



## **Vaporox (Pty) Ltd**

### **Waste Tyre Pyrolysis Plant – draft Environmental Management Programme**

**Locality: Mogwase, North West Province**

**Departmental Ref No: NWP/EIA/86/2013**

**Date: 20 October 2014**

**SHANGONI**  
*Management Services (Pty) Ltd*



# **DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)**

**Vaporox (Pty) Ltd**

**Waste Tyre Pyrolysis Plant –  
Draft Environmental Management  
Programme**

**Locality: Mogwase, North West Province**

**Departmental Ref No: NWP/EIA/86/2013**

**October 2014**

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## PROJECT DETAILS

**North West Department of Rural, Environmental and Agricultural  
Development**

**Reference No.: NWP/EIA/86/2013**

**Project Title:** Vaporox Waste Tyre Pyrolysis Plant, including the storage of dangerous goods (approximately 500m<sup>3</sup> of oil, ±5 tons of chemicals, such as catalysts, and 46 cubic tons of Liquefied Petroleum Gas) and the release of emissions from the pyrolysis plant that will require an Atmospheric Emission License.

**Project Number:** INN-NOR-13-09-02

**Compiled by:** Karien du Plessis

**Date:** 20 October 2014

**Location:** Pretoria

**Technical Reviewer:** Lizette Crous



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**Signature**



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## LIST OF ABBREVIATIONS

<b>AEL</b>	-	Atmospheric Emission License
<b>AIR</b>	-	Atmospheric Impact Report
<b>APPA</b>	-	Atmospheric Pollution Prevention Act, 1965 (Act No.45 of 1965)
<b>AQMP</b>	-	Air Quality Management Plan



<b>AQO</b>	-	Air Quality Officer
<b>BID</b>	-	Background Information Document
<b>CRR</b>	-	Comments Response Report
<b>EAP</b>	-	Environmental Assessment Practitioner
<b>ECA</b>	-	Environmental Conservation Act, 1989 (Act No. 73 of 1989)
<b>EIA</b>	-	Environmental Impact Assessment
<b>EIR</b>	-	Environmental Impact Report
<b>EMF</b>	-	Environmental Management Framework
<b>EMP</b>	-	Environmental Management Programme
<b>GN</b>	-	Government Notice
<b>I&amp;AP</b>	-	Interested and Affected Party
<b>IDP</b>	-	Integrated Development Plan
<b>NAAQS</b>	-	National Ambient Air Quality Standards
<b>NFAQM</b>	-	National Framework for Air Quality Management
<b>NEMA</b>	-	Environmental Management Act, 1998 (Act No. 107 of 1998) as amended
<b>NEM:AQA</b>	-	National Environmental Management: Air Quality Act, 2004 (Act No. 39, 2004)
<b>NW READ</b>	-	North West Department of Rural, Environmental and Agricultural Development
<b>R</b>	-	Regulation
<b>S&amp;EIR</b>	-	Scoping and Environmental Impact Reporting
<b>SAHRA</b>	-	South African Heritage Resources Agency
<b>SWMP</b>	-	Storm Water Management Plan

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# 1. INTRODUCTION

## The Applicant

The applicant is Vaporox (Pty) Ltd. They are planning to lease the proposed site from the landowner, the North West Development Corporation (Pty) Ltd, and use it for the development of a Waste Tyre Pyrolysis Plant.

## Background description

It is estimated that there are approximately 60 million legacy waste tyres in South Africa. These tyres take up space at landfill sites or are burnt, releasing noxious gases such as carbon monoxide and dioxins.

Recycling of waste tyres is one way to eliminate the above mentioned problem. This can be achieved through waste tyre pyrolysis. Pyrolysis is defined as thermal decomposition in an oxygen-free environment. The pyrolysis process is an effective way to eliminate the present build-up of waste tyres in South Africa.

## Project description

The proposed project entails the installation/construction of a Pyrolysis Plant at an existing facility (existing buildings and associated infrastructures) for the pyrolysis of waste tyres. The project will also include the storage of dangerous goods (approximately 500m<sup>3</sup> of oil, ±5 tons of chemicals, such as catalysts, and 46 cubic tons of Liquefied Petroleum Gas) and the release of emissions from the pyrolysis plant. Due to the emissions that will be generated, the plant requires an Atmospheric Emission License.

Waste tyres will be delivered by truck, weighed and stockpiled outside. The tyres will then be cleaned and conveyed into the shredder to produce chips. Thereafter, the shredded tyres will be fed into the pyrolysis reactor vessel, which is devoid of oxygen. Combustion of the pyrolysis gases outside the cylinder will heat the tyre pieces and result in the decomposition of the rubber polymers into smaller molecules. Products from the proposed waste tyre pyrolysis process includes steel, oil and char. The steel will be separated from the carbon black by using a magnet. The char will be further processed to Carbon black.

Produced oil will be stored in tanks and processed Carbon black will be stored in silos and bags. A backup generator will be installed for emergency situations or power failures and approximately 20m<sup>3</sup> of water will be stored at the facility, possibly in JoJo tanks, for the cooler. The proposed waste tyre pyrolysis plant will be self-sustainable as the pyro-gas generated from the pyrolysis process will be used to run the reactor vessel. An external fuel source (LPG) will only be used to start up the reactor vessel and as soon as the process generates its own gases, the external fuel source will be shut down.





Vaporox is also considering the installation of micro-turbines to use any excess gases produced in the pyrolysis process for the generation of electricity.

The proposed waste tyre pyrolysis plant will process approximately 95 tons of waste tyres per day and will operate 24 hours per day, seven days per week. The equipment will operate at between 400-600°C. At these operating conditions, 40 – 52% of the tyres will be converted into char, resulting in approximately 38 - 49.4 tons of char per day (EPA, 1993). The waste tyres will be sourced from trucking companies, tyre dealers and nearby mines. Tyres up to tractor size will be used in the process. Approximately seven day's stock of waste tyres ( $\pm 665$  tons) will be stored at the site prior to processing. Off-site storage of tyres is also a possibility.

A general pyrolysis process flow is shown in the figure below.

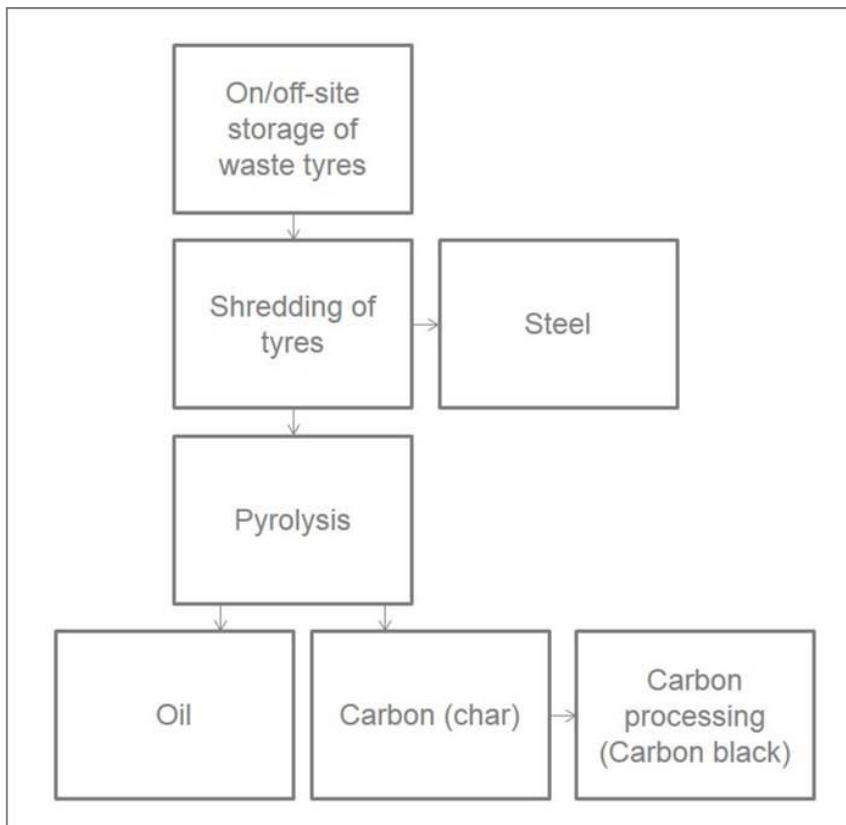


Figure 1: General pyrolysis process flow diagram

The following listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) are being applied for:



Table 1: Listed activities in terms of GN. No 545, dated 2010 under NEMA, 1998

Number and date of the relevant notice	Activity No	Description
GN. No. R 545, Listing Notice 2 of 18 June 2010	3	<p>The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.</p> <p>Facilities or infrastructure for the storage of dangerous goods will be constructed. This will include approximately 500m<sup>3</sup> of oil, ±5 tons of chemicals, such as catalysts, in bags and silos and 46 cubic tons of Liquefied Petroleum Gas (LPG).</p>
GN. No. R 545, Listing Notice 2 of 18 June 2010	5	<p>The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.</p> <p>The proposed waste tyre pyrolysis plant will require an Atmospheric Emission License in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) for the release of emissions from the plant. The Atmospheric Emission License application will be submitted to the Bojanala Platinum District Municipality – Health and Environmental Services Department.</p>
GN. No. R 545, Listing Notice 2 of 18 June 2010	26	<p>Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), except where such commencement requires basic assessment in terms of Notice of No. R544 of 2010.</p> <p>The proposed waste tyre pyrolysis plant will require an Atmospheric Emission License in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) for the release of emissions from the plant. The Atmospheric Emission License application will be submitted to the Bojanala Platinum District Municipality – Health and Environmental Services Department.</p>

An Atmospheric Emission License Application will be submitted to the Bojanala Platinum District Municipality for the following activity in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), List of Activities which result in Atmospheric Emissions which have or may have a significant detrimental effect on the Environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage (Government Notice No. 893 of 22 November 2013):



Table 2: Listed activities in terms of GN. No 893, dated 2013 under NEM: AQA, 2004

No. and date of relevant notice	Activity No	Description	Application
Government Notice No. 893 of 22 November 2013  Category 3: Carbonisation and Coal Gasification	Subcategory 3.1. Combustion Installations	Combustion installations not used primarily for steam raising or electricity generation.	All combustion installations (except test or experimental installations).
Government Notice No. 893 of 22 November 2013  Category 3: Carbonisation and Coal Gasification	Subcategory 3.4. Char, Charcoal and Carbon Black Production	Production of char, charcoal and the production and use of carbon black.	All installations producing more than 20 tons of char and charcoal.  All installations consuming more than 20 tons per month of carbon black in any processes.
Government Notice No. 893 of 22 November 2013  Category 4: Metallurgical Industry	Subcategory 4.21. Metal recovery	The recovery of metal from any form of scrap material by the application of heat.	All installations.
Government Notice No. 893 of 22 November 2013  Category 8: Thermal Treatment of General and Hazardous Waste	Subcategory 8.1. Thermal Treatment of General and Hazardous Waste	Facilities where general and hazardous waste are treated by the application of heat.	All installations treating 10kg per day of waste.

Government Notice No. 248 of 31 March 2010 previously stipulated the activities that require an Atmospheric Emission License.



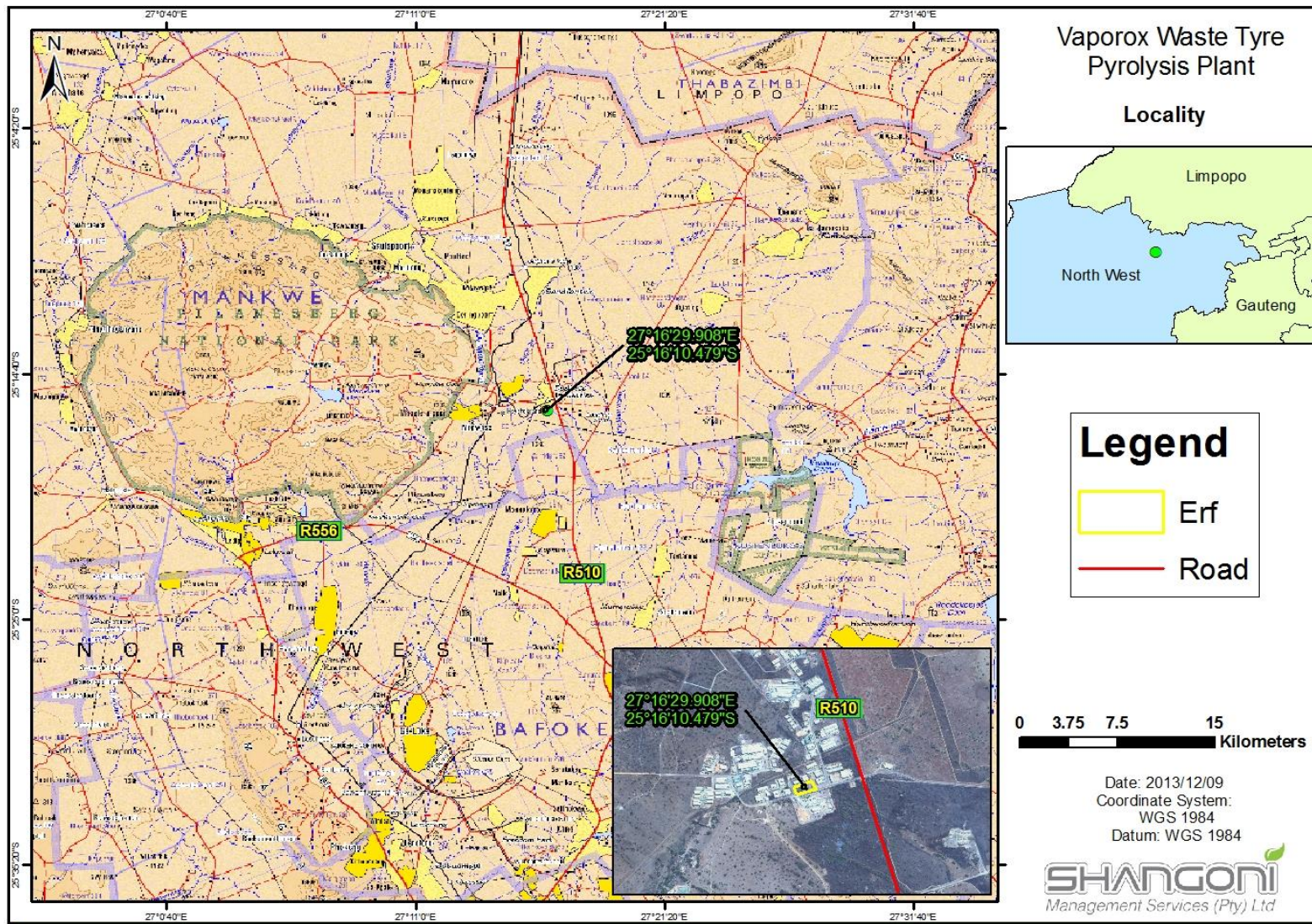


Figure 2: Site locality map

## 2. ENVIRONMENTAL ASSESSMENT PRACTITIONER

<b>Name of firm</b>	Shangoni Management Services (Pty) Ltd.	
<b>Postal address</b>	PO Box 74726 Lynwood Ridge Pretoria 0040	
<b>Telephone No.</b>	(012) 807 7036	
<b>Fax</b>	(012) 807 1014 / 086 643 5360	
<b>E-mail</b>	lizette@shangoni.co.za	
<b>Team of Environmental Assessment Practitioners (EAP) on project</b>		
<b>Name</b>	<b>Qualifications</b>	<b>Responsibility</b>
Mr Lourens de Villiers	<ul style="list-style-type: none"> <li>BSc. (Hons) (PU for CHE) MSc.(UP)</li> <li>More than 10 years' experience conducting Environmental Impact Assessments and Waste Management License Applications</li> </ul>	EIA Project Leader and Coordinator
Ms Lizette Crous	<ul style="list-style-type: none"> <li>Post Graduate Certificate Environmental Management (University of London)</li> <li>3 years' experience conducting Environmental Impact Assessments and Waste Management License Applications</li> </ul>	EAP
Ms Karien du Plessis	<ul style="list-style-type: none"> <li>B.Sc. (Hons) Environmental Management</li> <li>Approximately three months' experience conducting Environmental Impact Assessments and Waste Management License Applications.</li> </ul>	Junior EAP

## 3. SITE DOCUMENTATION

The following documentation must be available at the site office at all times:

- A copy of the Environmental Impact Assessment (EIA) Report;
- A copy of this Environmental Management Programme (EMP); and
- A copy of the Environmental Authorisation.



## 4. LEGISLATION

Table 3: Applicable legislation, policies and/or guidelines

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
<b>Laws of General Application</b>		
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	-	To establish a Constitution with a Bill of Rights for the RSA.
Environment Conservation Act, 1989 (Act No. 73 of 1989, as amended)	North West Department of Rural, Environmental and Agricultural Development	To control environmental conservation.
National Environmental Management Act, 1998 (Act No. 107 of 1998). National Environmental Management Amendment Act, 2008 (Act No. 62 of 2008).	North West Department of Rural, Environmental and Agricultural Development	To provide for the integrated management of the environment, and to regulate the 'Duty of Care' Principle.
Promotion of Access to Information Act, 2000 (Act No. 2 of 2000, as amended)	-	To give effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights.
<b>Air Quality and Noise</b>		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	Bojanala Platinum District Municipality	To reform the law regulating air quality to protect the environment by providing reasonable measures for the prevention of pollution. To provide for national norms and standards regulating air quality monitoring, management and control.
Environmental Conservation Act, 1989, Noise Control Regulations in terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989)	Bojanala Platinum District Municipality	To regulate the generation of noise and its impact on the environment.
<b>Water Management</b>		
National Water Act (NWA), 1998 (Act No. 36 of 1998)	Department of Water Affairs	To provide for fundamental reform of the law relating to water resources.
<b>Waste Management</b>		
National Environmental Management: Waste Act (Act No. 59 of 2008)	North West Department of Rural, Environmental and Agricultural Development	To reform the law regulating waste management in order to protect health and the environment by providing



Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
		reasonable measures for the prevention of pollution and ecological degradation.
National Environmental Management: Waste Act (Act No 59 of 2008) – Waste Classification and management regulations (GNR. 634 of 23 August 2013)	North West Department of Rural, Environmental and Agricultural Development	To regulate the classification and management of waste in a manner that supports and implements the provisions of the Waste Act.
GNR. 926 of 29 November 2013 – National Norms and Standards for the Storage of Waste	North West Department of Rural, Environmental and Agricultural Development	To provide a uniform national approach to the management of waste storage facilities, to ensure best practice in the management of waste storage facilities and to provide minimum standards for the design and operation of new and existing waste storage facilities.
GNR. 634 of 23 August 2013 – Waste Classification and Management Regulations	North West Department of Rural, Environmental and Agricultural Development	To regulate the classification and management of waste in a manner that supports and implements the provisions of the Waste Act, to establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence, to prescribe requirements for the disposal of waste to landfill, to prescribe requirements and timeframes for the management of certain wastes and to prescribe general duties of waste generators, transporters and managers.
Environmental Conservation Act, 1989, Waste Tyre Regulations, 2008.	North West Department of Rural, Environmental and Agricultural Development	To regulate the management of waste tyres by providing for the regulatory mechanisms.
Integrated Industry Waste Tyre Management Plan of the Recycling and Economic Development Initiative of South Africa (REDISA)	National Department of Environmental Affairs	To support and promote tyre recycling, providing the collection and depot infrastructure required to collect waste tyres from across the entire country and deliver them to approved recyclers.
<b>Biodiversity</b>		
National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)	North West Department of Rural, Environmental and Agricultural Development	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998.



Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	North West Department of Rural, Environmental and Agricultural Development	To provide for control over the utilisation of the natural agricultural resources of South Africa in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants.
National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)	North West Department of Rural, Environmental and Agricultural Development	To reform the law on veldt and forest fires.
Agricultural Pest Act, 1983 (Act No. 36 of 1983, as amended) – GN R276 of 5 March 2004	North West Department of Rural, Environmental and Agricultural Development	To regulate plants, plant products and other regulated articles when imported into South Africa.
<b>Soil and Land Management</b>		
National Environmental Management Act, 1998 (Act No. 107 of 1998). National Environmental Management Amendment Act, 2008 (Act No. 62 of 2008).	North West Department of Rural, Environmental and Agricultural Development	To provide for the integrated management of the environment and to regulate the 'Duty of Care' Principle.
Environment Conservation Act, 1989 (Act No. 73 of 1989, as amended)	North West Department of Rural, Environmental and Agricultural Development	To control environmental conservation.
<b>Heritage and Archaeological Resources</b>		
National Heritage Resources Act No 25 of 1999 (Act No. 25 of 1999, as amended)	South African Heritage Resources Agency	To introduce an integrated and interactive system for the management of the national heritage resources; to promote good government at all levels, and empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations.
<b>Protected Areas</b>		
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003, as amended)	North West Department of Rural, Environmental and Agricultural Development	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.
<b>Planning of New Activities</b>		
National Environmental Management Act, 1998 (Act No. 107 of 1998).	North West Department of Rural, Environmental and Agricultural Development	To provide for the integrated management of the environment and to regulate the 'Duty of Care' Principle.





Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
National Environmental Management Amendment Act, 2008 (Act No. 62 of 2008).		
EIA Regulations R 543, R 544, R 545 and R 546, dated 18 June 2010) under the NEMA, 1998	North West Department of Rural, Environmental and Agricultural Development	To regulate and control the authorisation of certain listed activities.
Government Notice (GN) 921: “List of waste management activities that have, or are likely to have a detrimental effect on the environment”, dated 2013.	North West Department of Rural, Environmental and Agricultural Development	To regulate and control the authorisation of certain waste-related listed activities.
<b>Municipal By-laws</b>		
Moses Kotane Local Municipality Water and Sanitation By-laws (LA 249, 20 June 2008)	Moses Kotane Local Municipality	To regulate water and sanitation related matters within the local municipal area.
Moses Kotane Local Municipality Solid Waste By-law 2013	Moses Kotane Local Municipality	To regulate the management of solid waste within the local municipal area.



## 5. ENVIRONMENTAL MANAGEMENT PROGRAMME

Refer to the tables below for the EMP. Responsibility is assigned to the relevant parties, keeping in mind that Vaporox (Pty) Ltd are ultimately still responsible for ensuring implementation of the EMP. The EMP must be updated should any significant changes occur to the operations at the Waste Tyre Pyrolysis Plant. The mitigation measures are set out in the tables below (per project phase), for the proposed waste tyre pyrolysis plant.

*Note:* Mitigation measures, as contained in the tables below, have taken the various alternatives into consideration.

### 5.1 SPECIFIC TRIGGERED LISTED ACTIVITY

#### 5.1.1 Planning, Construction, Operational, Rehabilitation and Decommissioning Phases

Table 4: EMP – Planning and Design Phase

Nature and significance of environmental impact					
Impact Description	Environmental Objective	Management / Mitigation Measures	Monitoring and Compliance Reporting	Timeframe	Responsibility
<b>Activity:</b>					
<ul style="list-style-type: none"> <li>Planning and design of the Waste Tyre Pyrolysis Plant</li> </ul>					
<b>Aspect:</b>					
<ul style="list-style-type: none"> <li>Inadequate design of the Waste Tyre Pyrolysis Plant and its abatement measures</li> <li>Inadequate design of storage vessels for pyrolysis oil, chemicals and LPG</li> <li>Inadequate design of the Waste Tyre Storage Area</li> <li>Inadequate design of the ablution facilities</li> <li>Inadequate design, repair and/or replacement of the sewerage and water pipeline systems</li> <li>Inadequate design of the water storage vessels</li> <li>Inadequate design or ineffective operation of the backup diesel generator</li> <li>Inadequate planning for the construction of the Waste Tyre Pyrolysis Plant</li> </ul>					
<b>Planning and Design Phase</b>					
<ul style="list-style-type: none"> <li>Air pollution (generation of atmospheric emissions) due to the inadequate design of the plant and its' abatement measures</li> <li>Generation of excessive noise due to the inadequate design of the Waste Tyre Pyrolysis Plant</li> <li>Soil, stormwater or groundwater pollution due to the inadequate design of the Waste Tyre Pyrolysis Plant</li> <li>Injury to workers due to unsafe operating conditions should the Waste Tyre Pyrolysis Plant not be designed correctly</li> <li>Resource wastage due to the inadequate design of the Waste Tyre Pyrolysis Plant</li> </ul>	To ensure adequate design of the Waste Tyre Pyrolysis Plant	<ul style="list-style-type: none"> <li>The Waste Tyre Pyrolysis plant must be designed to minimise the release of atmospheric emissions. A pipeline chimney stack height of 18.75m is recommended. Should a pipeline chimney stack height of 4m be chosen, the possibility of abatement technology being required must be considered when finalising the designs for the pyrolysis plant. The provisions and recommendations of the Atmospheric Impact Assessment Report and Atmospheric Emission License should be taken into account when the pyrolysis plant design is finalised.</li> <li>The Waste Tyre Pyrolysis plant must be designed to minimise the excessive generation of noise. Adequate silencers should be considered for all equipment and machinery.</li> <li>The Waste Tyre Pyrolysis plant must be designed to prevent the release of waste and effluent into the environment. Product storage areas must be designed to be within existing buildings and</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>Vaporox (Pty) Ltd</li> <li>Plant designer</li> </ul>



		<p>bunded areas, where applicable. The washing area for the tyres must be designed so that the wash water can be contained and re-used. Should any tyre wash water need to be disposed of into the municipal sewage disposal system, the design of the wash water system must ensure that the wash water is of such a quality that it will be permitted within the municipal system.</p> <ul style="list-style-type: none"> <li>• The Waste Tyre Pyrolysis plant must be designed with safety precautions, such as safety valves and Carbon monoxide (CO) sensor and alarm systems.</li> <li>• The design of the Waste Tyre Pyrolysis must take the Environmental Regulations for Workplaces, 1987, into consideration.</li> <li>• The Waste Tyre Pyrolysis plant must be designed to re-use its by-products as far as possible. For example, the washing system for the waste tyres can be designed as a closed system so that the wash water can be re-used to clean the tyres. The pyrolysis plant can also be designed to re-use the pyro-gases that it will generate to fuel the reactor vessel.</li> </ul>			
<ul style="list-style-type: none"> <li>• Air pollution (release of fugitive emissions) due to the inadequate design of the pyrolysis oil, chemical and LPG storage vessels</li> <li>• Soil, stormwater or groundwater pollution due to the inadequate design of the pyrolysis oil, chemical and LPG storage vessels</li> </ul>	To ensure adequate design of the storage vessels for pyrolysis oil, LPG and chemicals	<ul style="list-style-type: none"> <li>• The oil storage tanks must be designed in accordance with SANS 10089-1:2008 (The Petroleum Industry Part 1: Storage and distribution of petroleum products in above-ground bulk installations).</li> <li>• The LPG storage tank must be designed in accordance with SANS 10087-3:2008 (The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial and industrial installations).</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> <li>• Plant designer</li> </ul>
<ul style="list-style-type: none"> <li>• Air pollution (generation of dust) due to the inadequate design of the Waste Tyre Storage Area</li> <li>• Soil erosion due to the inadequate design of the Waste Tyre Storage Area</li> </ul>	To ensure adequate design of the Waste Tyre Storage Area	<ul style="list-style-type: none"> <li>• The design of the Waste Tyre Storage Area must be in accordance with the Waste Tyre Regulations, 2009.</li> <li>• Adequate stormwater management measures must be designed for the Waste Tyre Storage Area.</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> <li>• Plant designer</li> </ul>
<ul style="list-style-type: none"> <li>• Soil, stormwater or groundwater pollution due to the inadequate design of the ablution facilities</li> </ul>	To ensure adequate design of the ablution facilities	<ul style="list-style-type: none"> <li>• The planning phase must determine whether the existing ablution facilities will be sufficient for the maximum number of workers that will be present at the plant on any given day. If existing facilities are not sufficient, additional facilities must be constructed.</li> <li>• The current ablution facilities must be repaired and upgraded to acceptable standards.</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> <li>• Plant designer</li> </ul>
<ul style="list-style-type: none"> <li>• Soil, stormwater or groundwater pollution due to the inadequate design, repair and/or replacement of the sewerage pipeline system</li> <li>• Wastage of a valuable natural resource (water) due to the inadequate design, repair and/or replacement of the water pipeline system</li> </ul>	To ensure adequate design, repair and/or replacement of the sewerage and water pipeline systems	<ul style="list-style-type: none"> <li>• All broken or damaged sewerage and water pipelines must be replaced by suitable, new pipelines, should effective repair not be possible.</li> <li>• The new pipelines must be designed with durability in mind.</li> <li>• Meters must be installed to monitor the volume of water used at the pyrolysis plant.</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> <li>• Plant designer</li> </ul>
<ul style="list-style-type: none"> <li>• Wastage of a valuable natural resource (water) due to the inadequate design of the water storage vessels</li> </ul>	To ensure adequate design of the water storage vessels	<ul style="list-style-type: none"> <li>• Suitable water storage vessels must be chosen for the storage of cooling water on site. An examples of such a vessel is a JoJo tank.</li> <li>• An inspection schedule must be compiled so that the water storage vessels are regularly checked for leakages.</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> <li>• Plant designer</li> </ul>
<ul style="list-style-type: none"> <li>• Wastage of a valuable natural resource (diesel) due to the inadequate design or ineffective operation of the backup generator</li> </ul>	To ensure adequate design and effective operation of the backup diesel generator	<ul style="list-style-type: none"> <li>• The generator storage area must be designed to have a concrete floor, bund wall and sump system with sufficient capacity for the volume of diesel that the generator can take.</li> <li>• A maintenance schedule must be compiled for the generator and it must be operated as prescribed by the manufacturer.</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> <li>• Plant designer</li> </ul>
<ul style="list-style-type: none"> <li>• Delays due to poor planning.</li> <li>• Legal non-compliances to the Environmental Authorisation and EMP.</li> <li>• Harm to the environment.</li> </ul>	To ensure pro-active planning for the construction phase of the Waste Tyre Pyrolysis Plant	<ul style="list-style-type: none"> <li>• Obtain an Atmospheric Emission License and Waste Management License before commencing with the construction phase of the proposed project.</li> <li>• Obtain approval of the Waste Management Plan from the local municipality.</li> <li>• Obtain permission from the local municipality for the discharge of washwater into the municipal sewage disposal system, if required.</li> <li>• The approved EMP and Environmental Authorisation must be binding on the construction contractor and included in the tender documentation and contracts.</li> </ul>	Vaporox (Pty) Ltd must verify implementation of the mitigation measures proposed in this EMP.	Before construction commences	<ul style="list-style-type: none"> <li>• Vaporox (Pty) Ltd</li> </ul>



		<ul style="list-style-type: none"> <li>• Adequate planning and scheduling of the construction activities to allow for disruptions caused by rain and wet conditions. The scheduling must make provision for environmental training/awareness raising for workers prior to the commencement of construction. Records of all training must be maintained.</li> <li>• Adjacent land owners must be timeously informed that the construction phase will commence and must be kept informed of the progress throughout.</li> <li>• Appoint an independent Environmental Control Officer (ECO) prior to the commencement of the construction phase.</li> <li>• Ensure that a complaints register is kept at the construction site from the first day of construction.</li> <li>• Ensure that the Environmental Authorisation and EMP are kept at the construction site from the first day of construction.</li> <li>• Source unskilled labour locally, wherever possible.</li> <li>• A construction site plan must be compiled and approved by Vaporox and the ECO. The site plan must include the location of the construction camp, toilets, stores and site office.</li> </ul>			
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Table 5: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases – General Environment

<b>Activity:</b> <ul style="list-style-type: none"> <li>• Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>• Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>					
<b>Aspect:</b> <ul style="list-style-type: none"> <li>• Lack of knowledge amongst workers and contractors in terms of how their actions may impact on the environment.</li> </ul>					
<b>Nature and significance of environmental impact</b>					
<b>Impact Description</b>	<b>Environmental Objective</b>	<b>Management / Mitigation Measures</b>	<b>Monitoring and Compliance Reporting</b>	<b>Timeframe</b>	<b>Responsibility</b>
<b>Construction Phase</b>					
Harm to the environment in general (this includes pollution of soil and water resources, as well as harm to employees and wasteful practices in terms of resource use and waste management) during construction of the Waste Tyre Pyrolysis Plant.	To prevent harm to the environment by educating workers and contractors.	<ul style="list-style-type: none"> <li>• The contractor is to ensure that all employees, including sub-contractors and their employees, attend onsite Environmental Awareness/Training prior to commencing work on site.</li> <li>• Follow-up Environmental Awareness/Training may be required from time to time as new subcontractors or crews commence work or for specific activities that may potentially impact the environment.</li> <li>• The contractor is to maintain accurate records of any training undertaken.</li> <li>• The ECO shall monitor the contractor's compliance with the requirement to provide sufficient environmental awareness training to all site staff.</li> <li>• Training is to cover all aspects of the EMP and procedures to be followed.</li> <li>• All construction workers shall be issued with ID badges and clearly identifiable uniforms.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
<b>Operational Phase</b>					



<p>Harm to the environment in general (this can include pollution of soil and water resources, as well as harm to employees and wasteful practices in terms of resource use and waste management) during operation of the Waste Tyre Pyrolysis Plant.</p>	<p>To prevent harm to the environment by educating workers and contractors.</p>	<ul style="list-style-type: none"> <li>• All employees are required to attend onsite Environmental Awareness/Training prior to commencing work on site.</li> <li>• Follow-up Environmental Awareness/Training may be required from time to time as new employees commence work or for specific activities that may potentially impact the environment.</li> <li>• The facility manager is to maintain accurate records of any training undertaken.</li> <li>• Training is to cover all aspects of the EMP and procedures to be followed.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of operation</p>	<p>Facility Manager</p>
<p><b>Decommissioning Phase</b></p>					
<p>Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.</p>	<p>N/A</p>				

Table 6: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Atmosphere and Noise

<p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>• Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>• Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>					
<p><b>Aspect:</b></p> <p><u>Construction Phase</u></p> <ul style="list-style-type: none"> <li>• Vehicles not adhering to speed limits on the site.</li> <li>• Ineffective dust suppression.</li> <li>• Vehicle emissions released from additional construction vehicles and equipment used during the construction phase and clearance of vegetation.</li> <li>• Noise generated by additional construction vehicles and equipment during the construction activities.</li> </ul> <p><u>Operational Phase</u></p> <ul style="list-style-type: none"> <li>• Atmospheric emissions from the Waste Tyre Pyrolysis Plant.</li> <li>• Atmospheric emissions due to an inefficient emission abatement system.</li> <li>• Atmospheric emissions from the diesel generator on site.</li> <li>• Release of atmospheric emissions from potential burning of stockpiled tyres due to unsafe storage practices that result in the establishment of fires.</li> <li>• Potential establishment of fires due to the inadequate storage of diesel and oil.</li> <li>• Inadequate or ineffective storage of Carbon black and other products from the pyrolysis process.</li> <li>• Inadequate storage of ash.</li> <li>• Increased traffic flow to the site.</li> <li>• Noise generated by the pyrolysis process and vehicles travelling to and from the facility.</li> </ul>					
<p align="center"><b>Nature and significance of environmental impact</b></p>					
<p align="center"><b>Impact Description</b></p>	<p align="center"><b>Environmental Objective</b></p>	<p align="center"><b>Management / Mitigation Measures</b></p>	<p align="center"><b>Monitoring and Compliance Reporting</b></p>	<p align="center"><b>Timeframe</b></p>	<p align="center"><b>Responsibility</b></p>
<p><b>Construction Phase</b></p>					



<p>Degradation of ambient air quality due to dust generation.</p> <p>The road onsite is tarred, but is not in a good condition and is broken in places. There are open areas adjacent to the road where vehicles may travel, especially towards the area where the waste tyres will be stockpiled once the facility is operational.</p>	<p>To minimise the impact of vehicles travelling to and from the site as well as loading and offloading activities on the ambient air quality.</p>	<ul style="list-style-type: none"> <li>• A dustcart needs to be onsite to water down dusty roads.</li> <li>• Speed bumps or traffic speed signs need to be erected to reduce speeding onsite that could result in the generation of dust.</li> <li>• Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for 'cleaner' exhaust emissions.</li> <li>• A complaints register must be kept onsite. The register must record the following: Date when complaint was received, name of person who reported the complaint, details of the complaint and when and how concern was addressed.</li> </ul>	<p>ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.</p>	<p>During the construction phase.</p>	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
<p>Atmospheric pollution due to the release of emissions from vehicles as a by-product of the fuel combustion process.</p>	<p>To limit the generation of atmospheric emissions from construction vehicles.</p>	<ul style="list-style-type: none"> <li>• Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for 'cleaner' exhaust emissions.</li> <li>• Use cleaner, low Sulphur fuel, as far as possible.</li> <li>• Unnecessary idling of engines must be avoided.</li> </ul>	<p>ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.</p>	<p>During the construction phase.</p>	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
<p>According to Jorgensen &amp; Johnson (1981), the noise levels generated by general construction activities on a building site can reach levels of approximately 70 dB, caused by for instance heavy machinery. It can therefore be assumed that the proposed development will have a negative impact on the environmental noise of the area once construction starts.</p> <p>Sound is inversely proportional to the distance from the source and can get absorbed by buildings and vegetation barriers. Noise intensities (dB) will be at their highest on site and will decrease as one moves away from their sources.</p> <p>The noise decline curve gives an indication of how noise generated at the site will decrease with distance. It shows the distance that the sound would have travelled upon reaching a level of 60 dB, prescribed by the SABS as being the acceptable limit for environmental noise. According to the noise decline curve, at a distance of 27 metres from the construction site, the generated noise would have decreased to a level of 60 dB and at a distance of 45 metres it would have decreased to approximately 55dB. It can therefore be said that noise travelling further than 45 metres will have a low impact on neighbouring receptors.</p> <p>The site is situated within an existing industrial area and is surrounded by other industries that generate varying levels of noise. The site is also zoned for Industrial purposes. There are no known sensitive receptors, such as residential dwellings, within the immediate vicinity of the site. The construction activities will mostly entail repairs to existing infrastructure as well as the installation/construction of the Waste Tyre Pyrolysis plant and its associated structures.</p>	<p>To minimise noise generation during the construction phase.</p>	<ul style="list-style-type: none"> <li>• Schedule activities that will generate the most noise during times of the day that will result in least disturbance to adjacent industries.</li> <li>• Site workers and contractors will adhere to the requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) regarding hearing protection and noise control measures.</li> <li>• Regular maintenance of vehicles and equipment.</li> <li>• All equipment and machinery should be fitted with adequate silencers.</li> <li>• Working hours should be restricted to daylight hours.</li> <li>• No sound amplification equipment, such as sirens, loud hailers or hooters are to be used on site except in emergencies and no amplified music is permitted on site.</li> <li>• If work is to be undertaken outside of normal work hours permission must be obtained from the ECO and the facility manager.</li> <li>• No noisy work is to be conducted over the weekends or on public holidays.</li> <li>• The relevant stipulations of the Noise Control Regulations, 1992 (Government Notice No. 154 of 10 January 1992) must be adhered to.</li> <li>• A complaints register must be kept onsite. The register must record the following: Date when complaint was received, name of person who reported the complaint, details of the complaint and when and how concern was addressed.</li> </ul>	<p>ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.</p>	<p>During the construction phase.</p>	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
<p><b>Operational Phase</b></p>					



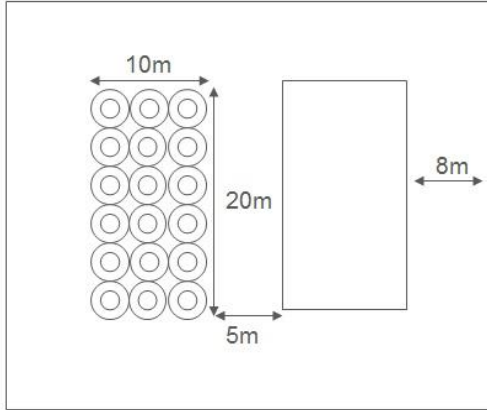
<p>Air pollution due to the release of emissions from the Waste Tyre Pyrolysis Plant.</p> <p>In general, one can expect pyrolysis plants to have minimal air pollution impacts because most of the pyro-gas generated by the pyrolysis process will be burnt to provide energy for the process itself. This burning process will release combustion gases (CO, SO<sub>2</sub>, NO<sub>2</sub> and PM10) (EPA, 1991), which are criteria pollutants [National Ambient Air Quality Standards (NAAQS)]. The combustion of these gases are much cleaner than combustion of raw feedstocks. For example, the combustion of pyro-gas is more similar to the combustion of natural gas than it is to the combustion of fossil fuels, like coal (University of California Riverside, 2006). Excess pyro-gas can be used to generate electricity, for example, using the micro-turbines that are being considered. Excess pyro-gas can also be flared.</p> <p>'Pure' Pyro-gas consists of a number of very harmful chemicals and should not be vented to the atmosphere without treatment. When pyro-gas is burnt to provide energy for the process or when it is flared, the pyro-gas is decomposed into water, Carbon dioxide (CO<sub>2</sub>), Carbon monoxide (CO), Sulphur dioxide (SO<sub>2</sub>) and Nitrogen oxides (NO<sub>x</sub>). Although these emissions are less harmful than Persistent Organic Pollutants (POPs), they are not without effect. They are just as likely to have a detrimental effect on the surrounding environment as they are more regularly emitted to the atmosphere by industry.</p> <p>Studies have shown that exposure to dioxins at high enough levels may cause a number of adverse health effects, including cancer. Periodic sampling of these emissions are therefore important to determine if they are generated by the specific pyrolysis process and if so how they can be controlled.</p> <p>The absence of oxygen (or low levels of oxygen) within the pyrolysis reactor vessel helps to inhibit the formation of dioxins and furans. Tyres also have low levels of Chlorine and are therefore not expected to result in significant dioxin emissions (University of California Riverside, 2006).</p> <p>Fugitive Volatile Organic Compound (VOC) emissions occur due to worn or loose packing around pump shafts and valve stems, from loose pipe connections (flanges), compressors, storage tanks, and open drains. Fugitive emissions of VOCs may be released from the oil storage tanks (California Integrated Waste Management Board, 1995).</p>	<p>To minimise the release of atmospheric emissions from the Waste Tyre Pyrolysis Plant.</p>	<ul style="list-style-type: none"> <li>• An Atmospheric Emission License must be obtained for the proposed facility for activities triggered in terms of Government Notice No. 893 of 22 November 2013 (in terms of the National Environmental Management: Air Quality Act, 2004).</li> <li>• The license conditions of the Atmospheric Emission License (if granted) must be adhered to.</li> <li>• Monitoring reports must be submitted to the licensing authority as stipulated in the Atmospheric Emission License.</li> <li>• All vented air must be directed upwards for efficient dispersion.</li> <li>• The oil storage tank(s) must be operated according to SANS 10089-1:2008.</li> </ul> <p><b>Fugitive emissions</b></p> <ul style="list-style-type: none"> <li>• It is recommended that a Leak Detection and Repair program be developed and implemented.</li> <li>• Fugitive VOC emissions can be significantly reduced by using components (such as pumps, valves and compressors) specifically designed to minimise fugitive emissions (EPA, 1991).</li> <li>• Fugitive VOC emissions can also be reduced by training operators and mechanics in ways to reduce fugitive emissions, by maintaining good supervision, and through good maintenance practices.</li> <li>• Periodic sampling of VOCs (including Chlorobenzenes, HCB, PCBs, Benzene, Toluene, Xylenes, PAHs and NH<sub>3</sub>) should take place to determine if the Leak Detection and Repair Program is sufficient in managing fugitive VOC emissions.</li> <li>• Should VOCs persist, it is recommended that emission control technology be investigated and an independently monitored Performance Verification Test conducted to determine the Destruction Efficiency (DE) and Destruction and Removal Efficiency (DRE) of principal organic hazardous compounds (POHC) using a suitable verification compound (e.g. trichloroethane).</li> <li>• A plan for conducting a Performance Verification Test must be submitted to the licensing authority at least 3 months prior to the commencement of such a test, and must include, amongst others, the following:             <ul style="list-style-type: none"> <li>▪ Motivation for why the plant should be used for treatment of High Level POPs;</li> <li>▪ A feasibility study showing that the plant is technically qualified;</li> <li>▪ Planned date for commencement of the test and expected duration;</li> <li>▪ Details on the waste to be co-processed during the test, including source, volume, composition etc.;</li> <li>▪ Motivation for the particular choice of waste and its suitability in providing an accurate and representative indication of the plant's DE and DRE, and therefore suitability to treat High Level POPs Containing Waste;</li> <li>▪ Extension of monitoring regime to include Chlorobenzenes, HCB, PCBs, Benzene, Toluene, Xylenes, PAHs and NH<sub>3</sub>; and</li> <li>▪ Monitoring and analysis to be conducted, the associated methodologies and independent parties responsible for monitoring.</li> <li>▪ A detailed, independent report documenting and interpreting the results of the Performance Verification Test must be compiled. As a minimum, a DE/DRE of 99.9999% would be required, as well as compliance with Air Emission Standards.</li> </ul> </li> <li>• Fugitive particulate emissions occur during the handling and processing of char. The PM10 emissions and should be controlled with dust collectors and a bag house.</li> <li>• Periodic emission sampling of PM10 (and later PM2.5 if found to be important in initial samplings) and their chemical analysis is recommended, to determine/verify its presence and respective sources in order to manage and/or control them if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
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<p>Fugitive particulate emissions escape during the handling and processing of char. Char contains carbon black, sulphur, zinc oxide, clay fillers, calcium and magnesium carbonates and silicates, all of which produce PM10 emissions.</p> <p>The inhaling of particulate matter may cause asthma, lung cancer, cardiovascular issues and respiratory diseases. It is therefore important to determine the presence of these particulates and their respective sources in order to manage and/or control them, if necessary.</p> <p>The Atmospheric Impact Assessment Report found that Scenario C (4m pipeline chimney height) resulted in <b>more</b> exceedances of the National Ambient Air Quality Standards than Scenario I. Scenario C may also prove to be acceptable in practice, but is more likely to require abatement technology.</p>		<p><b>Point source emissions</b></p> <ul style="list-style-type: none"> <li>It is recommended that Scenario I be implemented. Scenario C may also prove to be acceptable in practice, but it is more likely to require abatement technology.</li> <li>A feasibility study is recommended to determine the most viable monitoring method (periodic or continuous) and equipment that will comply with the requirements for compliance monitoring as specified in part 2 of GG 37054, GN 893. This feasibility study should take into consideration the special arrangements for activities listed as Sub category 3.1: Combustion installations and Sub category 4.21: Thermal Treatment of General and Hazardous Waste in part 3 of GG 37054, GN 893. The results of this study should be submitted to the Licensing authority for approval.</li> <li>Should monitoring show emissions persist above minimum emission standards specified for the facility, in part 3 of GN 893, it is recommended that emission control technology be investigated.</li> <li>The special arrangement for the listed activity: Thermal Treatment of General and Hazardous Waste, requires periodic measurements of heavy metals and dioxin and furan emissions to be undertaken. The generation of dioxin and furan emissions from the pyrolysis of waste tyres is, however, not expected. It is therefore recommended that, as a best practice measure, it be determined if heavy metals and/or dioxin and furans are present in the combustion gases before any monitoring schedule is proposed.</li> </ul>			
<p>The same impacts apply to Scenario I as given for Scenario C above.</p> <p>The Atmospheric Impact Assessment Report found that Scenario I (18.75m pipeline chimney height) resulted in <b>less</b> exceedances of the National Ambient Air Quality Standards than Scenario C. Scenario I is less likely to require abatement technology than Scenario C.</p>	<p>To minimise the release of atmospheric emissions from the Waste Tyre Pyrolysis Plant.</p>	<p><b>Management</b></p> <ul style="list-style-type: none"> <li>An impending Atmospheric Impact Assessment, within a year from the date of signature of the provisional Atmospheric Emission License, should be done using results from periodic emission measurement campaigns, combined with information from emission inventories as derived from point source monitoring.</li> <li>Hourly Sequential Ambient Air Quality data should be requested from the South African Ambient Air Quality Information system, to be used in impending Atmospheric Impact Assessments.</li> <li>Develop a Pollution Prevention Plan following the impending Atmospheric Impact Assessment. At this stage the National Pollution Prevention Plan regulations are still in draft and members of the public have been given the opportunity to comment on them. Unless it is changed in the final version, the National Pollution Prevention Plans Regulations will come into effect on the 31 March 2015. Pollution prevention plans will be revised every 5 years, but a progress report on its implementation of the plan will have to be submitted every year.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
<p>Air pollution due to the release of atmospheric emissions from the backup diesel generator. The combustion of diesel within the generator will result in the release of Sulphur dioxide (SO<sub>2</sub>), Carbon monoxide (CO), Particulate Matter (PM), Oxides of Nitrogen (NO<sub>x</sub>) and Hydrocarbon emissions.</p>	<p>To minimise the release of atmospheric emissions from the diesel generator.</p>	<ul style="list-style-type: none"> <li>Use cleaner, low Sulphur diesel as far as possible.</li> <li>Ensure that the generator is correctly maintained as stipulated by the manufacturer and repaired when required. Optimal combustion will allow for 'cleaner' emissions.</li> <li>Limit unnecessary idling of the generator.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
<p>Air pollution due to the release of emissions from tyre fires established on site.</p> <p>The burning of tyres generates black smoke and noxious gases such as carbon monoxide (CO), dioxins, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols, butadiene (www.epa.gov), furans, nitrous oxides, sulphur oxides, polychlorinated biphenyls (PCBs)</p>	<p>To prevent the establishment of fires at the site and in particular the establishment of a fire at the waste tyre storage area. This will subsequently prevent the release of emissions into the atmosphere from the burning tyres.</p>	<ul style="list-style-type: none"> <li>The site must have clearly visible signs posted near the entrance of the facility. The signs must show the operating hours, contact details and site regulations.</li> <li>A security attendant trained in fire prevention must be on site at all times.</li> <li>The site manager must be on site at all times (when the facility is open/operational).</li> <li>Adequate access for firefighting vehicles must be available to the waste tyre piles.</li> <li>Maintain adequate stockpiles of cover material to smother fires.</li> <li>The waste tyres must not be stored on steeply graded surfaces or anywhere else where they may pose a significant environmental or fire risk.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>





<p>and heavy metals (lead and arsenic). A number of these gases are deemed to be carcinogenic.</p>		<ul style="list-style-type: none"> <li>• Adequate firefighting equipment must be available on site and all employees must receive initial and follow-up training on the correct use of the equipment. The equipment must be maintained as stipulated by the manufacturer and the local fire department must be satisfied with the fire prevention measures on the site.</li> <li>• No single pile of waste tyres may exceed a height of 3 metres, a length of 20 metres or a width of 10 metres.</li> <li>• All interior firebreaks between the waste tyre piles must be at least five metres wide.</li> <li>• The edges of the waste tyre piles must be at least 8 metres from the perimeter fence and any buildings. The area between the piles and the fence and buildings must be clear of debris and vegetation.</li> <li>• All firebreaks must be at least 8 metres wide.</li> <li>• Waste tyre piles may not be located within 8 metres from a power line.</li> <li>• The following diagram gives an example of the correct waste tyre storage area design.</li> </ul> 			
<p>Nuisance and air degradation due to the generation of dust and particulates from the inadequate storage of ash, char and carbon black.</p> <p>According to the available information, no ash will be generated from the process under normal operating conditions. Ash will be formed under abnormal conditions where air creeps into the processing chamber. The ash will only be formed when combustion is taking place, but the process is specifically designed to not allow combustion to occur.</p>	<p>To prevent the inadequate storage of ash that may be generated under abnormal conditions.</p>	<ul style="list-style-type: none"> <li>• No products may be stored in the open. All products must be stored within the designated product storage buildings.</li> <li>• Carbon black must be stored in impermeable, sealable bags within the designated storage building.</li> <li>• Ash must be stored in impermeable, sealable bags within the designated storage building and disposed of at a licensed hazardous landfill site.</li> <li>• Any "spilled" Carbon black must be removed using an industrial vacuum system and not swept as this will cause the powder to become airborne.</li> <li>• Should some of the char need to be disposed of, it must be taken to a suitable, licensed landfill site. The char must be transported in sealed plastic bags to avoid the generation of fugitive particulate emissions (EPA, 1991).</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
<p>Nuisance and ambient air degradation due to the increased traffic flow to the site.</p>	<p>To minimise the impact of dust generated by the increased traffic frequency on the ambient air quality.</p>	<ul style="list-style-type: none"> <li>• A dustcart needs to be onsite to water down dusty roads.</li> <li>• Speed bumps or traffic speed signs need to be erected to reduce speeding onsite that could result in the generation of dust.</li> <li>• Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for 'cleaner' exhaust emissions.</li> <li>• A complaints register must be kept onsite. The register must record the following: Date when complaint was received, name of person who reported the complaint, details of the complaint and when and how concern was addressed.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
<p>Disturbance and nuisance to adjacent receptors due to noise generated by the operational activities.</p>	<p>To minimise the noise and nuisance generated by the operational activities.</p>	<ul style="list-style-type: none"> <li>• The site workers and contractors must adhere to the requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) regarding hearing protection and noise control measures.</li> <li>• Regular maintenance of vehicles, the back-up generator and equipment.</li> <li>• All equipment and machinery should be fitted with adequate silencers.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>



<p>The site is situated within an industrial area and is surrounded by other industries. There are no known sensitive receptors, such as residential dwellings, within the immediate vicinity of the site.</p>		<ul style="list-style-type: none"> <li>No sound amplification equipment, such as sirens, loud hailers or hooters are to be used on site except in emergencies and no amplified music is permitted on site.</li> <li>If work is to be undertaken outside of normal work hours permission must be obtained from the ECO and the facility manager.</li> <li>No noisy work is to be conducted over weekends or on public holidays.</li> <li>The relevant stipulations of the Noise Control Regulations, 1992 (Government Notice No. 154 of 10 January 1992) must be adhered to.</li> <li>A complaints register must be kept onsite. The register must record the following: Date when complaint was received, name of person who reported the complaint, details of the complaint and when and how concern was addressed.</li> </ul>	<p>kept onsite. Shortcomings must immediately be addressed.</p>		
<p><b>Decommissioning Phase</b></p>					
<p>Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.</p>	<p>N/A</p>				

Table 7: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Soil

<p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>					
<p><b>Aspect:</b></p> <p><b>Construction Phase</b></p> <ul style="list-style-type: none"> <li>Loss of topsoil due to ineffective topsoil removal and storage.</li> <li>Soil erosion due to the clearance of vegetation.</li> <li>Inadequate concurrent rehabilitation.</li> </ul> <p><b>Operational Phase</b></p> <ul style="list-style-type: none"> <li>Incorrect management of stormwater runoff.</li> </ul>					
<p align="center"><b>Nature and significance of environmental impact</b></p>					
<p align="center"><b>Impact Description</b></p>	<p align="center"><b>Environmental Objective</b></p>	<p align="center"><b>Management / Mitigation Measures</b></p>	<p align="center"><b>Monitoring and Compliance Reporting</b></p>	<p align="center"><b>Timeframe</b></p>	<p align="center"><b>Responsibility</b></p>
<p><b>Construction Phase</b></p>					
<p>Degradation and loss of a valuable resource (topsoil), where degraded vegetation needs to be cleared for the waste tyre storage area.</p>	<p>To reduce the duration and extent of topsoil exposure so as to preserve it as a resource and protect it from erosion.</p>	<ul style="list-style-type: none"> <li>Topsoil (top 150mm) is to be stockpiled in discrete areas and retained for future landscaping efforts around the waste tyre storage area.</li> <li>Any sub-soil or rocks removed should also be stockpiled separately and be used during the rehabilitation.</li> <li>Cleared vegetation should be used as a brush pack on topsoil stockpiles for erosion prevention.</li> <li>Minimise the length and steepness of slopes.</li> </ul>	<p>ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.</p>	<p>During the construction phase.</p>	<ul style="list-style-type: none"> <li>Construction contractor</li> <li>ECO</li> </ul>



		<ul style="list-style-type: none"> <li>• If sterilisation of the topsoil has occurred during stockpiling, inorganic fertilisers can be used to supplement the soils before seeding of the area takes place.</li> <li>• Replace topsoil concurrent with construction, whenever possible.</li> <li>• Cordon off areas under rehabilitation using danger tape. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access.</li> <li>• Aim to replace stockpiled topsoil to its original depth.</li> <li>• If there is not enough topsoil available from a particular soil zone, topsoil of a similar quality may be used to replace it. The suitability of substitute topsoil will be determined by a soil analysis and approved by the ECO.</li> <li>• Compacted soil should be ripped to ensure effective re-vegetation.</li> <li>• Work necessary additives, as indicated by the soil analysis, into the soil.</li> <li>• Re-vegetation by indigenous grass species.</li> <li>• If areas show no specific vegetation growth within three months, the areas shall receive additional topsoil, ripped to a depth of 100mm and re-planted.</li> <li>• Soil stabilising measures could include rotovating in straw bales (at a rate of 1 bale/20m<sup>2</sup>), applying mulching or brush packing, or creating windbreaks using brush or bales.</li> </ul>			
<b>Operational Phase</b>					
Soil erosion due to improper management of stormwater onsite.	To ensure adequate stormwater management and to prevent soil erosion.	<ul style="list-style-type: none"> <li>• The site must have an adequate and effective stormwater management system in place.</li> <li>• Stormwater measures should be inspected on a regular basis in order to ensure that the structures are functional and not causing soil erosion.</li> <li>• Where necessary, place culverts underneath road foundations.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
<b>Decommissioning Phase</b>					
Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.	N/A				

Table 8: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Soil, stormwater and groundwater pollution

<p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>• Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>• Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>
<p><b>Aspect:</b></p> <p><u>Construction Phase</u></p> <ul style="list-style-type: none"> <li>• Incorrect management, storage and disposal of concrete and cement or spillages from equipment used for construction (e.g. cement mixers).</li> <li>• Incorrect management, storage and disposal of chemicals.</li> <li>• Incorrect management, storage and disposal of construction, general and hazardous waste.</li> <li>• Unsanitary conditions on site.</li> <li>• Incorrect management and disposal of contaminated wash water or wastewater.</li> <li>• Leaking and/or spillages of fuels, greases and oils.</li> </ul> <p><u>Operational Phase</u></p> <ul style="list-style-type: none"> <li>• Incorrect management, storage and disposal of chemicals and fuels.</li> <li>• Incorrect management, storage and disposal of general and hazardous waste.</li> </ul>



- Unsanitary conditions on site.
- Incorrect management and disposal of contaminated wash water or wastewater.
- Incorrect management and contamination of stormwater runoff.
- Leaking or broken sewerage pipes.
- Incorrect storage of waste tyres and shredded tyres.
- Inadequate storage of oil, such as on a permeable surface.
- Inadequate storage of ash.

Nature and significance of environmental impact

Impact Description	Environmental Objective	Management / Mitigation Measures	Monitoring and Compliance Reporting	Timeframe	Responsibility
<b>Construction Phase</b>					
Soil, stormwater and groundwater pollution due to spillages and/or improper handling-, storage-, mixing- or disposal- of cement and concrete.	To prevent the pollution of soil, stormwater and groundwater as a result of spillage, improper handling, storage, mixing or disposal of cement and concrete.	<ul style="list-style-type: none"> <li>• Cement may only be mixed on an impermeable surface (not on bare soil).</li> <li>• Dry cement must be removed from the soil surface to prevent an impermeable layer forming on top of the soil. The cement must be disposed of together with any building rubble.</li> <li>• Ready-mix trucks are not permitted to clean chutes on site. Cleaning into foundations or a dedicated cleaning pit is permitted.</li> <li>• Bricklayers and plasterers are to minimise any cement spill or runoff in their work area and are to ensure that the work area is cleaned of all cement spillage at the end of each workday.</li> <li>• Both used and unused cement bags are to be stored in weatherproof containers so as not to be affected by rain or runoff.</li> <li>• Contaminated soil resulting from concrete or cement spills, including residue produced by the washing of cavities, are to be removed immediately after the spillage has occurred and placed on the appropriate rubble stockpile.</li> <li>• Runoff from the washing out of wall cavities is to be contained against the building by excavations or berms around the foundations. All reasonable measures must be taken to prevent the dirty water from contaminating the environment.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
Soil, stormwater and groundwater pollution due to poor management and accidental spills of hazardous chemical substances including fuel, greases and oils used onsite.	To prevent and minimise soil and water pollution as a result of poor management and accidental spills of hazardous chemical substances including fuel, greases and oils used onsite.	<ul style="list-style-type: none"> <li>• Identify all hazardous chemical substances used onsite including fuel, greases and oils.</li> <li>• Obtain the material safety data sheet of each of hazardous chemical substance.</li> <li>• Material Safety Data Sheets for all hazardous chemical substances must be readily available on site.</li> <li>• Ensure that the material safety data sheets have sufficient information to enable the user to take the necessary measures to protect his/her health and safety and that of the environment.</li> <li>• Train staff on the use of chemicals in accordance with the risks as described in the material data sheets.</li> <li>• Keep a stock inventory register of all chemicals in the store.</li> <li>• Powders must be stored above liquids.</li> <li>• Proper storage of chemicals in a lockable, well ventilated building.</li> <li>• Ensure adequate access control for the storage area.</li> <li>• Storage areas for hazardous chemicals are to comply with standard fire safety regulations.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>



		<ul style="list-style-type: none"> <li>• Safety signage including “No Smoking”, “No Naked Lights” and “Danger”, and product identification signs, are to be clearly displayed in areas housing chemicals.</li> <li>• Appropriate equipment to deal with emergency spill incidents is to be readily available on site. This includes fire extinguishers, spill kits for hydrocarbon spills, drip trays for equipment and/or machinery leaks, drums or containers for contaminated water.</li> <li>• Chemicals are to be properly labelled and handled in a safety conscious manner.</li> <li>• All personnel handling hazardous chemicals and hazardous materials are to be issued with the appropriate Personal Protective Equipment (PPE).</li> <li>• Ensure that diesel, fuel and/or oil tanks are in a bunded area with capacity of holding 110% of the total storage volume.</li> <li>• The removal of only the daily-required amount of chemicals to be used from the shed.</li> <li>• If refuelling on site or from drums, the ground must be protected and proper dispensing equipment is to be used i.e. hand pumps and funnels. Drums may not be tipped to dispense fuel.</li> <li>• Use of drip trays during filling of machinery or equipment. Drip trays should be emptied into secondary containers on a regular basis.</li> <li>• Ensure that any spilled chemicals cannot exit the designated storage area by constructing a berm or bump at the exit, or store chemicals in a spill tray.</li> <li>• Immediately clean all spillage of fuels, lubricants and other petroleum based products.</li> <li>• The contaminated material must be disposed of in accordance with the waste management procedure.</li> <li>• No hazardous chemicals must be discarded in the sewage or stormwater system.</li> <li>• Soil contaminated with hazardous chemical substances shall be treated as hazardous waste and removed from site.</li> </ul>			
Soil, stormwater and groundwater pollution due to poor waste management. Nuisance caused by odours and unsightly appearance of waste onsite.	To prevent soil, stormwater and groundwater pollution and nuisance due to poor waste management.	<ul style="list-style-type: none"> <li>• Building and demolition waste must be disposed of at a licensed landfill site. Steel should be taken to a licensed recycling facility.</li> <li>• The management of waste must be in accordance with the stipulations of the municipal Solid Waste By-law (2013).</li> <li>• Installation of sufficient waste bins, skips or bulk containers. Containers must be present on site at all times.</li> <li>• All containers (bins, skips or bulk containers) shall be kept in a clean and hygienic manner.</li> <li>• Containers (bins, skips or bulk containers) utilised for the disposal of general and hazardous waste must be demarcated accordingly.</li> <li>• Waste material may only be temporarily stored at areas demarcated for such storage practices.</li> <li>• General waste shall be stored in a manner that prevents the harbouring of pests.</li> <li>• General waste material should always be stored or disposed of separately from hazardous waste material (e.g. oil, diesel).</li> <li>• General and hazardous waste can be deposited into appropriately demarcated bins at the construction areas. Bins must then be emptied into appropriately demarcated skips or bulk containers at the end of each day or more often if required.</li> <li>• Skips or bulk containers should be removed to a licensed landfill site on a weekly basis or more often if required.</li> <li>• No littering is permitted and site clean-ups must regularly be undertaken.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
Soil, stormwater and groundwater pollution from unsanitary conditions onsite.	To prevent soil, stormwater and groundwater pollution from unsanitary conditions onsite.	<ul style="list-style-type: none"> <li>• Sufficient ablution facilities shall be provided – minimum of 1 toilet per 15 workers.</li> <li>• The ablution facilities must be on impermeable surfaces. Functional, existing ablution facilities can be used.</li> <li>• The location of chemical toilets is to be approved by the ECO prior to site establishment, but shall be located within 100m of any work point.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>



		<ul style="list-style-type: none"> <li>• Ablating anywhere other than in the toilets shall not be allowed.</li> <li>• Temporary ablution facilities are to be secured to prevent them from blowing or falling over.</li> <li>• The contractor shall ensure that any chemicals and/or waste from the ablution facilities is not spilled on the ground at any time.</li> <li>• Ablution facilities are to be serviced weekly or more frequently if required.</li> <li>• The contractor is to ensure that no spillage occurs and that the contents are removed from site on a regular basis.</li> <li>• Toilet paper must be provided at all times.</li> </ul>	reports to the competent authority.		
Soil and water pollution as a result of contaminated wash water entering the environment.	To prevent the pollution of soil, stormwater and groundwater through contaminated wash water. An example of this would be water that is contaminated with cement or concrete.	<ul style="list-style-type: none"> <li>• No washing of vehicles is permitted on site.</li> <li>• A dedicated temporary cleaning area is to be identified to facilitate washing of all cement equipment. The cleaning area could be a plastic lined cleaning pit or dedicated plastic or metal drums, located as close as possible to a water point.</li> <li>• No wastewater/wash water may be disposed of on site, onto the soil or into any water body.</li> <li>• Runoff from washing activities is to be contained by berms or trenches.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
Hydrocarbon pollution of soil, stormwater and groundwater due to the fuel-, grease- or oil spillages or leaking equipment and vehicles.	To prevent hydrocarbon pollution of soil, stormwater and groundwater through the spilling of fuel, grease or oil or leaking equipment and vehicles.	<ul style="list-style-type: none"> <li>• Equipment and vehicles are to be repaired immediately upon developing leaks.</li> <li>• Drip trays shall be supplied for all repair work undertaken on machinery on site.</li> <li>• Drip trays are to be utilised during greasing and re-fuelling of machinery and to contain incidental spills and pollutants.</li> <li>• Drip trays are to be inspected daily for leaks and effectiveness and emptied when necessary. This is to be closely monitored during rain events to prevent overflow.</li> <li>• Appropriate equipment to deal with emergency spill incidents is to be readily available on site. This includes fire extinguishers, spill kits for hydrocarbon spills, drip trays for equipment and/or machinery leaks and drums or containers for contaminated water.</li> <li>• Soil contaminated with hazardous substances, fuel or oil shall be treated as hazardous waste and removed from site.</li> <li>• If refuelling on site or from drums, the ground must be protected and proper dispensing equipment is to be used i.e. hand pumps and funnels. Drums may not be tipped to dispense fuel.</li> <li>• All liquid fuels (petrol and diesel) are to be stored in tanks or containers with lids.</li> <li>• Inspect vehicles on entering the construction site to ensure that they are in sound condition to reduce the risk of oil or diesel spillages.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
<b>Operational Phase</b>					
Soil, stormwater and groundwater pollution due to poor management and accidental spills of hazardous chemical substances including fuel, greases and oils used during operational activities.	To prevent and minimise soil, stormwater and groundwater pollution as a result of poor management and accidental spills of hazardous chemical substances including fuel, greases and oils used onsite.	Apply the same mitigation measures as for the construction phase.	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
Soil, stormwater and groundwater pollution due to poor waste management during operational activities. Nuisance caused by odours and unsightly appearance of waste onsite.  Domestic waste will be removed from site by the municipal waste removal service.	To prevent and minimise soil, stormwater and groundwater pollution and nuisance due to poor waste management.	<ul style="list-style-type: none"> <li>• The Waste Tyre Pyrolysis Plant must obtain a Waste Management License for activities that will be triggered at the proposed facility in terms of Government Notice No. 921 of 29 November 2013 (in terms of the National Environmental Management: Waste Act, 2008).</li> <li>• The management of waste must be in accordance with the stipulations of the municipal Solid Waste By-law (2013).</li> <li>• The Waste Tyre Pyrolysis Plant must be registered on the South African Waste Information System.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager



		<ul style="list-style-type: none"> <li>• All waste storage containers must comply with the conditions as stipulated in GNR. 926 of 29 November 2013.</li> <li>• Training must be provided continuously to employees working with waste. The training programme must include the provisions stipulated in GNR. 926 of 29 November 2013.</li> <li>• An Emergency Preparedness Plan must be compiled in accordance with GNR. 926 of 29 November 2013.</li> <li>• Monitoring, auditing, reporting and record keeping must be conducted in accordance with GNR. 926 of 29 November 2013.</li> <li>• Domestic waste must be removed from site on a weekly basis by the municipal waste removal service. If waste is not removed by the municipality, the facility manager must ensure that the domestic waste is removed to a licensed waste disposal site on a weekly basis.</li> <li>• Should any of the char need to be disposed of, it must be taken to a suitable, licensed landfill site. The char must be transported in sealed plastic bags.</li> <li>• Any of the products from the pyrolysis process (char, Carbon Black, fibres, pyrolysis oil and/or steel) that cannot be sold or re-used or processed further must be considered waste and disposed accordingly at a licensed landfill site (California Integrated Waste Management Board, 1995).</li> <li>• The Waste Classification and Management Regulations, 2013, and the National Norms and Standards for Disposal of Waste to Landfill, 2013, must be used to determine to which type of landfill a particular waste stream must be sent for disposal.</li> <li>• No littering is permitted and site clean-ups must regularly be undertaken.</li> </ul>			
<p>Soil, stormwater and groundwater pollution from unsanitary conditions onsite during operational activities.</p>	<p>To prevent soil, stormwater and groundwater pollution from unsanitary conditions onsite.</p>	<ul style="list-style-type: none"> <li>• Sufficient ablution facilities shall be provided – minimum of 1 toilet per 15 workers.</li> <li>• Functional, existing ablution facilities can be used.</li> <li>• Ablating anywhere other than in the toilets shall not be allowed.</li> <li>• Ablution facilities are to be serviced weekly or more frequently if required.</li> <li>• Toilet paper must be provided at all times.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
<p>Soil, stormwater and groundwater pollution as a result of contaminated wash water entering the environment during operational activities.</p> <p>Wash water will be generated when the waste tyres are cleaned prior to them being taken to the shredder. Rain water will also wash dirt and road oil from the tyres and this may result in contaminated stormwater runoff.</p>	<p>To prevent soil, stormwater and groundwater pollution by contaminated wash water.</p>	<ul style="list-style-type: none"> <li>• Cleaning the tyres using compressed air instead of water should be considered.</li> <li>• Water used for the washing of the incoming tyres should be used in a closed system, if possible. This will allow the re-use of water whilst also allowing the removal of oil and other particles from the water. The oil should be separated out and sent to a licensed oil recycling facility. Other debris or sludge should be disposed of at a licensed waste disposal site.</li> <li>• Wash water that cannot be re-used must also be disposed of at a licensed waste disposal site</li> <li>• Should it be desired for the tyre wash water to be discharged into the municipal sewage disposal system, permission must be obtained from the Moses Kotane Local Municipality in terms of Section 75 of the Water and Sanitation By-laws, 2008.</li> <li>• All the requirements and conditions contained in the Water and Sanitation By-laws, 2008, must be adhered to.</li> <li>• Subject to the above permission, the wash water must comply with the standards and criteria set out in Schedules “A” and “B” of the Water and Sanitation By-laws, 2008. Preliminary treatment may be required to ensure that these standards and criteria are met.</li> <li>• Subject to the above permission, the wash water entering the municipal sewage disposal system must comply with the following, unless otherwise authorised by the authorised official:             <ul style="list-style-type: none"> <li>▪ It may not have a temperature exceeding 45°C or 10°C above ambient temperature, whichever is higher at the point of entry to the sewer.</li> <li>▪ It may not have a pH of less than 6.0 or greater than 9.5.</li> <li>▪ It may not contain the following:</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>



		<ul style="list-style-type: none"> <li>❖ Calcium carbide or radioactive waste or isotope.</li> <li>❖ Yeast, yeast waste, molasses (spent or unspent), in excess of the amount permitted by the authorised official.</li> <li>❖ Cyanogen compounds capable of liberating hydrogen cyanide on acidification.</li> <li>❖ Degreasing solvents, petroleum spirit, volatile inflammable solvents or any substance which may, or is likely to, give off an inflammable or poisonous vapour at a temperature above 20°C.</li> </ul> <ul style="list-style-type: none"> <li>▪ It may not contain any matter in such concentrations as will, in the opinion of the authorised official, produce or is likely to produce in the final treated effluent at any sewage works or in any public water, any offensive or otherwise undesirable taste, odour, colour or any foam.</li> <li>▪ It may not prejudice the reuse of treated sewage effluent for industrial or similar purposes or adversely affect any of the processes by which sewage is treated, or produce sludge for disposal.</li> <li>▪ It may not contain any substance or material which is not amenable to treatment to a satisfactory degree at a sewage treatment works or which causes, or is likely to cause, breakdown or inhibition of the processes at such works.</li> <li>▪ It may not contain any substance or thing which is of such strength, or which is amenable to treatment only to such a degree as will result in effluent from the treatment works being unable to comply satisfactorily with the requirements of the Water Act, 1998.</li> <li>▪ It may not cause danger to health or safety of any person. It may not be injurious to the sewage disposal system nor may it prejudice the use of any ground by the Municipality for the sewage disposal system.</li> </ul> <ul style="list-style-type: none"> <li>• The wash water delivery pipeline into the municipal sewage disposal system must be maintained in a proper condition and free from leaks.</li> <li>• No wastewater/wash water may be disposed of on site, onto the soil or into any water body.</li> <li>• Runoff from washing activities is to be contained by berms or trenches.</li> <li>• No washing of vehicles is permitted on site.</li> <li>• A dedicated cleaning area is to be identified to facilitate washing of all equipment. The cleaning area could be a plastic lined cleaning pit or dedicated plastic or metal drums, located as close as possible to a water point.</li> </ul>			
Soil and groundwater pollution from leaking or broken sewerage pipes.	To prevent soil, stormwater and groundwater pollution from leaking or broken sewerage pipes.	<ul style="list-style-type: none"> <li>• Ablution facilities should be maintained to prevent or minimise blockage and leakages.</li> <li>• Should toilets become blocked or run slowly, this should be reported and the cause investigated. This could be due to a blocked or broken pipe leading from the toilets to the sewerage system.</li> <li>• Create employee awareness about the proper use of ablution facilities and the importance of proper hygiene. No cigarette butts, fats, oils, paper towels etc. may be disposed of into toilets or wash basins.</li> <li>• Toilets should have properly closing doors and be supplied with toilet paper.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
Contamination of clean stormwater runoff when the water runs through "dirty" areas on the site.	To ensure adequate stormwater management and to prevent the contamination of clean stormwater.	<ul style="list-style-type: none"> <li>• The site must have an adequate and effective stormwater management system in place.</li> <li>• No hazardous chemicals or waste may be discarded in the stormwater system.</li> <li>• Clean stormwater runoff from the surrounding environment must be channelled away from 'dirty' areas. These 'dirty' areas include the tyre storage area, buildings on site as well as any other product or waste storage areas.</li> <li>• Where necessary, place culverts underneath road foundations.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
Incorrect storage of waste tyres and shredded tyres resulting in soil, stormwater and groundwater pollution.	To ensure that the waste tyres are stored in the correct manner so as to prevent environmental pollution,	<ul style="list-style-type: none"> <li>• The waste tyre storage area must have an impermeable surface, such as a concrete slab.</li> <li>• The waste tyres must be stored in accordance with the stipulations in GNR. 926 of 29 November 2013.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted</li> </ul>	Life of Operation	Facility Manager





<p>Stored tyres (whole or in pieces) may leach substances into the soil if the tyres are stored on bare ground (California Integrated Waste Management Board, 1995).</p> <p>Should a fire become established at the waste tyre storage area, the burning tyres would decompose into the following:</p> <ul style="list-style-type: none"> <li>• Ash (typically containing carbon, zinc oxide, titanium dioxide, silicon dioxides);</li> <li>• Sulphur compounds such as carbon disulfide, sulphur dioxide, hydrogen sulphide;</li> <li>• Polynuclear aromatic hydrocarbons such as benzo(a)pyrene, chrysene, benzo(a)anthracene, etc.) in the oil that is produced;</li> <li>• Aromatic-, naphthenic- and paraffinic oils;</li> <li>• Particulates;</li> <li>• Various light-end aromatic hydrocarbons, such as toluene, xylene and benzene; and</li> <li>• Oxides of nitrogen and carbon (www.mfe.gov.nz).</li> </ul> <p>The oily runoff can be carried by water, if water is used to extinguish the fire, or by rainwater. It is estimated that the average passenger car tyre produces 7.8 litres of oil (www.epa.gov). Immediate soil pollution will be caused when the liquid decomposition products penetrate the soil. Gradual pollution of the deeper soil horizons and groundwater can also result from the leaching of ash and unburnt residues after rain events (www.mfe.gov.nz).</p> <p>The waste tyres will be stored in an area of up to 4 800m<sup>2</sup> prior to their processing in the pyrolysis plant.</p>	<p>due to, for example, the release of oil from burning tyres.</p>	<ul style="list-style-type: none"> <li>• The waste tyre storage facility must be registered within the competent authority within 90 days prior to the construction phase commencing.</li> <li>• The waste tyre storage facility must be designed in accordance with the stipulations in GNR. 926 of 29 November 2013.</li> <li>• The waste tyre storage facility must have correct access control and signage as stipulated in GNR. 926 of 29 November 2013.</li> <li>• The waste tyre storage facility must be operated as stipulated in GNR. 926 of 29 November 2013.</li> <li>• In accordance with the Waste Tyre Regulations (2009), the waste tyre storage area may not exceed 30 000m<sup>2</sup>.</li> <li>• A waste tyre storage area plan must be developed. The plan must be approved by the municipal fire department and must be available onsite at all times.</li> <li>• The site must have clearly visible signs posted near the entrance of the facility. The signs must show the operating hours, contact details and site regulations.</li> <li>• A security attendant trained in fire prevention must be on site at all times.</li> <li>• The site manager must be on site at all times (when the facility is open/operational).</li> <li>• No single pile of waste tyres may exceed a height of 3 metres, a length of 20 metres or a width of 10 metres.</li> <li>• All interior firebreaks between the waste tyre piles must be at least five metres wide.</li> <li>• The storage area must be flat and hard packed.</li> <li>• The site must make provision for storm water management.</li> <li>• The edges of the waste tyre piles must be at least 8 metres from the perimeter fence and any buildings. The area between the piles and the fence and buildings must be clear of debris and vegetation.</li> <li>• All firebreaks must be at least 8 metres wide.</li> <li>• Waste tyre piles may not be located within 8 metres from a power line.</li> <li>• The waste tyres must not be stored on steeply graded surfaces or anywhere else where they may pose a significant environmental or fire risk.</li> <li>• The stormwater system at the site must ensure that water runoff from the waste tyre storage area is contained. This will ensure that runoff water contaminated by oil from the burning of the tyres can be contained.</li> </ul>	<p>every 6 months and records kept onsite. Shortcomings must immediately be addressed.</p>		
<p>The inadequate storage of pyrolysis oil, such as on a permeable surface, together with the possibility of storage tank failure can lead to pollution of the soil, stormwater and groundwater. Such pollution can also be caused due to the incorrect storage of steel and Carbon black.</p>	<p>To ensure that the pyrolysis oil, steel and Carbon black is stored in a safe and responsible manner.</p>	<ul style="list-style-type: none"> <li>• The purified oil must be stored in suitably designed storage tanks, contained within an impermeable bund area. The bund area must be capable of containing a volume not less than the greatest amount of product (oil) that can be released from the largest tank. The capacity of the bund area must be calculated after the volume of the other tanks below the bund wall (excluding the largest tank), has been deducted.</li> <li>• The oil storage tanks must comply with SANS 10089-1:2008 (The Petroleum Industry Part 1: Storage and distribution of petroleum products in above-ground bulk installations).</li> <li>• All tanks must be labelled to show their composition and tank capacity. Bund walls must be labelled to show their capacity.</li> <li>• The bund area must be equipped with an operational sump and pump system to collect any oil that may spill.</li> <li>• The bund area must have adequate firefighting equipment installed to the satisfaction of the local authorities.</li> <li>• The steel that is removed from the tyres must be stored in containers prior to its removal off site.</li> <li>• The produced Carbon black must be stored in impermeable, sealable bags within the designated storage building.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>



<p>Inadequate storage of ash may result in the leaching of zinc and sulphur when rain water infiltrates through the ash.</p> <p>According to the available information, no ash will be generated from the process under normal operating conditions. Ash will be formed under abnormal conditions where air creeps into the processing chamber. The ash will only be formed when combustion is taking place, but the process is specifically designed to not allow combustion to occur.</p>	<p>To prevent the inadequate storage of ash that may be generated under abnormal conditions.</p>	<ul style="list-style-type: none"> <li>No ash may be stored in the open.</li> <li>Ash must be stored in impermeable, sealable bags within the designated storage building and disposed of at a licensed hazardous landfill site.</li> <li>The ash must be transported in sealed plastic bags.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	<p>Life of Operation</p>	<p>Facility Manager</p>
<p><b>Decommissioning Phase</b></p>					
<p>Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.</p>	<p>N/A</p>				

Table 9: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Resources

<p><b>Activity:</b></p>					
<ul style="list-style-type: none"> <li>Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>					
<p><b>Aspect:</b></p>					
<p><u>Construction Phase</u></p>					
<ul style="list-style-type: none"> <li>Inefficient and redundant use of valuable resources.</li> </ul>					
<p><u>Operational Phase</u></p>					
<ul style="list-style-type: none"> <li>Leaking or broken water storage vessels.</li> <li>Leaking or broken water pipelines.</li> <li>Inefficient or ineffective operation of the backup generator.</li> <li>Inefficient or ineffective operation of the Waste Tyre Pyrolysis plant.</li> </ul>					
<p style="text-align: center;"><b>Nature and significance of environmental impact</b></p>					
<p><b>Impact Description</b></p>	<p><b>Environmental Objective</b></p>	<p><b>Management / Mitigation Measures</b></p>	<p><b>Monitoring and Compliance Reporting</b></p>	<p><b>Timeframe</b></p>	<p><b>Responsibility</b></p>
<p><b>Construction Phase</b></p>					
<p>Wastage or depletion of valuable resources like water and electricity due to inefficient or redundant usage.</p> <p>Water and electricity will be obtained from the municipality using existing bulk service connections to the site.</p>	<p>To prevent the wastage or depletion of valuable resources.</p>	<p><b>General</b></p> <ul style="list-style-type: none"> <li>Ensure that all employees have been informed of the importance of natural resources (proper environmental training and awareness).</li> <li>Regular site inspection by supervisors.</li> </ul> <p><b>Water</b></p> <ul style="list-style-type: none"> <li>Regular inspection and maintenance of all water tanks, toilets, water pipes and taps.</li> </ul>	<p>ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.</p>	<p>During the construction phase.</p>	<ul style="list-style-type: none"> <li>Construction contractor</li> <li>ECO</li> </ul>



		<ul style="list-style-type: none"> <li>Leaking tanks, taps, toilets and pipes are to be repaired immediately.</li> <li>Running water taps and pipes may not be left unattended.</li> <li>All pipe, hose and tap connections are to be fitted with correct and appropriate plumbing fittings.</li> </ul>			
<b>Operational Phase</b>					
Wastage or depletion of water from the municipal water supply due to leaking or broken water pipelines and water storage vessels.	To prevent the wastage or depletion of a valuable resource.	<ul style="list-style-type: none"> <li>Ensure that all employees have been informed of the importance of natural resources (proper environmental training and awareness).</li> <li>Regular site inspection by supervisors.</li> <li>Regular maintenance and inspection of the municipal water supply pipeline(s) to the site.</li> <li>Monitoring of resource consumption to detect leakages as soon as possible.</li> <li>Integrity tests must be conducted on water storage vessels as stipulated by the suppliers.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
Inefficient or ineffective operation of the backup generator. This may lead to higher diesel usage should the generator not operate efficiently and can also result in more breakages than normal.	To ensure the efficient, long-term operation of the backup generator.	<ul style="list-style-type: none"> <li>Ensure that the generator is correctly maintained as stipulated by the manufacturer and repaired when required. Optimal combustion will allow for 'cleaner' emissions.</li> <li>Limit unnecessary idling of the generator.</li> <li>Only use the generator when required and use it as prescribed by the manufacturer.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
Wastage or depletion of valuable resources, such as LPG and water, due to inefficient or ineffective operation of the Waste Tyre Pyrolysis plant.	To ensure efficient operation of the Waste Tyre Pyrolysis plant so that resources are used optimally.	<ul style="list-style-type: none"> <li>The pyro-gas from the pyrolysis process must burn to provide energy for the pyrolysis process.</li> <li>Process Char into Carbon Black.</li> <li>Water used for the washing of the incoming tyres should be used in a closed system, if possible. This will allow the re-use of water.</li> <li>Cleaning the tyres using compressed air instead of water should be considered.</li> <li>The metal that is separated from the waste tyres must be recycled.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
<b>Decommissioning Phase</b>					
Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.	N/A				

Table 10: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Workers' safety

<p><b>Activity:</b></p> <ul style="list-style-type: none"> <li>Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>
<p><b>Aspect:</b></p> <p><u>Construction Phase</u></p> <ul style="list-style-type: none"> <li>Inadequate training of employees or contractors on risks associated with construction activities.</li> <li>Safety hazards may occur if equipment is not handled in the correct manner.</li> <li>Employees not receiving the correct PPE for their specific responsibilities.</li> <li>Employees not adhering to safety rules implemented at the site.</li> <li>Construction of the LPG storage tank.</li> <li>Construction of the pyrolysis oil storage tank(s).</li> </ul> <p><u>Operational Phase</u></p> <ul style="list-style-type: none"> <li>Inadequate training of employees or contractors on risks associated with operational activities.</li> </ul>



<ul style="list-style-type: none"> <li>• Safety hazards may occur if equipment is not handled in the correct manner.</li> <li>• Employees not receiving the correct PPE for their specific responsibilities.</li> <li>• Employees not adhering to safety rules implemented at the site.</li> <li>• Storage of LPG on site.</li> <li>• Storage of pyrolysis oil on site.</li> </ul>					
Nature and significance of environmental impact					
Impact Description	Environmental Objective	Management / Mitigation Measures	Monitoring and Compliance Reporting	Timeframe	Responsibility
<b>Construction Phase</b>					
Injury of employees and contractors working on site during the construction phase.	To ensure that contractors work in a safe working environment and are not injured.	<ul style="list-style-type: none"> <li>• An emergency procedure, taking into consideration all potential emergencies, such as a fire outbreak, hazardous chemical spill, etc. should be compiled.</li> <li>• The contractor is to ensure that all employees, including sub-contractors and their employees, are trained on the emergency procedure.</li> <li>• Follow-up emergency training may be required from time to time as new subcontractors or crews commence work.</li> <li>• The contractor is to maintain accurate records of any emergency training undertaken.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
Inadequate construction of the LPG storage tank can lead to failures during the operational phase.	To ensure that the LPG storage tank is constructed to the required specifications.	<ul style="list-style-type: none"> <li>• The LPG storage tank shall be constructed according to the stipulations of SANS 10087-3:2008 (The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial and industrial installations).</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
Inadequate construction of the pyrolysis oil storage tank(s) can lead to failures during the operational phase.	To ensure that the pyrolysis oil storage tank(s) is/are constructed to the required specifications.	<ul style="list-style-type: none"> <li>• The pyrolysis oil storage tank(s) shall be constructed according to the stipulations of SANS 10089-1:2008 (The Petroleum Industry Part 1: Storage and distribution of petroleum products in above-ground bulk installations).</li> <li>• The storage tanks must be installed with minimum safety distances and levels of protection as stipulated in SANS 10089-1:2008 and must be arranged so that firefighting can be carried out effectively with mobile and stationary fire-fighting equipment.</li> <li>• The pyrolysis oil storage tank or tanks must be adequately vented. Vent properties must be in accordance with SANS 10089-1:2008. All tanks must have approved emergency venting that will relieve excessive internal pressure in the event of fire exposure. The venting capacity shall be in accordance with an approved standard, such as API Std 2000.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>• Construction contractor</li> <li>• ECO</li> </ul>
<b>Operational Phase</b>					
Injury of employees working on site during the operation of the Waste Tyre Pyrolysis Plant.	To ensure that employees and contractors work in a safe working environment and are not injured.	<ul style="list-style-type: none"> <li>• All employees must receive relevant, job-specific training and must be adequately qualified to work at the facility.</li> <li>• All employees must be provided with the correct PPE for the work that they conduct. This includes, for example, boots, overalls, masks and gloves.</li> <li>• Clean overalls must be provided to workers on a daily basis.</li> <li>• New masks must be provided on a daily basis if disposable masks are used.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings</li> </ul>	Life of Operation	Facility Manager



		<ul style="list-style-type: none"> <li>• An emergency procedure, taking into consideration all potential emergencies, such as a fire outbreak, hazardous chemical spill, etc. should be compiled.</li> <li>• All employees, including sub-contractors and their employees, must be trained on the emergency procedure.</li> <li>• Follow-up emergency training may be required from time to time as new subcontractors or crews commence work.</li> <li>• The facility manager is to maintain accurate records of any emergency training undertaken.</li> <li>• Suitable sensors must be installed for gas, temperature and pressure within the Waste Tyre Pyrolysis Plant. The sensors will ensure that products are only removed from vessels when it is safe to do so.</li> <li>• A safety valve must be installed to release any excess pressure build-up within the reactor vessel.</li> <li>• A Carbon monoxide (CO) sensor and alarm system must be installed within the main working area so that workers can be alerted should the CO concentrations exceed safe limits.</li> <li>• The requirements of the Environmental Regulations for Workplaces, 1987, must be adhered to.</li> </ul>	must immediately be addressed.		
<p>The incorrect storage of LPG may lead to explosions, fires and harm to employees. The gas is stored as liquid under pressure. Leakages, especially of the liquid, will release large volumes of highly flammable gas. Ignition will result in a rate of combustion of near-explosive force. LPG is non-toxic, but it can induce headaches and dizziness and may cause cancer and genetic defects by inhalation if 1,3-butadiene is a component.</p> <p>According to the SDS, LPG is inherently biodegradable and accumulation in terrestrial organisms is unlikely. It is not expected to be harmful to aquatic organisms. Liquid release is only expected to cause localised, non-persistent environmental damage, such as freezing.</p> <p>Biodegradation of LPG may occur in soil and water. Volatilisation is expected to be the most important removal process in soil and water. LPG is expected to exist entirely in the vapour phase in ambient air.</p>	To ensure that the LPG is stored in a safe and responsible manner.	<ul style="list-style-type: none"> <li>• A copy of the Safety Data Sheet (SDS) for LPG must be kept on site and the provisions in the SDS followed.</li> <li>• No smoking may take place in the vicinity of the LPG storage tank and signage indicating "No Smoking" must be displayed.</li> <li>• Open flames, hot surfaces, heat and sparks must be kept away from the LPG storage tank and signage indicating the before mentioned must be displayed.</li> <li>• Employees must avoid breathing in the gas.</li> <li>• Employees must wear protective clothing such as goggles, gloves and face shields, to prevent eye, skin and face contact.</li> <li>• Protect the LPG storage tank from sunlight and place it in a secure or locked up location that is well ventilated.</li> <li>• Adequate firefighting equipment must be kept at the LPG storage tank. Use a suitable extinguishing media.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
The incorrect storage of the pyrolysis oil may lead to fires and harm to employees.	To ensure that the pyrolysis oil is stored in a safe and responsible manner.	<ul style="list-style-type: none"> <li>• Adequate firefighting equipment must be kept at the pyrolysis oil storage tank(s). Use a suitable extinguishing media.</li> <li>• No smoking may take place in the vicinity of the storage tank(s) and signage indicating "No Smoking" must be displayed.</li> <li>• Open flames, hot surfaces, heat and sparks must be kept away from the storage tank(s) and signage indicating the before mentioned must be displayed.</li> <li>• Place the oil storage tank(s) in a secure or locked up location.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular site inspections.</li> <li>• Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
<b>Decommissioning Phase</b>					
Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.	N/A				



Table 11: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Heritage

Activity:					
<ul style="list-style-type: none"> <li>Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>					
Aspect:					
<ul style="list-style-type: none"> <li>Disturbance of artefacts or sites of cultural heritage (archaeological and historical) significance.</li> </ul>					
Nature and significance of environmental impact					
Impact Description	Environmental Objective	Management / Mitigation Measures	Monitoring and Compliance Reporting	Timeframe	Responsibility
<b>Construction Phase</b>					
<p>Construction activities may disturb or destroy sites, features or artefacts of archaeological and/or historical importance.</p> <p>As the open space on site which will be disturbed by the proposed development is less than 5 000m<sup>2</sup>, a Heritage Impact Assessment has not been done. The property is zoned for Industrial Land Use and is in a disturbed state. For this reason, it is expected that the impact on any heritage resources would be low. To date, no comments have been received from the South African Heritage Resources Agency.</p>	To protect artefacts or sites of cultural heritage (archaeological and historical) significance.	If during any construction activities, any sites, features and objects of a cultural heritage (archaeological or historical) nature are exposed, an expert should be called in to investigate and suitable mitigation measures must be implemented. All activities in the area should be halted until the situation has been resolved.	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>Construction contractor</li> <li>ECO</li> </ul>
<b>Operational Phase</b>					
<p>Operational activities may disturb or destroy sites, features or artefacts of archaeological and/or historical importance.</p> <p>The property is zoned for Industrial Land Use and is in a disturbed state. For this reason, it is expected that the impact on any heritage resources would be low. To date, no comments have been received from the South African Heritage Resources Agency.</p>	To protect artefacts or sites of cultural heritage (archaeological and historical) significance.	If during any operational activities, any sites, features and objects of a cultural heritage (archaeological or historical) nature are exposed, an expert should be called in to investigate and suitable mitigation measures must be implemented. All activities in the area should be halted until the situation has been resolved.	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
<b>Decommissioning Phase</b>					
<p>Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.</p>	N/A				



Table 12: EMP - Construction, Operational, Rehabilitation and Decommissioning Phases: Infrastructure

<b>Activity:</b> <ul style="list-style-type: none"> <li>Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.</li> <li>Operation of the Waste Tyre Pyrolysis Plant.</li> </ul>					
<b>Aspect:</b> <ul style="list-style-type: none"> <li>Wear of access roads and insufficient vehicle inspections.</li> </ul>					
Nature and significance of environmental impact					
Impact Description	Environmental Objective	Management / Mitigation Measures	Monitoring and Compliance Reporting	Timeframe	Responsibility
<b>Construction Phase</b>					
Wear of access roads, accidents on access roads, unpermitted transport of materials and/or loss of materials being transported on access roads.	To minimise the impact of an increase of traffic on access roads to the construction site.	<ul style="list-style-type: none"> <li>Ensure that all vehicles using access roads are roadworthy.</li> <li>All loads are to be securely fastened when being transported.</li> <li>All vehicles are to adhere to the tonnage limitation and acquire a permit as required.</li> <li>All speed limits and other traffic regulations on the public roadways must be adhered to.</li> </ul>	ECO to verify implementation of the mitigation measures proposed in this EMP. ECO to submit monthly compliance reports to the competent authority.	During the construction phase.	<ul style="list-style-type: none"> <li>Construction contractor</li> <li>ECO</li> </ul>
<b>Operational Phase</b>					
Wear of access roads, accidents on access roads, unpermitted transport of materials and/or loss of materials being transported on access roads.	To minimise the impact of an increase of traffic on access roads to the Waste Tyre Pyrolysis Plant.	<ul style="list-style-type: none"> <li>Apply the same mitigation measures as for the construction phase.</li> </ul>	<ul style="list-style-type: none"> <li>Regular site inspections.</li> <li>Internal audits against this EMP must be conducted every 6 months and records kept onsite. Shortcomings must immediately be addressed.</li> </ul>	Life of Operation	Facility Manager
<b>Decommissioning Phase</b>					
Closure and decommissioning of the pyrolysis plant is not anticipated for the foreseeable future. Should the facility close, a detailed closure and rehabilitation plan will be submitted to the North West Department of Rural, Environmental and Agricultural Development prior to decommissioning.	N/A				



## 6. ENVIRONMENTAL AWARENESS PLAN

The following Environmental Awareness Plan must be implemented by Vaporox (Pty) Ltd in order to inform their employees and contractors of the environmental risk that may result from their work. The plan must be conducted as part of the induction process for all new employees (including contractors) that will perform work in terms of the proposed activities. Proof of all training provided must be kept on-site.

The Environmental Awareness Plan is referred to as the “SHE match” training programme. The training programme focuses on the following aspects:

1. Explaining clearly what the environment is and what the environment consist of namely: air, water, soil, fauna, flora and people.
2. Once participants have grasped the description of what the environment entails, the training focuses on the potential impacts that the construction and operational activities may have on each one of these environmental components. This is done by making use of the aspect register, where each one of the environmental aspects and associated impacts has been identified.
3. To ensure that the training is effective, visual aids are used. Photos are taken of actual and potential impacts occurring on site and in some cases role-play is used to illustrate a potential impact.
4. The participants are then exposed to a poster that reflects the various environmental components. The various photos taken are posted on the poster on a rotational basis and the participants indicate (based on the visual component) what environmental component was or could have been affected by the activities portrayed on the photo.
5. By doing this the participants visualise the action as well as the potential consequence (environmental impact) of their action.
6. This general awareness training must be done before construction commences and also when new employees start work. The training should be done every two years during the Operational Phase. The poster is posted in the communal area where the impacts are visualised and the photos rotated on a monthly basis.

