



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

RISK ASSESSMENT IN TERMS OF REGULATION 8 OF THE WASTE EXCLUSION REGULATIONS

<p>APPLICANT</p>	<p>ESKOM HOLDINGS SOC Ltd</p>
<p>WASTE STREAM OR PORTION OF A WASTE STREAM</p>	<p><u>ESKOM FRESH (NON WEATHERED) ASH: inclusive of Pulverised Fly Ash:</u> Pulverised coal fired boiler ash is a term for ash generated within a power station electricity generation process and is derived from firing boilers with pulverised coal. The ash is taken from the boiler prior to conditioning. This is the type of ash that is being considered for beneficial use. <u>Course Ash / Bottom Ash :</u> Bottom ash is part of the non-combustible residue of combustion in a power station. It accumulates and is collected from the bottom of the boiler and has therefore not gone through a precipitator or filtering process. <u>Clinker Ash:</u> Clinker ash is obtained from a chain grate boiler process that was used in the older power stations. This ash forms larger clinkers that closely resemble stone formations. <u>Run of Station Ash</u></p>

The practice of, under Station contingency, having to temporary dump quantities of fly ash in a designated area for later transportation to the ash dumps.

Cenospheres

Cenospheres are recovered from the surface of ash disposal ponds and are of similar chemical composition to ash. Due to a particle density of less than 1.0 kg/cm³ they float on the water.

Cementitious - Cement, Brick and Block Making

Geopolymers - including all cast products, eg Paving, Poles, Curb stones

Filler Applications - including but not limited to Ceramics, Paint, Rubber, Glue

Zeolites production

Metal and Mineral extraction

Mineral fibre production

WASTE GENERATING FACILITY

PHYSICAL ADDRESS OF FACILITY

POWER STATION NAME	COALFIELDS	Location
Arnot PS	Witbank	Rietkuil, 50km E of Middleburg
Camden PS	Witbank	15km E of Ermelo
Duvha PS	Witbank	15km E of Witbank

GrootMei PS	Witbank	Near Balfour in Mpumalanga
Hendrina PS	Witbank	Pullenshope, 40km S Middleburg
Kendal PS	Witbank	Near Ogies, 40km SW of Witbank
Komati PS	Witbank	Komati, 37 km from Middleburg
Kriel PS	Witbank	Between Kriel and Ogies
Lethabo PS	Free State	Between Vereeniging and Sasolburg
Majuba PS	Witbank	Between Volksrust and Amersfort
Matimba PS	Waterburg	LepHalale
Matla PS	Witbank	Between Kriel and Secunda
Tutuka PS	Witbank	25km from Standerton road to Bethal
Medupi PS (Partially operational)	Waterburg	LepHalale
Kusile PS (Partially operational)	Witbank	Nkangala district, Mpumalanga
Kimberley BVV Clinker Dump	Kimberley	Blankenberglei Power Station
Witbank Clinker Dump	Witbank	

<p>GPS CO-ORDINATES OF WASTE GENERATING FACILITY</p>	<p>The co-ordinates of all Eskom Power Stations are included in an <u>Appendix attached to this application.</u> THE CO-ORDINATES REPRESENT "ALL CORNERS" OF THE WASTE GENERATION FACILITY AS REQUIRED BY THE APPLICATION. SEVERAL CO-ORDINATES ARE REQUIRED TO IDENTIFY THE IRREGULAR SHAPE OF ESKOM ASH GENERATING FACILITIES. THE CO-ORDINATES REPRESENT THE BOUNDARIES OF THE POWER STATION PROPERTY WHICH WOULD INCLUDE ALL POSSIBLE ASH TAKE OFF SITES</p>
<p>CONTACT PERSON</p>	<p>WARREN FUNSTON</p>
<p>NAME</p>	<p>MEGAWATT PARK, MAXWELL DRIVE, SANDTON</p>
<p>ADDRESS</p>	<p>Warren.funston@eskom.co.za</p>
<p>EMAIL ADDRESS</p>	<p>011 800 4309</p>
<p>TELEPHONE</p>	<p>Coal can be defined as an inhomogeneous mixture of numerous types of metamorphosed plant material. Power generation in South Africa, largely depends on coal. Most of the coal has been found to be of low quality with a low heat value and containing a significant amount of inorganic (incombustible) contaminants, i.e. yielding high ash content as a result of coal burning process. Generally, all the inorganic material is not removed from the coal and becomes an integral part of the carbonaceous fuel fed to the boiler during the power generation process. The inorganic materials result in ash contents ultimately.</p>
<p>* DETAILED DESCRIPTION OF WASTE GENERATING PROCESS</p>	<p>Ash can be described as the dust-like material that results from the combustion of either hard (bituminous)</p>

coal or brown coal (lignite) in a wide variety of combustion processes such as power plant furnaces and fluidized bed boilers, and which is recovered from the flue gas by electrostatic or mechanical precipitation.

Ash characterisation

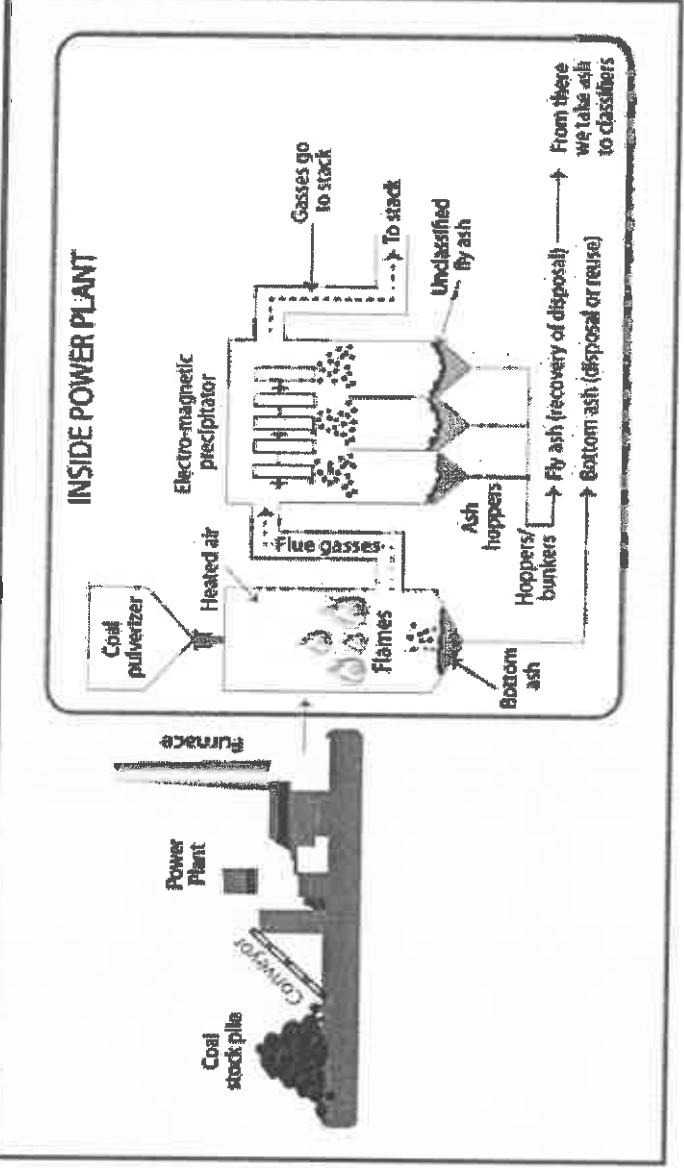
	Fly ash				Course ash		
	Hazardous	Why	Waste Type	Test used	Hazardous	Waste Type	Test used
Arnot	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Camden	Yes	pH above 11.5 Ca >1%	3	SANS 10234	No	3	SANS 10234
Duvha	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Grootvlei	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Hendrina	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Kendal	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Komati	Yes	pH above 11.5 Ca >1%	3	SANS 10234	No	3	SANS 10234
Kriel	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Kusile							
Lethabo	No		3	SANS 10234	No	3	SANS 10234

	Majuba	Yes	pH above 11.5	Human Health	3	SANS 10234	No	3	SANS 10234
	Matimba	Yes	pH above 11.5	Human Health	3	SANS 10234	No	3	SANS 10234
	Matla	Yes	pH above 11.5	Human Health	3	SANS 10234	No	3	SANS 10234
	Medupl	No			3	SANS 10234	No	3	SANS 10234
	Tutuka	Yes	pH above 11.5	Human Health	3	SANS 10234	No	3	SANS 10234

**PRODUCTION
PROCESS FLOW
CHART
ATTACHED**

YES X

NO



WASTE CLASSIFICATION SANS 10234:

HAZARDOUS WASTE X

GENERAL WASTE

REPORT ON RESULTS OF ENVIRONMENTAL HAZARD ASSESSMENT ATTACHED

YES X

NO

***A process flow chart must be attached to the process description**

RISK ASSESSEMENT

ASH USES

Activity	Risk Description	Environmental Receptor	Assessment of Criteria	Significance
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	Off Take	Transport	Storage	Interaction with soil	Interaction with ground water
Ash as a filler					
Cementitious uses					
Cement	x	x	x		
Bricks	x	x	x		
Blocks	x	x	x		
Non-Cementitious	x	x	x		
Geo-polymers	x	x	x		
True fillers					
Ceramics	x	x	x		
Rubber	x	x	x		
Paints	x	x	x		
Bitumen	x	x	x		
Metal/Mineral extraction	x	x	x		

		Impact	Probability	Magnitude	Duration	Scale	
Transport of Fly Ash.	Dust generated in large quantities during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers. In large quantities, ash dust might settle on water body surfaces and be ingested by aquatic vertebrates and invertebrates.	Nearby botanical species including agricultural crops. Nearby natural (groundwater or surface water) or man made water sources or water bodies Vertebrate or invertebrate aquatic life Air pollution	1	2	1	1	4
	Although ash has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of ash dust.	Soil Pollution					
Transport of Bottom course ash	Accidental spillages during loading and unloading of vehicles. Dust will be less of a factor in the handling of course / bottom ash. Spillages during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers.	Nearby botanical species including agricultural crops. Nearby natural (groundwater or surface water) or man made water sources or water bodies	4	4	1	1	24
	Although ash has been shown to	Vertebrate or					

	increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of ash spillage	invertebrate life Soil Pollution	aquatic						
Transport of all Ash	Spillage of ash or water containing ash from the transport vehicles on route to the ash users. Dust generated in large quantities during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers. In large quantities, ash dust might settle on water body surfaces and be ingested by aquatic vertebrates and invertebrates. Although ash has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of ash dust.	Nearby species including agricultural crops. Nearby natural (groundwater or surface water) or man made water sources or water bodies Vertebrate or invertebrate aquatic life Air pollution Soil Pollution	L	1	8	2	2	12	

<p>Transport of all Ash : Compliance of vehicle to Road traffic Act</p>	<p>Vehicles in poor condition or inadequate to transport ash will facilitate uncontrolled spillages of ash. Dust generated in large quantities during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers. In large quantities, ash dust might settle on water body surfaces and be ingested by aquatic vertebrates and invertebrates.</p> <p>Although ash has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of ash dust.</p>	<p>Nearby species including agricultural crops.</p> <p>Nearby natural or made water sources or water bodies</p> <p>Vertebrate or invertebrate aquatic life</p> <p>Air pollution</p> <p>Soil Pollution</p>	<p>L</p>	<p>1</p>	<p>8</p>	<p>2</p>	<p>3</p>	<p>13</p>
<p>Storage of Ash</p>	<p>Soil contamination by ash stored at the user facility. Fresh Fly ash will be stored in tankers or closed bins / containers and it remains improbable that any contamination will occur.</p> <p>Ash spillages in liquid form could contaminate water bodies and be detrimental to vertebrate and invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to</p>	<p>Natural and man-made surface water bodies and Groundwater.</p> <p>Soil contamination</p>	<p>L</p>	<p>1</p>	<p>6</p>	<p>2</p>	<p>1</p>	<p>9</p>

	<p>groundwater aquifers. Although ash has been shown to increase the pH of the soil, certain soils might be contaminated ash spillages.</p>					
<p>Storage of Ash</p>	<p>Groundwater contamination by ash stored at the user facility. Fresh Fly ash will be stored in tankers or closed bins / containers and it remains improbable that any contamination will occur</p> <p>Ash spillages in liquid form could contaminate water bodies and be detrimental to vertebrate and invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to groundwater aquifers</p>	<p>Natural and man-made surface water bodies and Groundwater.</p>	L	1	4	2 1 7
<p>Storage of Ash</p>	<p>Surface water contamination by ash storage at the user facility. Fresh Fly ash will be stored in tankers or closed bins / containers and it remains improbable that any contamination will occur</p> <p>Ash spillages in liquid form could contaminate water bodies and be detrimental to vertebrate and</p>	<p>Natural and man-made surface water bodies and</p>	L	2	2 2	1 10

	<p>invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to groundwater aquifers.</p>									
<p>Potential for stockpiled ash to generate leachate during rainfall</p>	<p>Leachate contaminants may be transported by stormwater runoff into nearby drainage lines, streams and rivers resulting in secondary impacts. They may also percolate into the groundwater resulting in secondary impacts on the aquifer.</p>	L	1	2	2	1	2	1	5	
<p>Construction and design of an ash handling and/or storage facility</p>	<p>Ash facilities which are poorly ventilated will cause possible health impacts. Poorly ventilated ash workplaces will likely result in health symptoms and skin and dermal irritations associated with ash particle ingestion.</p>	L	1	6	3	1	10			
<p>Construction and design of an ash handling and/or storage facility</p>	<p>Ash facilities close to natural water bodies will cause possible soil or water contamination. Spillage or dust blown particles if in large enough quantities, might contaminate natural and man-made surface water bodies.</p>	L	1	4	2	1	7			

<p>Access to Control Ash facilities</p>	<p>Uncontrolled access to ash facilities will lead to non compliance to the controls of the Risk Management Plan. Unsupervised spillage or dust blown particles if in large enough quantities, might contaminate natural and man-made surface water bodies.</p>	<p>Soil pollution Water Pollution</p>	L	1	6	2	2	9
<p>Handling of Ash on site / Extraction of Ash / On and off loading of Ash</p>	<p>Dust generated during loading and unloading of vehicles. Spillage of ash material or slurry. Dust generated in large quantities during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers. In large quantities, ash dust might settle on water body surfaces and be ingested by aquatic vertebrates and invertebrates. Although ash has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of ash dust.</p>	<p>Nearby botanical species including agricultural crops. Nearby natural (groundwater or surface water) or man made water sources or water bodies Vertebrate or invertebrate aquatic life</p>	L	1	2	1	1	4

<p>Emergency or unplanned event</p>	<p>Loss of containment with potential impacts to air, soil, ground and surface water. In an emergency or unplanned event, dust generated in large quantities might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers. In large quantities, ash dust might settle on water body surfaces and be ingested by aquatic vertebrates and invertebrates.</p> <p>Although ash has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of ash dust.</p>	<p>Nearby botanical species including agricultural crops.</p> <p>Nearby natural (groundwater or surface water) or man made water sources or water bodies</p> <p>Vertebrate or invertebrate aquatic life</p>	<p>L</p>	<p>1</p>	<p>8</p>	<p>2</p>	<p>2</p>	<p>12</p>
<p>Storm water management</p>	<p>The inadequate management of stormwater on site will allow discharge of contaminated water to the environment. Ash contaminated effluent or stormwater if diverted into water bodies, may be harmful if ingested by aquatic vertebrates and invertebrates.</p>	<p>Natural surface and ground water aquifers</p> <p>Man-made water bodies</p>	<p>L</p>	<p>1</p>	<p>6</p>	<p>2</p>	<p>2</p>	<p>10</p>

<p>Leaching of ash elements</p>	<p>The chemical reaction of ash particles with natural elements in the surrounding soil and water could lead to the leaching of harmful metals into the environment. The leaching of harmful metals from ash will be toxic to all vertebrate and invertebrate life in the soil substrate and water bodies. The negative effect will likely be extended to the health of the soils and the botanical biodiversity of the area.</p>	<p>Soil structures, geology, ground pathways and aquifers surface and water</p>	<p>L</p>	<p>1</p>	<p>2</p>	<p>2</p>	<p>1</p>	<p>5</p>
<p>Decommissioning of site</p>	<p>Without a decommissioning plan a non active site may lead to ash spillages or contamination of surrounding air, soil and water. In the scenario of an abandoned site, dust generated in large quantities might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers. In large quantities, ash dust might settle on water body surfaces and cause harm if ingested by aquatic vertebrates and invertebrates. In severe cases, an abandoned site might eventually contaminate groundwater at the site. Although ash has been shown to increase the pH of the soil, certain soils might be contaminated with</p>	<p>Nearby species including agricultural crops. Nearby natural (groundwater or surface water) or man made water sources or water bodies Vertebrate or invertebrate aquatic life</p>	<p>L</p>	<p>1</p>	<p>2</p>	<p>2</p>	<p>1</p>	<p>5</p>

	large and continuous deposition of ash dust.													
CLINKER ASH: Spontaneous combustion	The medium to long term storage of clinker ash potentially increases the likelihood of spontaneous combustion. The high carbon content of clinker ash in storage may smoulder and ignite. Any fire moving of the property will cause damage and loss to all terrestrial life including slow moving reptiles and mammals.	In extreme cases and if left unattended for a length of time, fire may spread to adjoining property and damage the environment and biodiversity of species.	M	4	8	2	2	2					48	
Harvesting of cenospheres	Drowning or bodily injury by persons trying to harvest cenospheres from the water surface. Working alone / life saving buoys life jackets Notifications / registers.	Injury to body and loss of life	L	1	10	1	0	11						
SOCIO-ECONOMIC RISKS: Positive spin offs at risk should ash beneficiation not be possible:														
Job creation	Increase in job creation for unskilled to semiskilled workforce in vulnerable communities.	Local economy	+											

Small business development	The low cost of ash and the relaxation of some of the Norms and Standards will promote small business development	Local economy	+						
Community based projects	The low cost of ash and the relaxation of some of the Norms and Standards may empower vulnerable communities to participate in projects. Eskom assistance may also promote community based projects.	Local economy	+						

ACCOUNTING FOR ASH BENEFICIATED
“CRADLE TO GRAVE PRINCIPLE”

The generator retains the ultimate responsibility for ensuring that the waste is handled, stored, transported and disposed of according to the legislation and in an environmentally sound and responsible manner. The law requires that all producers of waste account for the volumes produced and recycled until the waste is properly disposed of or beneficiated into a product fit for use. The following systems will be used to account for the ash recycled from Eskom’s Power Station:

- **Bottom ash** - Eskom uses weighbridge solution at each loading point to capture the ash volumes taken.
- **FLY ash** - Off takers have installed their own weighbridges solution which will also be integrated into Eskom bottom ash weighbridge solution in order to centralise the volume database and provide consolidated reporting.
- **Mixed ash** - Eskom uses weighbridge solution at each loading point to capture the ash volumes taken.

Notwithstanding the current weighbridge solutions Eskom will continue to review the use of other means of accounting for ash volumes including:

- front end-loaders with load cells,
- Standard Cubic Meter Unit Weigh Method

SUPPORT FOR PREVIOUSLY DISADVANTAGED COMPANIES

As a state-owned entity we are conscious of the socio-economic challenges that the country is facing and we are building partnerships with relevant stakeholders to address the poverty challenge. We have active communication channels with DPE, DEA, DTI, MPG, MEGA, etc. to explore various economic opportunities in the form of jobs and businesses through the ash and gypsum programme.

We currently have a number of companies from previously disadvantaged groups that we are supporting to meet the legislative requirements in order to establish their operations where ash is used as an input raw material in their operations as coal ash has been classified as a hazardous waste, and therefore a waste management license or an equivalent is required. Waste management license when done on an individualised basis will take up to 24 months and cost R200k and this was serving as a barrier to entry for the interested previously-disadvantaged owned entities. Through partnership with DEA Eskom is able to facilitate and extend Eskom's section 74 exemption to these companies. Our database shows we have 40 companies on the process of getting their section 74 exemption licenses. 14 of these companies have already successfully obtained their license and established their operations resulting in 19 direct jobs have been created as a result of the ash programme.

The following template will be used for reporting purposes of socio economic and tonnages moved:

Off-taker	Power Station	Type of Ash	Uses	Monthly Tonnages	BEE Level	Black Ownership	Sub-contracting	Direct Jobs

The following factors and criteria must be used to assess the impacts of the activities:

Criteria	
MAGNITUDE (Severity)	DURATION
10 - Very high	5 - Permanent (longer than 10 years)
8 - High	4 - Long-term (5 to 10 years)
6 - Moderate	3 - Medium-term (12 months to 5 years)
4 - Low	2 - Short-term (0 to 12 months)
2 - Minor	1 - Immediate
SCALE	PROBABILITY (Likelihood)
5 - International	5 - Definite
4 - National	4 - Highly probable
3 - Regional	3 - Medium probability
2 - Local	2 - Low probability
1 - Site only	1 - Improbable
0 - None	0 - None

Magnitude
Magnitude measures the size of the impact

Duration
Duration refers to the lifetime of the impact i.e. how long it will last

Scale
The scale refers to the extent of the impact, i.e. will the impact be felt at the local, regional, global scale and so.

Probability
The probability refers to the chance of impact to occur. The potential impact could be most likely to occur, unlikely, etc.

Assessment of Significance of impact
Significance rating of the potential impacts illustrates the importance of the impact itself. The size of area affected by pollution may be extremely high but the significance of this effect is dependent on the concentration or level of pollution in that area. In order to determine the significance of impact, the following method was used:
Significance Points (SP) = (Magnitude + Duration + Scale) x Probability

The values of SP are then ranged as follows:

Rating		Description
SP >60	Indicates high environmental significance	An impact which could influence the decision about whether or not to proceed with the activities regardless of any possible mitigation.
SP 30 – 60	Indicates moderate environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <30	Indicates low environmental significance	Impacts with little real effect and which will not have an influence on or require modification of the activities.
+	Positive impact	An impact that is likely to result in positive consequences/effects

I, **W FUNSTON** hereby declare that I have read the completed the Risk Assessment form and hereby confirm that the information is to the best of my knowledge true and correct.

Furthermore, I declare that I am fully aware of my responsibilities in terms of the Waste Exclusion Regulations, and that failure to comply with these Regulations may constitute an offence in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008).

Applicant (Full names) ESKOM HOLDINGS SOC Ltd

Designation Manager: Biodiversity and Waste

Signature



Date 20 September

Place JHB

FOR OFFICE USE ONLY

Date Received			
Decision Taken	Authorised	Not Authorised(provide reasons)	
Reference Number			

