forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

RISK MANAGEMENT PLAN IN TERMS OF REGULATION 10 OF THE WASTE EXCLUSION REGULATIONS

	(For official use only)
File Reference Number:	12/9/11
NEAS Reference Number:	
Date Received:	

Risk Assessment for an application for exclusion of waste stream or portion of waste stream in terms of the National Environmental Management: Waste Act, 2008(Act No.59 of 2008), as amended.

Kindly note that:

1. This form is current as of 01 April 2021. It is the responsibility of the applicant to ascertain whether subsequent versions of the form have been published or produced by the competent authority.

2. The information must be typed within the spaces provided in the form. The sizes of the spaces provided are not necessarily indicative of the amount of information to be provided. Spaces are provided in tabular format and will extend automatically when each space is filled with typing.

3. Incomplete forms (including information as required in the application form may be returned to the applicant for revision and the inclusion of additional information.

4. Unless protected by law, all information filled in on this application will become public information on receipt by the competent authority. Any interested and affected party should be provided with the information contained in this application on request, during any stage of the application process.

BACKGROUND INFORMATION	
APPLICANT	Southern Protein (Pty) Ltd.
CONTACT PERSON	Peet Venter
NAME	Southern Protein (Pty) Ltd.
ADDRESS	Portion 45 (Remaining extent) of the farm Weltevreden 227, Registration Division IR, Victor Khanye Local Municipality, Mpumalanga
E-MAIL ADDRESS	Peet.Venter@afgrifeeds.co.za
TELEPHONE	013 665 1027
CELL PHONE	

WASTE FACILITIY OR FACILITIES						
SOURCE (S) OF WASTE	Coal fired boilers					
WASTE TO BE BENEFICIATED	Boiler ash					
GPS CO-ORDINATES AT CORNERS OF WASTE GENERATING FACILITY OR FACILITIES	**LATITUDE**			**LONGITUDE**		
	26°	06’	52.18”	28°	45’	0.43”
	26°	06’	52.24”	28°	45’	3.08”
	26°	07’	2.16”	28°	45’	2.66”
	26°	07’	2.99”	28°	45’	2.20”
	26°	07’	3.39”	28°	45’	1.70”
	26°	07’	3.54”	28°	44’	55.36”
	26°	06’	57.76”	28°	44’	55.59”
	26°	06’	57.82”	28°	44’	57.99”
	26°	06’	55.15”	28°	44’	58.37”
	26°	06’	55.23”	28°	45’	0.10”
BENEFICIAL USE/S	Brick making					

WASTE GENERATING PROCESS		
MSDS ATTACHED IF HAZARDOUS	YES X	~~NO~~
WASTE GENERATING FACILITY	HAZARDOUS X	~~GENERAL~~

I, Charlotte Mapleby (the Applicant) hereby declare that I have read the completed Risk Management Plan 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).

Signature of the applicant[1]/ Signature on behalf of the applicant:

Charlotte

Name of Applicant:

Environmental officer

Designation:

17/11/2022

Date:

[1] If the applicant is a juristic person, a signature on behalf of the applicant is required as well as proof of such authority.

7. RISK MANAGEMENT PLAN

Risk management plan for the beneficial use of the boiler ash

Activity	Risk Description	Action(s) to minimise/ manage the risk	Responsibility (Who is responsible to do it)
1. Loading of ash onto trucks	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • Dust management during loading of ash through wetting of ash. • Stop loading of ash during extreme wind conditions.	Boiler operator
		Corrective mitigation measure • Wearing of relevant PPE (dust mask and eye protection) during ash loading.	Boiler operator Ash transporters
2. Transportation of ash	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • Dust management during transportation will include ensuring vehicles follow an approved route that will limit the exposure of dust in communities. • Side tippers with tarpaulin devices will be recommended for the transportation of ash, however, those that cannot be covered will not be filled to the brim and will be required to go through a dust suppression (wetting) process. **Corrective mitigation measure** • None	Ash transporters
		Preventative mitigation measure • Compliance with the Road Traffic Act. **Corrective mitigation measure** • Implementation of the Emergency response plan.	

Activity	Risk Description	Action(s) to minimise/ manage the risk	Responsibility (Who is responsible to do it)
		• Use of Safety Data Sheet (SDS) with hazard classification which is provided to all customers and transporters.	
3. Off-loading of ash	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • Dust management during loading of ash through wetting of ash. • Stop off-loading of ash during extreme wind conditions. **Corrective mitigation measure** • Wearing of relevant PPE (dust mask and eye protection) during ash off-loading.	Ash transporters Ash users
4. Storage of ash	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • Dust management during storage through wetting of ash. • Avoid loading of ash during extreme wind conditions. **Corrective mitigation measure** • Wearing of relevant PPE (dust mask and eye protection) when working in ash storage area. **Preventative mitigation measure** • Storage area designed to prevent rainfall run-off from carrying ash away. • Discourage excessive storage of ash - Facilities storing more than a 100 m^3 of ash at a time, should have a firm impermeable surface on which to place the ash and a	Ash users

Activity	Risk Description	Action(s) to minimise/ manage the risk	Responsibility (Who is responsible to do it)
		system to collect and store run-off arising from the ash storage facility. **Corrective mitigation measure** • The use of Safety Data Sheet (SDS) with hazard classification which is provided to all ash users. • Clean-up plan to be implemented where ash is carried way from storage area.	
5. Handling of ash (i.e. screening, crushing, blending etc.)	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • Dust management during handling of ash through wetting of ash. • Adherence to production process and product standards and regulations. **Corrective mitigation measure** • Wearing of relevant PPE (dust mask and eye protection) during ash handling.	Ash users
6. Disposal of ash and ash containing products	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • The use of Safety Data Sheet (SDS) where disposal guidance is provided. • The use of the National Norms and standard for the assessment of waste for disposal and the Regulations for the classification and management of waste. **Corrective mitigation measure** • Clean-up plan to be implemented where ash is not disposed properly.	Ash users
7. Residual ash stockpiled after closure, decommissioning or change of	Uncontrolled dispersion of ash/dust	**Preventative mitigation measure** • Contractual agreement with ash customers to include the following clause: "The owner of the facility, including the subsequent owner of the facility will remain responsible	Ash users

Activity	Risk Description	Action(s) to minimise/ manage the risk	Responsibility (Who is responsible to do it)
ownership of user facility		for any adverse impacts on the environment and health stemming from stockpiled ash, even after operations have ceased. **Corrective mitigation measure** • Land remediation	
Beneficial end use	No identifiable risk	No specific mitigation measures recommended	N/A

7.1 Mechanism to record the amount of waste distributed

Section 9c of the Regulations (No. 715) states that the applicant must have a mechanism in place to record the amount of waste distributed to specific users for a permitted use, including the number of enterprises established or supported and the extent to which previously disadvantaged individuals have been supported.

At Southern Proteins ash is transported through the submerged conveyor belt and into the skip and as soon as it is filled it goes through a weigh bridge and a waste manifest is prepared. It is taken straight to three communities in Botleng where the bricks are to be manufactured. The finished bricks then will be sold again to the community for re-use.

7.2 Beneficial uses locally or internationally of the waste material

As per requirements of the GN 715 in GG 41777 of 18 July 2018, Regulation 7 (a) (Regulations Regarding the Exclusion of a Waste Stream or a Portion of a Waste Stream from the Definition of Waste), the application must demonstrate that the waste is being or has been or will be used for a beneficial purpose either locally or internationally. Below is references to literature where the waste material at issue (“coal ash”) is used for beneficial use.

7.2.1 Ash as an engineering material

Data published by the US Department of Transportation shows that up to 32% of fly ash is currently being used for beneficial purposes, the majority of which is used for cement and concrete, structural fills and in road building (bases and sub-bases).

Several ASTM[6] guidelines have been printed on the beneficial use of ash in engineering principles (Table 14).

The main mineral component of class F fly ash is aluminosilicate glass accompanied by crystalline mullite, iron oxides (hematite, magnetite), quartz, and unburned carbon fragments. Because of these properties, they are a widely used mineral resource in many areas of industry, such as agriculture, medicine, chemical technology, environmental protection, and engineering (Payara and Dutta, 2003[7]).

Due to the high abundance of the raw mineral materials, mullite could be regarded as an excellent candidate for the fabrication of porous hollow fibre ceramic membranes.

Table 13: Table 1-2: Ash uses (US Department of Transportation)

ACI 229R	Controlled Low Strength Material (CLSM)
ASTM C 311	Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
AASHTO M 295 **ASTM C 618**	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 593	Fly Ash and Other Pozzolans for use with Lime
ASTM D 5239	Standard Practice for Characterizing Fly Ash for Use in Soil Stabilization
ASTM E 1861	Guide for the Use of Coal Combustion By-Products in Structural Fills

Additional references in the design and construction for highway engineers are listed below.

Portland Cement Concrete

- ACI Manual of Concrete Practice, American Concrete Institute, Farmington Hills, Michigan.
- Fast Track Concrete Pavements, Technical Bulletin 004P, American Concrete Pavement Association, Skokie, Illinois, 1994.

Stabilized Base Course

- Coal Fly Ash in Pozzolanic Stabilized Mixtures for Flexible Pavement Systems (Flexible Pavement Manual), American Coal Ash Association, Washington, DC.
- Guidelines and Guide Specifications for Using Pozzolanic Stabilized Mixture (Base Course or Subbase) and Fly Ash for In-Place Subgrade Soil Modifications, AASHTO Task Force Report 28, Washington, DC.
- Soil and Pavement Base Stabilization with Self-Cementing Coal Fly Ash, American Coal Ash Association, Alexandria, Virginia, May 1999.

[6] ASTM International, formerly known as American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

[7] Payara, P., & Dutta, P. K. (2003). Zeolites: A primer. In S. M. Auerbach, K. A. Carrado, & P. K. Dutta (Eds.), Handbook of zeolite science and technology (pp. 5–64). New York: Basel.

- Flowable Fill ACI 229R, Controlled Low Strength Materials, American Concrete Institute, Farmington Hills, Michigan.
- NRMCA Flowable Fill Pamphlet, National Ready Mixed Concrete Association.

Grouts for Pavement Sub-sealing

- Slab Stabilization Guidelines for Concrete Pavements, Technical Bulletin 018P, American Concrete Pavement Association, Skokie, Illinois, 1994.

Soil Improvement

- Soil and Pavement Base Stabilization with Self-Cementing Coal Fly Ash, American Coal Ash Association, Alexandria, Virginia, May 1999.
- Fly Ash for Soil Improvement, Geotechnical Special Publication No. 36, American Society of Civil Engineers, New York, New York, 1993.
- Guidelines and Guide Specifications for Using Pozzolanic Stabilized Mixture (Base Course or Subbase) and Fly Ash for In-Place Subgrade Soil Modifications, AASHTO Task Force Report 28, Washington, DC.

Structural Fills/Embankments

- ASTM E 1861, Structural Guide for the Use of Coal Combustion By- Products in Structural Fills, American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- Technical Advisory T 5080.9, Use of Coal Ash in Embankments and Bases, U.S. Department of Transportation, Federal Highway Administration, Washington, DC, May 1988.

Asphalt Pavements

- American Association of State Highway Transportation Officials. Standard Method of Test, Mineral Filler for Bituminous Paving Mixtures, AASHTO Designation M17-83, Part 1 Specifications, 14th Edition, 1986.
- L. Allen Cooley, Jr. and Michael H. Huner. Evaluation of Fly Ash Sources for Use as Mineral Filler in Hot Mix Asphalt, Proceedings: 14th International Symposium on Management and Use of Coal Combustion Products, Volume 2, Palo Alto, California, January 2001.

7.2.2 Coal fly ash in bricks and clay bricks

A laboratory study into the characteristics and leaching behaviour of coal fly ash for the use as base material for bricks (Malaviya *et al*, 1999) encouraged the use of fly ash bricks compared to clay bricks due to its environmental stability and leaching behaviour.

The clay brick used for construction purposes is the age-old product and is being used confidently by the consumers even today. With the fast-urban development, the demand for bricks have been increasing allowing brick industry to exploit topsoil which is not favoured upon. In order to meet the increasing demand of brick, the fly ash-based brick can be an alternative with the improved engineering properties. Ash plays primarily the role of replacing the topsoil and thus silica and other constituents play a normal role. The presence of unburnt carbon is very advantageous as it saves the fuel consumption during firing. In other words, the ash with higher LoI is more useful for these applications (Malaviya et al, 1999). **Note:** The Southern Proteins Ash recorded a high LoI of 42.3%. After mixing clay and fly ash in proper proportion; extrusion and drying; the bricks are fired in kilns.

According to (Malaviya et al, 1999) there are certain distinct advantages of fly ash based bricks over the conventional red bricks and these are (Sagar, et al, 2014) –

i. Uniform and standard product size resulting in 10% less consumption of bricks per unit construction;
ii. Cement Consumption is less in cement and mortar;
iii. Compressive strength is more than conventional red bricks (> 100 kg/ cm2) and further increase with the passage of time;
iv. Less load on foundation due to light weight; and
v. Due to the property of less water absorption and no weathering effects, surfaces can be left exposed without plastering and direct application of paint is also possible.

The ash changes into a non-toxic product when mixed with lime at ordinary temperature as the calcium silicate hydrates and forms a dense composite inert block possessing the potential as a good building material.

Cement gets its strength from chemical reactions between the cement and water. The process is known as hydration. Cement is manufactured by crushing, milling and proportioning the following materials:

- Lime or calcium oxide, CaO: from limestone, chalk, shells, shale or calcareous rock
- Silica, SiO_2: from sand, old bottles, clay or argillaceous rock
- Alumina, Al_2O_3: from bauxite, recycled aluminium, clay
- Iron, Fe_2O_3: from clay, iron ore, scrap iron and fly ash
- Gypsum, $CaSO_4.2H_20$: found together with limestone

The materials, without the gypsum, are proportioned to produce a mixture with the desired chemical composition and then ground and blended by one of two processes - dry process or wet process. The materials are then fed through a kiln at to produce greyish-black pellets known as clinker. The alumina and iron act as fluxing agents which lower the melting point of silica. After this stage, the clinker is cooled, pulverized and gypsum added to regulate setting time. It is then ground extremely fine to produce cement. Refer to Section 7.2.2 for the chemical composition of the basic compounds and clinker.

The cement clinker formed has the following typical composition (Table 14):

Table 14: Typical composition of clinker

Compound	Formula	% by weight[1]
Tricalcium aluminate	$Ca_3Al_2O_6$	10
Tetracalcium aluminoferrite	$Ca_4Al_2Fe_2O_{10}$	8
Belite or dicalcium silicate	Ca_2SiO_5	20
Alite or tricalcium silicate	Ca_3SiO_4	55
Sodium oxide	Na_2O	Up to 2
Potassium oxide	K_2O	
Gypsum	$CaSO_4.2H_2O$	5

7.2.3 Coal ash as substitute for cement and river sand

Rafieizonooz *et al* (2017)[8] investigated the toxicity characteristics and durability of concrete containing coal ash as substitute for cement and river sand. From their TCLP (toxicity characteristic leaching procedure) results, they concluded that none of the toxic elements leached higher than the maximum concentration of contaminants for toxicity characteristics. They concluded that transportation, disposal and utilization of coal ash as clean construction material's replacement could be utilized to reduce environmental problems, increase efficiency and reduced unit cost production of concrete.

7.2.4 Coal ash re-use (EPA, 2021)

Coal ash, also referred to as coal combustion residuals (CCR), can be used in different products and materials. Coal ash can be beneficially used to replace virgin materials removed from the earth, thus conserving natural resources. EPA encourages the beneficial use of coal ash in an appropriate and protective manner, because this practice can produce positive environmental, economic, and product benefits such as: reduced use of virgin resources, lower greenhouse gas emissions, reduced cost of coal ash disposal, and improved strength and durability of materials. The most recent available data from responses to an American Coal Ash Association (ACAA) survey of electric utilities shows that in 2018, at least 41 million tons of coal ash were beneficially used.

Encapsulated uses of CCR involve binding the coal ash, such as in wallboard, concrete, roofing materials, and bricks in a way that minimizes the CCR from escaping into the surrounding environment. There are important benefits to the environment and the economy from the use of coal ash in encapsulated form. The two largest encapsulated uses reported by the ACAA in 2018 are fly ash used in "concrete/concrete products/grout" (13.4 million tons) and flue gas desulfurization (FGD) material gypsum used in "gypsum panel products" (12.3 million tons), making up over 60 percent of the total amount of coal ash beneficially used.

In 2013, EPA developed a methodology for evaluating encapsulated beneficial uses of CCR. This methodology can support beneficial use determinations by allowing the user to demonstrate whether releases from an encapsulated beneficial use of coal ash are comparable to or lower than those from analogous products made without coal ash, or are at or below relevant regulatory and health-based benchmarks, during use. EPA used the methodology to evaluate the potential environmental impacts associated from fly ash used as a direct substitute for Portland cement in concrete, and from FGD gypsum used as a replacement for mined gypsum in wallboard. EPA's evaluation concluded that the beneficial use of encapsulated CCR in concrete and wallboard is appropriate because environmental releases are comparable to or lower than those from analogous non-CCR products or are at or below relevant regulatory and health-based benchmarks (EPA, 2001).

[8] Rafieizonooz, M., Salim, M. R., Mirza, J., Hussin, M. W., Salmiati, Salmiati, Khan, R., Khankhaje, E. (2017). Toxicity characteristics and durability of concrete containing coal ash as substitute for cement and river sand. Elsevier Ltd 2017.

8. CONCLUSION

The main objective of this project is to submit an application to the minister of Department of Forestry, Fisheries and the Environment ("DFFE") to exclude the boiler ash generated at Southern Proteins from the definition of "waste" as per the requirements of the GN 715 in GG 41777 of 18 July 2018 (*Regulations regarding the exclusion of a waste stream or a portion of a waste stream from the definition of waste*).

The investigation assessed the risks related to the beneficial use of the material (brick making) and proposed a risk management plan to manage the material in an environmentally sustainable manner. This report will be submitted with the application forms for the exclusion application.

Based on the data generated and the assessment the following are concluded:

- The ash is a low risk waste with low potential for contaminant release but does require some level of control and ongoing management.
- The beneficial use of the material ('bricks') would not pose any health hazards should safety and management measures be implemented.
- Risks towards the receiving environment are low even unmitigated.
- The potential impacts will have little real effect and will not have an influence on or require modification of the activities.

SAFETY DATA SHEET

Conforms to ISO 11014-1 and the South African Occupational Health and Safety Act (86/1993)

July 2022

ASH MATERIAL

1. COMPANY INFORMATION

Name:	Southern Proteins (Pty) Ltd
Address:	Farm Weltevreden
	Dryden
	Eloff
	2211
Trading Name:	Southern Proteins
Registration number:	2016/441054/07
Tel Number:	013 665 1027

2. HAZARDS IDENTIFICATION

High proportions of amorphous non-crystalline materials (80.2%) with minor and variable amounts of crystalline phases, most commonly mullite ($3Al_2O_3 \cdot 2SiO_2$) and quartz (SiO_2), are the main components of the boiler ash. The x-ray diffraction (XRD) analysis showed that mullite, which is typically present in the matrix of ash, is most dominant with a content of 13.8%. This is followed quartz with 3.9% and the clay mineral kaolinite ($(Al_2Si_2O_5(OH)_4)$) with 0.8%. The amorphous phase can be subdivided into amorphous aluminium-silicon and amorphous silicon.

The multi-element analyses results reveal a variety of major elements to be present in concentrations >1% but these elements, including silica (Si), aluminium (Al), calcium (Ca) and iron (Fe) do not represent major health concerns and are relatively low risk elements.

The pH of the material was measured as 9.33 (1:20) indicating that the material is naturally alkaline and, therefore, it is highly unlikely that dissolution of trace metals will occur in significant amounts. Trace metals Metalloids such as arsenic (As), molybdenum (Mo) and boron (B) could be solubilised under alkaline conditions.

The following potential hazards are recognised:

Physical hazards

The ash material is not explosive, flammable or oxidising and do not release toxic gases when in contact with water or acid. It is, therefore, classified as non-hazardous in terms of physical hazards.

Health hazards

The constituents present in concentrations > 1% include silica (Si), aluminium (Al), iron (Fe) and calcium (Ca) but these constituents do not constitute health risks. Carcinogenic metals, such as As, cadmium (Cd), chromium (Cr) and nickel (Ni) are all present in quantities ≤ 0.1% The waste materials are, therefore, not considered as hazardous in terms of human health.

Target Organs: May cause respiratory irritation upon exposure to high airborne concentrations. May cause eye irritation if material contacts eye.

Hazard statements:

May be harmful if swallowed (H303).

May be harmful if inhaled (H333).

Precautionary Statement:

Wear protective gloves/protective clothing/eye protection/face.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present. Continue rinsing.

If skin irritation occurs: Get medical advice/attention.

If eye irritation persists: Get medical advice/attention.

Environmental hazards

Ash poses no risk of substandard leachate quality generation unless it were to come into contact with an acidic solution, which is unlikely to occur.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

The ash material is composed of the following:

Constituent	*Content (%)*	CAS number
SiO_2	27.4	7631-86-9
Al_2O_3	19.0	1344-28-1
CaO	3.76	1305-78-8
Fe_2O_3	3.19	1309-37-1
TiO_2	1.06	13463-67-7

Constituent	*Content (%)*	CAS number
MgO	0.88	1309-48-4
K_2O	0.385	1309-48-4
P_2O_5	0.287	7723-14-0
MnO	0.029	1344-43-0
LOI	42.3	N/A

4. FIRST AID MEASURES

Eye: Flush eyes with plenty of water for a minimum of 15 minutes. Keep rotating the eyes to ensure complete flushing of all particles. Do not rub eyes. Seek medical attention promptly if irritation persists or any abrasions occur.

Skin: Not severely abrasive on skin but skin should be washed with cool water and mild soap or detergent if rash or irritation occurs.

Inhaled: No specific first aid measures are needed but remove affected person promptly to fresh air. Seek medical attention for discomfort or if coughing or other symptoms do not subside. Always use proper PPE.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry powder, carbon dioxide, foam or water spray.

Exposure Hazards: The product will not ignite easily.

6. ACCIDENTAL RELEASE MEASURES

Personal Precaution: Wear personal protective clothing with a respiratory mask.

Emergency: Isolate the spill and prevent further leakage or spillage.

Environmental: Prevent entry of the spilled product into waterways, sewers or confined areas.

Clean up methods: Sweep up and shovel it into suitable containers for re-use, recovery or disposal. Avoid creating a dust cloud.

Other Information: See Section 13 for disposal Considerations.

7. HANDLING AND STORAGE

Handling: Handle in a well-ventilated area. Keep dust formation to a minimum. Always wear correct PPE.

Protective clothing: Chemical protective clothing should not be required under normal circumstances when using this material.

Storage: No special storage requirements but store where excessive wind cannot disperse dust particles.

8. ENGINEERING MEASURES

Occupational Exposure Limits (OEL):

There are no exposure limits available for the waste stream, therefore the ingredients or a substance close to the ingredients will be used. Below is Exposure Limits for dust and silicon. The exposure limits for nuisance dust (particulates not otherwise regulated) are the most important and should be used.

Particulates not otherwise regulated – Total Dust

TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)

General Industry - TWA 15 mg/m^3

Construction Industry – TWA 15 mg/m^3

TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)

ACGIH Guideline: TWA 10 mg/m^3 (Inhalable Particles)

Silicon [CAS No. 7440-21-3]

TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)

TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)

Personal protection during working application:

Respiratory: Suitable dust masks of same nature as for nuisance dust (NB, recommendations/specifications to be informed by an occupational health practitioner (only in its dry state).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Dark Grey
Odour:	None
Odour Threshold:	Not applicable since there is no odour
pH:	9.33
Melting Point:	Not Available

Boiling Point:	Not available
Flash Point:	Not Applicable Inorganic Substance
Evaporation Rate:	Not available
Flammability:	Not Flammable
Explosion limits:	Not Explosive
Vapour Pressure:	Not Available
Vapour Density:	Not Applicable
Relative Density:	Not Available
Water Solubility:	Not available
Partition Coefficient:	Not Applicable, Inorganic Substance

10. STABILITY AND REACTIVITY

Chemical stability:

Stable under normal temperatures and pressures

Possibility of Hazardous Reactions:

Avoid reactions with acids such as hydrofluoric acid and nitric acid and bases.

Conditions to Avoid:

Avoid generating dust. Ash poses an inhalation risk when dry.

11. TOXICOLOGICAL INFORMATION

Acute Potential Effects:

Possible silicosis, fibrosis, cancer (in its dry state only)

May be harmful if swallowed

May be harmful if Inhaled

Chronic Potential Health Effects:

The substance may be toxic to lungs and upper respiratory tract when in its dry form. Repeated or prolonged inhalation or unprotected exposure to the substance can produce target organ damage.

Likely routes of exposure:	Eye contact, skin contact, inhalation
Target Organs:	Skin, Eyes, Respiratory System

12. ECOLOGICAL INFORMATION

Persistence and Degradability:

Most ingredients are of inorganic nature and do not biodegrade.

Ecotoxicity:

Daphnia 48hr mortality rate:	-100% - Highly Toxic
Fish 96hr mortality rate:	-100% - Highly Toxic
Aquatic Plants 72hr mortality rate:	-68% - Toxic
Micro-algae	Results inconclusive
Bacteria	Not tested

Mobility in soil:

Constituents relatively insoluble in water.

Expected to be relatively immobile in soil.

Bioaccumulation:

Constituents are relatively insoluble and not expected to bioaccumulate.

13. DISPOSAL CONSIDERATIONS

The preferred methods of disposal are firstly recycling or re-using and lastly landfill. Disposal should comply with the waste disposal legislation as well as any other municipal regulations. This product should never be disposed of down any drains or sewage lines or within watercourses.

14. TRANSPORT INFORMATION

Transport Hazard Class:	None
Environmental hazard:	Not Applicable
Special Precaution for User:	Not Hazardous for transportation. Avoid dust formation.

15. REGULATORY INFORMATION

No constituents contained in this product has been listed in the Hazardous Chemical Substances Regulations for the Occupational Exposure Limit.

National legislation:

Waste Classification and Management Regulations (GN R.634 of 23 August 2013) National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN R.635 of 23 August 2013).

SANS 10228:2010 The identification and classification of dangerous goods for transport (Edition 5).

SANS 10234- A List of classification and labelling of chemicals in accordance with the Globally Harmonized System (GHS).

National Road Traffic Act (Act 93 of 1996).

16. OTHER INFORMATION

Date of issue: 1st Issue; July 2022

Compiled by: GIY Hydro (Pty) Ltd trading as AquiScience

The data in this SDS relates only to the specific material designated herein and does not relate to use in combination with other materials and in any process. The author assumes no responsibility for any physical or chemical changes, which the Buyer/User may make to the material designated in this SDS.