here represents the current environmental conditions of the ash dam complex at Komati Power Station and surrounds. It is indicative of pollution and degradation due to Komati operations, human, agricultural and mining activities in the area and naturally occurring phenomena. Baseline information was sourced from desktop studies, site inspections and from on-going monitoring completed at the site. The baseline information serves as a reference point to scientifically measure or professionally judge future changes to the environment that may occur with the operation of Ash Dam Extension 3 at Komati Power Station.

5.1 Regional Setting

Komati Power Station is located midway between Middelburg and Bethal in Mpumalanga (Figure 1) on the farm Komati Power Station 56 IS. The power station lies west of the R 35 provincial road north east of Komati Village. The existing ash dam complex is adjacent to the Komati Village and is located south of the power station, north of the R542 provincial road and between the R35 and Komati Village.

The Koornfontein Coal Mine is located west of the power station while the adjacent surrounds are comprised of agricultural farms. Additional residential areas, Blinkpan/Koornfontein, are located to the west of the power station, adjacent to the coal mine.

5.2 Climate

Komati Power Station occurs in an area with typical Highveld conditions. The summers are moderate and wet while the winters are harsh, cold and dry. Minimum long term temperatures have been recorded from -1.8°C to 13.7°C with maximum temperatures ranging between 18.4°C and 27.1°C, Average daily temperatures are in the middle 20°C range in summer (October to March) and are lower than 15°C in winter (April to September). Winter minima fall below 0°C in June, July and August.

The average total annual rainfall is ~735 mm with the rain falling mostly in the summer months (October to April). Peak rainfall occurs in January.

The prevailing wind directions are from the north-east and north, with frequencies of up to 10% and strong wind speeds of up to 15 m/s. During the day-time the predominant winds are from the north-westerly, northerly and easterly sectors, with an increase in frequency of winds from the north-westerly sector. Night-time conditions are characterised by winds from the north-easterly and south–easterly sectors. The seasonal variability in the wind field for the Komati Power Station site for 2006 is shown in Figure 6. In the summer months, winds from the easterly, south easterly and northerly sectors dominate, and stronger winds of up to 15 m/s occur from these directions. The winter months reflect winds from the northerly, south-easterly and westerly sectors, with a decrease in the frequency of winds from the northerly sector.

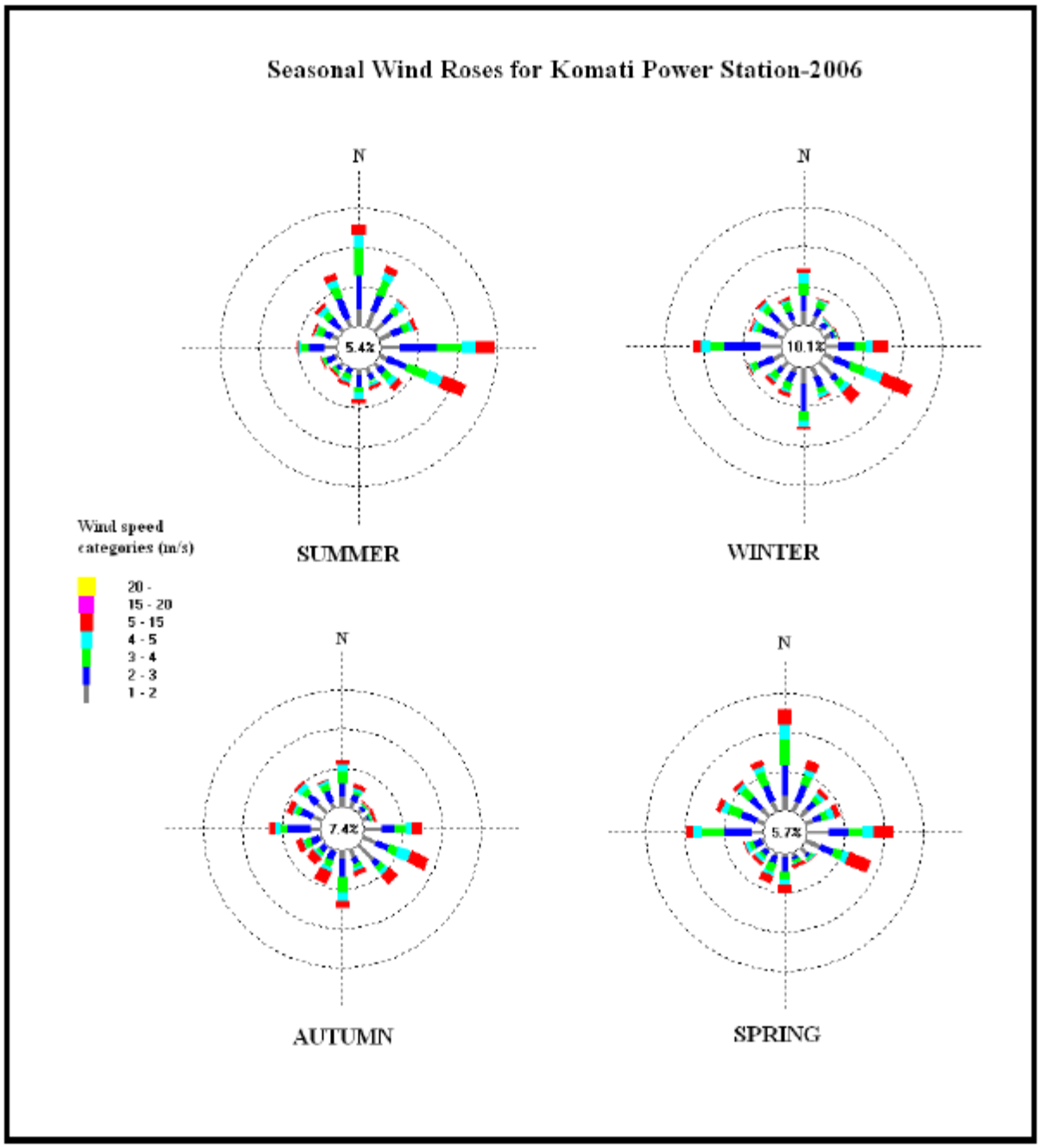

Figure 4: Seasonal Wind Roses for Komati Power Station (2006)

5.3 Topography

Surface topography of the ash dam area is gently undulating to flat with the majority of the area sloping toward the north-west. The topographical high of the ash dam area lies near the junction of the R35 and R542 provincial roads at approximately 1655 masl. The site slopes gently and consistently down to a natural topographical low near the Gras Dam (1610 masl). A small drainage line ran through the centre of the ash dam complex.

5.4 Geology

The regional geology consists of various groups within the Karoo Supergroup as well as numerous dolerite intrusions. Dolerite dyke and sill intrusions are ubiquitous throughout the area although no formations are

known to occur on the ash dam site. The Ecca group occurs extensively with the region and of the 16 formations, one, the Vryheid formation, dominates the immediate study area. The Vryheid formation comprises shale and sandstone elements interspersed with coal beds. These were laid down in a number of different cycles of deltaic and fluvial processes. Locally, siltstones and sandstones of the Vryheid Formation are encountered. These rock types weather to fine grained sands, silts and clays. In the lower terrain units a transported wet, clayey sand with occasional gravels overlies the residual profile.

Komati Power Station is situated within the Springs-Witbank Coalfield. The sediments of the coalfield were deposited on an undulating pre-Karoo floor and consequently the distribution and thickness of the Karoo Sequence sediments vary significantly. The sediments of the Karoo basin were deposited in fluvial floodplains and shallow shelves over a period of more than one hundred million years extending from the late Carboniferous (290million years ago) to the early Jurassic (190million years ago).

5.5 Soils and Land Capability

During geotechnical investigations of the ash dam site a number of test pits were excavated and the soil profiles recorded. The typical profile comprised:

0 – 1 m	Hillwash: moist, brown, loose, slightly clayey silty, fine and medium sand.
1- 1.7 m	Ferruginised Hillwash: moist, red brown mottled orange brown and grey, dense to very dense, moderately ferrunginised, slightly clayey silty fine sand with ferricrete nodules and concretions.
1.7 – 4.1 m	Ferruginised Transition: Moist, mottled orange brown red brown and grey, dense, moderately cemented and ferrunginised, clayey fine and medium sand with ferricrete nodules and concretions
4.1 – 4.9 m	Reworked Residual Siltstone/Sandstone: Moist, yellow brown mottled grey, firm to stiff, poorly ferrunginised, slightly micaceous, clayey fine and medium sand to sandy clay.

The reworked horizon grades into a residual siltstone of very stiff, sandy silt that extends to depths of 10 m. In the southern areas of the site very dense residual sandstone is encountered from depths of 2.5 m.

Soils in the footprint of Ash Dam Extension 3, particularly in the lower lying areas are damp to completely inundated. Much of the surface water on the site is derived from the seepage that comes from the existing ash dams. Topsoil was stripped from the entire site during the construction of Ash Dam Extension 3. This topsoil was used to cover portions of the existing ash dams that were being closed and rehabilitated.

Land capability of the majority of the local region is classed as arable and agriculture is extensively practiced. Construction of Ash Dam Extension 3 has severely limited the land capability through the removal of the topsoil.

5.6 Groundwater

The following section has been summarized from information in the groundwater impact assessment report compiled by Rison Groundwater Consulting and from comments by GHT Consulting Scientists (see Appendices).

5.6.1 Aquifer

Rocks of the Karoo Supergroup are not known for the development of economic aquifers, although occasional, high-yielding boreholes may be encountered. Generally, two distinct aquifers, namely a shallow, weathered aquifer and a deeper fractured aquifer occur. In the Komati area the general weathered aquifer extends to approximately 15 m below surface and there is a strong relationship between surface topography and groundwater level (99.96% correlation). The predominant groundwater flow in the study area is in a northerly direction toward the unnamed Koornfontein tributary, along a topographical gradient of approximately 1:70. Based on the geological borehole logs the depth of weathering in the weathered aquifer is relatively deep in places, reaching depths in excess of 66m in valley areas. Recharge to the aquifer is estimated to be in the order of 3% of the annual rainfall. The aquifer is often perched and due to the impermeable shale horizons, which restrict the downward filtration of rainwater into the aquifer, may even be artesian in places. The largest accumulation of water is normally confined to the contact between the weathered and “fresh” bedrock. Borehole yields in this aquifer are generally low due to the low transmissivity parameters of the aquifer material.

The deeper fractured aquifer, formed by bedding planes, fractures and faults is developed from approximately 10m. This aquifer seldom constitutes an economic aquifer as there is seldom significant groundwater flow as a result of the low porosity of the Ecca group rocks. Aquifer flows may be increased where secondary structures, such as dykes, have increased porosity and water bearing conduits. Water quality in the fractured aquifer is generally of a poorer quality as a result of the concentration of salts and the slow recharge rate. No dykes or sills are known from the site and results from the aquifer testing suggest that the aquifer is heterogeneous and not well developed in the study area. It is likely that the two aquifers are interconnected and that groundwater flows between the two.

The regional groundwater quality from the weathered aquifer in undisturbed areas is good due to the dynamic recharge from rainfall. A total of nine monitoring boreholes have been drilled at Komati Power Station and monitoring has been undertaken at various stages by different consulting firms. The assessment of sampling results from 2007 and 2008 indicated that the local aquifer is affected by contaminants. The source of these contaminants is most likely materials situated on-surface within the ash dam complex. The contaminants are not necessarily derived from disposed ash. Elevated sulphate, iron, chloride, magnesium, manganese and calcium levels were recorded in the majority of the monitoring boreholes at Komati Power Station (Appendix 12). There are no known groundwater users on the ash dam site or between the ash dam and the unnamed tributary of the Koornfontein mine.

It is expected that a groundwater mound occurs around the ash dams as a result of seepage from the ash body and return water dam into the underlying soil. Shallow groundwater seepage intercepted in test pits dug around the ash dam (2007-2008) suggests this.

5.6.2 Numerical Model

The numerical groundwater model was used to understand the current baseline conditions and to predict the likely impacts of the existing ash dams on groundwater quality. The groundwater model was run over a 100 year time period. Contamination, resulting from the current ash dams, is expected to move in a northerly direction towards the unnamed Koringspruit tributary north of the power station. Although the contaminant plume is expected to move relatively slowly through the aquifers, the model predicted that contamination from the ash dams will probably reach the unnamed tributary within 50 years. It is anticipated that sulphate concentrations (Figure 9), in groundwater contributing to stream baseflow could exceed 200 mg/l while the sodium concentrations (Figure 11) could exceed 50 mg/l and electrical conductivity (Figure 13) could increase to more than 100 mS/m. The result is that the baseflow water quality would not conform to SABS drinking water standards (Class 0) after the 50 year period. The impacts of the pollution plume on water quality will vary with high and low stream flows.

The numerical model completed by GHT (2009) indicates that migration of the contaminants seems to be localized with a relatively slow rate of lateral migration. The major pollution remains localised in the vicinity of the potential pollution sources. Movement of contamination to the deeper aquifer system appears limited. However a better understanding of the deep aquifer system is required to determine if pollution may migrate vertically. These findings are in agreement with the numerical model that was presented by Rison (2008).

5.6.3 Monitoring

The monitoring of boreholes around the Komati Power Station and ash dam complex (up to November 2012) has recorded groundwater with quality above the recommended standard limits. Mg and $S0_4$ are generally the main ions of concern although Ca, Fe, Mn and Na are sometimes recorded above the recommended reference limits. The main boreholes downstream the ash dam complex that exhibit clear signs of contamination are AB04, AB07 and AB55. AB06 shows limited contamination. A time series evaluation of the concentrations of these ions indicates a spike in concentrations in 2009, with decreasing trends since then. The current explanation for this observed trend is likely the high level of surface disturbances and the relative lack of surface water drains during the refurbishment of the ash dam complex. Various ash, coal discard and waste piles were disturbed in this period. High volumes of water were stored on and seeped from the ash dams. It is possible that this contamination influenced the groundwater quality.

With the construction of surface water drains and the sub-soil seepage trench in 2009 much of the surface and shallow groundwater flow from the ash dams has been captured and is prevented from reaching groundwater. Since then the recorded water quality in the boreholes has improved to levels recorded between 2002 and 2006 (see Figure 2).

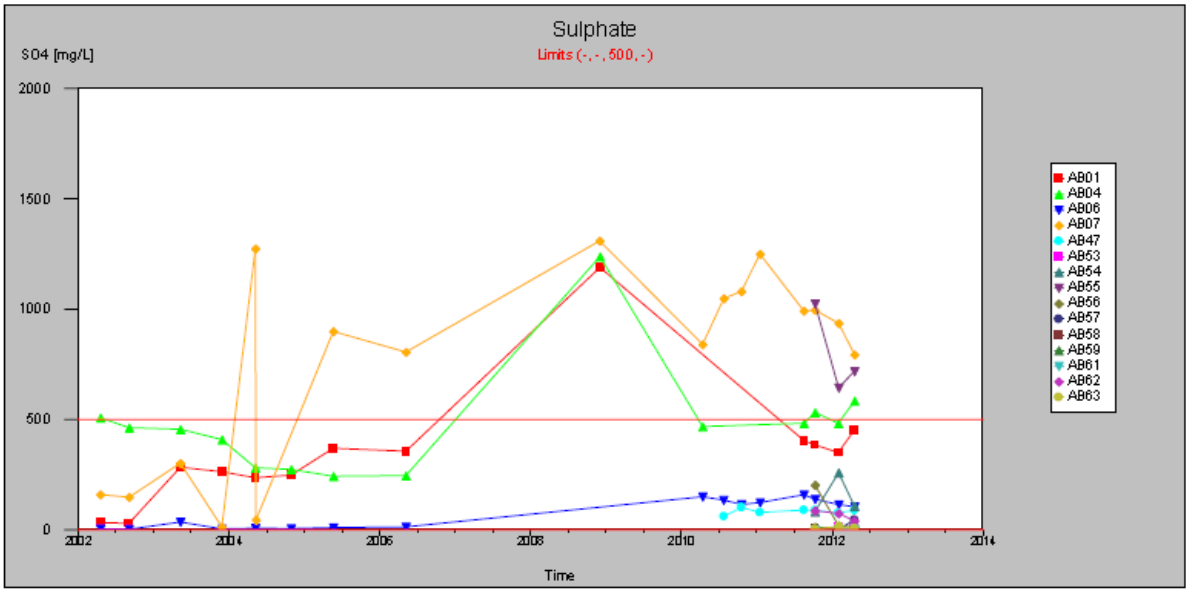

Figure 5: Sulphate Concentration Time Series in Boreholes at the Ash Dam Complex (GHT Consulting Scientists)

Limited impacts on groundwater quality are visible when water quality is examined in boreholes away from the pollution source (ash dam area). Virtually no impacts are visible at AB53, AB54, AB 56 and AB57. These boreholes also monitor the deeper aquifer and the water qualities recorded indicate that the contamination has not reached the deeper aquifer

5.7 Surface Water

5.7.1 Catchment

The Komati Power Station falls within the B11B quaternary catchment that has a surface area of approximately 482 km^2. The Koornfontein River runs to the north west of the Komati Power Station, and is joined by an unnamed tributary that flows from east to west past the power station. The Koornfontein River also passes the Koornfontein and Goedehoop Coal mines and drains to the Olifants River catchment. Historically the ash dam area drained in a north westerly direction, via a small unnamed drainage line to the Koornfontein River. The ash dams lie close to the head of this small catchment area.

The majority of the catchment of the unnamed drainage line is occupied by the dirty water area of the existing ash dams. Prior to the upgrades of the ash dams much of this dirty storm water was being released to the environment. Currently the storm water runoff from the existing ash dams is contained within a system of surface drains and is pumped to the ash water return dam. The Ash Dam Extension 3 footprint is also equipped with dirty water drains and the sub-soil seepage trench to collect and contain dirty water. Storm water from the site and seepage from the existing ash dams flows across the footprint of Ash Dam Extension 3. This surface water is collected in the surface drains or sub-soil trench and is pumped to the ash water return dam. No dirty storm water leaves the ash dam footprint.

Clean storm water is diverted around the ash dam complex and is released into the unnamed drainage line. The site for Ash Dam Extension 3 also has a clean water diversion.

5.7.2 Monitoring

The monitoring of surface water around the Komati Power Station and ash dam complex (up to November 2012) has recorded surface water with quality above the recommended standard limits. Na and SO_4 are generally the main ions of concern although Na, F, Mn and Ca are sometimes recorded above the recommended reference limits. The main points downstream of the ash dam complex that exhibit clear signs of contamination are AC05, AP02 and AP03. AC05 is a dirty water canal while AP03 is a seepage recovery dam. Water quality at these points is expected to be poor.

AP02 is clean water dam (Gras Dam) and the water qualities recorded here are a concern. The electrical conductivity and levels of Na, Mg and SO_4 exceed the recommended reference limits. The water qualities in the Gras Dam have declined significantly since 2010. This indicates that Gras Dam continues to receive contaminated water either in surface runoff or from sub-soil seepage in the shallow groundwater. Further investigation is required to understand this.

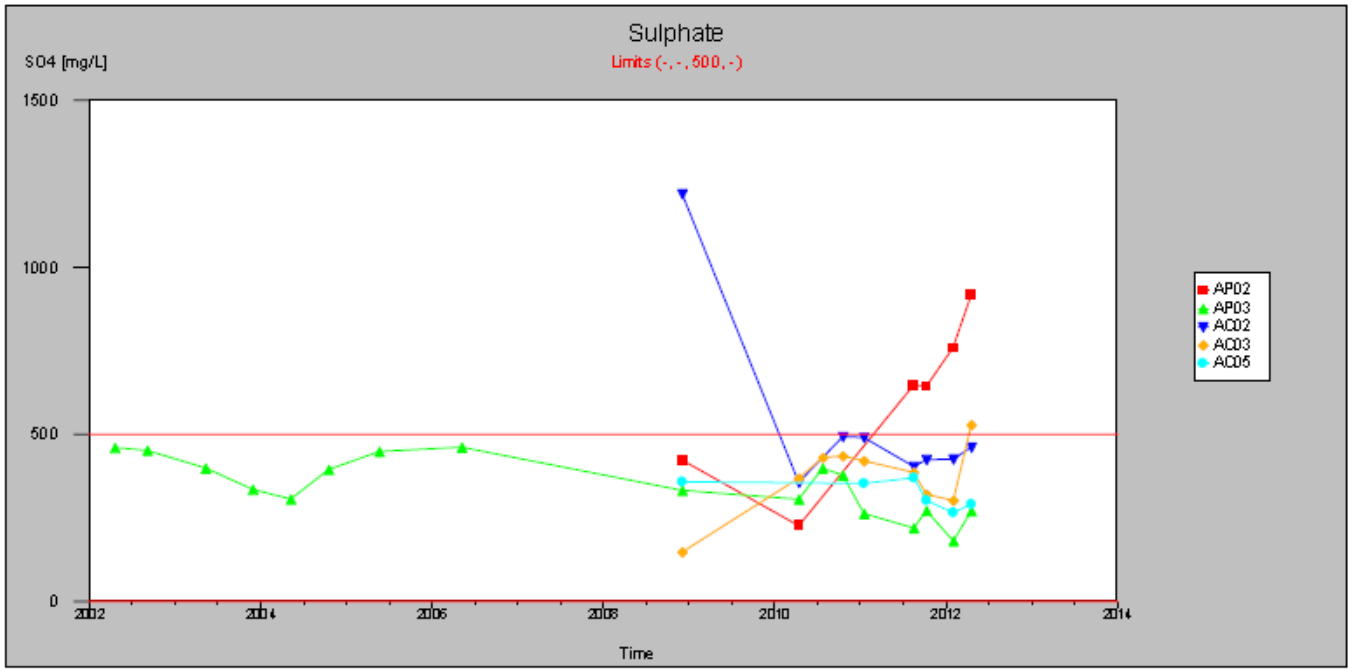

Figure 6: Sulphate Concentration Time Series in Surface Water at the Ash Dam Complex (GHT Consulting Scientists)

5.8 Land Use

The predominant land uses in the area are electricity generation and transmission facilities, coal mining operations, and agricultural activities with pockets of residential areas supporting these activities. The area of Ash Dam Extension 3 is between the existing ash dams, the power station and Komati Village. The site for Ash Dam Extension 3 has already been transformed during the construction of the site infrastructure.

5.9 Ecology

The Komati Power Station falls within the Highveld Grasslands region and in the Eastern Highveld Grassland vegetation type (Mucina & Rutherford, 2006). These short, dense grasslands are found on the gently undulating plains of the Highveld and include some low hills and pan depressions. The vegetation is dominated by the usual Highveld grass composition including *Aristida, Digitaria, Eragrostis, Themeda* and *Tristachya* spp. Occasional rocky outcrops occur with wiry, sour grasses and some woody species. The sward often has an extensive herb component. In general the vegetation unit is poorly conserved and transformation has been extensive (~44%) as a result of cultivation, plantations, mining and urbanisation. Erosion is not typically a concern within this vegetation unit.

The Ash Dam Extension 3 footprint is located within the Komati Power Station Property, adjacent to the existing ash dam complex. The area slopes gently to the north and was bisected by a small drainage line that drained via the Gras Dam to the Koornfontein River. Extensive historical and more recent operational disturbances altered the site. The disturbances include; roads and tracks; old buildings; seepage; deposits of ash, coal and other wastes; various in-stream and off-stream impoundments and the construction of Ash Dam Extension 3.

In 2008 the site was vegetated with a mixture of natural, disturbed and invasive species. The majority of the area is dominated by a grass sward of indigenous grasses, but many of the species on the site are typical of disturbed areas. Common species include *Hyparrhenia hirta*, *Cymbopogon validus*, *Sporobolus* spp and *Melenis repens*. In some places the grass sward has been extensively invaded by Kikuyu. There are a number of stands of exotic trees across the site; these include species such as the Black Wattle, Poplar, Willow and Bluegum. In addition there are numerous weed species occurring on the site including: the Spear Thistle (*Cirsium vulgare*), Cosmos (*Cosmos bipinnatus*), Tall Khakiweed (*Tagetes minuta*), and Large Thorn-apple (*Datura ferox*). The central drainage line, adjacent wet areas and dams have extensive reed (*Arund*o spp) and bulrush stands. In the areas with damp soils there are numerous sedge species and hydrophilic grasses as well as extensive stands of *Imperata cylindrical*, which is used to vegetate the walls of the existing ash dam.

Topsoil and all vegetation was completely removed from the ash dam footprint during the construction of Ash Dam Extension 3 in 2009. The bulk of the site has since re-vegetated with a similar mix of natural, disturbed and invasive species. Much of this would have been from root masses and send remaining in the in-situ soils. See Plate 1.

Plate 1: Current Status of Ash Dam Extension 3

Fauna on the ash dam site is limited by the disturbed nature of the area, both as a result of agriculture and power generation activities. in 2008 a number of common grassland bird species were observed in the natural and secondary grasslands, however sensitive grassland specialist such as lark, pipit, korhaan and cisticola spp are not expected to occur. Various water and wetland bird species were observed on the dam and wetland areas at the ash dam site. These included species such as White-faced Whistling Duck, Egyptian Goose, Yellow-billed Duck, Reed Cormorant, Sacred Ibis, Cattle Egret, Hadeda Ibis, Cape Weaver, Twany-flanked Prinia and Nedicky. All of these species are widespread and highly adaptable in their use of disturbed habitats. In its current status the footprint of Ash Dam Extension 3 is likely to support a similar assemblage of species.

No mammal species were observed during the 2008 site visit, but signs of Common Reedbuck, Grey Duiker and Porcupine were observed. It is likely that other common mammal species frequent the area, either permanently or on a transient basis however, as a result of the long history of disturbance of the ash dam site no sensitive mammal species are expected to persist. In its current status the footprint of Ash Dam Extension 3 is likely to support a similar assemblage of species.

5.10 Air Quality

The following section has been summarized from information in the air quality impact assessment report (see Appendix 13).

The Mpumalanga Highveld region has long been noted to have elevated air pollution concentrations and a number of sources of elevated emissions are located in the region. These sources have been associated with the long-range transportation of pollutants and have the potential for impacting on the air quality of the adjacent and more distant regions Criteria pollutants identified as of major concern in the region include particulates, sulphur dioxide and nitrogen oxides.

Sources of SO_2 and NO_x that occur in the region include Eskom power stations, industrial emissions, blasting operations at mines and spontaneous combustion of discard at coal mines, veld burning, vehicle exhaust emissions and household fuel burning. The highest ground level concentrations due to the Eskom Power Station stack emissions are expected to occur during unstable conditions when the plume is forced to ground in relatively close proximity to the power station.

Various local and far-a-field sources are expected to contribute to the suspended fine particulate concentrations in the region with the Eskom Power Stations predicted to contribute only marginally to such concentrations. Local sources include wind erosion from exposed areas, fugitive dust from agricultural and mining operations, particulate releases from industrial operations, vehicle entrainment from roadways and veld burning. Household fuel burning also constitutes a significant local source of low-level emissions. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute significantly to background fine particulate concentrations over the interior.

A cumulative study was conducted for Eskom in 2006 which predicted the highest and annual average concentrations of particulates in the study region for all the sources (Figures 6 and 7). The study led to the conclusion that elevated PM10 concentrations were predicted to occur in the study region as a result of regional emission sources and those of local operations. Background maximum daily concentrations were estimated to be between 25 µg/m³ and 75µg/m³ in the region. Annual average concentrations are estimated to be about 10 µg/m³.

The air quality impacts of the existing ash dam operations were considered using air dispersion modeling. The main source of fugitive dust emissions during operation of the ash dams is wind erosion from exposed surfaces. The predicted highest daily average ground PM10 level concentrations for baseline operations were less than 5 µg/m³, beyond the site boundary (Figure 15 and Table 12). These concentrations are well below the daily SA standard of 180 µg/m³ and the proposed SA standard of 75 µg/m³. The predicted maximum daily dust deposition rates for the baseline operations were 120 mg/m²/day and do not exceed the SANS residential dust fallout limit of 600 mg/m²/day beyond the site boundary or at any of the sensitive receptor sites (Figure 17 and Table 12).

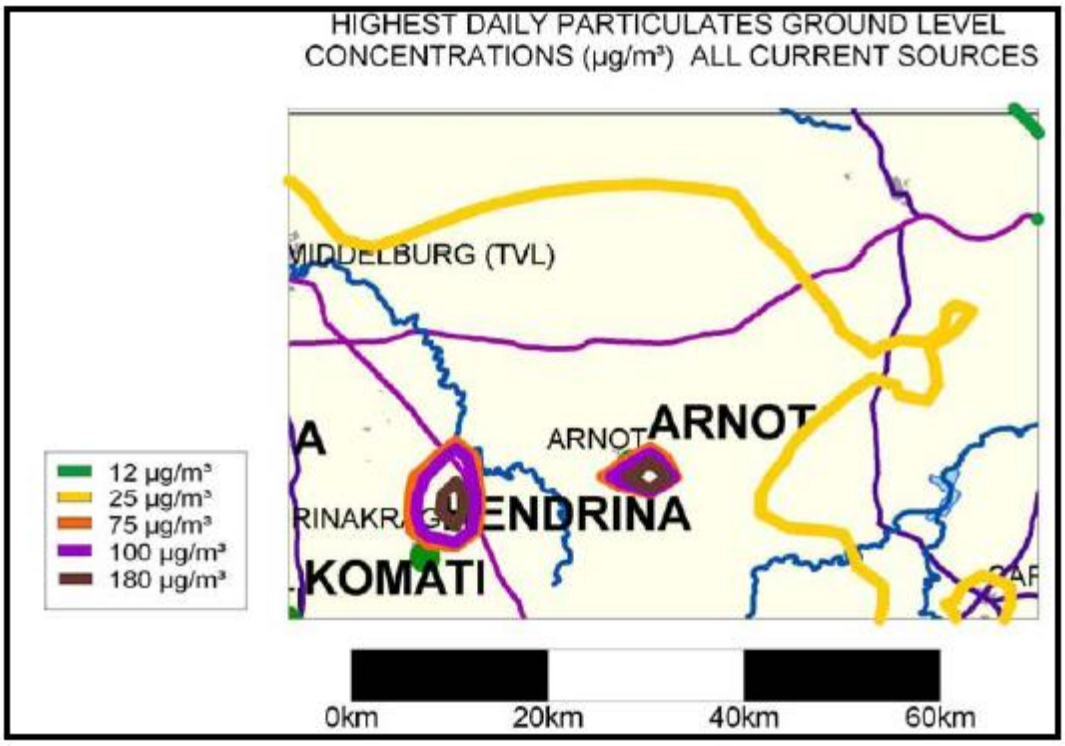

Figure 7: Predicted Highest Daily PM10 Concentrations in the Study Area

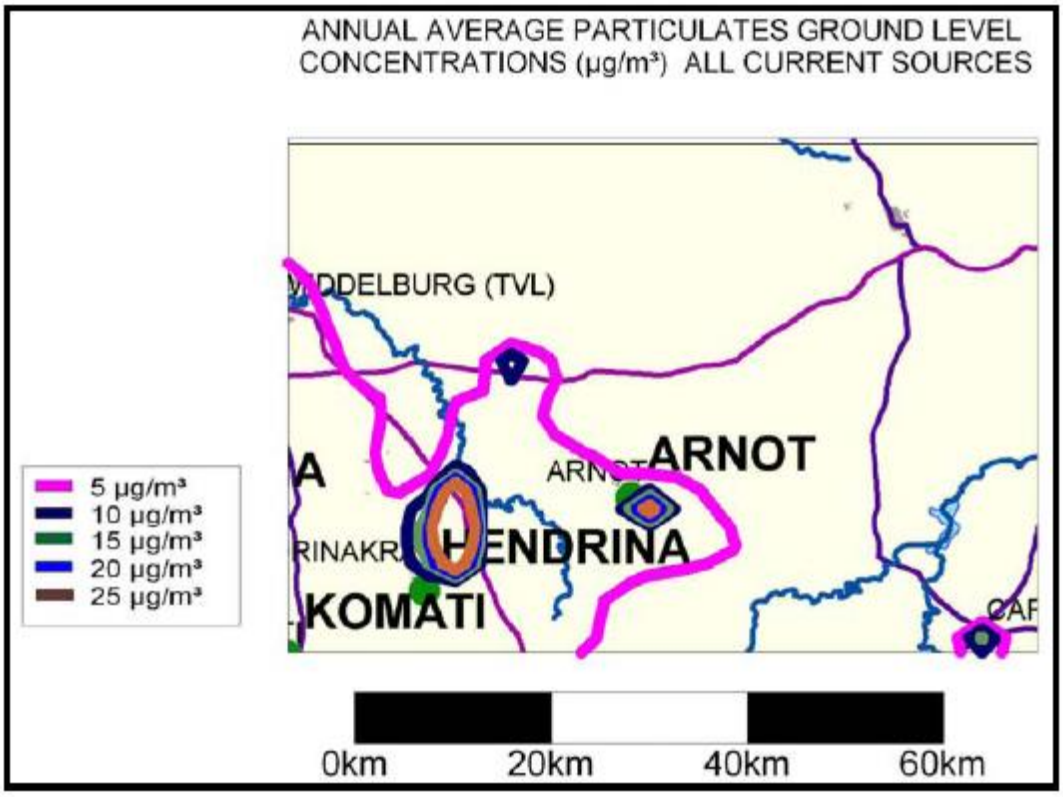

Figure 8: Predicted Annual Average PM10 Concentrations in the Study Area

5.11 Noise

Currently, the main source of noise in the area emanates from Komati Power Station and re-commissioning operations there. Noise sources include the operation of heavy machinery and the handling of materials at the power station and ash dam sites. Additional noise sources in the area include vehicles on the nearby provincial road, the mining operations and agricultural activities.

5.12 Cultural Heritage

The area is a farming district and there are known burial sites associated with many of the homesteads. No sites or artefacts of heritage value were discovered on the ash dam site during the heritage assessment. No sites or artefacts of heritage value were discovered on the ash dam site during the construction.

5.13 Visual Environment

The Komati Power Station, local coal mines (Koornfontein and Goedehoop) and associated infrastructure dominate the visual environment in this otherwise rural area. The mines and power station are large scale installations that dwarf other visual attributes in the area. The existing ash dams are large structures with a regular profile, but are vegetated and therefore less visually obtrusive than much of the other power station infrastructure. Numerous power lines depart from the power station and have a strong impact on the character of the area.

5.14 Social and Economic Environment

Komati Power Station lies within the Steve Tshwete Local Municipality and adjacent to the Komati and Blinkpan Villages. Municipal administration takes place in Middelburg, about 40 km to the north. Middelburg is a large, growing town and is an important agricultural and industrial centre in the region. Middelburg is the seat of local government and hosts a number of industries including stainless steel, coal mining, agriculture and electricity generation. The economic situation in the municipality is generally good with a number of large industries providing significant employment. Unemployment is around 30%.

The Steve Tshwete municipal area has a population of approximately 145 000 people. Water provision and sanitation services in the urban areas is generally very good with all residents having access to IDP standard water and sanitation, however in the rural areas the situation is poor. Rural households, including most of the informal settlements have access to electricity, but only 27% of rural households have access to electricity. Coal, paraffin and candles are thus still extensively used in the rural and informal settlements as sources of energy.

Approximately 398 persons, including Eskom personnel and contractors are currently employed at Komati Power Station during the re-commissioning phase. It is expected that there will be a permanent force of 217 employees at the power station during operation. 8 people will be involved in the management and maintenance of the ash dam facilities.

Komati Village was owned by Eskom prior to the mothballing of Komati Power Station, but nearly all of the houses are now privately owned. There are approximately 440 residential stands in Komati Village and a large proportion of the employed people work at the power station or associated services. A large number of people working at the power station live and commute from Middelburg, Witbank or Bethal. Service provision in Komati Village is of a high standard with all houses having water, electricity and sewerage facilities. Potable water to the Komati Village and the surrounding mines is provided by Komati Power Station.

6. Results of Public Consultation

6.1 Issues and Concerns from Previous EIA Process

The public participation for the previous EIA was undertaken between August 2007 and June 2008. Comments received during that process are included in the Table below.

Table 9: Previous Issues and Concerns raised by IAPs

COMMENT / ISSUE RAISED	PROJECT RESPONSE
Can it be guaranteed that the ash dam will never break its wall under heavy rain conditions and kill half of the residents Komati Village?	The ash dam is to be constructed, operated and monitored in accordance with the legal requirements and industry standards. A risk assessment was completed for the dam to determine the zone of influence and safety classification in terms of SANS 10286. Water levels on the dam will be managed to ensure that the dam cannot overtop during extreme rainfall. In addition, the dam infrastructure, including the gravity decant penstock, sump, pumps and return water dam have been designed such that neither storm nor ash water will be stored on the dam at any time. This will prevent the phreatic level (water table) within the outer wall from rising thereby ensuring the stability of the outer wall. The current ash dams at Komati Power Station have been in operation since the 1960s and have not broken. This provides good evidence of the sound integrity of the ash dam system.
Why is the ash not disposed of into the closed mine workings?	In the past ash was disposed of in the underground workings but this practice was discontinued. The underground disposal of ash from Komati Power Station has not been considered because there is the potential that the underground disposal of ash may result in impacts on groundwater resources that would be difficult to manage. On-surface disposal of ash results in a facility that is more easily managed. Impacts are likely to be easier to detect and mitigate.

6.2 Summary of Issues raised by Current Interested and Affected Parties

No persons have registered as IAPs during the current public participation process. No comments or concerns have been raised to date.

Table 10: Current Issues and Concerns raised by IAPs

No	IAP Issues	Project Response to IAP Issues	Reference to Report Section where IAP Issues are Addressed
1.			
2.			
3.			

6.3 Authority Issues and Concerns

The competent authority and the DWA: Engineering Services are the only Departments to have provided comments. See Sections 3.5.1 and 3.5.2 for a discussion of these issues.

Table 11: Authority Issues and Concerns, with Project Responses

No	IAP Issues	Project Response to IAP Issues	Reference to Report Section where IAP Issues are Addressed
1.			
2.			
3.			

7. Environmental Impact Assessment

Potential environmental (biophysical and socio-economic) impacts associated with the OPERATION of Ash Dam Extension 3 at Komati Power Station are evaluated in the following sections. A summary of the methodology used to assess the significance of environmental impacts is provided below. The methodology is fully described in Section 2.8.

7.1 Summary of Impact assessment Criteria

The significance of each impact was calculated as follows:

Impact significance = (extent + severity + duration + frequency) x probability

Although the criteria used for the assessment of impacts attempts to quantify the significance, it is important to note that the assessment is generally a qualitative process and therefore the application of these criteria is open to interpretation. The assessment process involved the application of scientific measurements and professional judgment to determine the significance of environmental impacts associated with the project. The assessment thus largely relied on experience of the environmental assessment practitioner and the information provided by the specialists who undertook studies for the EIA.

For each impact, the current situation is considered, then the impact is assessed with the addition of the Ash Dam Extension 3 and finally the total cumulative impacts assessed.

7.2 Assessment of Key Direct Impacts

The impact assessment has considered the operation of Ash Dam Extension 3 at Komati Power Station.

7.2.1 Topography

Construction of Ash Dam Extension 3 did not result in any major alterations to site topography. The deposition of ash into Ash Dam Extension 3 over a period of 20 years will change the natural topography of the site from gently sloped area to a steep-sided, flat-topped mound, nearly 50 m higher than the current ground level. Thus Ash Dam Extension 3 will result in a significant impact on the site topography.

Ash Dam Extension 3 is however adjacent to a series of existing ash dams and will be developed to the same height as these dams Ash Dam Extension 3 will not result in a topography that is significantly altered from overall current topography and the cumulative change in the topography is thus considered to be of low significance.

7.2.2 Soils and Land Capability

The construction of Ash Dam Extension 3 over a footprint area of approximately 42 ha included the removal and salvage of topsoil from the entire footprint. The current site has little soil and very low land capability.

Operation of the ash dam will have no further impact on the topsoil resource. Future land capability will be restricted to those uses deemed safe and acceptable following closure of the ashing operation. The direct impact on the site's land capability is of moderate significance.

Ash Dam Extension 3 is adjacent to a series of existing ash dams which will have similar restrictions on land use after closure. The cumulative impact on land use is of moderate significance.

7.2.3 Groundwater

The objective of the numerical groundwater flow model (Rison, 2008) was to predict the cumulative impact of the Ash Dam Extension 3 on groundwater quality. Two situations were modeled, including the current, baseline situation (status quo) and the future situation with the development of Ash Dam Extension 3 (including remedial measures at the existing dams, but without a liner).

7.2.3.1 Historical Situation

Details on the groundwater conditions that would result at Komati if the current situation continued have been discussed under the baseline chapter (Section 5.6). Modeling predicted that if the current situation persisted then the groundwater conditions near the unnamed tributary of the Koringspruit River were likely to deteriorate within 50 years (see Figures 9, 11 and 13). Impacts of high significance on groundwater are expected as a result of the seepage of contaminants into the groundwater resource. It is expected that the contaminants arise from a variety of sources including coal stockpiles, other wastes and contaminants and the existing ash dams.

Remedial measures, aimed at improving the management of seepage and groundwater at Komati Power Station, have been implemented to rectify the groundwater issues that developed while the power station was mothballed and those that arose during the re-commissioning (J&W 2007a). The main intervention was the sub-soil seepage trench that was installed along the entire downstream boundary of the ash dam complex. As much as 15 000 m^3 of water are recovered from this system per month. Perimeter drains capture dirty water runoff from the site.

Monitoring of groundwater in the period since the implementation of the remedial measures has recorded an improvement in water quality in some of the boreholes downstream of the ash dam complex. See discussion in Section 5.6.3. This could indicate that:

- some of the groundwater contamination was derived from surface sources disturbed during the ash dam construction. These sources were removed during the site clean-up or are now contained within the dirty water footprint of the ash dam and the contaminants are no longer reporting to groundwater; and/or

- the seepage cut-off trench is preventing contaminated water arising from the ash dam footprint from reporting to groundwater.

The monitoring data has corroborated the predictions of the groundwater model. Water qualities in boreholes downstream of the ash dam complex have stabilized or improved. This provides substantive evidence of the effectiveness of the remedial measures implemented at the ash dam complex. However, a number of parameters of the water quality in these boreholes remain in excess of the reference standards. This is indicative of the historical, and possible on-going, contamination of groundwater from sources at the ash dam complex (ash as well as other sources).

7.2.3.2 Ash Dam Extension 3 (unlined)

Groundwater conditions at Komati Power Station, with the addition of Ash Dam Extension 3 to the current situation, were simulated with the groundwater flow model. It was assumed that by the time Ash Dam Extension 3 was constructed that the remedial measures at the ash dam complex would be in place and these were included in the model parameters. Contamination of the groundwater is predicted to continue to occur from the ash dam complex. The plume is predicted to move in a northerly direction towards the unnamed Koringspruit tributary and will extend marginally further west than during the 'current situation' model. The increase in extent of the contamination plume is due to the additional hydraulic head provided by Ash Dam Extension 3. Elevated sulphate (Figure 10), sodium (Figure 12) and electrical conductivity (Figure 14) levels within the vicinity of the tributary are predicted to become noticeable within 50 to 80 years.

Although the addition of Ash Dam Extension 3 may marginally increase seepage and the production of contaminants, the design measures and the sub-soil seepage cut-off drain were predicted to significantly reduce the rate of contamination of the groundwater. While the extent of the contamination plume is predicted to extend further west than without Ash Dam Extension 3, the rate of spread is predicted to be reduced when compared with the historical situation. The effect of the sub-soil seepage cut-off drain will be to slow the spread of contamination and reduce the downstream concentration of pollutants by capturing seepage water and directing it to the return water dam. The herring-bone drain that will capture water from under Ash Dam Extension 3 will also reduce the seepage to groundwater.

Although some contamination will escape underneath the cut-off drain and continue to pollute the groundwater, there will be a reduction in groundwater pollution levels when compared with predictions for the current situation. The improvement over the predictions for the current situation is despite the addition of Ash Dam Extension 3 to the ash dam complex. Therefore, as long as the planned remedial measures are implemented, the addition of Ash Dam Extension 3 will not substantially change the contamination of groundwater over the current situation.

The unmitigated impacts of Ash Dam Extension 3 and the Ash dam Complex on groundwater are expected to be of high significance as water quality will be adversely affected. However, with the planned mitigatory designs and the implementation of remedial measures the impacts of Ash Dam Extension 3 on groundwater are expected to reduce to moderate significance as contaminants are partially contained. The current level of degradation is also expected to stabilize or improve as remedial measures are implemented and seepage to groundwater from the ash dam complex is reduced. The development of Ash Dam Extension 3 will therefore not substantially change the cumulative impact of the Komati Power Station and ash dams on groundwater.

Analysis of the ash from Komati Power Station during the waste classification identified a number of Contaminants of Concern in the ash. These elements, including Arsenic (As), Barium (Ba), Boron (B), Lead (Pb), Chromium (Cr), Magnesium (Mg) and Strontium (Sr), have the potential to leach from the ash under certain conditions and could be transported into groundwater. It is therefore expected that if leaching from the ash was the only source of groundwater contamination that one or a number of these elements would be recorded at elevated levels in the groundwater. Although not all of these elements are included in the monitoring regime, those that are (B, Cr, Mg) have not typically been recorded in excess of reference standards. It is more typically the sulphates (SO_4), Manganese (Mn), Sodium (Na) and Fluoride (F) that contribute to the groundwater exceeding the reference standards. This provides further evidence the source of groundwater contamination may be something other than the ash.

7.2.3.3 Ash Dam Extension 3 (lined)

Ash Dam Extension 3, as constructed in 2009-2010, included a herring-bone under drain system and a seepage cut-off drain to limit seepage from the ash pile into groundwater. These measures were predicted to reduce the contamination risk of Ash dam Extension 3 significantly in relation to the historical ash dams. However it was still anticipated that a certain level of seepage would arise from the ash dam complex and would, in the long-term, contribute to groundwater contamination.

Following a consultation with DWA: Engineering Services and JAWS, Eskom were advised that the current design of Ash Dam Extension 3 was not adequate. Without a liner the facility does not have adequate measures to prevent the potential contamination of the groundwater resource as is required by Section 19 of the National Water Act, 1998. The DWA advised that, given the classification of the ash as a Class 3 waste in terms of the WCMR, it is necessary to improve the facility to include a containment barrier system under the ash pile. A single composite liner compliant with a type C barrier system across the base of the ash dam would be adequate as a practical mitigation measure.

With the addition of a composite liner barrier system it is expected that the contribution of Ash Dam Extension 3 to the contamination of groundwater will be significantly reduced. The great majority of hydraulic flow through the ash pile will be contained on the liner and will report to the drainage system. Thus with the upgrade of Ash Dam Extension 3 to a lined facility it is anticipated that future concentrations of pollutants in the groundwater will be reduced when compared with the unlined facility. The future rate of spread of the contamination plume will also be reduced as the hydraulic head provided by Ash Dam Extension 3 will be separated from the groundwater resource. Thus the contamination of groundwater will be significantly reduced when compared to the model results presented in Figures 10,12 and 14. The design improvement will reduce the impact of Ash Dam Extension 3 on groundwater to low significance. However the cumulative impact of the ash dam complex on groundwater will remain of moderate significance as contaminants from the existing ash dams will continue to seep into the groundwater.

On-going groundwater monitoring will be essential to assess the spread of a pollution plume and determine the effectiveness of the mitigation measures. Groundwater monitoring must be conducted at the existing monitoring network on a quarterly basis. It is further recommended that future monitoring must include all of the CoCs identified in the ash classification. Investigations to improve the understanding of the geohydrological regime (i.e. the connectivity between the upper and deeper aquifer systems) will add value.

If future monitoring detects an on-going and significant decline in groundwater quality downstream of the ash dams then Eskom must develop an informed groundwater management plan for approval by the competent authority. Such plan must contain measures to prevent further contamination and limit the dispersion of contaminated groundwater. Eskom must undertake the investigations required to determine the feasibility and operating parameters of any such project.

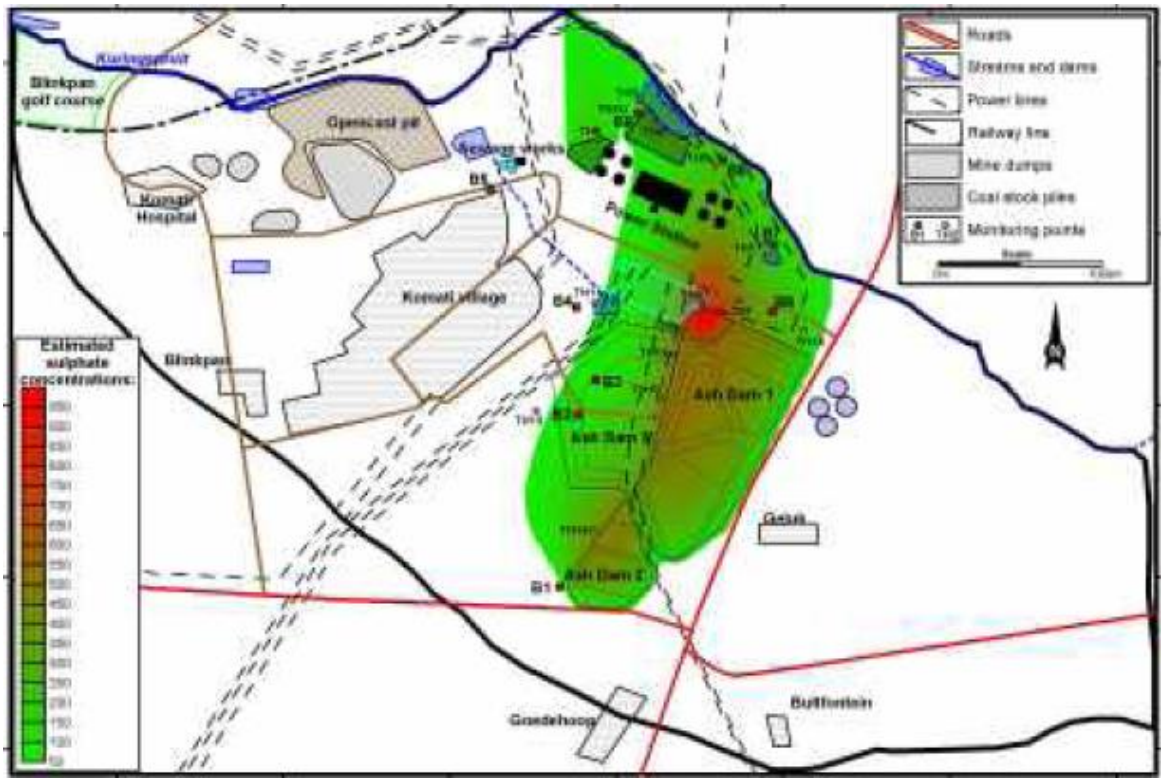

Figure 9: **Predicted Sulphate Contaminant Plume at Komati Ash Dam (Status quo)** (Rison)

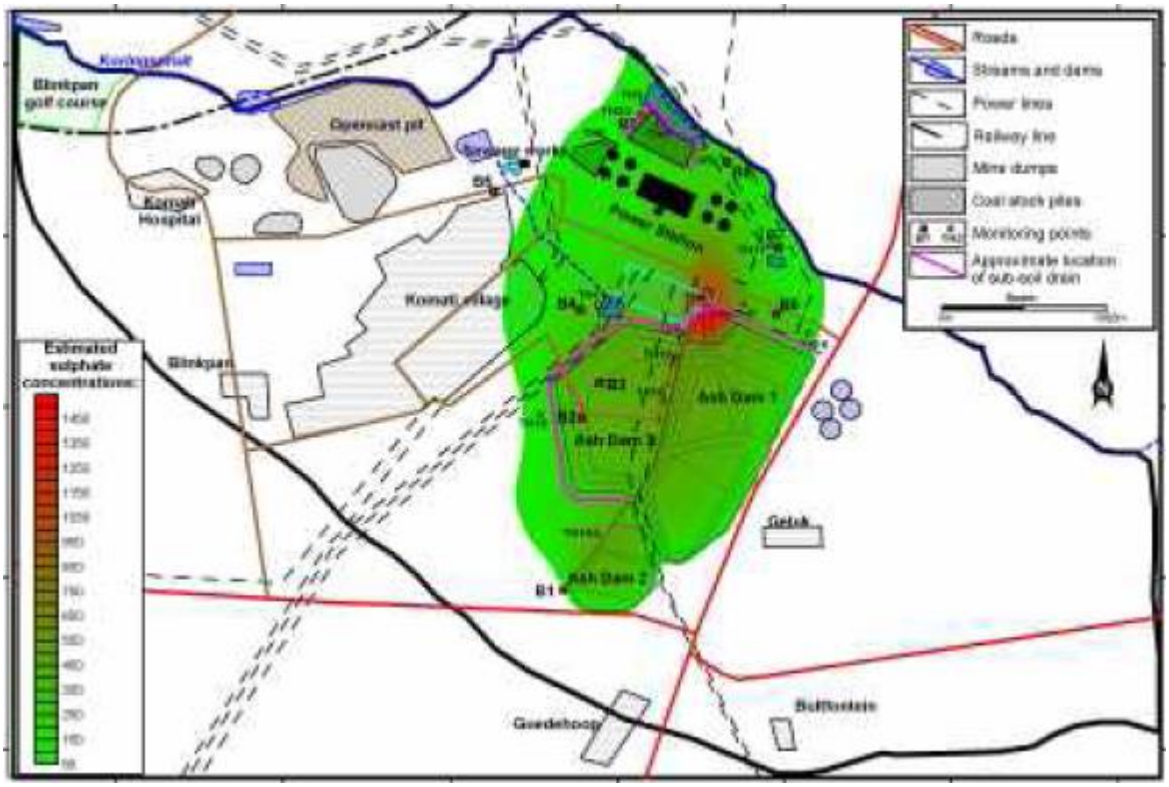

Figure 10: **Predicted Sulphate Contaminant Plume at Komati Ash Dam (Future)** (Rison)

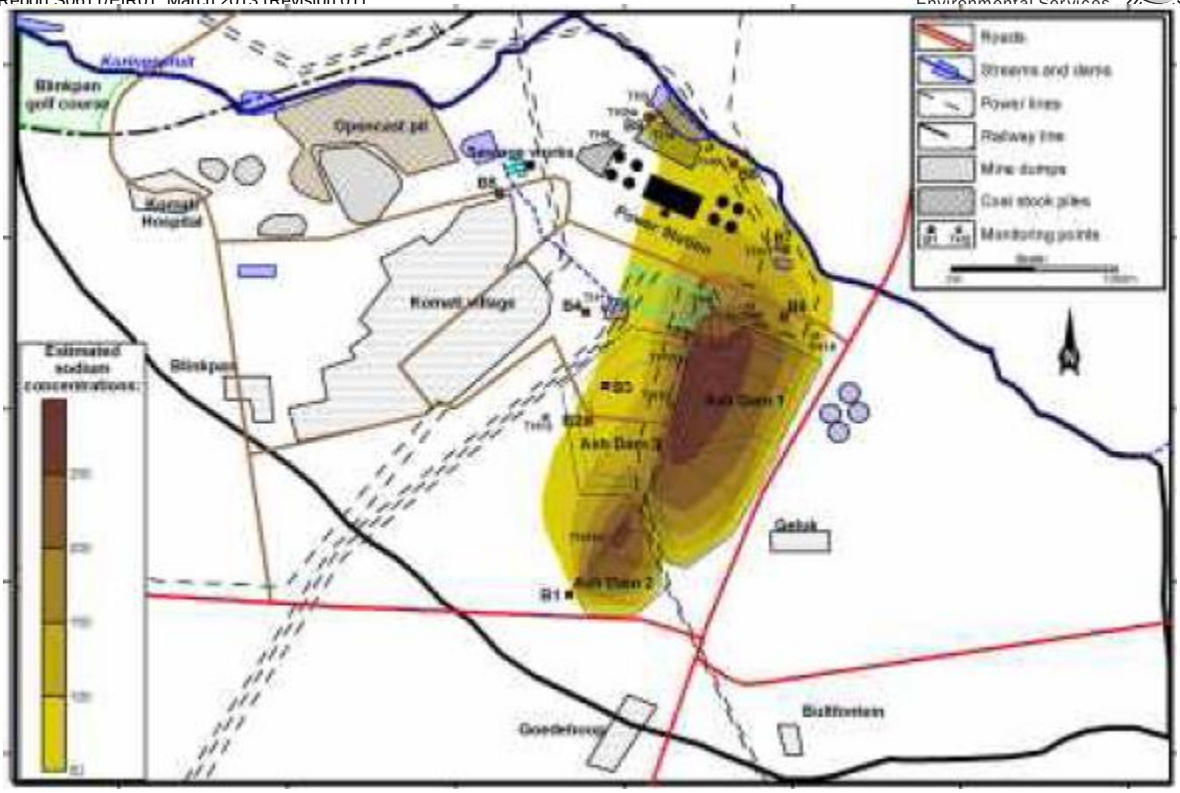

Figure 11: Predicted Sodium Contaminant Plume at Komati Ash Dam (Status quo) (Rison)

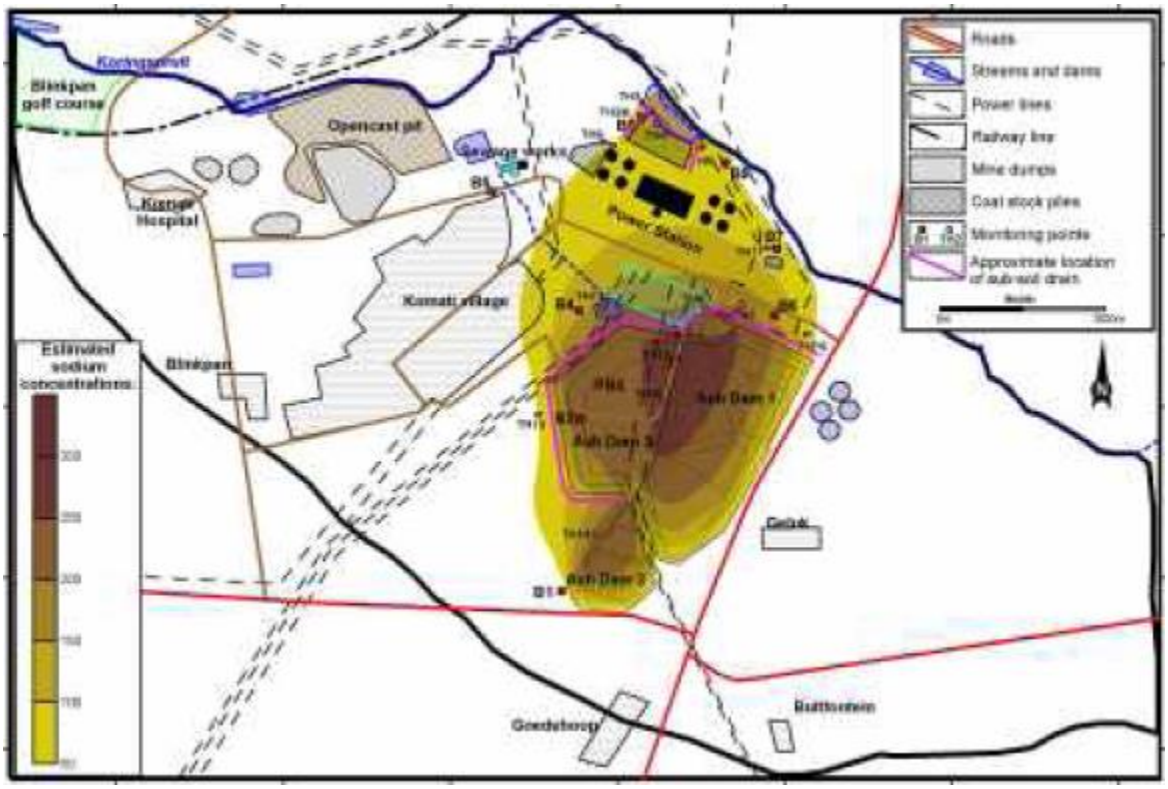

Figure 12: Predicted Sodium Contaminant Plume at Komati Ash Dam (Future) (Rison)

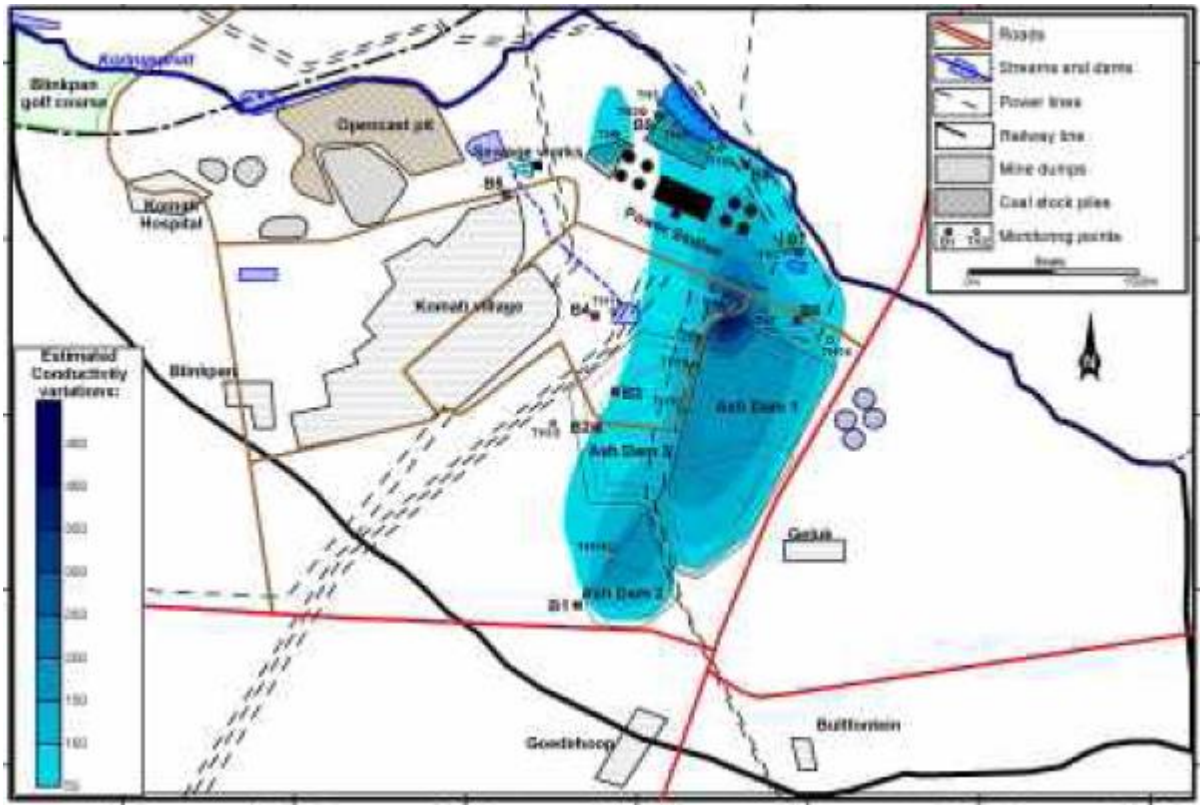

Figure 13: Predicted Electrical Conductivity Increase at Komati Ash Dam (Status quo)
(Rison)

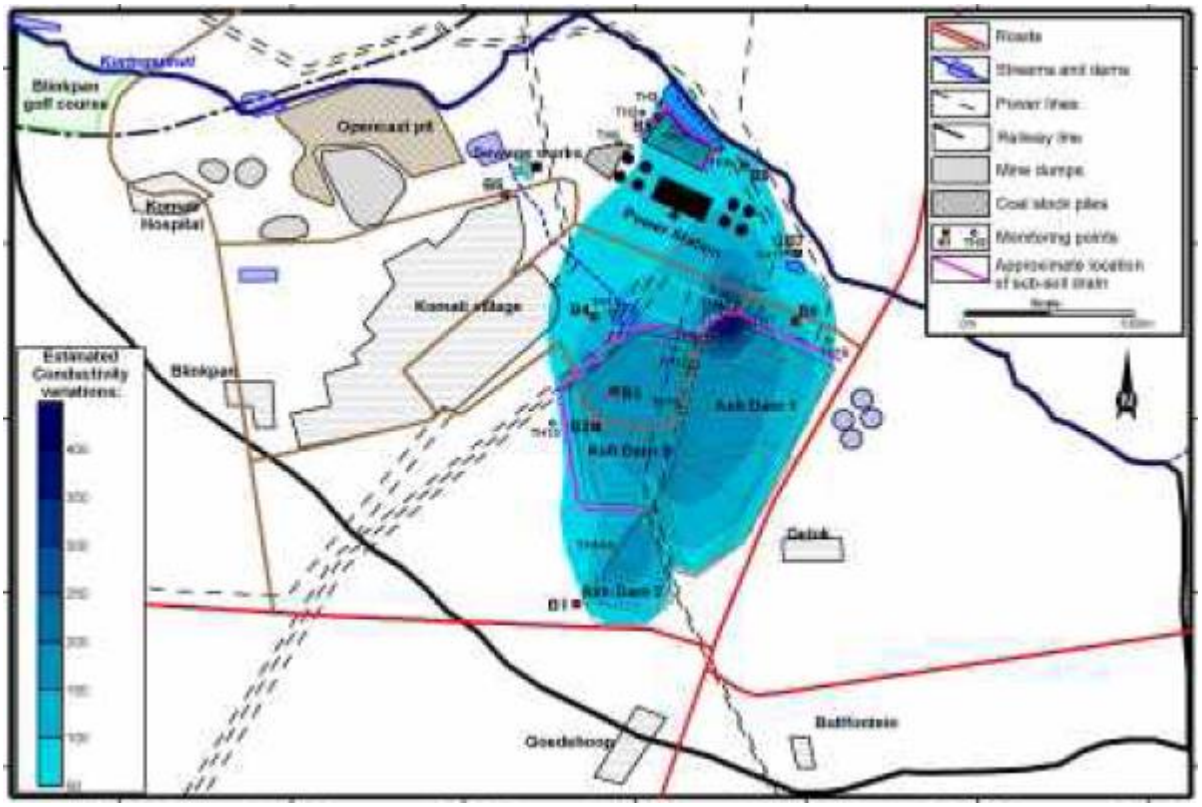

Figure 14: Predicted Electrical Conductivity Increase at Komati Ash Dam (Future)
(Rison)

7.2.4 Surface Water

Storm water that comes into contact with ash has the potential to become polluted and transport contaminants to the local water resources. Pollutants, including dissolved salts and sediments may be dispersed in the contaminated run-off water. Construction of Ash Dam Extension 3 has increased the surface area of the ash dam complex and results in a greater cumulative risk for surface water pollution. Pollution can reduce the quality of the water and alter the biota occurring in the stream. Pollutants will also be transported downstream and add to the contaminant load in the Olifants River which is a highly stressed catchment. The unmitigated impacts of surface water pollution are likely to be of medium significance.

Previously the dirty run-off water and seepage water from the existing ash dams escaped the un-maintained dirty water system. Gras Dam and the downstream environment were being contaminated. This was exacerbated during the initial works on the ash dams and the footprint of Ash Dam Extension 3 as various coal stockpiles and other wastes were disturbed. Impacts on surface water were of concern.

The dirty water containment systems for the ash dam complex were upgraded as part of the remedial measures with cut-off drains and a sub-soil seepage trench being installed around the ash dams. These were expected to be effective in collecting dirty water from the ash dams and draining it to the dirty water dam. Precipitation falling onto the ash dams is largely contained within each ash dam, while run-off from the ash dam slopes is contained by cut-off trenches and drained to the dirty water dam. Containment of all the dirty water will be essential to protect surface water resources and reduce the significance of impacts. The intent was that Gras Dam should be restored to a clean water dam. The cumulative impact of all the ash dams on surface water is expected to be of low significance, which is an improvement over the current situation without the remedial measures.

Storm water controls to divert clean storm water around the ash dam complex are largely in place for the existing dams and will be effective for Ash Dam Extension 3. Clean storm water is diverted around the site and released to the environment.

Monitoring of surface water in the period since the implementation of the remedial measures has recorded an improvement in some water quality, but an on-going decline in the Gras Dam (AP02). The water qualities in the Gras Dam have declined significantly since 2010. Electrical conductivity, Na and $S0_4$ and Mg are recorded above the recommended reference limits. The water qualities recorded in Gras Dam are a concern. This indicates that Gras Dam continues to receive contaminated water either in surface runoff or from sub-soil seepage in the shallow groundwater. Water from the Gras Dam flows to the environment and is thus contaminating these watercourses. The impact is of moderate significance, but could increase to high significance if the water quality declines further. At this point in time there is no connection between the declining water quality at AP02 and Ash Dam Extension 3.

Eskom must undertake the investigation required to understand the source of contamination of Gras Dam. Urgent intervention is required to reverse the decline in water quality. Until such time as the water quality in Gras Dam is improved, Eskom must prevent the release of this water to the environment. It is recommended that surface water monitoring be continued to assess the success of polluted run-off control measures.

7.2.5 Land Use

Development of Ash Dam Extension 3 has affected the use of approximately 42 ha of land. The land forms part of the Komati Power Station and is designated as part of the ash dam complex. As a developed ash dam the land will not be available for alternate uses either in the medium or the long-term. Although, the rehabilitation of the dam will probably result in the successful establishment of vegetation it is unlikely that the land will be able to be utilized for any other purpose. However, given that the land is currently used as support services for the Komati Power Station and will continue to be used for the same purpose, the impact is considered to be of low significance. There is no change to the cumulative impact.

7.2.6 Ecology and Biodiversity

Ash Dam Extension 3 was constructed on a previously disturbed site. Disruptions to the natural habitat and the subsequent loss of biodiversity from the site had occurred to a large extent. No range-restricted or red data species were recorded. While the site was still well represented by indigenous fauna and flora, these were largely comprised of generalist species that adapt to, or thrive in disturbed situations. In addition there were numerous alien, invasive plant species across the site.

The construction of Ash Dam Extension 3 on the 42 ha site resulted in the loss of all of the non-mobile fauna and flora from the site. The loss was not considered significant as these species are well represented elsewhere in the area. The drainage line and some of the wetland areas at the site were also lost under Ash Dam Extension 3. These wetland habitats were artificially supported by seepage emanating from the ash dams and supported numerous alien invasive and disturbance tolerant species. The wetland area was not naturally supported and in addition the majority of the drainage line and wetland forms part of the dirty water area for the ash dam complex. Thus, although the development of the ash dam resulted in the complete destruction of the site, the loss of the habitat and biodiversity is not considered significant and there is no change to the cumulative impact.

7.2.7 Air Quality

The results from the air dispersion modeling are discussed below.

7.2.7.1 Operations

The main source of fugitive dust emissions during operation of the ash dam is wind erosion from exposed surfaces. Dispersion simulations determined the inhalable particulate (PM10) concentrations and dustfall rates for the current baseline scenario (existing ash dam operations) (Figure 12 and Table 9) and for the operational phase of Ash Dam Extension 3 (existing ash dam operations with extension 3 operations).

Operations of the current ash dams are predicted to result in very low PM10 concentrations and intermediate dustfall rates. The addition of Ash Dam Extension 3 to the baseline operations resulted in a negligible increase in the predicted highest daily average ground PM10 level concentrations. Concentrations remained well below the daily SA standard of 180 µg/m³ and the proposed SA standard of 75 µg/m³ at the site boundary (Figure 13 and Table 9). While the predicted highest daily PM10 concentrations from the ash dam operation do not exceed the SANS standards, the combination of ash dam emissions with the elevated background concentrations (between 25-75 µg/m³) could exceed the SANS standard beyond the site boundary or at some of the sensitive receptor sites. Similarly, the annual values are expected to be higher than predicted due to the current background PM10 levels (of ~10 µg/m³). The direct impacts, as a result of the exceedance of air quality standards, will be of very low significance, but the cumulative impacts will be of medium significance.

The predicted maximum daily dust deposition rate for the operation of Ash Dam Extension 3 increased, but still did not exceed the SANS residential dust fallout limit of 600 mg/m²/day beyond the site boundary or at any of the sensitive receptor sites (Figure 15 and Table 9). Dustfall rates may also be higher than predicted by the model when local background levels are taken into consideration. No direct impacts are expected to result and cumulative impacts are expected to remain unchanged. Effective dust control measures, in line with good practice, should be implemented at the ash dam complex. Measures to be considered include the vegetation of daywalls and completed surfaces and the development of screens and berms to reduce wind speeds across exposed areas.

Table 12: Predicted Highest Daily Average PM10 Concentrations and Dustfall Rates during Baseline Operations and with Ash Dam Extension 3

Scenario	Highest Daily Average PM10 Concentrations(µg/m3)				Maximum Total Daily Dustfall (mg/m2/day)			
	At Site Boundary	Komati	Koornfontein	Blinkpan	At Site Boundary	Komati	Koornfontein	Blinkpan
Current Baseline	5	2	0.5	0.5	120	111	23	22
Existing + Ash Dam Extension 3	6	4.2	0.77	0.8	260	229	32	35

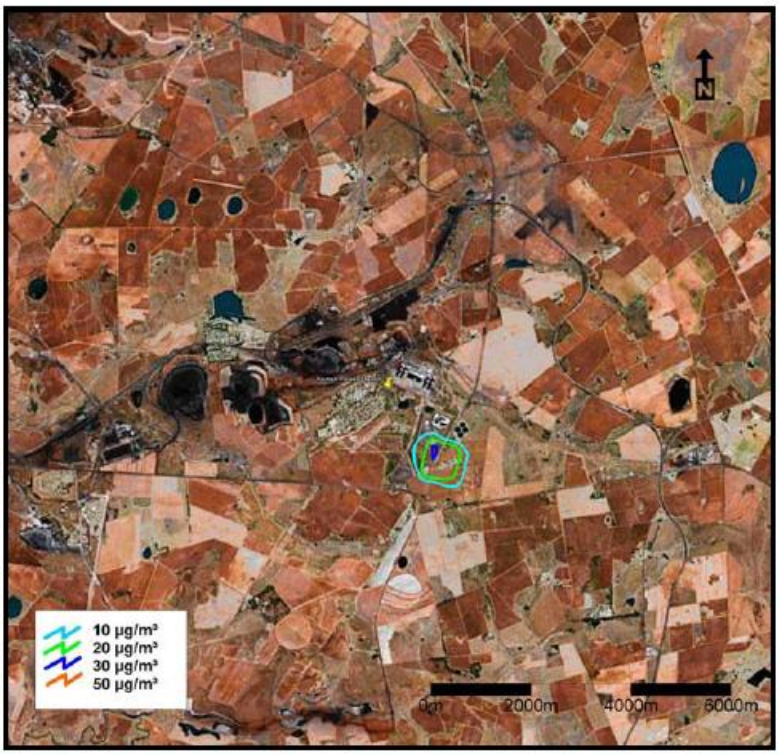

Figure 15: Highest Daily PM10 Concentrations during Baseline Operations
(Airshed Planning Professionals)

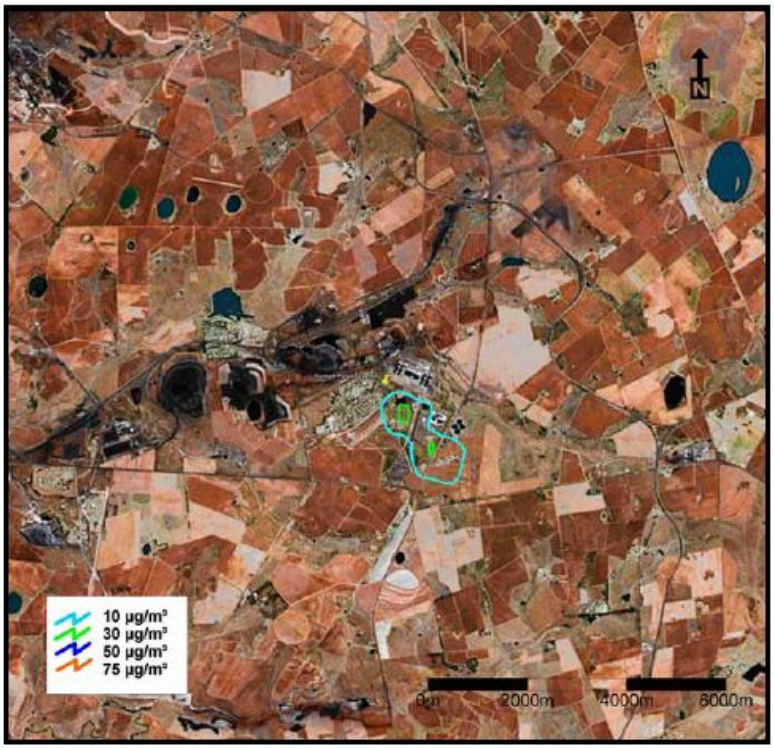

Figure 16: Highest Daily PM10 Concentrations during Extension 3 Operations
(Airshed Planning Professionals)

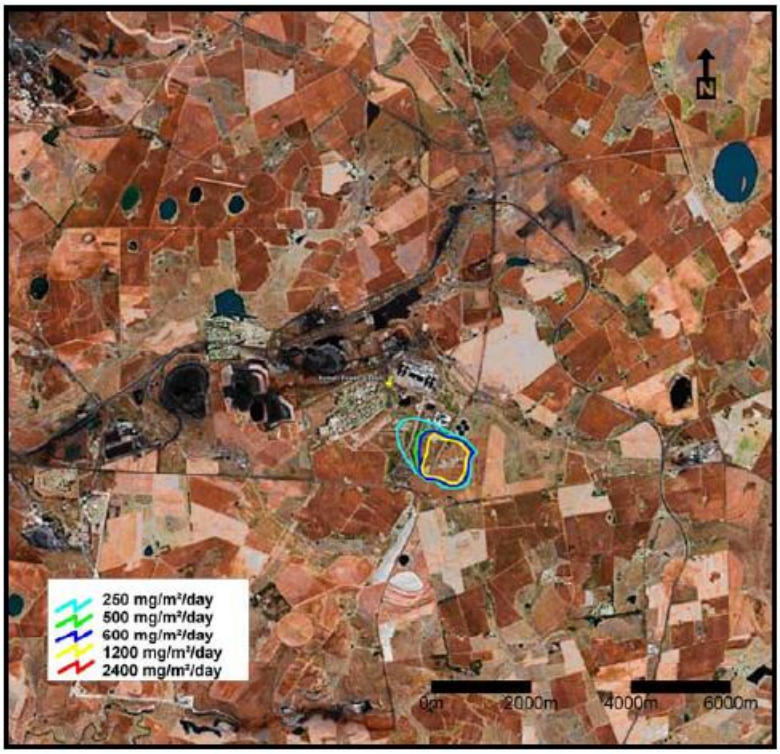

Figure 17: Maximum Daily Dust Deposition Rates during Baseline Operations
(Airshed Planning Professionals)

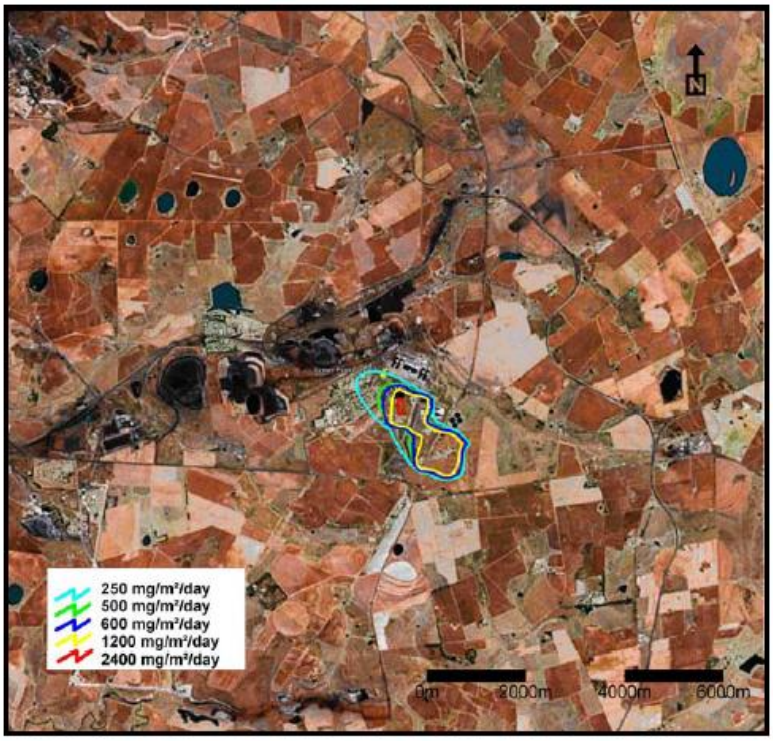

Figure 18: Maximum Daily Dust Deposition Rates during Extension 3 Operations
(Airshed Planning Professionals)

7.2.8 Noise

Operation of Ash Dam Extension 3 will involve the same operating procedures as for the current ash dam complex. Ash is delivered as slurry in pipelines and the use of heavy machinery is limited to the construction of roads and the compaction of day walls. Noise generation from operations of the ash dams is generally minimal and thus no additional noise impacts are expected. The nearest receptors are located more than 300 m distant

7.2.9 Cultural Heritage

The footprint of Ash Dam Extension 3 was disturbed during construction and no heritage sites or artefacts were discovered (Appendix 14). No impact will occur during operation.

7.2.10 Visual

The proposed dam site is currently gently sloped and was vegetated with natural grassland interspersed with exotic trees. Construction of the ash dam resulted in all vegetation being stripped from the site. The operation of Ash Dam Extension 3 will result in a change to the topography and deposition of the light coloured ash. The views of the site will be changed to a steep-sided mound, of pale ash, with pipelines and roads. The proposed ash dam is however adjacent to a series of existing ash dams and will be developed in a similar manner, to the same height. Ash Dam Extension 3 will form a very small part of the views from the provincial roads and the entrance to Komati Power Station as it is largely screened by the existing ash dams. The views from the residential areas will change as Ash Dam Extension 3 will occupy more of the foreground, however the background and skyline will not change. Ash Dam Extension 3 will result in a direct visual impact of low to medium significance, but will not change the overall visual appearance of the area and the cumulative impact is unchanged. The establishment of vegetation cover on the outer walls of the ash dam would limit the visual impact.

7.2.11 Social and Economic

The re-commissioning of Komati Power Station has revitalised the economy of Komati Village, providing employment and economic input into the area during the construction and subsequent operations period. The development of Ash Dam Extension 3 forms an integral part of the re-commissioning process and will enable Komati Power Station to operate for a further 20 years or more, thereby ensuring continued employment for at least 217 people. Approximately 20 persons were employed on the construction and a further 8 persons will be employed for the operation of the ash dams. This is a positive impact of moderate significance.

Komati Power Station was re-commissioned to provide additional electrical generation capacity in order to assist in alleviating the current energy short-fall in South Africa. Once operating at full capacity Komati will produce approximately 970 MW for the distribution in the national grid. The existing ash dams a maximum remaining capacity for approximately nine (9) months of ash deposition. Therefore without Ash Dam Extension 3, operations and electricity generation at Komati Power Station will have to be scaled down significantly or cease entirely. Ash Dam Extension 3 will facilitate the operation of Komati Power Station for most or perhaps all of the station's planned life. This is a positive impact of moderate significance.

It is predicted that elevated dustfall rates may occur during operation of Ash Dam Extension 3 as a result of wind erosion from exposed surfaces. Dustfall can result in nuisance impacts in residential areas. . The nearest receptors are located more than 300 m distant. Predicted dustfall in the nearby sensitive receptors will be well below the recommended standards for residential areas and thus impacts of low significance are expected Mitigation, in line with good practice, should be implemented to prevent dustfall from becoming an issue in Komati Village.

The infiltration of contaminants from the ash dam has been predicted to result in some pollution of local groundwater, and it is further expected that this contaminant plume will disperse northwards over the course of the next 100 years. Modelling of the contaminant levels and plume dispersal associated with Ash Dam Extension 3 have indicated that the elevated concentrations of sulphate, sodium and electrical conductivity may extend as far as the tributary to the Koornfontein River. With the addition of the liner system to Ash Dam Extension 3 the predicted concentrations and rate of dispersal will further reduce over the modelled results. Dispersion of the contaminant plume will not result in exceedances of the SABS drinking water standards for at least 50 years +. There are no known groundwater users within the area between the ash dam complex and the tributary to the Koornfontein River (GHT, 2009), thus no significant impacts are expected on groundwater users.

Development of Ash Dam Extension 3 will result in a larger ash dam facility that is closer to the adjacent areas of Komati Village than the current situation. This could present a greater safety risk to residents should the dam fail. A risk assessment on the zone of influence and a safety classification in terms of SANS10286 will be completed for Ash Dam Extension 3. It is likely that the dam will classify as a high hazard dam due to the locality of Komati Village. Ash Dam Extension 3 has been designed, and will be constructed and operated under supervision, by professional engineers to the required standards.

7.2.12 No-go Alternative

Not operating Ash dam Extension 3 would prevent the great majority of the direct impacts described in the preceding sections from occurring. This would also limit the cumulative impact from the ash dam complex, particularly on groundwater quality, but also on topography, air quality and the visual environment. As the ash dam is already constructed a number of impacts have already occurred, including the loss of topsoil, reductions in land capability, vegetation clearance and damage to the sites ecology. Without operating the ash dam some of these impacts may be partially reversible, but none completely so.

If Ash Dam Extension 3 is not brought into operation this will significantly reduce the electrical output from and the overall life of Komati Power Station. The loss of electrical generation capacity from the national grid would greatly increase the risk of load shedding that would significantly affect the Republic of South Africa and other international customers. Not operating Komati Power Station would reduce or eliminate the environmental impacts that arise from the power station (air emissions, water use etc) but would also see the termination of employment and constitute a significant loss on the investment made in the RTS of Komati Power Station.

Table 13: Assessment of environmental impacts for the operation of Ash Dam Extension 3 at Komati Power Station

Mitigation measures for all of the impacts identified are included in the draft Environmental Management Programme report.

Environmental Impact Assessment			Without Mitigation	With Mitigation						
Impact	**Design and Operations Measures for Impact Control**	**Project Phase / Timing**	**Impact Significance**	Extent	Severity	Duration	Frequency	Probability	Impact Sig	**Impact Significance**
Retrofit Construction Activities										
Disturbance of natural or relatively undisturbed areas beyond the ash dam footprint (construction/stockpiling etc)	Restrict working areas to within footprint of ADE3. Construction personnel to only access areas approved for construction. Stockpiles to be placed on disturbed areas.	Construction	Neg Moderate	1	1	2	2	1.5	-19	Neg Low
Disruption to existing management systems (blocking of drains etc)	Construction personnel to be informed of existing systems. Functionality of existing systems should not be compromised. Construction personnel to only access areas approved for construction.	Construction	Neg Moderate	1	1	1	1	1	-17	Neg Low
Occupational Health Risks to contractors during construction.	Employee induction and training Use of appropriate PPE Medical surveillance	Construction	Neg Moderate	1	1	1	1	1	-17	Neg Low
OPERATIONS										
Topography										
Change in natural topography with rise of ash dam	Restrict ADE3 to final height equivalent to existing dams.	Operational	Neg Moderate	1	3	4	4	4	-35	Neg Moderate
Soils and Land Capability										

Environmental Impact Assessment			Without Mitigation	With Mitigation						
Impact	**Design and Operations Measures for Impact Control**	**Project Phase / Timing**	**Impact Significance**	Extent	Severity	Duration	Frequency	Probability	Impact Sig	**Impact Significance**
Loss of topsoil	Occurred during construction - none required	Operational	no impact							no impact
Reduction in land capability	Occurred during construction - none required	Operational	no impact							no impact
Groundwater										
Contamination of groundwater from disposed ash	Sub-soil seepage trench and sump downstream of ash dam complex. Herringbone drainage system in basin of ADE3. GCL liner in basin of ADE3. Second herringbone drainge system in fist ash layer.	Operational	Neg Very High	1	1	3	2	2	-20	Neg Low
Surface Water										
Dirty water run-off from ash disposal areas contaminating surface water resources.	Ash to only be disposed within the ash dam footprint. Maintain seepage drainage systems and perimeter drains. All dirty water collected to be pumped to the ash water return dam. Manage sump and dams to prevent spillages.	Operational	Neg Very High	1	1	3	2	2	-20	Neg Low
Loss of surface water run-off to the catchment	Divert clean water around the ADE3 and return to the environment.	Operational	Neg Moderate	1	1	3	4	4	-31	Neg Moderate
Ecology and Biodiversity										
Loss of terrestrial habitat and biodiversity	Occurred during construction - none required	Operational	no impact							no impact

Environmental Impact Assessment			Without Mitigation	With Mitigation						
Impact	**Design and Operations Measures for Impact Control**	**Project Phase / Timing**	**Impact Significance**	Extent	Severity	Duration	Frequency	Probability	Impact Sig	**Impact Significance**
Decline in aquatic habitat quality and species composition.	Maintain seepage drainage systems and perimeter drains. All dirty water collected to be pumped to the ash water return dam. Manage sump and dams to prevent spillages.	Operational	Neg High	1	1	3	2	2	-20	Neg Low
Air Quality										
Generation of PM10 emissions that could result in exceedance of standards for PM10 concentrations.	Vegetate ash dam walls and completed areas as soon as possible. Minimise the size of exposed, dry surfaces.	Operational	Neg Moderate	1	1	3	1	1	-19	Neg Low
Generation of dust that could result in exceedance of standards for dustfall rates.	Vegetate ash dam walls and completed areas as soon as possible. Minimise the size of exposed, dry surfaces. Restrict vehicle speed on site to 30 km/h	Operational	Neg Moderate	1	1	3	1	1	-19	Neg Low
Noise										
Increase in noise levels from site	Maintain machinery to manufacturer's specifications	Operational	Neg Moderate	1	1	3	2	2	-20	Neg Low
Heritage										
Damage to heritage resources	None uncovered during construction - none required.	Operational	no impact							no impact
Visual Environment										

Environmental Impact Assessment			Without Mitigation	With Mitigation						
Impact	**Design and Operations Measures for Impact Control**	**Project Phase / Timing**	**Impact Significance**	Extent	Severity	Duration	Frequency	Probability	Impact Sig	**Impact Significance**
Change in and disruption of natural views	Construct dam to height of existing dams. Vegetate slopes as soon as possible.	Operational	Neg High	2	1	4	4	4	-32	Neg Moderate
Social and Economic										
Economic benefits through employment	Employment preference to local persons	Operational	Pos Moderate	2	1	3	4	4	31	Pos Moderate
Continued generation of electricity at Komati and reduced risk of load shedding.	Operate Komati Power Station to provide base load electrical supply as required. Utilise ADE3 for disposal of ash.	Operational	Pos Very High	4	4	3	2	2.5	65.5	Pos Very High
Occupational health risk from worker exposure.	Frequent ash sampling and analysis to identify contaminants of concern. Employee induction and training Appropriate PPE Medical surveillance	Operational	Neg Moderate	1	1	3	1	1.5	-20	Neg Low
Public health risk from PM10 from site emissions.	Vegetate ash dam walls and completed areas as soon as possible. Minimise the size of exposed, dry surfaces. On-going monitoring in Komati Village to quantify the risk. Implement additional measures if monitoring indicates exceedances of reference standards.	Operational	Neg Moderate	1	1	3	1	1.5	-20	Neg Low
Nuisance from dustfall.		Operational	Neg Moderate	1	1	3	1	1.5	-20	Neg Low

Environmental Impact Assessment			Without Mitigation	With Mitigation						
Impact	**Design and Operations Measures for Impact Control**	**Project Phase / Timing**	**Impact Significance**	Extent	Severity	Duration	Frequency	Probability	Impact Sig	**Impact Significance**
Health risk to local groundwater users from reduced water quality.	Sub-soil seepage trench and sump down stream of ash dam complex. Herringbone drainage system in basin of ADE3. GCL liner in basin of ADE3. Second herringbone drainage system in first ash layer to drain seepage. Implement additional measures if monitoring indicates exceedances of reference standards	Operational	Neg High	2	1	3	2	2	-29	Neg Moderate
No-go Alternative										
Elimination of potential operational impacts from ADE3		Operational	Pos High							
Lost employment for personnel at ADE3 and Komati Power Station		Operational	Neg Moderate							
Loss of electrical output from Komati Power Station and increased risk of load shedding		Operational	Neg Very High							

8. Environmental Impact Statement

The EIA concluded that operation of Ash Dam Extension 3, with the improvements to engineered design, is not subject to any fatal flaws. The majority of operational impacts that may affect the site or local receptors are of medium to low significance and no impacts of high significance that cannot be mitigated will result. Ash Dam Extension 3 is not expected to contribute substantially to the cumulative impacts.

Construction of Ash Dam Extension 3 resulted in the complete transformation of the site. The soils, land use land capability and ecology of the site were permanently altered. Operation of Ash Dam Extension 3 will not have any further direct impact on these aspects. No heritage resources were found in the footprint of Ash Dam Extension 3.

The operation of Ash Dam Extension 3 will result in a number of impacts with direct effects on the site. These include significant changes to topography and the visual environment. However, in context with the existing ash dam complex the cumulative impact of these changes will not be significant. Operations will generate occasional noise, but the site is sufficiently distant from receptors that no disturbance will occur.

Contamination of groundwater was identified as the most important issue relating to the operation of Ash Dam Extension 3. Groundwater contamination from existing sources at Komati Power Station is being detected in monitoring boreholes and is currently an impact of concern. Pollution of the groundwater from sources at Komati Power Station could continue over the long term and cause widespread changes to groundwater chemistry that would impact on surface and groundwater quality. The ash dams are one potential source of contamination and the addition of Ash Dam Extension 3 will enlarge the source area for contaminants. This could increase the groundwater pollution risk from Komati Power Station. However, Ash Dam Extension 3 is being implemented with various management measures to limit groundwater contamination.

Groundwater modelling for an unlined Ash Dam Extension 3 predicted a marginal, westerly increase in the extent of the groundwater contamination plume when compared to the current plume. However, with the inclusion of the remedial measures at the power station and the improved seepage controls downstream of the whole ash dam complex, the magnitude and rate of spread of the contamination plume was expected to reduce from current levels. While the direct impact of groundwater contamination from Ash Dam Extension 3 was of moderate significance, the new ash dam did not contribute substantially to the existing groundwater contamination risk. Recent monitoring results have indicated an improvement in groundwater quality since 2009 that is consistent with the implementation of the remedial measures (although this is without Ash Dam Extension 3). This could be an indication of the effectiveness of the seepage cut-off trench in containing seepage from the ash dam complex.

With the addition of a single composite liner across the basin of Ash Dam Extension 3 the hydraulic head in the ash pile will be separated from the underlying shallow groundwater. The double herring bone drainage systems will further facilitate the separation of shallow groundwater from seepage water and leachate. This will significantly reduce the contribution of Ash Dam Extension 3 to both contaminant concentrations and the rate of spread of any existing or future contaminant plume. The direct impact of a lined Ash Dam Extension 3 on groundwater quality is anticipated to be of low significance. Ash Dam Extension 3 will not contribute significantly to the existing groundwater contamination risk nor will it worsen the current or future levels of groundwater pollution resulting from Komati Power Station.

The contamination of surface water at the ash dam complex is also an impact of concern. Storm water management systems are in place to contain dirty runoff. Monitoring at the Gras Dam has however recorded a decline in water quality since 2009. This indicates that Gras Dam is receiving contaminated water either in surface runoff or from sub-soil seepage in the shallow groundwater. Water from the Gras Dam flows to the environment and is thus contaminating surface water. The current impact is of moderate significance, but could increase to high significance if the water quality declines further. At this point in time there is no relation between Ash Dam Extension 3 and the poor surface water quality.

The implementation of design and mitigation measures for Ash Dam Extension 3 will be important to ensure that the identified impacts remain of low significance. The effective implementation of the remedial measures at the ash dam complex, as well as improved control of all water at the Komati Power Station, are expected to reduce the significance of the cumulative surface and groundwater contamination impacts. Ground and surface water monitoring will be vital to detect contamination plumes. Eskom will need to undertake further intervention if monitoring detects deteriorating water quality.

In addition, it must be considered that operation of Ash Dam Extension 3 is required as an essential development to facilitate the continued operation of and power generation from the Komati Power Station. Without Komati Power Station the base-load electrical power supply in Southern Africa will be reduced by nearly 1 MW. This will result in supply risks that could increase the chance of load shedding.

It is recommended that Ash Dam Extension 3 be granted a waste management licence by the competent authority in terms of the National Environmental Management: Waste Act, 2008. The recommendations set out in the draft EMPr should be included as a condition of project implementation.

9. Consultant Declaration

Synergistics Environmental Services is an independent environmental consultancy that was established in South Africa in 2004. Synergistics Environmental Services acted as independent consultants to Eskom and has no financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010. Matthew Hemming, the company director responsible for the reporting on this project, is an Environmental Assessment Practitioner with over 7 years of experience in the field of environmental consulting, particularly in the mining and waste management sectors.

Synergistics has made every effort to disclose, to the competent authority and interested and affected parties, all relevant facts and material information that has the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2010. It is deemed that the environmental assessment process followed meets the requirements of the legislation to ensure that the regulatory authorities receive sufficient information to enable an informed decision.

I, the undersigned herewith declare that this environmental impact assessment report represents an objective and complete assessment of the environmental issues associated with the operation of Ash Dam Extension 3 at Komati Power Station.

COMPILED BY:

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10. Draft Environmental Management Programme

10.1 Introduction

This draft environmental management programme (dEMPr), for the operation of Ash Dam Extension 3 at Komati Power Station, has been prepared as per the requirements of the EIA Regulations (Regulation 33 of GNR 543, 2010). The EMPr, once approved by the competent authority, is a legal document and Eskom is overall accountable and responsible for the implementation thereof.

The EMP details the actions/mitigation measures to be put in place to ensure the protection of the environment and lessen any environmental impacts associated with the OPERATION of Ash Dam Extension 3. The EMPr is structured to include:

- The project activity/aspect requiring management;
- The management objective arising from these activities/aspects;
- The management and monitoring actions to be implemented, and
- The timeframes associated with the required management or monitoring action.

10.1.1 Project Activity

The aspects covered by the EMP include those described in Section 5 of the Environmental Impact Assessment Report.

10.1.2 Responsible Persons

The responsible persons for each management and mitigation measure are detailed in the tables below. Most responsibility will fall to the Komati Power Station Manager.

10.2 Management and Mitigation Measures

10.2.1 Planning and design

Planning and design of Ash Dam Extension 3 are complete and there is no requirement for management measures.

10.2.2 Retrofit Construction Phase

Construction of Ash Dam Extension 3 at Komati Power Station was undertaken in 2009 and 2010. The ash dam was constructed in terms of the approved EMP and compliance was monitored and audited on a monthly basis by an Environmental Control Officer. Monthly reports were submitted to the Department.

The addition of a liner system to Ash Dam Extension 3 will require further construction work before operation of the facility is commenced. Eskom will request permission from the DEA to commence with the retrofit construction of the revised design, as approved by the DWA, as soon as contractors can be appointed. This will be in parallel to the DEA review of the EIA and the waste management licence decision.

The requirements to avoid, reduce and mitigate environmental impacts of this retrofit construction are detailed in Table 13.On-going development and upward growth of the ash dam takes place as part of ashing operations and as such will be dealt with in the operations EMP.

10.2.3 Operations Phase

Operation of the ash dam is the responsibility of Eskom's Generation Division, but may be sub-contracted to one or more contractors. Management of operations at Ash Dam Extension is to be undertaken in terms of the Operations Manual for the facility as well other operating procedures that exist for Komati Power Station and the ash dams. The Operations Manual details the technical and engineering parameters that must be implemented to ensure safe and efficient operation of Ash dam Extension 3.

Environmental impacts associated with the operation of Ash Dam extension 3 must be avoided, reduced and or mitigated through the measures set out in this EMP, as detailed in Table 14. Compliance with the Komati Power Station's Environmental Management System as well as other valid licences and authorisations will also be required.

Table 14: Retrofit Construction Environmental Management Programme

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
Roles and Responsibilities			
To define roles and responsibilities for the implementation of the Retrofit Construction EMP.	Ultimate responsibility for the implementation of and compliance with the Retrofit Construction EMP rests with Eskom.	Eskom	On approval of EMP
	Eskom is to appoint a Komati Power Station Environmental Practitioner (EP) responsible for implementing/ overseeing implementation of the existing RoD, Waste Management Licence and EMPr conditions and for the auditing of contractor compliance with the EMPr.	Eskom	On approval of EMP
	Eskom is to ensure that adherence to the EMPr is included as a contractual commitment for any contractor(s) employed at the ash dam site.	Eskom	In all project tenders and contracts
	Each contractor is to ensure compliance with EMP by their personnel and sub-contractors.	Eskom	At appointment, continuous
	Any exceptions from compliance with the EMPr are to be reported to the project manager at scheduled project meetings.	ECO and EP	During Retrofit construction
Monitoring and Compliance			
To ensure the effective implementation of the EMP.	The contractor is to undertake weekly EMPr compliance assessments using a basic checklist.	Contractor	Implement immediately and repeat weekly
	The Eskom EP is to undertake site inspections during construction to assess compliance with the EMPr	EP	Ad hoc, but repeat at least monthly
	The Eskom EP is to undertake a detailed EMPr compliance audits once a quarter during construction and again at the completion of construction.	EP	Implement immediately and repeat quarterly
Environmental Awareness			
To ensure that the workforce are aware of their responsibilities toward environmental protection and the EMP requirements.	All personnel involved in the project are to undergo environmental induction and awareness training, which should be provided by the contractor(s). The EP is to approve the content of the induction material. Records of such training to be kept as proof.	Contractor	Prior to contractor commencing work on site.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
Public Relations			
To minimise disturbance to neighbours and surrounding communities.	All machinery and vehicles to be maintained in good working order to minimise noise generation.	Contractor	During Retrofit construction
	A complaints register is to be established and maintained by the Contractor. The public must be able to access the register. The EP must be informed of any complaint within 24hrs or its reporting	Contractor	From the start of Retrofit construction.
	Complaints are to be investigated and report back or progress is to be given to the complainant in terms of Komati Power Station's ISO 14001 communication strategy.	EP	From the start of Retrofit construction.
Air Quality Management			
To minimise the generation of PM10 and dustfall from the ash dam construction site.	Do not disturb vegetation or soils beyond the ash dam footprint.	Contractor	From the start of Retrofit construction.
	Regulate vehicle speed on unpaved roads to 40 km/h or less.	Contractor	From the start of Retrofit construction.
	Implement dust control/ suppression on all roads and disturbed areas. Aim for at least 50% control efficiency.	Contractor	From the start of Retrofit construction.
Surface Water Management			
To separate clean and contaminated storm water at the ash dam site.	Storm water drains must be in place and not be blocked or damaged.	Contractor	From the start of Retrofit construction.
To prevent the release of contaminated run-off into the environment.	All construction activities should take place inside of the ash dam footprint so that any dirty water run-off is contained by the perimeter drains	Contractor	From the start of Retrofit construction.
	Run-off from areas where ash, chemicals, fuels, oils and greases are handled is to be contained on site and prevented from being released into the environment.	Contractor	From the start of Retrofit construction.
Groundwater Protection			
To prevent the release of contaminated seepage water into the environment.	The seepage cut-off trench must not be blocked or damaged.	Contractor	From the start of Retrofit construction.
Protection of Natural Ecology			
To ensure that the area of impact is kept to a	Only vegetation within the ash dam footprint area is to be cleared or removed.	Contractor	From the start of Retrofit construction.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
minimum.	Construction vehicles and personnel are not to disturb vegetation beyond the construction site.	Contractor	From the start of Retrofit construction.
	The collection of animals or plant material or the picking of plants on site or the surrounds is prohibited.	Contractor	From the start of Retrofit construction.
	Construction sites are to be accessed via the designated access roads only. Where additional roads are required these are to be authorised through appropriate authorisation processes.	Contractor	From the start of Retrofit construction.
	Use existing lay down areas or areas within the ash dam footprint as far as practicable. Lay down areas are to be kept to a minimum size.	Contractor	From the start of Retrofit construction.
Protection of Heritage Resources			
To ensure the protection of heritage resources	Should archaeological artefacts or human remains be unearthed during construction, operations are to be ceased and the find reported immediately to the ECO. Work in that area is only to continue when authorised by the ECO after consultation with the South African Heritage Resources Agency (SAHRA).	Contractor	From the start of Retrofit construction.
	It is an offence to remove historical artefacts from where they are found on site.	Contractor	From the start of Retrofit construction.
Incident Reporting			
To ensure that all environmental incidents are reported and remedial action is implemented.	All environmental incidents are to be reported to the EP immediately.	Contractor	As and when required
	The EP must verify and document each environmental incident. All environmental incidents must be reported to the ER.	EP	As and when required
	All environmental incidents are to be investigated and the appropriate preventative and remedial actions identified and implemented.	EP and Contractor	As and when required
Spill Prevention			
To contain and manage spillage of hazardous chemical substances	All hazardous chemical substances are to be stored in bunded areas. The bund should have capacity to contain 110% of the volume of the chemical substances stored there.	Contractor	From the start of Retrofit construction.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
	Material Safety Data (MSD) sheets for all chemicals to be kept on site.	Contractor	From the start of Retrofit construction.
	Where hazardous chemicals are stored on site, a spill kit must be available.	Contractor	From the start of Retrofit construction.
	The contractor's site manager must be familiar with the procedure and equipment for the clean-up of spillages. Job specific training, to be provided to members working in such areas, must include awareness of hazardous chemicals and emergency procedures.	Contractor	From the start of Retrofit construction.
	Chemical spills are to be regarded as an environmental incident.	Contractor	From the start of Retrofit construction.
	Hazardous chemicals (including those used for cleaning and spill clean ups) are not to be released into environment. These materials are to be contained and disposed as hazardous waste.	Contractor	From the start of Retrofit construction.
To prevent and contain spillages of fuels, oils and greases.	All fuel tanks used in construction are to be aboveground and bunded in accordance with the requirements for flammable liquids. Receptacles must comply with SANS100-1:2003 (SABS089-1:2003).	Contractor	From the start of Retrofit construction.
	New and used oil as well as hazardous workshop waste is to be stored within bunded areas in accordance with the requirements for flammable liquids.	Contractor	From the start of Retrofit construction.
	All areas where fuel is handled are to be provided with impervious surfaces to prevent seepage and leakage.	Contractor	From the start of Retrofit construction.
	All vehicles are to be checked for leaks before commencing work on site, and should be inspected weekly.	Contractor	From the start of construction, weekly
	Drip trays with adequate capacity are to be placed beneath parked vehicles which drip oil.	Contractor	As required.
	All equipment that leaks fluid must be repaired immediately or removed from site when necessary.	Contractor	As required.
	Servicing of vehicles is only to take place within designated areas within the construction camp.	Contractor	From the start of Retrofit construction.
	Servicing and repair areas to be provided within impervious services.	Contractor	From the start of Retrofit construction.
	Should it be necessary to carry out repair or maintenance of vehicles and machinery in the field, a temporary impervious surface is to be put in place into	Contractor	As required.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
	prevent contamination of soils in the area where oil, grease or fuel can be spilled.		
Waste Management			
To minimise waste production	Waste materials that can be returned to the supplier must be identified and proper arrangements are to be made for make this to happen.	Contractor	During Retrofit construction.
	Recyclable materials are to be salvaged and arrangements made for these to be removed from site for recycling.	Contractor	During Retrofit construction.
To ensure the appropriate disposal of hazardous waste.	All hazardous waste produced on site is to be consolidated and kept in a receptacle within a bunded area.	Contractor	During Retrofit construction.
	Hazardous waste is to be removed from site for disposal at a permitted hazardous landfill site.	Contractor	During Retrofit construction.
	All used oils and lubricants as well as hazardous workshop waste is to be disposed at a permitted facility.	Contractor	During Retrofit construction
	Soils that have become contaminated with fuel, oils or greases are to be bio-remediated or disposed of as hazardous waste.	Contractor	As required.
To ensure the appropriate disposal of general waste.	All general waste is to be removed and disposed at a permitted waste disposal site that can accept such waste.	Contractor	During Retrofit construction.
	All areas are to be kept free of litter.	Contractor	During Retrofit construction.
	The burning of waste on site is prohibited.	Contractor	During Retrofit construction.
Control of Invasive Weed Species			
To prevent the proliferation of weed species	The establishment of invasive weeds on areas disturbed during construction is to be prevented. A weed management programme is to be implemented.	Eskom	Immediate
Dirty Water Management			
To prevent the release of contaminated water into the environment.	Dirty water from areas where ash, chemicals, fuels, oils and greases are handled is to be contained on site and prevented from being released into the environment.	Contractor	During Retrofit construction.
	All dirty water should be directed to the dirty water dam via berms or trenches, or collected in a sump and pumped to the dirty water dam.	Contractor	During Retrofit construction.
To ensure the appropriate management of	If static ablutions are not available then chemical toilets are to be provided at	Contractor	During Retrofit construction.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
sewage.	strategic points where construction activities are being undertaken. There should be at least 1 toilet for every 15 workers.		
	Sewage waste from chemical toilets is to be disposed of at a recognised sewerage facility.	Contractor	During Retrofit construction.
Construction Site Rehabilitation			
To promote the restoration of natural ecology in areas disturbed by construction.	All waste and infrastructure that will not be used during operation is to be removed from site once construction is completed.	Contractor	At completion of Retrofit construction.
	All soils that have become contaminated with oils, fuels, greases are to be bio-remediated or lifted and disposed as hazardous waste once construction is completed.	Contractor	At completion of Retrofit construction.
	Lay down, camp, working, stockpile, road and other compacted areas, not being used for other projects, are to be ripped to 150 mm to break compacted layers.	Contractor	At completion of Retrofit construction.
	Following ripping, all areas being rehabilitated are to be seeded with a seed mix approved by Eskom. A weed management programme is to be implemented.	Contractor	At completion of Retrofit construction.
	All construction areas undergoing rehabilitation must be inspected by the EP following rehabilitation and again 6 months later. The EP must declare the site rehabilitation satisfactory before the contractor is absolved of responsibility.	EP	At completion of Retrofit construction, and 6 months later.

Table 15: Operations Environmental Management Programme

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
Roles and Responsibilities			
To define roles and responsibilities for the implementation of the Operations EMP.	Ultimate responsibility for the implementation of and compliance with the operations EMP rests with Eskom.	Eskom	From operation of ash dam.
	Eskom is to appoint a Komati Power Station Environmental Practitioner (EP) responsible for implementing/ overseeing implementation of the RoD, Waste Management Licence and EMP conditions and for the auditing of contractor compliance with the EMP.	Eskom	From operation of ash dam.
	Eskom is to ensure that adherence to the EMP is included as a contractual commitment for any contractor(s) employed at the ash dam site.	Eskom	In all project tenders and contracts
	Each contractor is to ensure compliance with EMP by their personnel and sub-contractors.	Contractor	During operations, continuous
	Any exceptions from compliance with the EMP are to be reported to the project manager at scheduled project meetings.	ECO and EP	During operation
Environmental Awareness			
To ensure that all members of the Eskom workforce are aware of their responsibilities toward environmental protection and the EMP requirements.	All Eskom personnel involved in management or monitoring of the ash dams are to undergo environmental induction and awareness training, which should be provided by the Eskom EP.	Eskom and EP	From commencement of operations, and when required.
To ensure that all members a contractors workforce are aware of their responsibilities toward environmental protection and the EMP requirements.	Each contractor is to provide environmental induction and awareness training, to his personnel involved in the management of the ash dams. The content of the induction is to be reviewed and approved by the Eskom EP.	Contractor and EP	From commencement of operations and repeat annually.
Public Relations			
To minimise disturbance to neighbours and surrounding communities.	Notify local residents of changes to operational practices that could result in impacts or disturbances.	Contractor and EP	When required
	A complaints register is to be established and maintained.	Eskom	Continued from construction.
	Complaints are to be investigated and report back is to be given to the complainant	Eskom	From operation of ash dam.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
	within 48 hours of the complaint.		
Technical Management Ash Dam of Extension 3			
To ensure the safe operation of Ash Dam Extension 3.	Manage the deposition of ash and the water stored on the ash dam as per the Operations Manual. Maintain the required freeboard on the daywall for the 1:50 year rainfall event.	Eskom	From operation of ash dam.
	Standpipe piezometers, to detect water levels in the ash dam walls are to be installed around the perimeter of Ash Dam Extension 3. The ash dam engineer is to specify the location of the piezometers. These should be read and interpreted on a monthly basis.	Eskom	From operation of ash dam, monthly.
	Conduct annual stability analysis of Ash Dam Extension 3.	Eskom	From operation of ash dam, annually.
	Daywalls of Ash Dam Extension 3 should be inspected on a regular basis for cracking and erosion.	Eskom	From operation of ash dam, as per schedule. Daily inspection by the operator. Monthly inspections by the operator and Eskom. Annual inspections by the operator, Eskom and a professional engineer.
	Conduct regular inspection of the ash delivery pipe system.	Eskom	From operation of ash dam, daily.
To minimise the pollution risk of ash disposal.	No waste material, other than ash, may be disposed into the ash dam without written permission from the competent authority.	Eskom	From operation of ash dam.
Air Quality Management			
To minimise the generation of PM10 and dustfall from the ash dam.	The outer slopes of daywalls and completed surfaces of the ash dam must be vegetated as soon as possible. Follow Eskom rehabilitation guidelines.	Eskom	From operation of ash dam.
	Disturbance of outer slopes of completed daywalls by vehicles or machinery must be avoided. In operational areas vehicles are only to drive on designated roads (except where access is required for operations).	Eskom	From operation of ash dam.
	Where exposed surfaces are observed to generate dust during windy conditions,	Eskom	From operation of ash dam.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
	these sites must be actively managed to limit dust entrainment (wetting, vegetation, windbreaks etc).		
Surface Water Management			
To separate clean and contaminated storm water at the ash dam site.	Storm water control to divert clean storm water away from the site must be maintained in terms of GN 704.	Eskom	From operation of ash dam.
To prevent the release of contaminated run-off into the environment.	Run-off from contaminated areas must be contained on site and prevented from being released into the environment. All containment measures must be designed and maintained in terms of GN 704.	Eskom	From operation of ash dam.
	The dirty water control systems, including trenches, drains, sumps, pumps and dams are to be maintained in terms of GN 704.	Eskom	From operation of ash dam.
	Determine the cause of the water quality decline in the Gras Dam. Correct the issues to reverse the decline in water quality.	Eskom	Immediate, as soon as possible.
	If the water quality is not improved then measures must be implemented to prevent water in the Gras Dam from flowing to the environment.	Eskom	If required
To prevent the sedimentation and erosion of the local rivers and tributaries.	Erosion controls must be maintained around the site. Remedial action must be taken to reduce water flow speeds, prevent erosion and repair damage.	Eskom	From operation of ash dam.
Groundwater Protection			
To prevent the release of contaminated seepage water into the environment.	When operating machinery on or excavating within the ash dam cognisance must be given to the liner system. All pre-work risk assessments must consider and ensure the integrity of the liner system	Eskom	From operation of ash dam.
	Maintain cut-off seepage trench in a functional state.	Eskom	From operation of ash dam.
To improve the understanding of geohydrology at the ash dam complex	Undertaken investigations to improve the understanding of the geohydrological regime (i.e. the connectivity between the upper and deeper aquifer systems)	Eskom	As required
To reverse the dispersion of significant groundwater contamination (if it occurs)	If monitoring records an on-going and significant decline in groundwater quality then Eskom must develop an informed groundwater management plan for approval by the competent authority. Such plan must contain measures to prevent further contamination and limit the dispersion of contaminated groundwater. Eskom must undertake the investigations required to determine the feasibility and	Eskom	If required

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
	operating parameters of any such project.		
Protection of Natural Ecology			
To ensure that the area of impact on vegetation is kept to a minimum.	No disturbance of soils or vegetation beyond the operational areas of the ash dam and associated infrastructure.	Eskom	From operation of ash dam.
To ensure that the area of impact on fauna and flora is kept to a minimum.	The collection or trapping of animals and the collection or cutting of indigenous plant material on site or the surrounds is prohibited.	Eskom	From operation of ash dam.
	Ash dam is to be accessed via the designated access road or via existing roads. Where additional roads are required these are to be authorised through appropriate authorisation processes.	Eskom	From operation of ash dam.
Incident Reporting			
To ensure that all environmental incidents are reported and remedial action is implemented.	All environmental incidents and potential non-compliances are to be reported to the site manager, EP and Eskom managers responsible for the facility.	Eskom	As and when required
	The EP must verify and document each environmental incident.	EP	As and when required
	All environmental incidents are to be investigated and the appropriate preventative and remedial actions identified and implemented.	Eskom	As and when required
Monitoring and Compliance			
To ensure the effective implementation of the EMP.	Contractors are to review EMP compliance on a weekly basis. Environmental Compliance is be included on the agenda for Contractor management meetings and recorded in Contractor reports to Eskom.	Contractor	Implement from appointment of contractor and repeat weekly
	The Eskom EP is to undertake an EMP compliance audit on a quarterly basis.	EP	Implement from commencement of operations and repeat quarterly
	An annual EMP compliance assessment report is to be produced by an independent party.	Eskom	Implement from commencement of operations and repeat annually
	Environmental incidents and non-compliances are to be recorded and reported to Eskom managers responsible for the facility.	Eskom	On record of any environmental incident
To record changes in groundwater quality.	Monitor groundwater qualities in boreholes around ash dam site for changes in	EP	Implement from commencement of

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
	chemistry (as per Section 10.3.1.1).		operations and repeat quarterly
To record changes in surface water quality.	Monitor surface water qualities at identified points down-stream of the ash dam site for changes in chemistry (as per Section 10.3.1.2).	EP	Implement from commencement of operations and repeat quarterly
To record changes in air quality.	Eskom is to install 2 dustfall monitoring stations as per specialist recommendations.	Eskom	Implement immediately
	Monitoring of dustfall rates at monitoring stations.	EP	Implement from commencement of operations and repeat monthly
Spill Prevention			
To prevent the spillage of ash into the environment.	The integrity of the daywalls must be maintained The ash levels must be monitored to ensure the required freeboard on the daywalls. All ash delivery pipelines are to be maintained in a functional state and inspected.	Eskom	From operation of ash dam.
To contain and manage any ash spillage.	Develop an emergency procedure for control and clean-up of an ash spillage. The site manager must be familiar with the procedure and equipment. Job specific training must include awareness of hazards and emergency procedures.	Eskom	Immediate
	Ash spills that extend beyond the ash dam surface are to be regarded as an environmental incident.	Eskom	Immediate
	Hazardous chemicals (including those used for cleaning and spill clean ups) are not to be released into environment. These materials are to be contained and disposed as hazardous waste.	Eskom	From operation of ash dam.
To prevent and contain spillages of chemicals, fuels, oils and greases.	Should it be necessary to carry out repair or maintenance in the field, a temporary impervious surface is to be put in place into prevent contamination of soils.	Eskom	As and when required
Waste Management			
To ensure the appropriate disposal of general waste.	All general waste is to be removed and disposed at a permitted waste disposal site that can accept such waste.	Eskom or Contractor	From operation of ash dam.
	Waste bins are to be provided and all areas are to be kept free of litter. Littering will not be tolerated.	Eskom or Contractor	From operation of ash dam.
	The burning of waste on site is prohibited.	Eskom or Contractor	From operation of ash dam.

Objectives and Goals	Management and Monitoring Actions	Implementation Programme	
		Responsibility	Implementation & Frequency
Control of Invasive Weed Species			
To prevent the proliferation of weed species	A weed management programme is to be implemented at the ash dam site. The programme should aim to control weeds as defined in the Conservation of Agricultural Resources Act (Act 43 of 1983).	EP	From operation of ash dam.
Dirty Water Management			
To prevent the release of contaminated water into the environment.	Dirty water must be contained on site and prevented from being released into the environment as Komati Power Station is a zero effluent disposal site.	Eskom	From operation of ash dam.
	Storm and dirty water control systems must be maintained in a functional state in terms of GN 704.	Eskom	From operation of ash dam.

10.2.3.1 On-going Rehabilitation

Rehabilitation of Ash Dam Extension 3 involves the vegetating of areas of the ash dam where operations have been completed and further ash will not be deposited. The establishment of vegetation should occur continuously during the construction of the daywalls, on benches that have been completed. Rehabilitation should be completed as follows:

- Scarify the surface to break any crust that may have developed;
- Cover with topsoil to a depth of at least 150 mm (other organic materials may be substituted); and
- Vegetate either by,
    - Seeding with appropriate seed mix; or
    - Planting grass sods.

Rehabilitated areas must be monitored and maintained on a quarterly basis until such time as the ground has stabilised and the vegetation is deemed self-sustaining. Supervision of rehabilitation and monitoring is the responsibility of the Komati Power Station Environmental Practitioner. Maintenance should include follow-up seeding and the repair of erosion.

10.2.4 Decommissioning and Closure

Decommissioning and closure of the ash dam will occur after the dam has reached capacity, or the power station has ceased to produce ash, whichever occurs soonest. Final closure of all the ash dams will be managed in accordance with a closure plan to be developed by Eskom in accordance with the requirements of the relevant authorisation processes at that time. A specific closure plan has not yet been developed for the ash dam site. Eskom will embark on the development of a plan for closure at least two years prior to planned closure of the site.

10.3 Monitoring

10.3.1 Environmental Monitoring

10.3.1.1 Groundwater

A network of groundwater monitoring boreholes exist in and around Komati Power Station (Figure 16) and it is recommended that these boreholes continue to be used to monitor potential contamination downstream of Ash Dam Extension 3. Boreholes B2 and B3 were within the footprint of Ash Dam Extension 3 and were sealed. An additional borehole was drilled to the west of Ash Dam Extension 3.

Groundwater monitoring of boreholes around the ash dam complex is to be conducted by the Komati Power Station on a quarterly basis and should include measurement of the following parameters:

Table 16: Parameters for Analysis in Surface and Groundwater Monitoring

pH	Electrical Conductivity (EC)	Chloride (Cl)
Calcium (Ca)	Potassium (K)	Nitrate (NO_3)
Sulphate (SO_4)	Magnesium (Mg)	Sodium (Na)
Aluminium (Al)	Total Iron (Fe)	Total alkalinity
Nitrates	Nitrites	Ammonia (NH_4)
Arsenic (As)	Chromium (Cr)	Boron (B**)**
Manganese (Mn)	Barium (Ba)	

Groundwater depth in the monitoring boreholes should be recorded on a monthly basis and daily records should be kept of rainfall.

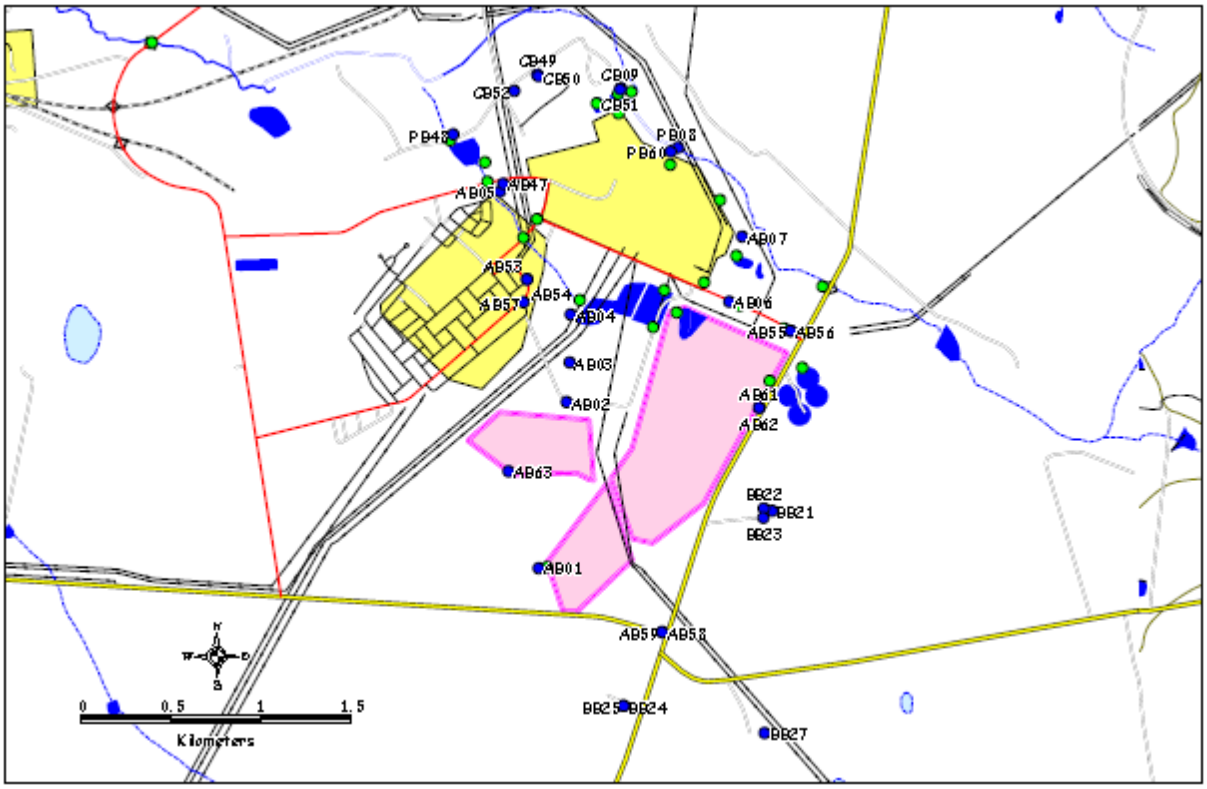

Figure 19: Groundwater Monitoring Points for the Komati Ash Dam Extension 3
(GHT Consulting Scientists) groundwater monitoring point current ash dam footprint

10.3.1.2 Surface Water

A network of surface water monitoring points exist in and around Komati Power Station (Figure 17) and it is recommended that these sites continue to be used to monitor potential contamination downstream of Ash Dam Extension 3. Monitoring should be conducted by the Komati Power Station on a quarterly basis and should include the same parameters as set out for groundwater monitoring.

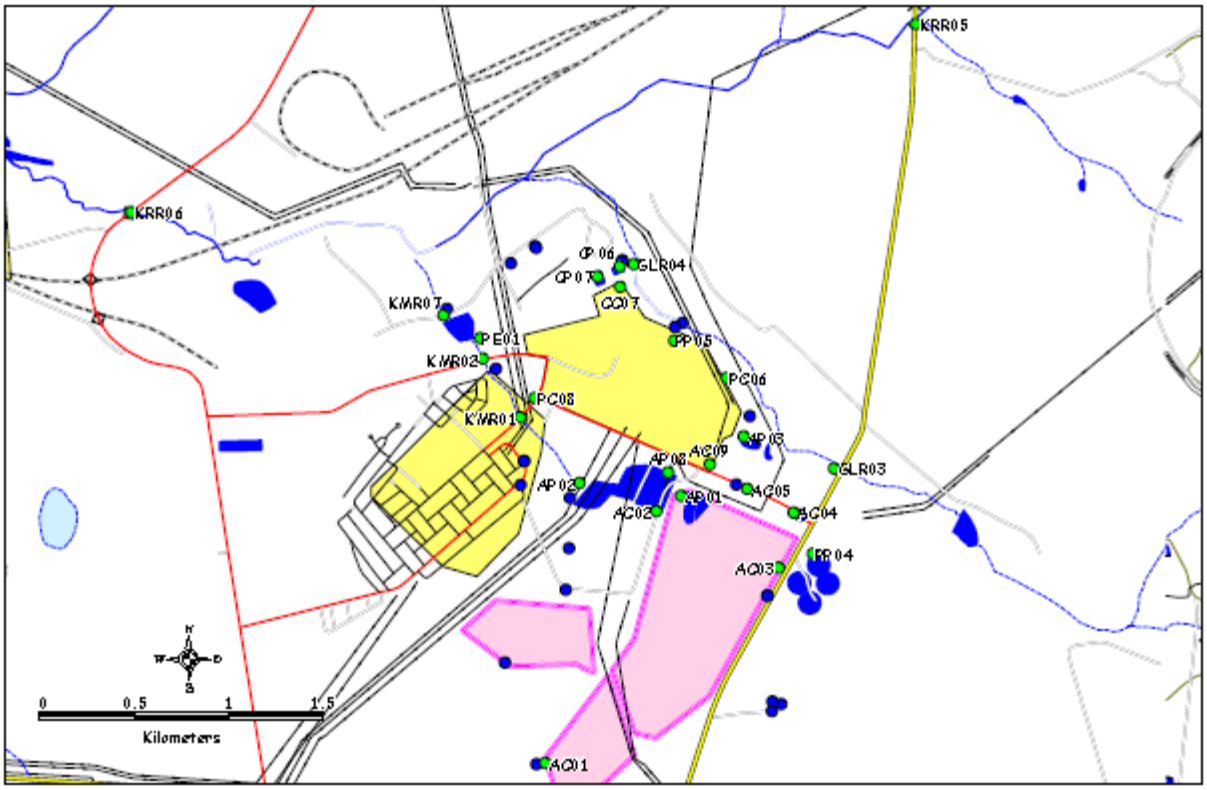

Figure 20: Surface Water Monitoring Points for the Komati Ash Dam Extension 3
(GHT Consulting Scientists) ●groundwater monitoring point ▭current ash dam footprint

10.3.1.3 Air Quality

Eskom operate an air quality monitoring station in Komati Village. A dust fallout monitoring network must be established around the ash dam complex and should include dust fallout buckets at a position west of the ash dam, near to Komati Village, and another north of the ash dam (Figure 18). Monthly sampling of fall out dust should be conducted by the Komati Power Station.

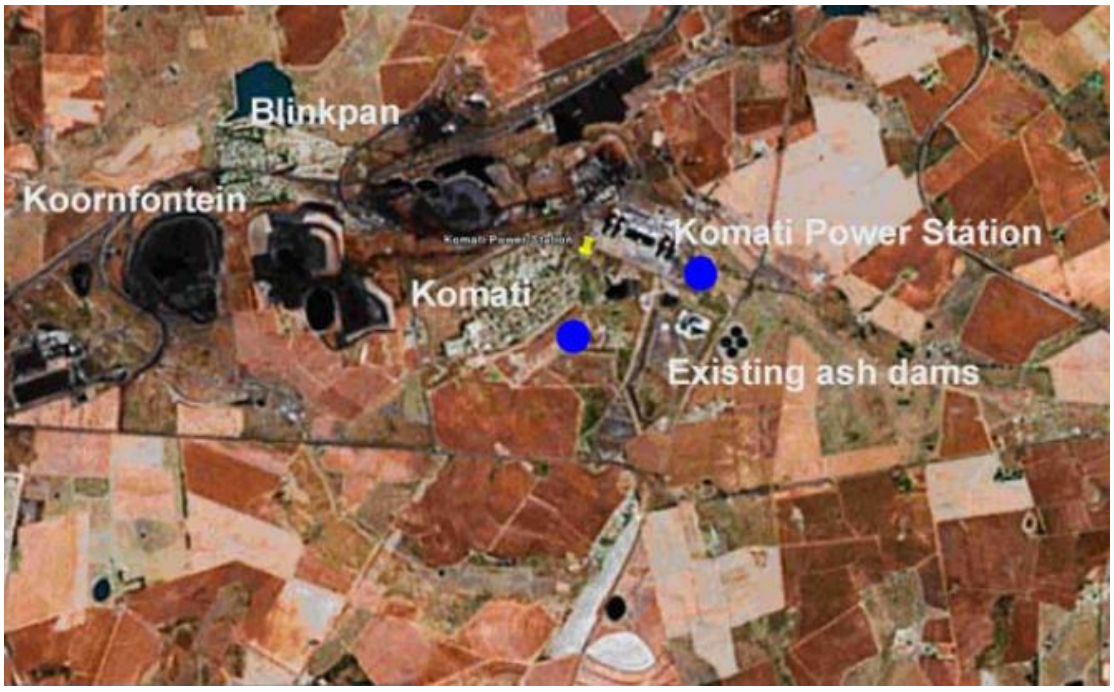

Figure 21: Proposed Dust Bucket Locations at Komati Power Station

10.3.1.4 Vegetation Establishment and Erosion Control

Rehabilitated areas of Ash Dam Extension 3 should be inspected every 6 months by the Komati Power Station to assess the success of vegetation establishment. Rehabilitated areas must be monitored and maintained to ensure that the vegetation cover is self-sustaining and that erosion is not occurring. Maintenance should include follow-up seeding and the repair of erosion where necessary.

10.3.1.5 Alien Invasive Plants

The ash dam complex should be inspected by the Komati Power Station on an annual basis for the presence of alien invasive plants as defined in the Conservation of Agricultural Resources Act (Act 43 of 1983). An annual report, documenting the presence, distribution and abundance of all alien invasive plants across the site should be produced. The report should make comparisons with previous data to assess the effectiveness of alien plant control at the ash dam complex. A strategy must be developed that outlines the methods and timeframes for the controls required to manage alien invasive plants at the ash dam complex.

10.3.1.6 EMP Compliance Monitoring and Reporting

Quarterly EMP audits must be conducted by the Komati Power Station during operations and an annual EMP compliance audit report must be produced by an independent environmental practitioner.

The annual EMP compliance audit report must incorporate results from the various monitoring programmes and should be submitted to the Department of Environmental Affairs.

10.3.2 Operations Monitoring

Monitoring of operational parameters must be undertaken as set out in the Operations Manual and any procedures thereto.

10.4 Environmental Awareness Plan

Eskom must present an annual induction, which includes an environmental awareness aspect, to all site personnel. The information required includes a description of the local environment, the sensitive aspects of this environment, the risks associated with the disposal of ash at the Komati Power Station and the obligations of personnel towards environmental controls and methodologies. All on-site activities should be approached in a risk-averse manner and the precautionary principle should always be applied. All contractors involved in work on Ash Dam Extension 3 must also be presented with the induction prior to commencing work.

If necessary, “refresher” meetings/ talks should be held at a frequency determined by Eskom/ contractor (as applicable) based on the level of risk to the environment.

10.5 Financial Provision

Funding for environmental management and monitoring for the Ash Dam Complex is included in the operational budget for Komati Power Station. Funding for management of an environmental emergency would be sourced from the Power station Manager’s budget.

10.6 Records, Reporting and Performance Assessment

Records must be kept of ash disposed to Ash Dam Extension 3 and should detail the volume of ash disposed per period. Records should also be kept of water recovered in the various sumps and the volume pumped to the ash water return dam. Records must be kept of any environmental incidents. Copies must be kept of all monitoring results and reports, as well as any investigations and resulting reports.

All records related to the implementation of this EMP must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for submission to the relevant authorities if so requested. It is recommended that photographs are taken of the site prior to, quarterly during operations and through the course of rehabilitation as a visual reference. These photographs should be filed with other records related to this EMP.

COMPILED BY:

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Matthew Hemming
MSc. Conservation Biology
Director
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ACCEPTED BY:

_____

XXX
Eskom Holdings SOC Limited

List of Appendices

Appendix A: Waste Management Licence Application and DEA Consultation

DEA Accept WML

Record of Meeting held with DEA

DEA Exemption from provisions of the 2010 EIA Regulations

Comments from the DWA on the facility design

DWA approval of revised design for Ash dam extension 3

Appendix B: Public Consultation Documentation

B1: Advertisements and Site Notices

B2: Notification Letter and Distribution List

B3: Database of Registered Interested and Affected Parties
- None

B4: Responses from Interested and Affected Parties
- None

B5: Correspondence to Interested and Affected Parties
- Notification of draft EIA Report for review.

B6: Comments on EIA Report
- None

Appendix C: Facility Designs

Previous

Current

Appendix D: Geohydrological Investigation

Appendix E: Air Quality Impact Assessment

Appendix F: Heritage Study

Appendix G: Groundwater Investigations and Monitoring by GHT

Appendix H: Ash Classification Report

Appendix I: Procedures and Operations Manuals