

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

APPLICANT	ESKOM HOLDINGS SOC Ltd
WASTE STREAM OR PORTION OF A WASTE STREAM	<p><u>ESKOM 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.</p> <p><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.</p> <p><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.</p> <p><u>Run of Station Ash</u> The practice of, under Station contingency, having to temporary dump quantities of fly ash in a designated area for later tar</p>

to the ash dumps.

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

Road Construction

Mine Backfilling

Treatment of Acid Mine Drainage

Soil Amelioration - combined with and without other organics eg SLASH – sewerage sludge, manure. Other organic sludges

**WASTE
GENERATING
FACILITY**

PHYSICAL ADDRESS OF FACILITY	POWER STATION NAME	COALFIELDS	Location
	Arnot PS	Witbank	Rietkuij, 50km E of Middleburg
	Camden PS	Witbank	15km E of Ermelo
	Duvha PS	Witbank	15km E of Witbank
	Grootvlei PS	Witbank	Near Balfour in Mpumalanga
	Hendrina PS	Witbank	Pullenshope, 40km S Middleburg
	Kendal PS	Witbank	Near Ogies, 40km SW of Witbank
	Komatati PS	Witbank	Komatati, 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	Blankenbergvlei 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 Appendix attached to this application. 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>NAME</p>	<p>WARREN FUNSTON</p>
<p>ADDRESS</p>	<p>MEGAWATT PARK, MAXWELL DRIVE, SANDTON</p>
<p>EMAIL ADDRESS</p>	<p>Warren.funston@eskom.co.za</p>
<p>TELEPHONE</p>	<p>011 800 4309</p>
<p>* DETAILED DESCRIPTION OF WASTE GENERATING PROCESS</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>

Ash can be described as the dust-like material that results from the combustion of either hard (bituminous) 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

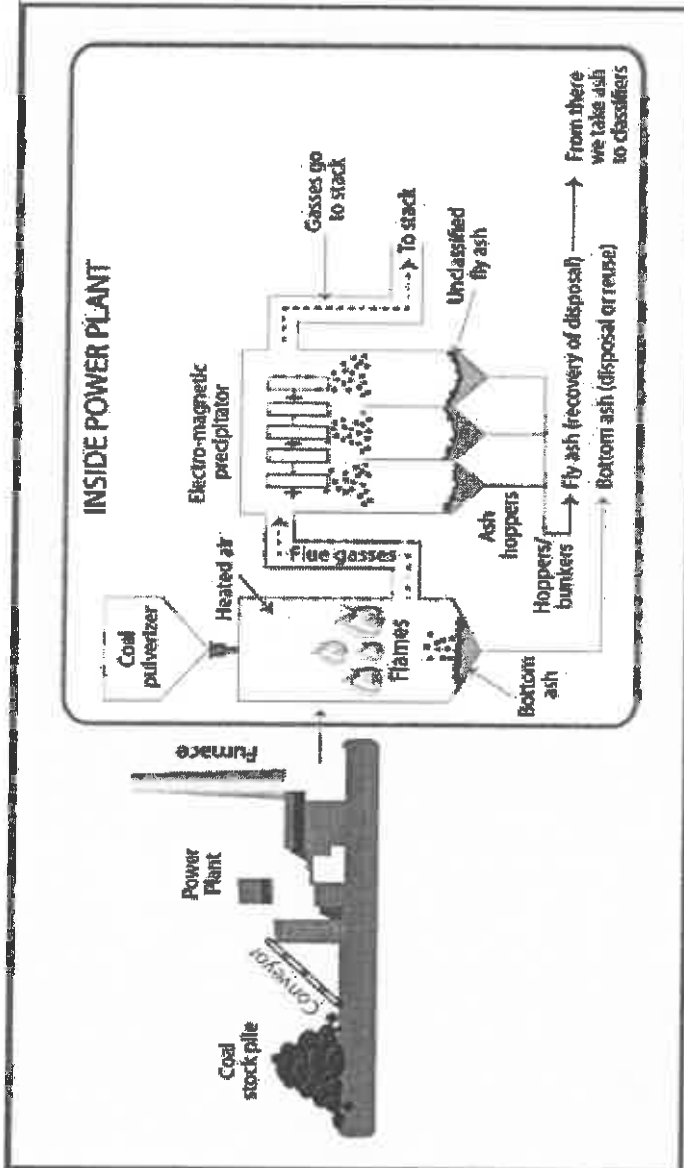
	Fly ash				Course ash		
	Hazardous	Why	Waste Type	Test used	Hazardous	Waste Type	Test used
Arnot	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Camden	Yes	pH above 11.5 Ca >1%	3	SANS 10234	No	3	SANS 10234
Duvha	Yes	pH above 11.5	3	SANS 10234	No	3	SANS 10234
Grootvlei	Yes	pH above 11.5	3	SANS 10234	No	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	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
	Medupi	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

	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		
Soil Amelioration	x	x	x	x	x
Mine Backfilling	x	x	x	x	x
AMD Treatment	x	x	x	x	x
Road Construction	x	x	x		

Activity	Risk Description	Environmental Receptor	Assessment of Criteria					Significance
			Impact	Probability	Magnitude	Duration	Scale	
<p>Transport of Ash.</p>	<p>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.</p> <p>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 or (groundwater or surface water) or man made water sources or water bodies</p> <p>Vertebrate or invertebrate aquatic life</p> <p>Air pollution</p> <p>Soil Pollution</p>	L	1	2	1	1	4

<p>Transport of Bottom course ash</p>	<p>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.</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 spillage</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>Soil Pollution</p>	<p>L</p>	<p>4</p>	<p>4</p>	<p>1</p>	<p>1</p>	<p>24</p>
<p>Transport of all Ash</p>	<p>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.</p> <p>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</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>Air pollution</p> <p>Soil Pollution</p>	<p>L</p>	<p>1</p>	<p>8</p>	<p>2</p>	<p>2</p>	<p>12</p>

	<p>large and continuous deposition of ash dust.</p>																		
<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 botanical species including agricultural crops.</p> <p>Nearby natural or made surface water) or man made water sources or water bodies</p> <p>Vertebrate or invertebrate aquatic life</p> <p>Air pollution</p> <p>Soil Pollution</p>	L	1	8	2	3												
<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</p>	<p>Natural and man-made surface water bodies and Groundwater.</p> <p>Soil contamination</p>	L	1	6	2	1												

	<p>invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to 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</p>	<p>Natural and man-made surface water bodies and</p>	L	2	2	2	1	10

	<p>detrimental to vertebrate and 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>	<p>Soil, Land and water pollution</p>	L	1	2	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>	<p>Health impacts to staff, handlers and workers of ash</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>	<p>Soil pollution Water Pollution</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>	<p>L</p>	<p>1</p>	<p>6</p>	<p>2</p>	<p>2</p>	<p>9</p>
<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>	<p>L</p>	<p>1</p>	<p>2</p>	<p>1</p>	<p>1</p>	<p>4</p>

<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 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>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>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, surface and ground water pathways and aquifers</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 botanical species including agricultural crops. Nearby natural or made water sources or water bodies Vertebrate or aquatic invertebrate life</p>	<p>L</p>	<p>1</p>	<p>2</p>	<p>2</p>	<p>1</p>	<p>5</p>

	L	2	4	2	2	16
<p>Production of secondary waste</p> <p>The treatment of AMD with ash will result in the formation of secondary sludge which will require proper disposal. Improper disposal could lead to the contamination of soil, surface and ground water</p>	<p>Soil pollution Surface water and ground water pollution</p>					
<p>SOCIO-ECONOMIC RISKS: Positive spin offs at risk should ash beneficiation not be possible:</p>						
<p>Job creation</p>	<p>Local economy</p>	<p>Increase in job creation for unskilled to semiskilled workforce in vulnerable communities.</p>				
<p>Small business development</p>	<p>Local economy</p>	<p>The low cost of ash and the relaxation of some of the Norms and Standards will promote small business development</p>				
<p>Community based projects</p>	<p>Local economy</p>	<p>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.</p>				

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	An impact which could influence the decision about whether or not to proceed with the activities regardless of any possible mitigation.
SP 30 – 60	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	Impacts with little real effect and which will not have an influence on or require modification of the activities.
+	An impact that is likely to result in positive consequences/effects

I, **WGS 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 2018

Place JHB

FOR OFFICE USE ONLY

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

