Vaporox (Pty) Ltd

Waste Tyre Pyrolysis Plant – draft Environmental Impact Report (EIR)

Locality: Mogwase, North West Province

Departmental Ref No: NWP/EIA/86/2013

Date: 11 November 2014

SHANGONI
Management Services (Pty) Ltd

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Vaporox (Pty) Ltd

Waste Tyre Pyrolysis Plant – Draft Environmental Impact Report (EIR)

Locality: Mogwase, North West Province

Departmental Ref No: NWP/EIA/86/2013

NOVEMBER 2014

Unit C8
Block @ Nature
472 Botterklapper Street
Pretoria

Office: + 27 (0)12 807 7036
Fax: +27 (0)12 807 1014

SHANGONI
Management Services (Pty) Ltd

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^3 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

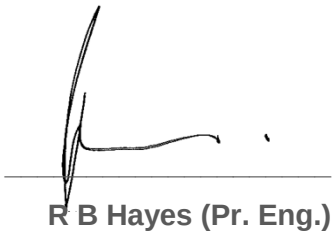
Project Coordinator: Innovative Business Systems (Pty) Ltd

Compiled by: Lizette Crous

Date: 11 November 2014

Location: Pretoria

Technical Reviewer: Brian Hayes



R B Hayes (Pr. Eng.)

EXECUTIVE SUMMARY

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.

Background description

The Waste Tyre pyrolysis plant is proposed for an industrial site that is currently unused. The site was used for industrial purposes in the past and has existing buildings, road infrastructure and bulk service supplies.

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^3 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.

Legal requirements and legislative process

As part of the proposed Vaporox Waste Tyre pyrolysis project, listed activities defined under the National Environmental Management Act, Act No. 107 of 1998 (NEMA, 1998) and the regulations there under will take place. Relevant listed activities triggered by the proposed activities are described further in this Scoping Report (refer to Part 1.5).

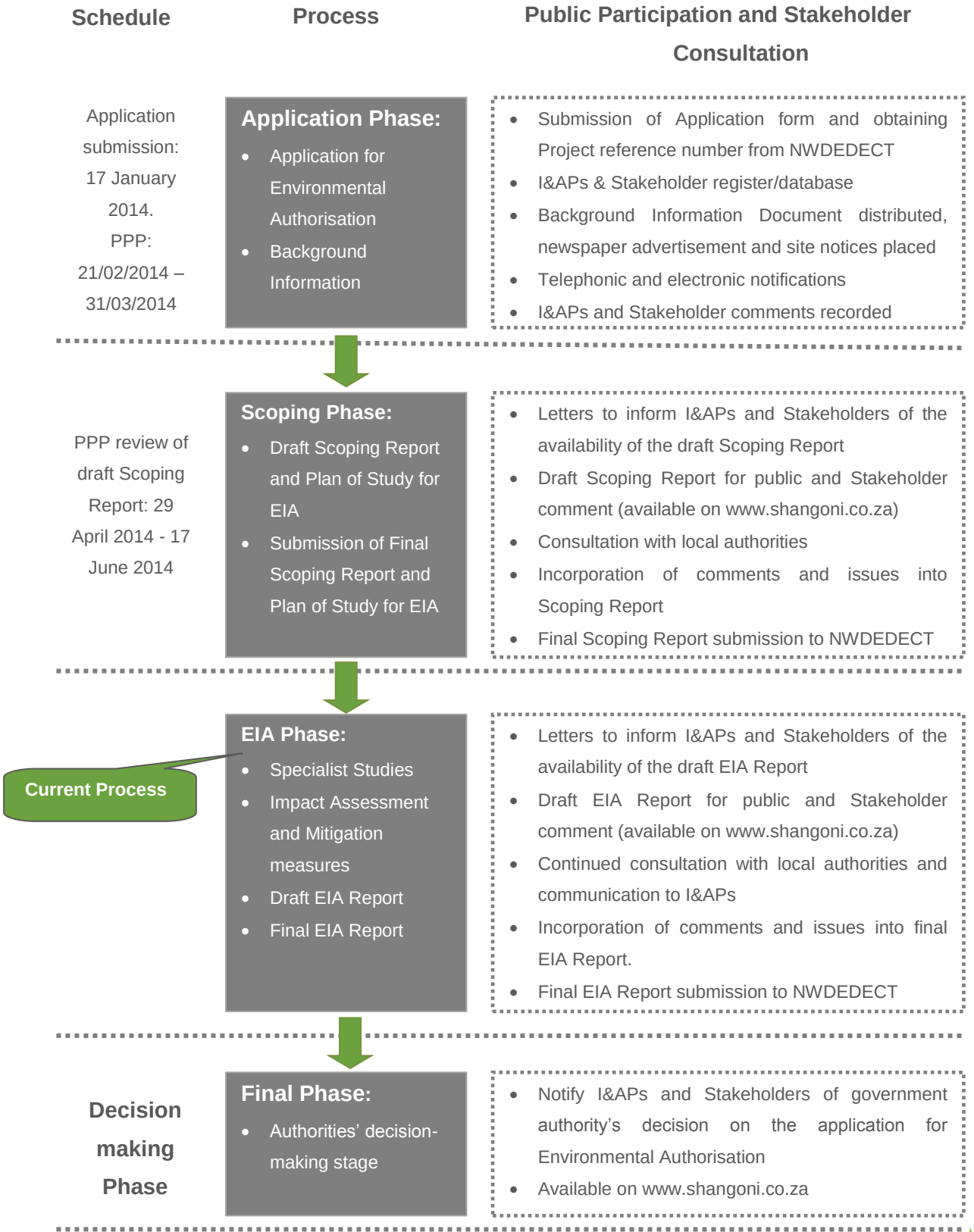
It is the intention of this draft Environmental Impact Assessment Report to provide the necessary information pertaining to the proposed activities associated with the project, as required in terms of the Environmental Impact Assessment Regulations (EIA Regulations R543: EIA Regulations in terms of Chapter 5 of the NEMA, 1998, dated June 2010) under the NEMA, 1998. This draft Environmental Impact Assessment Report intends to highlight all information relevant to the proposed Waste Tyre pyrolysis project.

In conjunction to this Application for Environmental Authorisation, the following will also be applied for:

- An Atmospheric Emission License; and

- A Waste Management Licence and its associated Basic Environmental Impact Assessment process.

The diagram below provides a visual representation of the Scoping- and EIA approach followed in terms of NEMA, 1998, and the Environmental Impact Assessment Regulations, dated 2010.



Environmental impacts associated with the project

The purpose of this document is to supply the North West Department of Rural, Environment and Agricultural Development with the requested information pertaining to the National Environmental Management Act (NEMA), as amended, and Regulation 28 of the Environmental Impact Assessment Regulations, dated 2010. Contained in this document is a detailed investigation of the activity and site-specific potential impacts associated with the proposed Waste Tyre Pyrolysis project.

This application for environmental authorisation of the above mentioned activities entails conducting a full Scoping and Environmental Impact Assessment process. During the Environmental Scoping Report (ESR) phase, the baseline potential impacts related to the proposed activities were identified.

Regulation 31 (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998, requires that an Environmental Impact Report (EIR) includes an assessment of the status; extent; duration; probability; reversibility; replaceability of resources; and mitigatory potential of the major potential environmental impacts of the proposed project be undertaken. Refer to Part 7 of this report for a detailed risk assessment. The table below summarises the impacts that have been identified and evaluated for the proposed project.

Potential Impact	Environmental Significance Pre Mitigation			Environmental Significance Post Mitigation		
	P[1]	M[2]	S[3]	P	M	S
General Environment						
Construction Phase: Harm to the environment in general	3	2	M	2	2	L
Operational Phase: Harm to the environment in general	3	3	M	2	2	L
Atmosphere and Noise						
Construction Phase: Degradation of ambient air quality due to dust generation	3	3	M	2	2	L
Construction Phase: Atmospheric pollution due to the release of emissions	3	3	M	2	2	L
Construction Phase: Noise pollution	4	3	H	3	3	M
Operational Phase: Air pollution due to the release of emissions from the Waste Tyre Pyrolysis Plant – Scenario C	5	3	H	5	2	M
Operational Phase: Air pollution due to the release of emissions from the Waste Tyre Pyrolysis Plant – Scenario I	5	2	M	5	1	L
Operational Phase: Air pollution due to the release of emissions from the backup diesel generator	3	3	M	2	3	M
Operational Phase: Air pollution due to the release of emissions from fires established on site	3	4	H	2	3	M
Operational Phase: Nuisance and air degradation due to the generation of dust and particulates	4	3	H	2	2	L
Operational Phase: Nuisance and degradation of ambient air quality due to increased traffic	3	3	M	2	2	L
Operational Phase: Disturbance and nuisance to adjacent receptors due to noise generation	4	2	M	3	1	L
Soil						
Construction Phase: Degradation and loss of topsoil	3	3	M	2	2	L
Operational Phase: Soil erosion	3	2	M	2	1	L
Soil, stormwater and groundwater pollution						
Construction Phase: Soil, stormwater and groundwater pollution due to spillages and/or improper handling, storage, mixing or disposal of cement and concrete	3	3	M	2	2	L
Construction Phase: Soil, stormwater and groundwater pollution due to poor management and accidental spills of hazardous chemicals	3	3	M	2	2	L
Construction Phase: Soil, stormwater and groundwater pollution due to poor waste management	4	2	M	2	2	L
Construction Phase: Soil, stormwater and groundwater pollution due to unsanitary conditions onsite	3	3	M	1	2	L

CHAP

[1] Probability
[2] Magnitude
[3] Severity

Potential Impact	Environmental Significance Pre Mitigation			Environmental Significance Post Mitigation		
	P[1]	M[2]	S[3]	P	M	S
Construction Phase: Soil and water pollution due to contaminated wash water entering the environment	3	3	M	2	2	L
Construction Phase: Hydrocarbon pollution of soil, stormwater and groundwater	3	3	M	2	2	L
Operational Phase: Soil, stormwater and groundwater pollution due to poor management and accidental spills of hazardous chemicals	4	4	H	3	3	M
Operational Phase: Soil, stormwater and groundwater pollution due to poor waste management	3	3	M	2	2	L
Operational Phase: Soil, stormwater and groundwater pollution due to unsanitary conditions onsite	3	3	M	2	2	L
Operational Phase: Soil, stormwater and groundwater pollution due to contaminated wash water entering the environment	3	3	M	2	2	L
Operational Phase: Soil and groundwater pollution from leaking or broken sewerage pipes	3	3	M	1	3	L
Operational Phase: Contamination of clean stormwater runoff	4	3	H	2	2	L
Operational Phase: Soil, stormwater and groundwater pollution due to incorrect storage of waste and shredded tyres	3	4	H	2	2	L
Operational Phase: Soil, stormwater and groundwater pollution due to inadequate storage of pyrolysis oil	4	3	H	2	2	L
Operational Phase: Leaching of zinc and sulphur due to inadequate storage of ash	3	3	M	1	3	L
Resources						
Construction Phase: Wastage or depletion of valuable resources like water and electricity due to inefficient or redundant usage	3	2	M	2	2	L
Operational Phase: Wastage or depletion of water due to leaking or broken water pipelines and water storage vessels	3	2	M	2	2	L
Operational Phase: Wastage of diesel due to inefficient or ineffective operation of the backup generator	3	3	M	2	2	L
Operational Phase: Wastage or depletion of valuable resources, such as LPG and water, due to inefficient or ineffective operation of the Waste Tyre Pyrolysis Plant	3	2	M	2	2	L
Workers' Safety						
Construction Phase: Injury of employees and contractors working on the site	3	3	M	2	2	L
Construction Phase: Failure of the LPG storage tank due to inadequate construction	3	3	M	1	3	L
Construction Phase: Failure of the pyrolysis oil storage tank(s) due to inadequate construction	3	3	M	1	3	L
Operational Phase: Injury of employees working on site	3	3	M	2	2	L
Operational Phase: Explosions, fires and harm to employees due to the incorrect storage of LPG	3	4	H	2	3	M
Operational Phase: Fires and harm to employees due to the incorrect storage of pyrolysis oil	3	4	H	2	3	M
Heritage						
Construction Phase: Disturbance or destruction of sites, features or artefacts of archaeological and/or historical importance	1	3	L	1	2	L

Potential Impact	Environmental Significance Pre Mitigation			Environmental Significance Post Mitigation		
	P[1]	M[2]	S[3]	P	M	S
Operational Phase: Disturbance or destruction of sites, features or artefacts of archaeological and/or historical importance	1	3	L	1	2	L
Infrastructure						
Construction Phase: Wear of access roads, accidents on access roads, unpermitted transport of materials and loss of materials being transported on access roads	4	2	M	2	2	L
Operational Phase: Wear of access roads, accidents on access roads, unpermitted transport of materials and loss of materials being transported on access roads	4	2	M	2	2	L

Appropriate mitigation measures will assist in minimising the potential impacts on the surrounding environment during the construction and operational phases of the proposed plant. A draft Environmental Management Programme (EMP) has also been compiled, with the aim of serving as a working document in order to manage and/or mitigate the identified potential impacts. Refer to Appendix F for a copy of the draft EMP.

The main mitigation measures that should be applied to the proposed project include the following:

- Environmental Awareness Training for all contractors and workers;
- A complaints register must be kept on site to record and deal with complaints from people in the vicinity of the site;
- An Atmospheric Emission License must be obtained for the pyrolysis plant;
- The mitigation and monitoring measures proposed in the Atmospheric Impact Assessment Report must be implemented at the site;
- Oil and LPG storage tanks must be designed and operated in accordance with SANS 10089-1:2008 and 10087-3:2008, respectively;
- Adequate firefighting equipment must be available on site and all employees must receive 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;
- All waste tyres must be stored in a manner that prevents the establishment of fires;
- No products from the pyrolysis process may be stored in the open and all storage containers and/or bags must be sealed during storage and transportation. Storage must occur on impermeable surfaces; and
- Soil, stormwater and groundwater pollution must be prevented through the correct handling, storage and disposal of cement, concrete, waste and chemicals.

Based on the outcomes of the Environmental Impact Assessment, conducted as part of this full Scoping and Environmental Impact Assessment process, as well as the alternatives assessment, the following recommendations are made:

1. The proposed project/activity (the construction and operation of the Waste Tyre Pyrolysis Plant) should be authorised and allowed to proceed on the preferred site (25°16’12.40’’; 27°16’25.36’’), on condition that the proposed plant also obtains an Atmospheric Emission License;
2. The mitigation measures proposed in this report and the draft Environmental Management Programme must be implemented during all phases of the proposed project;
3. It is assumed that the mitigation measures proposed in this report and the draft Environmental Management Programme will be correctly implemented by the applicant and that they will be effective;
4. It is recommended that Scenario I be implemented for the pipeline chimney stack height of the proposed Waste Tyre Pyrolysis Plant;

5. A communications pathway must be established that would allow the designated ECO to accept and deal with stakeholder complaints;
6. Proposed mitigation measures should be incorporated as far as possible into the operational plan for the plant; and
7. Strict monitoring and enforcement of requirements of the EMP must be undertaken to ensure that contractors and operators adhere to these requirements.

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DEFINITIONS

Air Pollution

According to NEM: AQA means any change in the composition of the air caused by smoke, soot, dust (including fly ash), including cinders, solid particles of any kind, gases, fumes, aerosols and odour substances. *[NEM: AQA, (Act 39 of 2004)]*

Air Quality Management Plan

Means a plan referred to in Section 15 of NEM: AQA *[NEM: AQA, (Act 39 of 2004)]*

Air Shed Priority Area

Means an area as set out in term of Section 18 of the National Environmental Management: Air Quality Act of 2004, Act No 36 of 2004. [*NEM: AQA, (Act 39 of 2004)]*

Ambient Air

Excludes air regulated by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993). [*NEM: AQA, (Act 39 of 2004)]*

Atmospheric Emission

Means any emission or entertainment process emanating from a point, non-point or mobile source that results in air pollution. [*NEM: AQA, (Act 39 of 2004)]*

Building and Demolition Waste

Means waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure, and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition *[NEM: WA, (Act No. 59, 2008)].*

Demography

The scientific study of human population, especially, with reference to their size, structure and distribution.

Domestic Waste

Means waste, excluding hazardous waste, that emanates from premises that are used wholly or mainly for residential, educational, health care, sport or recreation purposes *[NEM: WA, (Act No. 59, 2008)].*

Environment

The surroundings (biophysical, social and economic) within which humans exist and that are made up of

(i) the land, water and atmosphere of the earth;
(ii) micro-organisms, plant and animal life;
(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and
(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Aspects

Elements of an organisation's activities, products or services that can interact with the environment.

Environmental Degradation

Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

Environmental Impacts

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Environmental Impact Assessment

A study of the environmental consequences of a proposed course of action.

Environmental Impact Report

A report assessing the potential significant impacts as identified during the environmental impact assessment.

Environmental Impact

An environmental change caused by some human act.

General Waste

Means waste that does not pose immediate hazard or threat to health or to the environment, and includes-

(a) domestic waste;

(b) building and demolition waste;

(c) business waste; and

(d) inert waste *[NEM: WA, (Act No. 59, 2008)].*

Hazardous waste

Means any waste that contains organic or inorganic elements compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment *[NEM: WA, (Act No. 59, 2008)].*

Land use

Land use is defined as the various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

Pollution

Pollution means any change in the environment caused by -

(i) substances;

(ii) radioactive or other waves; or

(iii) noise, odours, dust or heat,

emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future *[NEM: WA, (Act No. 59, 2008)].*

Pollution Prevention

Pollution prevention can be any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal. [*NEM: AQA, (Act 39 of 2004)]*

Public Participation Process

A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.

Recovery

In terms of the Waste Tyre Regulations, 2009, means the controlled extraction of a material or the retrieval of energy from waste tyres.

Recycle

In terms of the Waste Tyre Regulations, 2009, means the separation and processing of materials from waste tyres for further use as new products or resources.

Registered Interested and Affected Party

In relation to an application, means an interested and affected party whose name is recorded in the register opened for that application.

Topography

Topography, a term in geography, refers to the "lay of the land" or the physio-geographic characteristics of land in terms of elevation, slope and orientation.

Tyre

In terms of the Waste Tyre Regulations, 2009, means a continuous pneumatic covering made of natural rubber or synthetic rubber or a combination of natural and synthetic rubber encircling a wheel, whether new, used or retreaded.

Vegetation

All of the plants growing in and characterising a specific area or region; the combination of different plant communities found there.

Waste

As per the definition of the National Environmental Management Waste Act, Act 59 of 2008 - means any substance, whether or not that substance can be reduced, re-used, recycled and recovered—

(b) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;

(c) which the generator has no further use of for the purposes of production;

(d) that must be treated or disposed of; or

(e) that is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but— (i) a by-product is not considered waste; and 3(ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste.

Waste Tyre

In terms of the Waste Tyre Regulations, 2009, means a new, used, retreaded, or un-roadworthy tyre, not suitable to the retreaded, repaired, or sold as a part worn tyre and not fit for its original intended use.

Waste Tyre Processor

In terms of the Waste Tyre Regulations, 2009, means any person or entity that is engaged in the commercial re-use, recycling or recovery of waste tyres.

ABBREVIATIONS

AEL	-	Atmospheric Emission License
AIR	-	Atmospheric Impact Report
APPA	-	Atmospheric Pollution Prevention Act, 1965 (Act No.45 of 1965)
AQMP	-	Air Quality Management Plan
AQO	-	Air Quality Officer
BID	-	Background Information Document
CRR	-	Comments Response Report
EAP	-	Environmental Assessment Practitioner
ECA	-	Environmental Conservation Act, 1989 (Act No. 73 of 1989)
EIA	-	Environmental Impact Assessment
EIR	-	Environmental Impact Report
EMF	-	Environmental Management Framework
EMP	-	Environmental Management Programme
GN	-	Government Notice
I&AP	-	Interested and Affected Party
IDP	-	Integrated Development Plan
NAAQS	-	National Ambient Air Quality Standards
NFAQM	-	National Framework for Air Quality Management
NEMA	-	Environmental Management Act, 1998 (Act No. 107 of 1998) as amended
NEM:AQA	-	National Environmental Management: Air Quality Act, 2004 (Act No. 39, 2004)
NW READ	-	North West Department of Rural, Environmental and Agricultural Development
R	-	Regulation
S&EIR	-	Scoping and Environmental Impact Reporting
SAHRA	-	South African Heritage Resources Agency
SWMP	-	Storm Water Management Plan

1. INTRODUCTION

This draft EIR forms part of an application for environmental authorisation for the Vaporox Waste Tyre pyrolysis plant in Mogwase, North-West Province. The application is made in terms of the EIA Regulations, dated 2010 under the National Environmental Management Act, 1998 (NEMA, 1998) (Act 107 of 1998).

The application process is undertaken on behalf of the applicant, Vaporox (Pty) Ltd. Vaporox appointed Innovative Business Systems (Pty) Ltd as Project Coordinators to oversee the entire EIA project process and to appoint an independent environmental practitioner to assist the applicant in undertaking the process as prescribed in the before mentioned environmental legislation. Innovative Business Systems (Pty) Ltd subsequently appointed Shangoni Management Services.

An application to undertake an Environmental Impact Assessment (Scoping and Environmental Impact Reporting) process was submitted to the identified competent authority (the North West Department of Rural, Environmental and Agricultural Development). The Department subsequently registered the project and the formal process was thereby initiated. All the findings from the scoping process are included in this report.

This draft EIR is divided into the following parts:

- Part 1: Introduction (including a description of the project);
- Part 2: Nature and extent of the environment affected by activity;
- Part 3: Applicable legislation and guidelines;
- Part 4: Public Participation Process;
- Part 5: Need and desirability for the project;
- Part 6: Consideration of alternatives;
- Part 7: Environmental Impact Assessment;
- Part 8: Environmental Impact Statement; and
- Part 9: Conclusion.

1.1 Process followed

1.1.1 The EIR in terms of the requirements of NEMA, 1998

Regulation 31(2) of the EIA Regulations, 2010 under the NEMA, 1998, lists aspects that must be included in EIA Reports. The table below indicates the parts where information has been provided as part of this EIR.

Table 1: The EIR in terms of the EIA Regulations, 2010, under the NEMA, 1998

Regulation No:		Description	EIR Part
R543 Regulation 31(2)(a)		Details of the Environmental Assessment Practitioner (EAP).	Part 1 & Appendix G
	(i)	Details of the EAP who prepared the report.	
	(ii)	Details of the expertise of the EAP to carry out the environmental impact assessment.	
R543 Regulation 31(2)(b)		A description of the proposed activity.	Part 1
R543 Regulation 31(2)(c)		A description of the property on which the activity is to be undertaken and the location of the activity on the property.	Part 1
R543 Regulation 31(2)(d)		A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity.	Part 2
R543 Regulation 31(2)(e)		Details of the public participation process conducted:	Part 4 & Appendix E
	(i)	Steps undertaken in accordance with the plan of study.	
	(ii)	List of persons, organisations and organs of state that were registered as interested and affected parties.	
	(iii)	A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments.	
	(iv)	Copies of any representations and comments received from registered interested and affected parties.	
R543 Regulation 31(2)(f)		A description of the need and desirability of the proposed activity.	Part 5
R543 Regulation 31(2)(g)		A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity.	Part 6, 7 & 8
R543 Regulation 31(2)(h)		An indication of the methodology used in determining the significance of potential environmental impacts.	Part 7
R543 Regulation 31(2)(i)		A description and comparative assessment of all alternatives identified during the environmental impact assessment process.	Part 6 & 8
R543 Regulation 31(2)(j)		A summary of the findings and recommendations of any specialist reports or report on a specialised process.	Part 2 & 7

Regulation No:		Description	EIR Part
R543 Regulation 31(2)(k)		A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.	Part 7
R543 Regulation 31(2)(l)		An assessment of each identified potentially significant impact, including:	Part 7
	(i)	Cumulative impacts.	
	(ii)	The nature of the impact.	
	(iii)	The extent and duration of the impact.	
	(iv)	The probability of the impact occurring.	
	(v)	The degree to which the impact can be reversed.	
	(vi)	The degree to which the impact may cause irreplaceable loss of resources.	
	(vii)	The degree to which the impact can be mitigated.	
R543 Regulation 31(2)(m)		A description of any assumptions, uncertainties and gaps in knowledge.	Part 9 (if applicable)
R543 Regulation 31(2)(n)		A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Part 9
R543 Regulation 31(2)(o)		An environmental impact statement which contains:	Part 8
	(i)	A summary of the key findings of the environmental impact assessment.	
	(ii)	A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives.	
R543 Regulation 31(2)(p)		A draft environmental management programme containing the aspects contemplated in Regulation 33 of the EIA Regulations, 2010.	Appendix F
R543 Regulation 31(2)(q)		Copies of any specialist reports.	Appendix D
R543 Regulation 31(2)(r)		Any specific information that may be required by the competent authority.	*Appendix A; Appendix C; Appendix D; Section 1.6 and Table 2; Section 7.3.1 and Appendix F; and Appendix F.
R543 Regulation 31(2)(s)		Any other matters required in terms of sections	None at present

Regulation No:	Description	EIR Part
	24(4)(a) and (b) of the Act.	

*The information that was requested by the North West Department of Rural, Environmental and Agricultural Development is listed in their letter attached under Appendix G of this report.

1.2 Details of the Project Applicant

Name of Applicant	Vaporox (Pty) Ltd
Postal Address	PO Box 1856, Heidelberg, 1438
Fax No.	086 679 0029
Email Address	mavimbta@vodamail.co.za
Landowner	North West Development Corporation (Pty) Ltd
Farm name and portion on which the activities take place	Portion 0 of Erf 37, Bodirelo Township, JQ, North West Province
Title Deed Number and 21 Digit Code	T0JQ00840000003700000
Co-ordinates of operation	25°16'12.40''; 27°16'25.36''

1.3 Details of the Project Coordinator

Name of firm	Innovative Business Systems (Pty) Ltd
Contact Person	Ditebogo N. Sebesho
Postal address	PostNet Suite #264 Private Bag X21 Bryanston 2021
Telephone No.	072 905 0913
Fax	086 226 2590
E-mail	ditebogo@ibs-africa.com

Innovative Business Systems (Pty) Ltd

Innovative Business Systems specialises in setting up and the implementation of management systems. Service offerings include:

- Management Systems Consulting;
- System Optimisation;
- Technical Audits;
- Quality Assurance;

- Outsourcing; and
- Project Coordination/Management.

1.4 Appointed Environmental Assessment Practitioner

Name of firm	Shangoni Management Services (Pty) Ltd.	
Postal address	PO Box 74726 Lynwood Ridge Pretoria 0040	
Telephone No.	(012) 807 7036	
Fax	(012) 807 1014/086 643 5360	
E-mail	lizette@shangoni.co.za	
Team of Environmental Assessment Practitioners on project		
Name	**Qualifications & experience to conduct the EIA**	**Responsibility**
Mr Lourens de Villiers	• MSc. Water Resource Management (UP) • BSc. (Hons) (PU for CHE) • More than 12 years' experience conducting Environmental Impact Assessments and Waste Management License Applications	Project Director
Ms Lizette Crous	• Post Graduate Certificate Environmental Management (University of London) • 3 years' experience conducting Environmental Impact Assessments and Waste Management License Applications	EAP
Ms Patricia van der Walt	• B.Sc. (Hons) (Applied Science in Environmental Technology) • 3 years' experience conducting Environmental Impact Assessments, Waste Management License Applications and Atmospheric Emission License Applications.	EAP

* Detailed CVs for the project team are attached (Appendix G).

Lourens de Villiers – Project Director

Lourens holds a M.Sc. Water Resource Management degree from the University of Pretoria and has ten years' experience in the environmental field. He specialises in compilation and management of Environmental Impact Assessments (EIA's) for commercial, industrial, agri-industrial, mining and residential developments. Lourens is also actively involved in third party ISO 14001 certification audits in the mining and industrial sectors.

Lizette Crous – Environmental Practitioner

Lizette obtained a B.Sc. degree specialising in Biodiversity and Ecology from the University of Stellenbosch. She is currently completing a M.Sc. in Environmental Management at the University of London and is responsible for Waste Management License Applications and non-mining Environmental Impact Assessments (EIA) at Shangoni.

Patricia van der Walt – Environmental Practitioner

Patricia obtained a B.Sc. degree in Microbiology and Life Sciences from the University of Limpopo, majoring in Biochemistry, Physiology and Biology. She went on to complete her B.Sc. Hons (Applied Science) degree in Environmental Engineering at the University of Pretoria, specialising in Environmental management, Air management, Water quality management and Waste management. She is responsible for Environmental Impact Assessments (EIA), Air emission licenses and Waste management licenses at Shangoni.

1.5 Current situation

Currently, waste tyres are disposed of at landfill sites, where they take up valuable air space, and are stockpiled or dumped in residential, rural and industrial areas across South Africa. Some tyres are recycled, but many are burnt, releasing oils that seep into the ground and noxious gases such as carbon monoxide and dioxins (www.redisa.org.za). Burning one ton of waste tyres produces approximately 450kg of toxic gases (Splainex Ecosystems Ltd, 2009-2011). In some rural areas, waste tyres are also burnt to generate heat, especially in winter months, resulting in health risks to those inhaling the resultant fumes (www.redisa.org.za). In terms of the Waste Classification and Management Regulations (NEM: WA) of 23 August 2013, tyres are seen as general waste and do not require classification (Annexure 1 of the regulations).

The Waste Tyre pyrolysis plant is proposed for an industrial site that is currently unused. The site was used for industrial purposes in the past and has existing buildings, road infrastructure and bulk service supplies.

1.6 Proposed activities

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.

At the proposed plant, waste tyres will be delivered by truck, weighed and stockpiled outside. The tyres will then be cleaned and conveyed into a shredder to produce chips. Thereafter, the shredded tyres will be fed into a pyrolysis reactor vessel that is devoid of oxygen. The reactor will be a continuous fluidised based reactor. 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 include oil, steel and char. The oil will be purified by first cracking it and then passing it through several reactors that are packed with catalysts. The purification process will remove carbon particles, sulphur and ash. 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^3 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 off. 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 being produced 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 (±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.

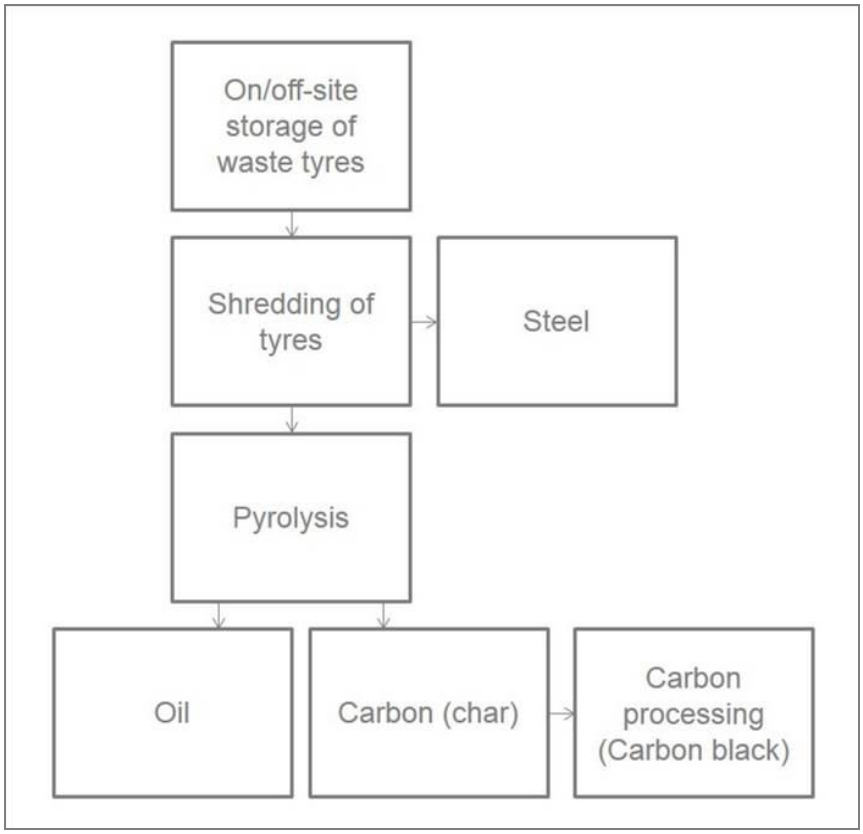


Figure 1: General pyrolysis process flow diagram

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

Table 2: 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	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. Facilities or infrastructure for the storage of dangerous goods will be constructed. This will include approximately 500m^3 of oil, ±5 tons of chemicals, such as catalysts, in bags and silos and 46 cubic tons of Liquefied Petroleum Gas (LPG).
GN. No. R 545, Listing Notice 2 of 18 June 2010	5	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.

Number and date of the relevant notice	Activity No	Description
		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.
GN. No. R 545, Listing Notice 2 of 18 June 2010	26	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. 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.

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):

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.

No. and date of relevant notice	Activity No	Description	Application
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.

1.6.1 Proposed locality

The proposed site for the Waste Tyre pyrolysis plant is located on Portion 0 of Erf 37, Bodirelo Township, JQ, Mogwase, North West Province. The site is situated within the Moses Kotane Local Municipality of the Bojanala Platinum District Municipality.

Table 3: Administrative and water management boundaries

Province	North West Province
District Municipality	Bojanala Platinum District Municipality
Local Municipality	Moses Kotane Local Municipality
Ward	10
Quaternary Catchment	A22F
Water Management Area (if applicable)	Crocodile (West) and Marico
Air Shed Priority Area	Waterberg-Bojanala National Air Shed Priority Area

Table 4: Direction and distance to the nearest towns

Closest town	Distance from site	Direction from site
Doringpoort	7km	North-west
Sun City	20km	South-west
Rustenburg	41km	South

The site locality map and layout plan are given in the figures below and are also attached in Appendix A. Site photographs are also provided after the site layout plan.

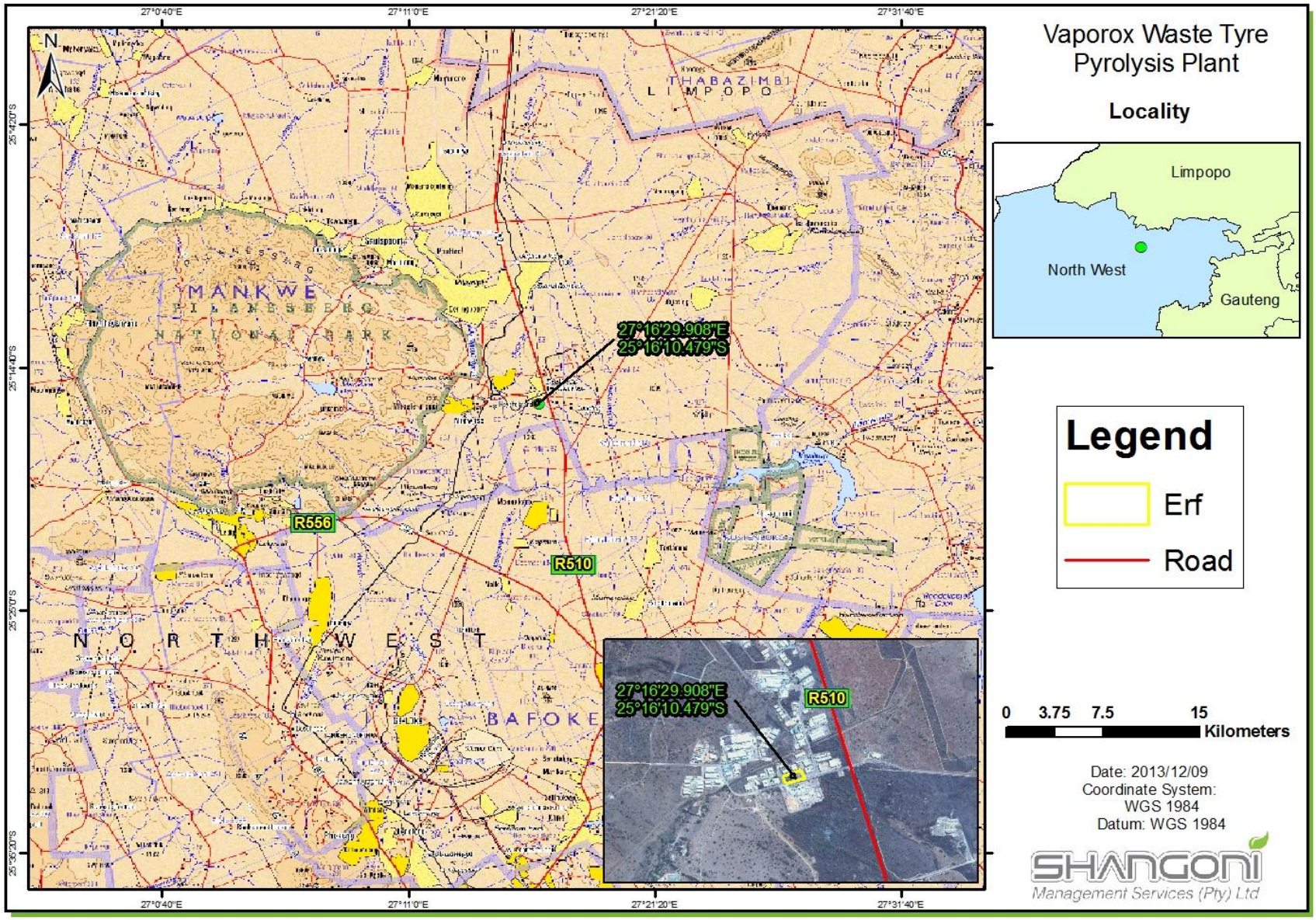


Figure 2: Site locality map

Figure 3: Site Layout Plan

Figure 4: Existing access to the site

Figure 5: Existing building 1

Figure 6: Existing building 2

Figure 7: Existing buildings (building 3 at the back on the right of the photograph)

Figure 8: Inside of building 1

Figure 9: Inside of building 2

Figure 10: Inside of building 3

Figure 11: Open piece of land to the east of the three existing buildings (1)

Figure 12: Open piece of land to the east of the three existing buildings (2)

1.6.2 Land tenure and use of immediately adjacent land

Most of the properties surrounding the proposed site are owned by the North West Development Corporation (Pty) Ltd and are used for industrial activities, such as steel works. There is also a bus service across the road from the site (Mvelatrans (Pty) Ltd t/a Bojanala Bus Services).

The adjacent land owners of the proposed site are listed in the table below and shown in the figure thereafter. Also refer to Part 4 for more detail regarding the Public Participation Process.

Table 5: Adjacent land owners of the proposed site

Adjacent Land Owner
North West Development Corporation (Pty) Ltd
Mvelatrans (Pty) Ltd t/a Bojanala Bus Services
New Era Recycling (Part of the New Era Group)
Durab Manufacturing
Four Tops Engineering Service CC

1.6.3 Design

The following figure shows a conceptual process flow for the proposed Waste Tyre Pyrolysis Plant. As the final design layouts and engineering drawings have not been finalised as yet, these layouts and drawings will be supplied to the Department once they have been finalised. These designs are also subject to confidentiality agreements.

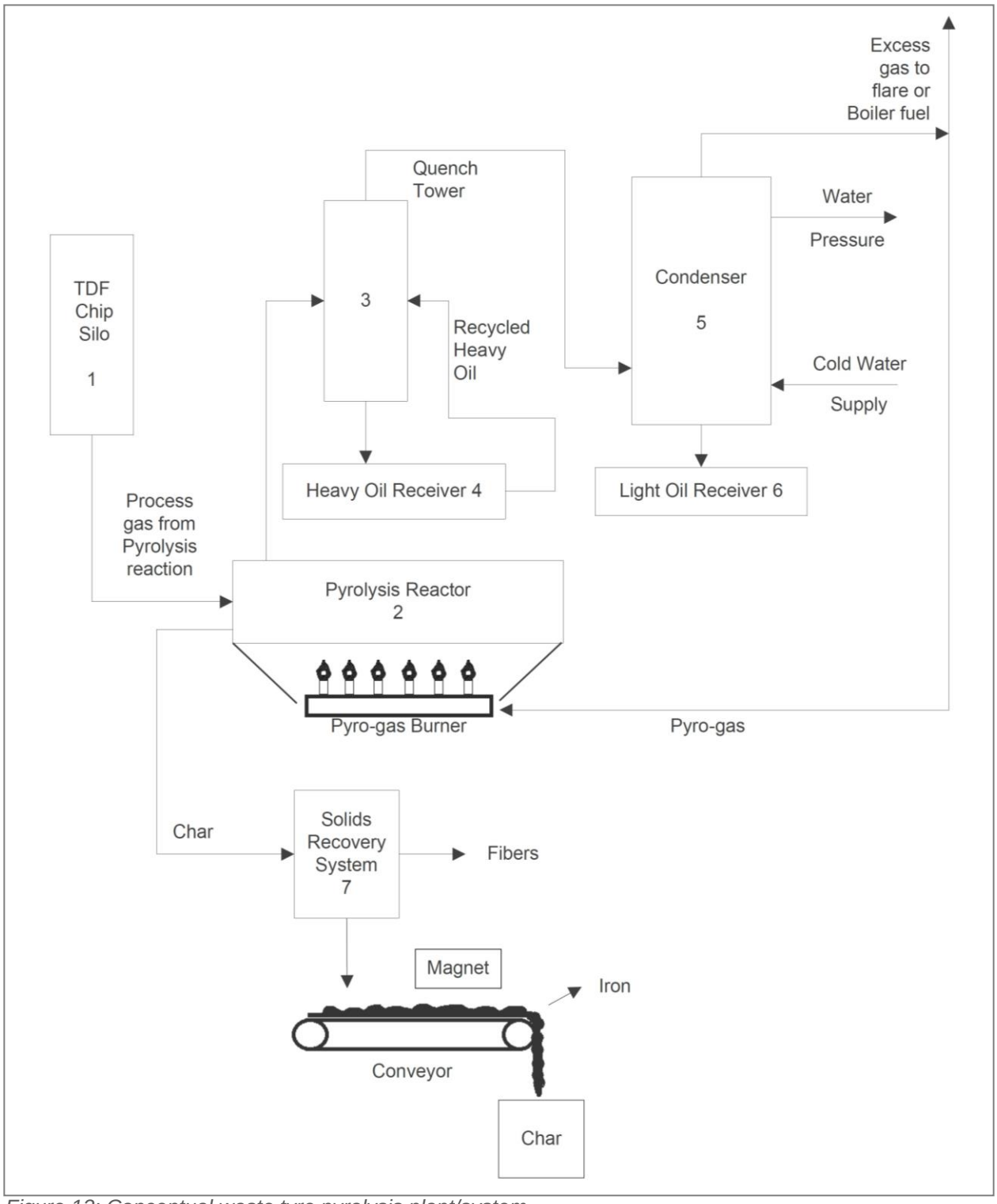


Figure 13: Conceptual waste tyre pyrolysis plant/system

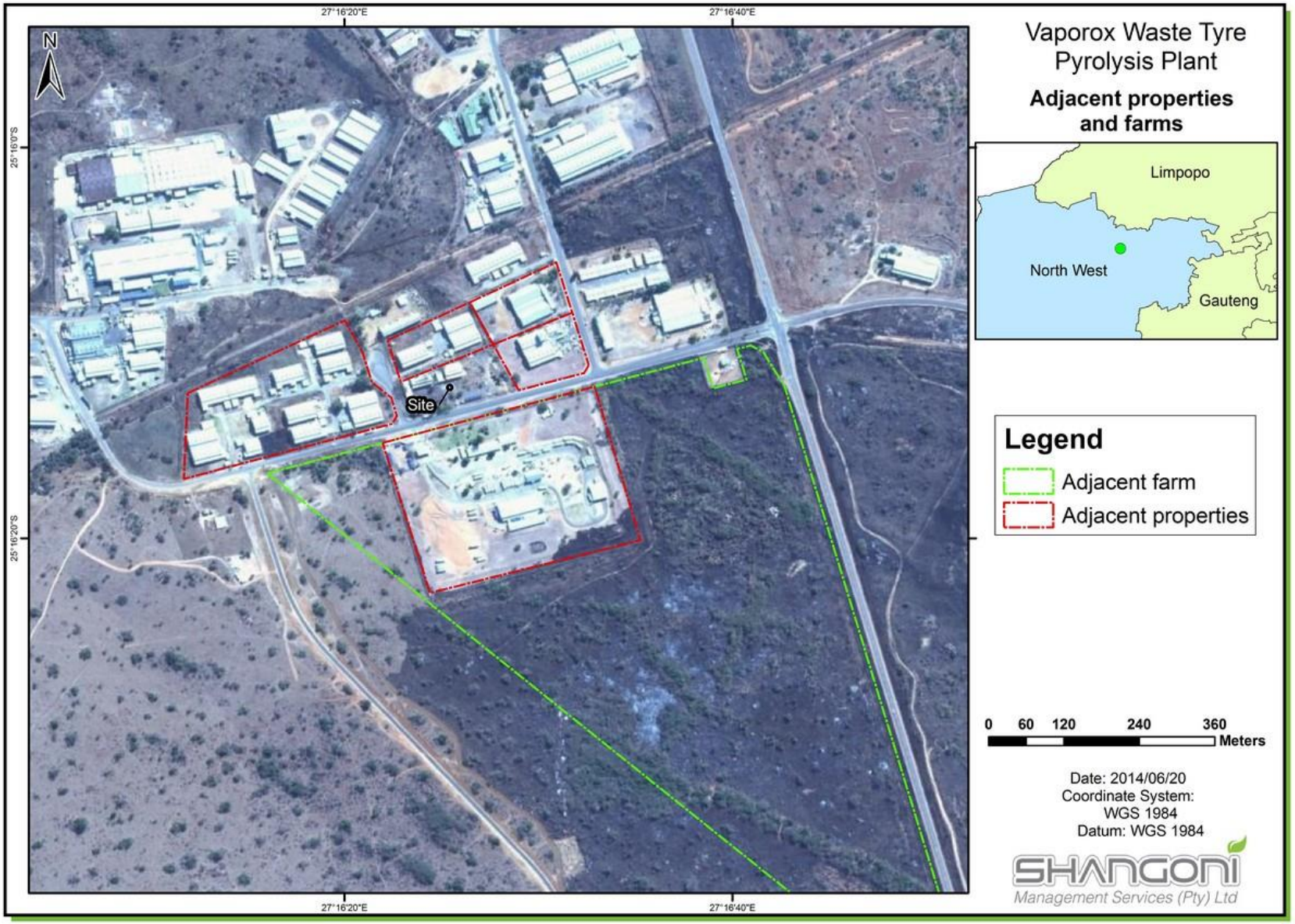


Figure 14: Properties adjacent to the proposed site

2. NATURE AND EXTENT OF THE ENVIRONMENT AFFECTED BY ACTIVITY

2.1 Geology

According to Mucina & Rutherford (2006), the northern areas that are covered by Central Sandy Bushveld (the vegetation type of the site) are underlain by sedimentary rocks belonging to the Waterberg Group, Mokolian Erathem. These are mostly sandstone, shale and siltstone rocks of the Vaalwater Formation and sandstone, siltstone and conglomerate rocks of the Alma Formation. Large parts of the southern and eastern areas are underlain by granite rocks belonging to the Lebowa Granite Suite and granophyre (fine-grained igneous) rocks belonging to the Rashoop Granophyre Suite. Both of these suites belong to the Bushveld Complex, Vaalian (Mucina & Rutherford, 2006).

As shown in the figure below, the site is underlain by felsic, intermediate rocks of the Lebowa Granite Suite, Bushveld Complex (Vaalian).

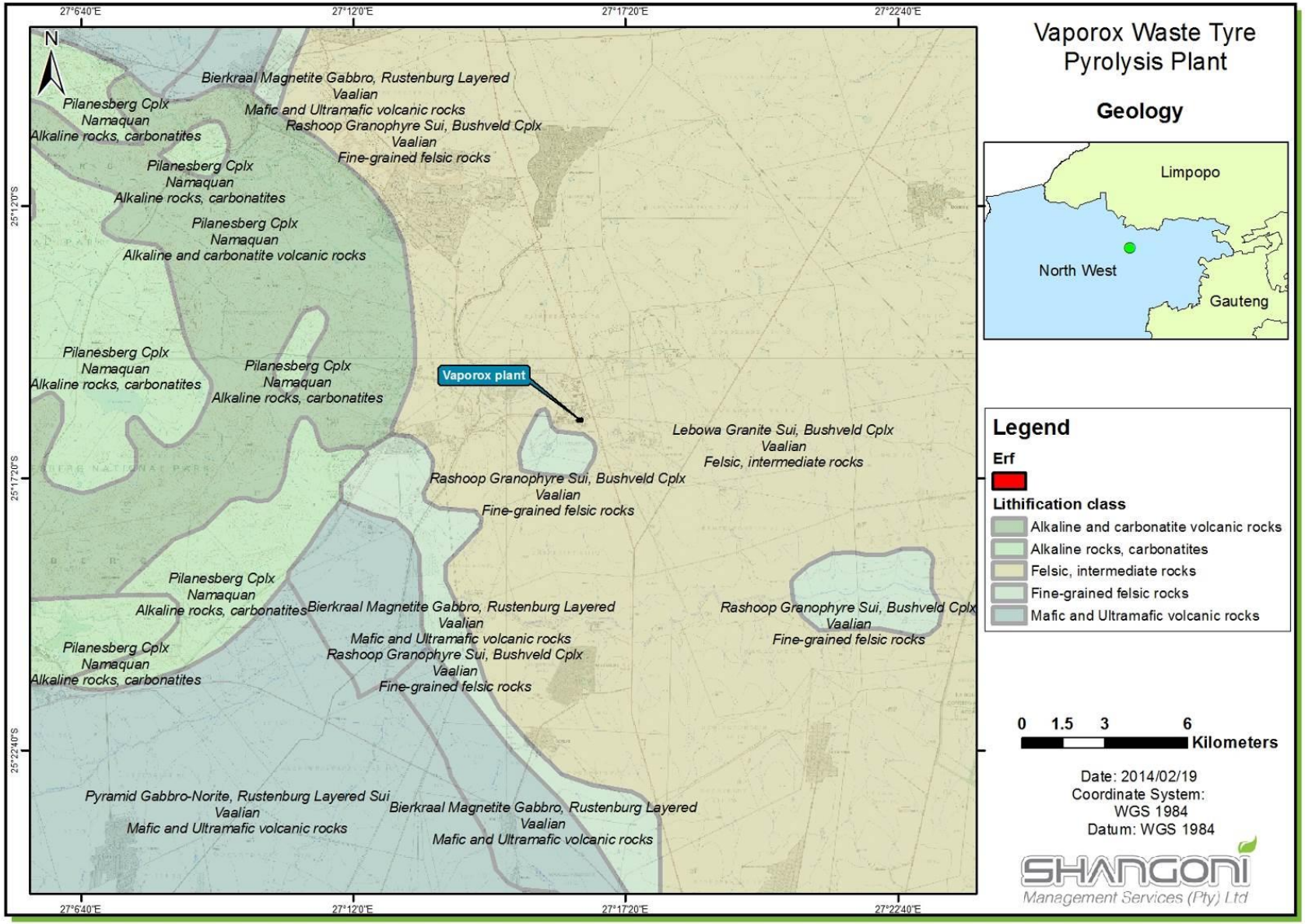


Figure 15: Geology of the site

2.2 Regional climate

2.2.1 Rainfall

The mean annual rainfall at the site area is 401 – 600mm per annum (AGIS, 2007). The figure below shows the annual monthly rainfall at the site for 2012, as compiled from Numerical Weather Prediction (NWP) Meteorological Data (Crown, 2009).

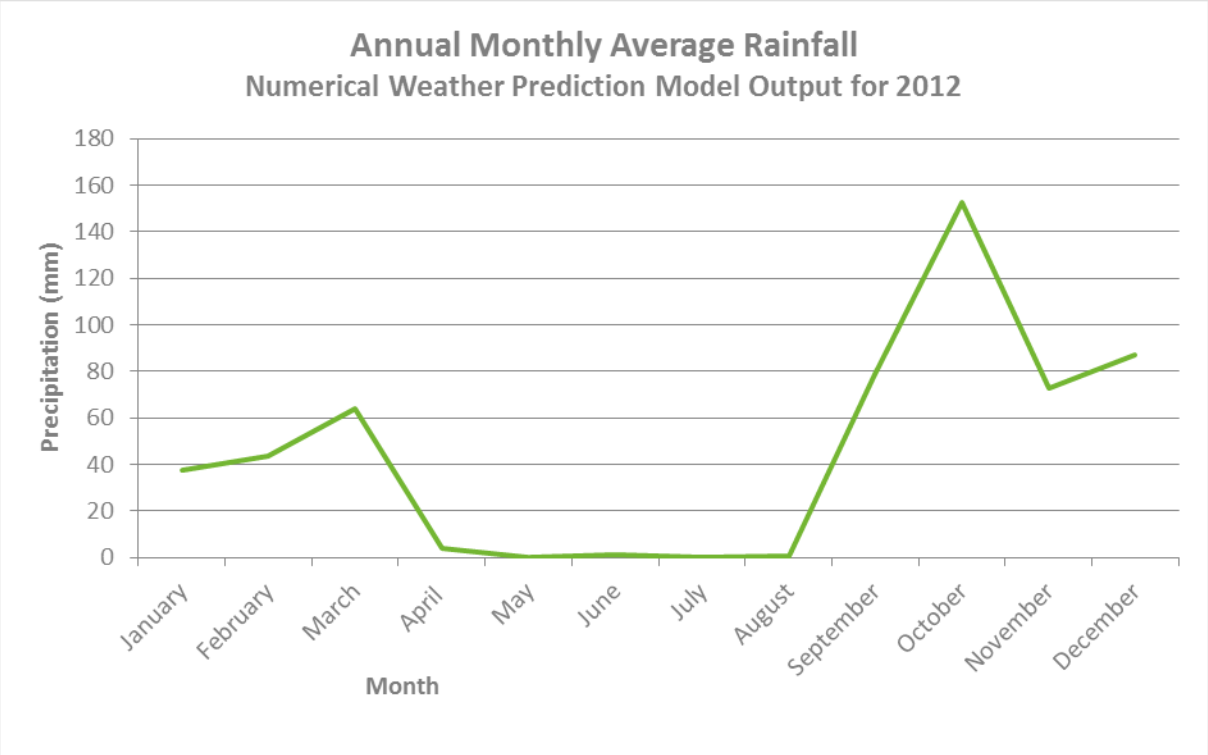


Figure 16: Annual monthly rainfall at the site (Crown, 2009)

2.2.2 Temperature

According to the AGIS Comprehensive Atlas, 2007, the maximum mean annual temperature for the site is between 29.1°C and 31°C and the minimum mean annual temperature for the site area is between 2.1°C and 4°C. The figure below shows the annual monthly average temperature at the site for 2012, as compiled from Numerical Weather Prediction (NWP) Meteorological Data (Crown, 2009).

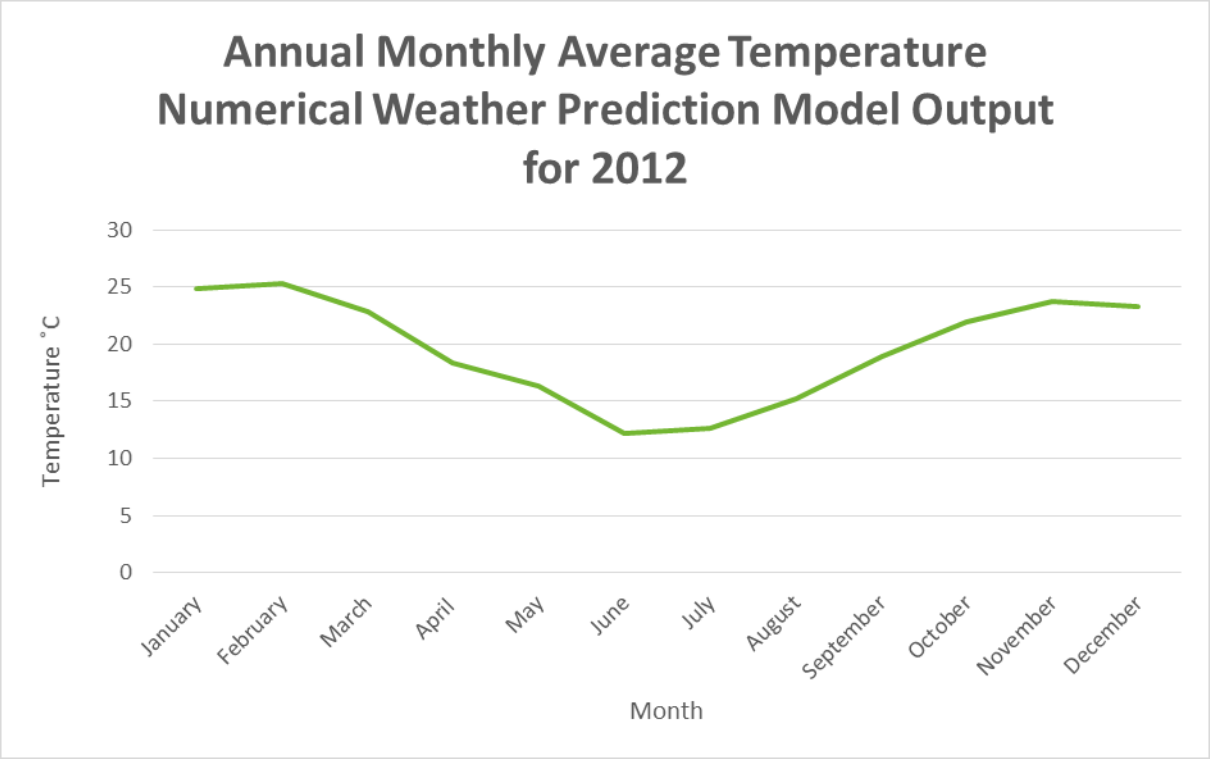


Figure 17: Annual Monthly Average Temperature at the site (Crown, 2009)

2.2.3 Evaporation

The Mean Annual Evaporation of the area is 1 700-1 800mm per annum (DWAF, 2010).

2.2.4 Wind

The figure below shows the annual and seasonal prevailing wind direction at the site for 2012, as compiled from Numerical Weather Prediction (NWP) Meteorological Data (Crown, 2009). The prevailing wind direction at the site is from the South east-east.

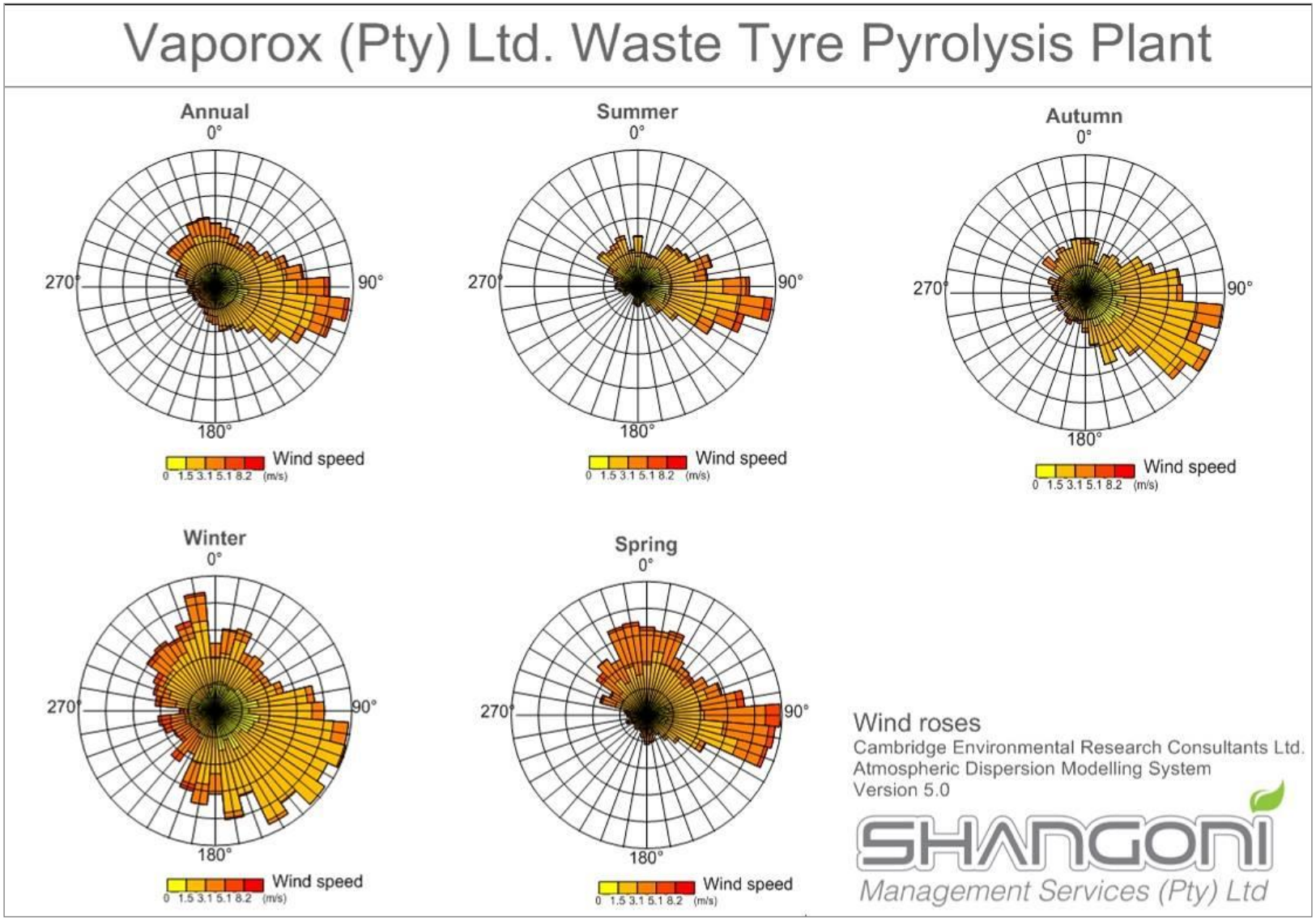


Figure 18: Wind roses showing the prevailing wind direction at the site (Crown, 2009)

2.3 Topography

According to Mucina and Rutherford (2006), areas covered by Central Sandy Bushveld (the vegetation type of the site), are characterised by low, undulating areas that are sometimes found between mountains, as well as catenas and sandy plains (Mucina and Rutherford, 2006). A catenas is defined as a group of soils that are found together within a landscape and share the same parent material.

As can be seen in the figure below, the site slopes downwards from the eastern to western part of the site. The elevation is 1 092 metres above sea level (masl) on the eastern boundary of the site and 1 085 metres above sea level on the western boundary of the site. Existing Building 1 is situated at an average elevation of 1088masl, Existing Building 2 is situated at an average elevation of 1088masl and Existing Building 3 is situated at an average elevation of 1087masl. According to the AGIS Comprehensive Atlas (2007), the slope of the site is between 0 and 5%.

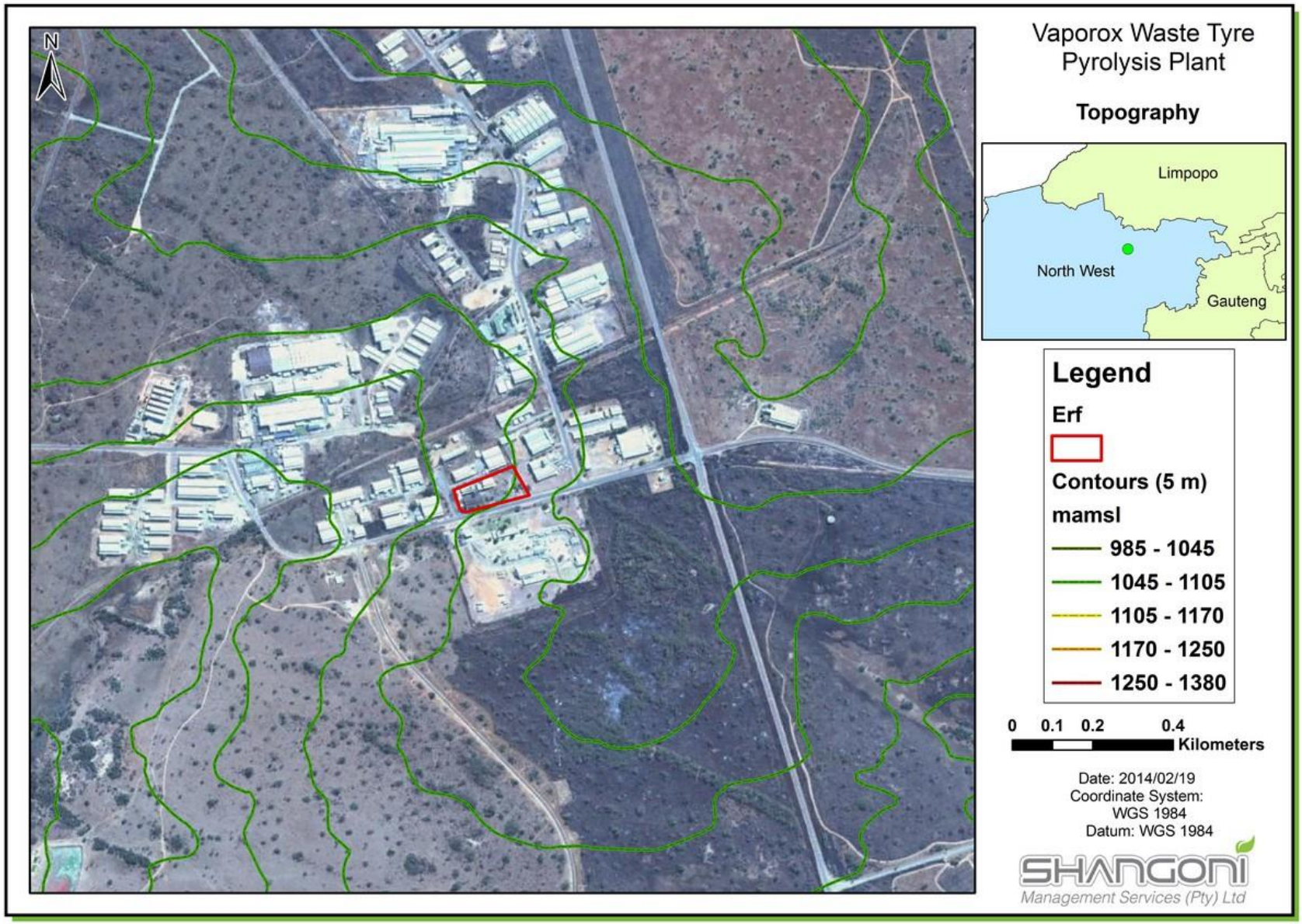


Figure 19: Topography of the site

2.4 Soils

In general, soils underlying Central Sandy Bushveld (the vegetation type of the site), are deep Hutton or Clovelly soils that are well-drained and often have a catenary sequence of Hutton at the top and Clovelly on the lower slopes. Shallow Glenrosa soils may also occur and the main land types are Ac, Ba, Bb, Bd and Fa (Mucina & Rutherford, 2006).

As shown in the figure below, the site is characterised by one soil type, namely S21. S21 soils are an association of Class 13 and 16 soils and are undifferentiated, shallow soils. The soils may receive water runoff from associated rocks (water intake areas) and have restricted land use options. The land type of the site is Fa4 according to the AGIS Comprehensive Atlas (2007). The clay content of this land type varies between 4 and 40% for the A horizon, between 4 and 10% for the E horizon and between 4 and 57% for the B21 horizon (AGIS, 2007).

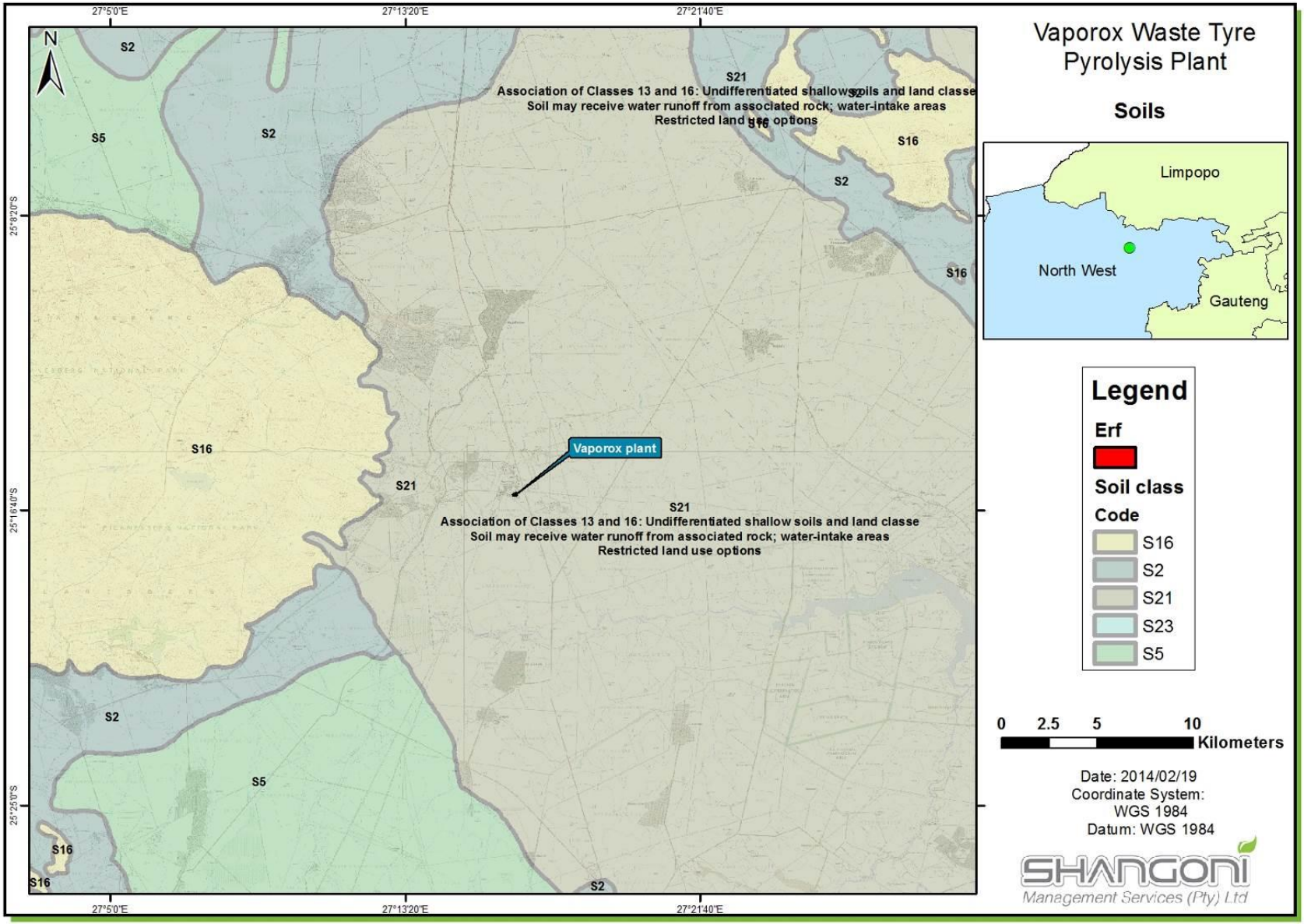


Figure 20: Soil type present at the site

2.5 Land use and land capability

The property is zoned as Industrial land and three existing buildings, erected by the previous owners/tenants are present on the site, together with associated infrastructures such as roads and the entrance gate. The buildings and associated infrastructures cover approximately half of the property and the remaining areas is open land.

According to the AGIS Comprehensive Atlas (2007) the land capability of the property is “Moderate Potential Agricultural Land”. The dominant land use surrounding the property is industrial uses, urban/built-up areas, residential areas, bush veldt and a municipal landfill site. A number of the adjacent properties are also owned by the North West Development Corporation. In the wider area surrounding the site, a number of mines, the Pilanesberg National Park and the Vaalkop Dam Nature Reserve are present.

2.6 Vegetation

As the site was disturbed previously when buildings were constructed, only half of the site has remaining vegetative cover present. Due to the disturbed nature of the vegetation onsite, a desktop assessment was undertaken at this stage to describe the nature of any natural vegetation surrounding the site.

As shown in the figure below, the vegetation type of the area and site is Central Sandy Bushveld (SVcb 12). This bushveld is found at an elevation of between 850 and 1 450 metres above sea level in the Mpumalanga, Limpopo, North-West and Gauteng Provinces. The vegetation type is listed as “Vulnerable” with a conservation target percentage of 19%. Currently, less than 3% of the vegetation type areas are statutorily conserved in a number of nature reserves such as the Skuinsdraai and Doorndraai Dam Nature Reserves. A further 2% is conserved in other reserves, such as private reserves and the Wallmansthal SANDF Property (Mucina & Rutherford, 2006).

2.6.1 Dominant species

Important and biologically important taxa within the Central Sandy Bushveld vegetation type are given in the tables below.

Table 6: Important taxa within the Central Sandy Bushveld (Mucina & Rutherford, 2006)

Taxa	Species
Tall trees	*Acacia burkei (d), A. robusta, Sclerocarya birrea* subsp. *caffra*
Small trees	*Burkea africana (d), Corbretum apiculatum (d), C. zeyheri (d), Terminalia sericea (d), Ochna pulchra, Peltophorum africanum, Rhus leptodictya.*
Tall shrubs	*Combretum hereroense, Grewia bicolor, G. monticola, Strychnos pungens.*
Low shrubs	*Agathisanthemum bojeri (d), Indigofera filipes (d), Felicia fascicularis, Gnidia sericocephala.*

Geoxylic suffrutex	*Dichapetalum cymosum (d).*
Woody climber	*Asparagus buchananii.*
Graminoids	*Brachiaria nigropedata (d), Eragrostis pallens (d), E. rigidior (d), Hyperthelia dissoluta (d), Panicum maximum (d), Perotis patens (d), Anthephora pubescens, Aristida scabrivalvis* subsp*. scabrivalvis, Brachiaria serrata, Elionurus muticus, Eragrostis nindensis, Loudetia simplex, Schmidtia pappophoroides, Themeda triandra, Trachypogon spicatus.*
Herbs	*Dicerocaryum senecioides (d), Barleria macrostegia, Blepharis integrifolia, Crabbea angustifolia, Evolvulus alsinoides, Geigeria burkei, Hermannia lancifolia, Indigofera daleoides, Justicia anagalloides, Kyphocarpa angustifolia, Lophiocarpus tenuissimus, Waltheria indica, Xerophyta humilis.*
Geophytic herb	*Hypoxis hermerocallidea.*
Succulent herb	*Aloe greatheadii* var *davyana.*

Table 7: Biogeographically important taxa (Central Bushveld endemics) within the Central Sandy Bushveld (Mucina & Rutherford, 2006)

Taxa	Species
Graminoid	*Mosdenia leptostachys.*
Herb	*Oxygonum dregeanum* subsp*. canescens* var*. dissectrum.*

2.6.2 Alien invasive species

A number of alien plants are widely scattered at low densities within the Central Sandy Bushveld vegetation type. These alien species include *Cereus jamacaru, Eucalyptus* species*, Lantana camara, Melia azedarach, Opuntia ficus-indica and Sesbania punicea.*

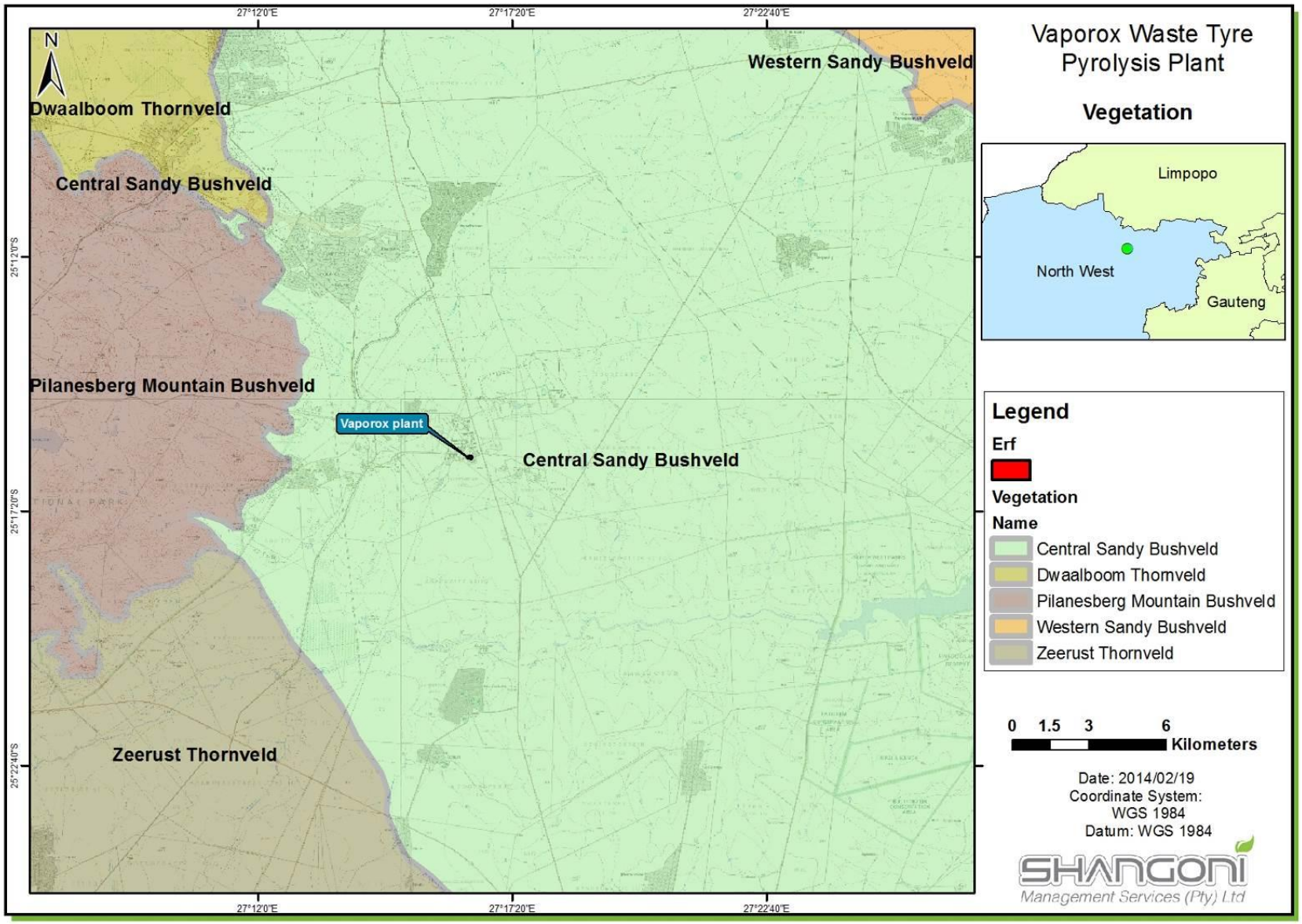


Figure 21: Vegetation type at the site

2.7 Animal life

2.7.1 Commonly occurring species

According to the South African Biodiversity Information Facility (SIBIF), the following animal species commonly occur in n the vicinity of the project site.

Table 8: List of commonly occurring insect species in the vicinity of the site (SANBI, 2009)

Scientific name	Common name
Crocisaspidia chandieri	Species of Apidae (bees)
Lipotriches rubella	Species of Apidae (bees)
Amegilla sp.	Species of Blue-banded Bee
Anthophora sp.	Species of Apidae (bees)
Megachile sp.	Species of Leafcutter Bee
Xylocopa caffra	Species of Carpenter Bee

Table 9: List of commonly occurring fish species in the vicinity of the site (SANBI, 2009)

Scientific name	Common name
Oreochromis mossambicus	Mozambique Tilapia
Pseudocrenilabrus philander	Southern Mouthbrooder
Tilapia sparrmanii	Banded Tilapia
Chetia flaviventris	Canary Kurper
Barbus unitaeniatus	Slender Barb
Barbus paludinosus	Straightfin Barb

2.7.2 Endangered species

The following tables show the IUCN (International Union for Conservation of Nature and Nature Resources) Red List of Threatened Species that are found in the North West Province. Importantly, these species are not necessarily present at the specific project site. The following abbreviations are used: EN: Endangered; VU: Vulnerable; NT: Near Threatened; DD: Data Deficient; and LC: least concern.

Table 10: IUCN Red List of threatened mammal species (IUCN, 2013)

Scientific name	Common name	Red List Status
Graphiurus ocularis	Spectacled Dormouse	LC
Mystromys albicaudatus	White-tailed Mouse	EN
Pronolagus rupestris	Smith's Red Rock Hare	LC

Table 11: IUCN Red List of threatened insect species (IUCN, 2013)

Scientific name	Common name	Red List Status
Anax ephippiger	Vagrant Emperor	LC
Anax imperator	Blue Emperor	LC

Scientific name	Common name	Red List Status
Anax speratus	Orange Emperor	LC
Cacyreus virilis	Alternative Bush Blue	LC
Capys alphaeus	Orange-banded Protea Butterfly	LC
Crocothemis sanguinolenta	Little Scarlet	LC
Diplacodes lefebvrii	Black Percher	LC
Frankenbergerius forcipatus	-	DD
Ischnura senegalensis	Common Bluetail	LC
Orthetrum chrysostigma	Epaulet Skimmer	LC
Lestes pallidus	Pallid Springwing	LC
Nesciothemis farinosa	Black-tailed Skimmer	LC
Orthetrum trinacria	Long Skimmer	LC
Palpopleura deceptor	Deceptive Widow	LC
Pantala flavescens	Globe Skimmer	LC
Paternympha narycia	Spotted-eye Brown	LC
Pseudagrion kersteni	Kersten's Sprite	LC
Rhyothemis semihyalina	Phantom Flutterer	LC
Sympetrum fonscolombii	Red-veined Darter	LC
Tramea basilaris	Keyhole Glider	LC
Trithemis annulata	Violet Dropwing	LC
Trithemis arteriosa	Red-veined Dropwing	LC
Trithemis furva	Navy Dropwing	LC
Trithemis kirbyi	Orange-winged Dropwing	LC
Tuxentius calice	White Pierrot	LC

Table 12: IUCN Red List of threatened reptile species (IUCN, 2013)

Scientific name	Common name	Red List Status
Acontias percivali	Percival's Legless Skink	LC
Chamaeleo dilepis	Common African Flap-necked Chameleon	LC
Lygodactylus nigropunctatus	Black-spotted Dwarf Gecko	LC
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC

Table 13: IUCN Red List of threatened millipede (Diplopoda) species (IUCN, 2013)

Scientific name	Common name	Red List Status
Doratogonus levigatus	-	LC
Doratogonus rugifrons	-	LC

Table 14: IUCN Red List of threatened snail and slug (Gastropoda) species (IUCN, 2013)

Scientific name	Common name	Red List Status
Biomphalaria pfeifferi	-	LC
Galba truncatula	-	LC

Table 15: IUCN Red List of threatened fish species (IUCN, 2013)

Scientific name	Common name	Red List Status
Barbus brevipinnis	Shortfin Barb	NT
Barbus motebensis	Marico Barb	VU
Barbus rapax	Southern Papermouth	LC
Barbus sp. nov. 'Waterberg'	Waterberg Shortfin Barb	NT
Barbus trimaculatus	Threespot barb (FB)	LC
Chetia flaviventris	Canary Kurper	LC
Chiloglanis pretoriae	Shortspine Suckermouth	LC
Labeo rosae	Rednose Labeo	LC
Labeo umbratus	Moggel	LC
Labeobarbus aeneus	Vaal-orange Smallmouth Yellowfish	LC
Labeobarbus kimberleyensis	Largemouth Yellowfish, Vaal-orange Largemouth Yellowfish	NT
Labeo capensis	Orange River Mudfish	LC

Table 16: IUCN Red List of threatened crustacea (Malacostraca) species (IUCN, 2013)

Scientific name	Common name	Red List Status
Potamonautes calcaratus	-	LC
Potamonautes sidneyi	Sidney's River Crab	LC
Potamonautes unispinus	Single-spined River Crab	LC

The site is situated approximately 220m from a tributary of the Mogwase River.

2.8 Surface water

2.8.1 Catchment areas

The site lies within the A22F quaternary catchment as shown in the figure below. This quaternary catchment region is situated within the Crocodile (West) and Marico Water Management Area. The main rivers within this Water Management Area give rise to the Limpopo River at their confluence (DWAF, 2004).

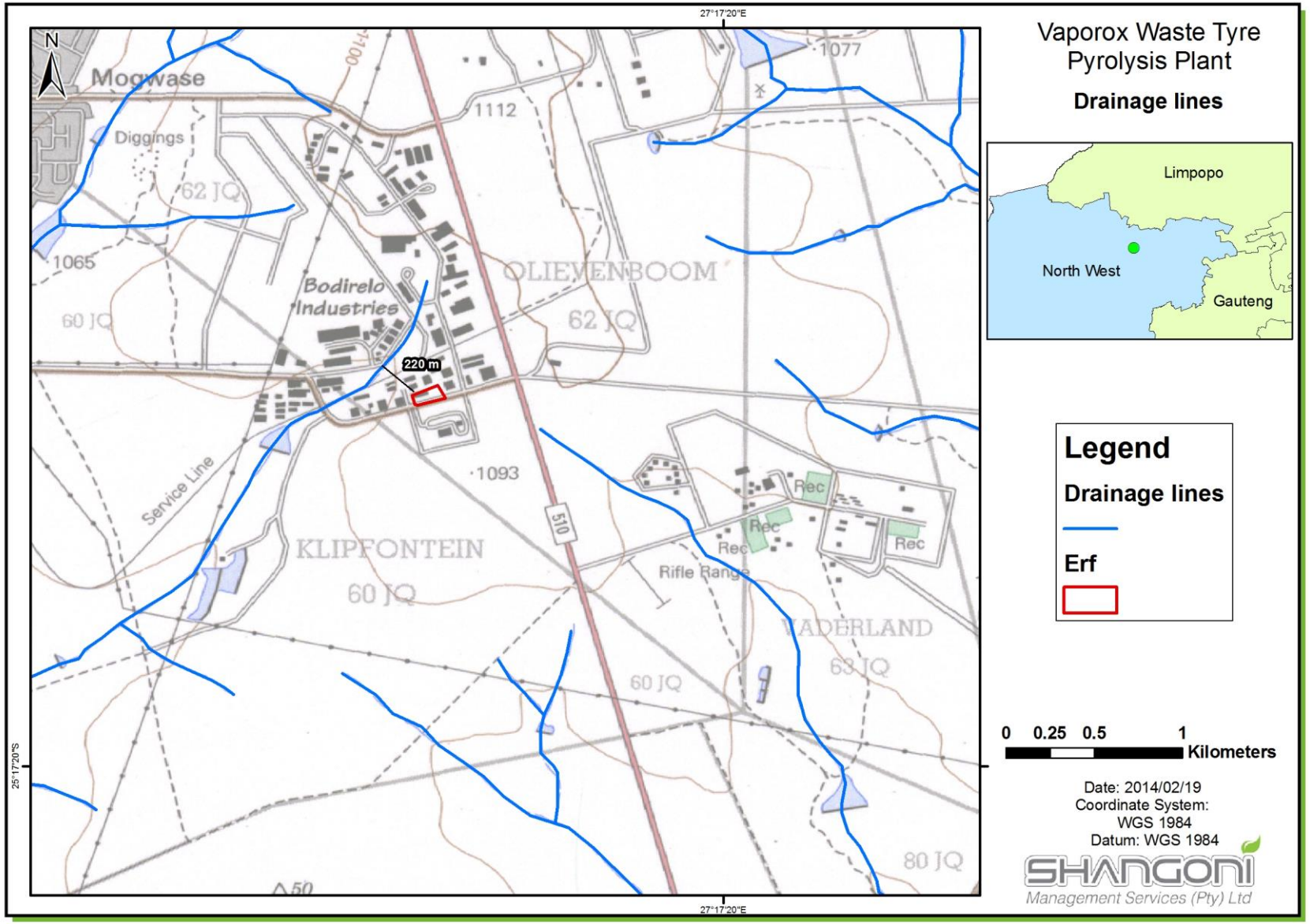


Figure 22: Quaternary catchment within which the site lies together with drainage lines in the immediate vicinity of the site

2.8.2 Mean annual runoff (MAR)

The total Natural Mean Annual Runoff for the Crocodile (West) and Marico Water Management Area is 855 million m^3/annum and the Ecological Reserve is 164 million m^3/annum (DWAF, 2004).

2.8.3 Surface water quantity and use

No surface water is used or will be used on the property as an existing municipal water supply is present to the site.

2.8.4 Water authority

The relevant water authority is the Department of Water Affairs, Hartebeespoort Regional office.

2.9 Groundwater

2.9.1 Aquifer type

The aquifer type of the area is d3, intergranular and fractured aquifers with median borehole yields of 0.5-2 litres/second (Geohydrological Map Sheet 2526, 1999). The aquifers are classified as “minor” aquifers (DWA, 2012).

The groundwater recharge is approximately 4mm per annum and the baseflow is approximately 2mm per annum in the area of the site (DWAF, 2010).

2.9.2 Depth of water tables

The depth to the water level is approximately 19mbgl (metres below ground level) in the area of the site (DWAF, 2010).

2.9.3 Groundwater use

No groundwater is or will be used on the property as an existing municipal water supply is present to the site.

2.9.4 Groundwater quality

The groundwater quality, in terms of mean TDS (total dissolved solids), underlying the area of the site is 418mg/ℓ (DWAF, 2010).

2.10 Sensitive landscapes

As shown in the figure below, there are no sensitive areas on the proposed site itself. Sensitive areas include for example, wetlands and Critical Biodiversity Areas (CBAs) as determined in Provincial Biodiversity Conservation Plans. According to the Biodiversity Conservation Plan for the North-west

Province, areas surrounding the proposed site have been designated as Biodiversity Conservation Areas, Terrestrial CBA Category 1 and 2 (shown in green on the figure below). The site is situated 4.4km to the south-east of the Pilanesberg National Park.

According to the South African Biodiversity Institutes Biodiversity GIS database, no wetlands are present on the site (SANBI, 2004).

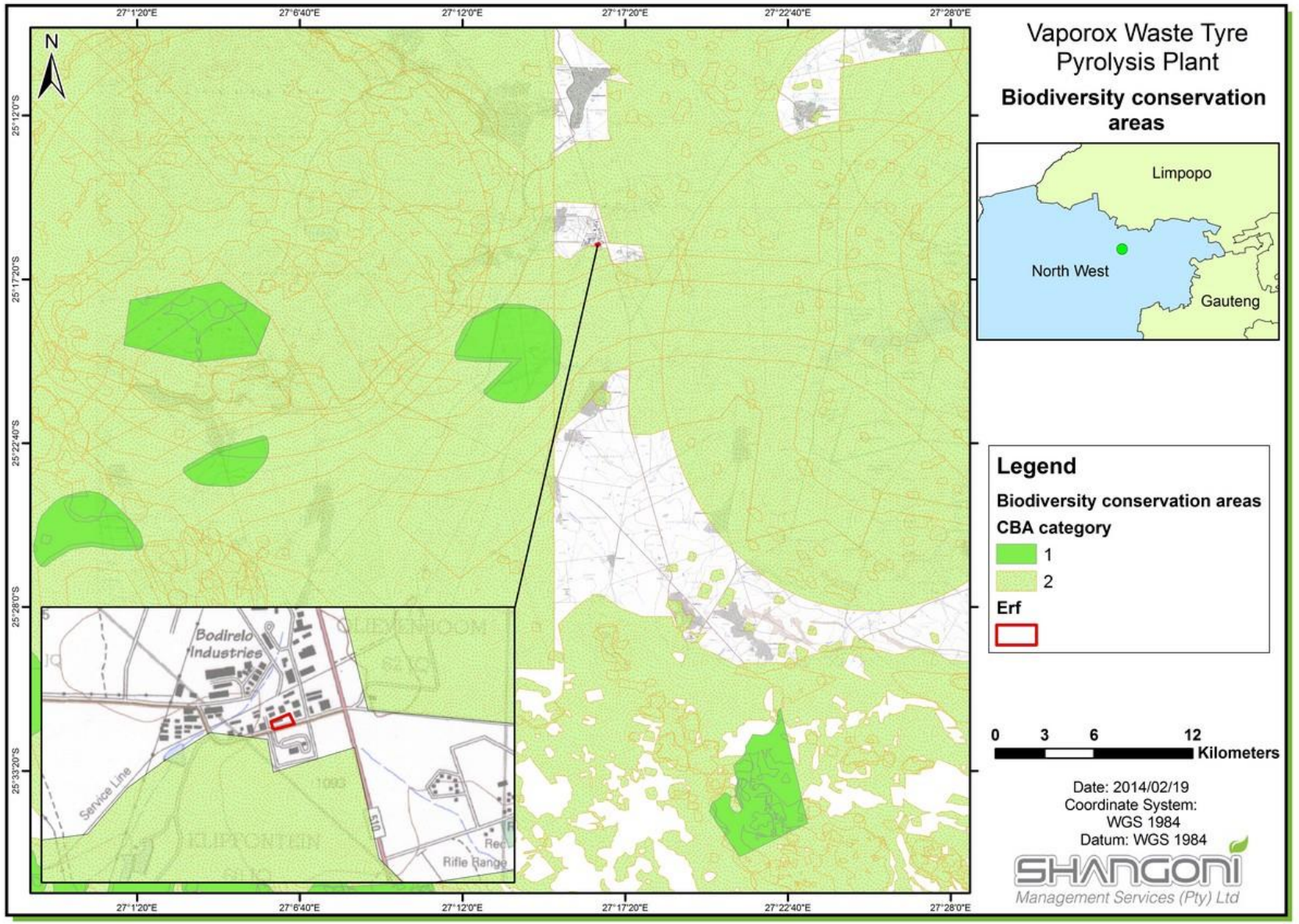


Figure 23: Sensitive areas in the vicinity of the site

2.11 Sites of archaeological and cultural interest

Approximately half of the site has been disturbed in the past by previous owners by the construction of three buildings and associated infrastructures. No information is available relating to the possible presence or absence of any sites of cultural heritage (historical and/or archaeological). The South African Heritage Resources Agency has been informed of the proposed development and Shangoni is awaiting feedback from them as to whether a Heritage Impact Assessment is required as part of this Environmental Impact Assessment process.

2.12 Air Quality

2.12.1 Background Ambient Air Quality of the area

According to the South African National Framework for Air Quality Management, the Waterberg District potentially has poor air quality, mainly due to emissions from industries. Industries in the Waterberg District are mainly small to medium-sized industries and include brickworks, dairy product-, meat- and oil- processing plants and the manufacturing of animal feeds. Other main activities in the area are agriculture, forestry, game farming and eco-tourism. Additional proposed industrial developments will make the Waterberg District an important role player in terms of air quality in the near future.

The Waterberg-Bojanala area has been declared a National Air Shed Priority Area in Government Notice No. 495 of 2012 (amended by Government Notice No. 154 of 8 March 2013). The Bojanala Platinum District consists of a number of atmospheric pollution sources, such as a power station, many open-cast mining operations, heavy and light industries, a refinery, motor vehicles as well as houses where coal is used for domestic heat generation (DEA, 2014).

Once an airshed area has been declared a priority area, an Air Quality Management Plan must be developed for that area. The following are proposed emission reduction strategies for small industries within the Waterberg district:

- The electronic database of all small industries developed as part of the AQMP should be updated by the District Municipality in conjunction with the Limpopo Province;
- Periodic site inspections and emissions measurements should be undertaken by the District Municipality;
- DEAT should develop a permit system for all non-listed activities;
- The District Municipality should model scheduled trade by-laws;
- As part of the current standards setting process, standards for small boilers will be proposed; and
- The Waterberg District Municipality should review these standards for possible inclusion into the Municipal by-laws.

2.13Visual aspects

The proposed site is situated on the corner of a road crossing (Ramokoka Drive and an unnamed road) and is clearly visible to passing motorist on both roads. The site is also visible from neighbouring properties on all sides. The surrounding land uses are also industrial and the area is zoned as Industrial land. Most of the buildings in the area therefore have an industrial appearance.

2.14Socio-economic aspects

The site is situated within the Moses Kotane Local Municipality, Bojanala Platinum District Municipality, North West Province.

2.14.1 Demography

According to the 2011 census, 242 554 people formed part of the 75 193 households in the Moses Kotane Local Municipality. The average household size is 3.2 people per household. The growth rate in the municipality is 0.22% per annum. There are 98.8 men for every 100 women (Statistics South Africa, 2011) in the municipality and the table below shows the age structure of the municipality.

Table 17: Moses Kotane Local Municipality age structure -Census 2011 (Statistics South Africa, 2011)

Age Group	Percentage of population (%)
Under 15 years of age	29.2
15 to 64 years of age	63.1
Over 65 years of age	7.7
Total	**100**

2.14.2 Major economic activities

The economy of the region is mostly dominated by the mining industry. This industry contributes 42% of the GDP (Gross Domestic Product) and 39% of employment opportunities in the province. The second largest industry is the agricultural industry that contributes 13% of the GDP and 18% of the employment opportunities in the province. The tourism industry is also very important in the province (Moses Kotane Local Municipality, 2013/2014) and the Pilanesberg National Park is situated approximately 6,3km to the west of the proposed site.

2.14.3 Unemployment and employment

The 2011 census found that the official unemployment rate was 37.9% and the youth unemployment rate (15 to 34 years of age) was 47.4%. The dependency ratio was 58.6 per 100 people between the ages of 15 and 64 years (Statistics South Africa, 2011).

3. APPLICABLE LEGISLATION AND GUIDELINES

The table below provides an indication of the main legislation, policies and/or guidelines applicable to the proposed project.

Table 18: Applicable legislation, policies and / or guidelines

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
Laws of General Application		
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.
Air Quality and Noise		
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.
Water Management		
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.
Waste Management		

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
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 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.
Biodiversity		
National Environmental Management Biodiversity Act, 2004 (Act No. 10 of	North West Department of Rural, Environmental and	To provide for the management and conservation of South Africa's

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
2004)	Agricultural Development	biodiversity within the framework of the National Environmental Management Act, 1998.
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.
Soil and Land Management		
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.
Heritage and Archaeological Resources		
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.
Protected Areas		
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.
Planning of New Activities		
National Environmental Management	North West Department of	To provide for the integrated

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
Act, 1998 (Act No. 107 of 1998). National Environmental Management Amendment Act, 2008 (Act No. 62 of 2008).	Rural, Environmental and Agricultural Development	management of the environment and to regulate the 'Duty of Care' Principle.
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.
Municipal By-laws		
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.

4. PUBLIC PARTICIPATION PROCESS

4.1 Objectives of the Public Participation Process (PPP)

Section 24 of the Constitution of the Republic of South Africa of 1996 guarantees everyone the right to an environment that is not harmful to their health and well-being and to have the environment protected for the benefit of present and future generations. In order to give effect to this right, the National Environmental Management Act (NEMA), 1998, as amended, came into effect.

In terms of Section 24(4) of the NEMA, 1998, as amended, procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment must, *inter alia*, ensure, with respect to every application:

- Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;
- That the findings and recommendations flowing from an investigation, the general objective of integrated management laid down in NEMA, 1998, as amended, and the principles of environmental management set out in Section 2 of NEMA, 1998, as amended, are taken into account in any decision made by the organ state in relation to any proposed policy, programme, process, plan or projects, consequences or impacts; and
- Public information and participation procedures which provide all integrated and affected parties, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures.

One of the general objectives of integrated environmental management laid down in Section 23(2) (d) of NEMA, 1998, as amended, is to: “ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment”.

The National Environmental Management Principles as stipulated in NEMA, 1998, as amended state:

- “Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- The participation of all interested and affected parties in environmental governance must be promoted, and all people must have an opportunity to develop the understanding, skills and capacity necessary to achieve equitable and effective participation, and participation by vulnerable and disadvantage persons must be ensured”.

4.2 Legislation and guidelines followed for the PPP

The public participation process for this project was conducted by Shangoni Management Services in terms of:

- The procedures and provisions in terms of the NEMA 1998, as amended;
- Chapter 6 of the EIA Regulations of 2010;
- GN 807; Public Participation Guideline in the Environmental Impact Assessment Process, dated October 2012; and
- Other relevant legislation such as the Promotion of Access to Information Act (PAIA), 2000.

Refer to Appendix E for an extract regarding the required public participation process to be followed, taken from the relevant legislation and guidelines

4.3 Public Participation Process followed

4.3.1 Identification and registration of I&APs and key stakeholders

The table below lists adjacent landowners that were identified and notified (by means of e-mail and/or registered post) of the proposed project. Copies of the notifications to the I&APs have been included in Appendix E.

Table 19: List of adjacent landowners identified and notified

Company Name	Contact Person
North West Development Corporation (Pty) Ltd	Mrs Tebogo Kesiamang
Mvelatrans (Pty) Ltd t/a Bojanala Bus Services	Mr Albert Snyders
New Era Recycling (Part of the New Era Group)	Mr Danie Van Rooyen
Durab Manufacturing	Mr Anton Jonker
Four Tops Engineering Service CC	Mr Essau Motloung

All organs of state that may have jurisdiction in respect of the proposed project are considered to be registered I&APs.

The following organs of state were notified of the proposed project:

- Moses Kotane Local Municipality;
- Bojanala Platinum District Municipality;
- North West Department of Agriculture and Rural Development (now North West Department of Rural, Environmental and Agricultural Development);
- North West Department of Finance;
- North West Department of Local Government and Traditional Affairs;
- North West Department of Human Settlements, Public Safety and Liaison;
- North West Department of Public Works, Roads and Transport;

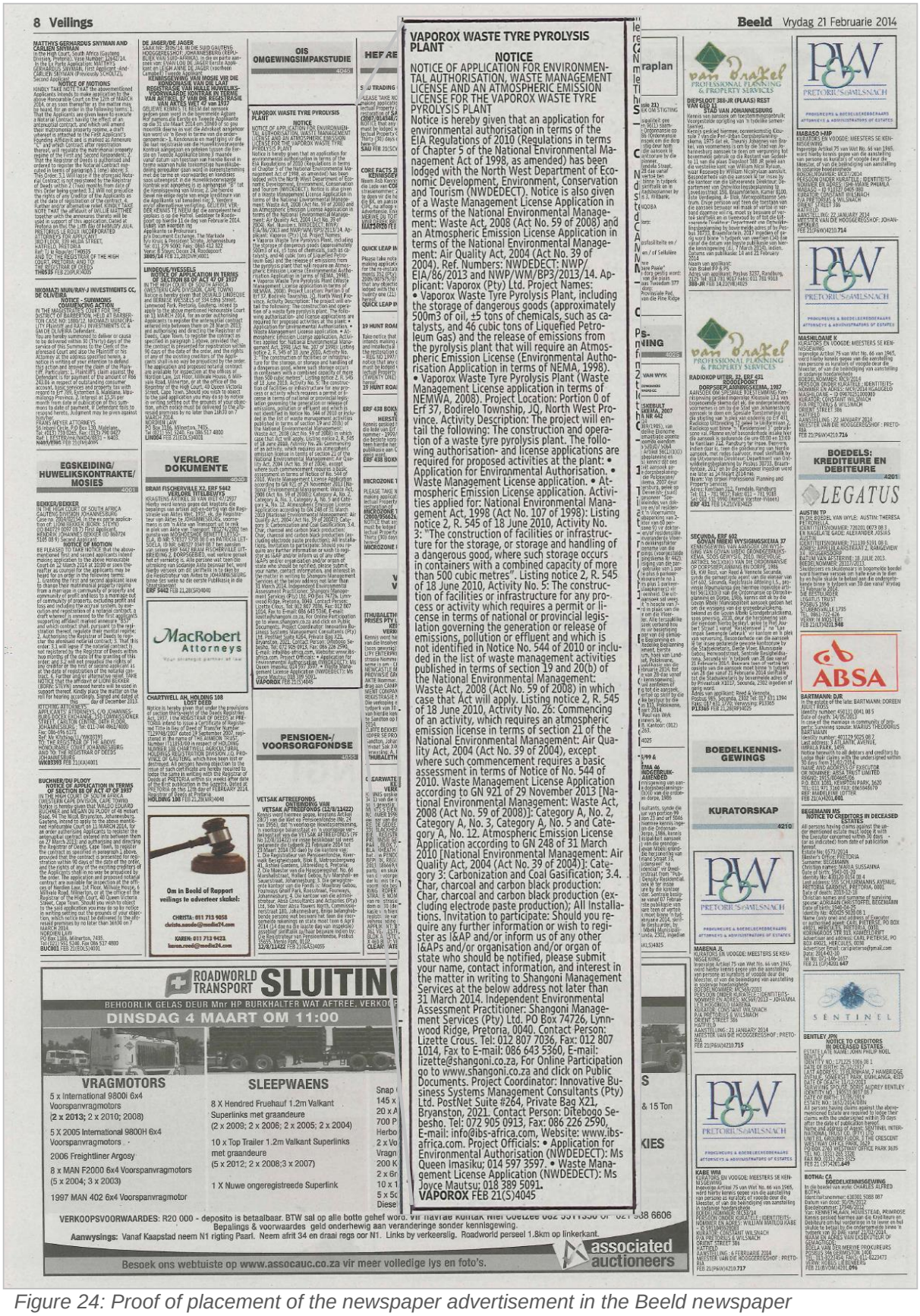
- North West Department of Social Development;
- North West Department of Health;
- Department of Water Affairs;
- South African Heritage Resources Agency;
- Pilanesberg National Park; and
- Vaalkop Dam Nature Reserve.

Copies of the notifications to the organs of state have been included in Appendix E and examples are included in the following pages.

4.3.2 Methods of notification

4.3.2.1Advertisements

The proposed project was advertised in two local newspapers, the Beeld and the Rustenburg Herald, on the 21st of February 2014. These newspapers were found to be the most appropriate newspapers in terms of their accessibility to I&APs in the vicinity of the proposed site. A copy of the advertisements and proof of their placement is attached in Appendix E and is also given in the figures below.



8 Veilings

Beeld Vrydag 21 Februarie 2014

VAPOROX WASTE TYRE PYROLYSIS PLANT

NOTICE

NOTICE OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION, WASTE MANAGEMENT LICENSE AND AN ATMOSPHERIC EMISSION LICENSE FOR THE VAPOROX WASTE TYRE PYROLYSIS PLANT

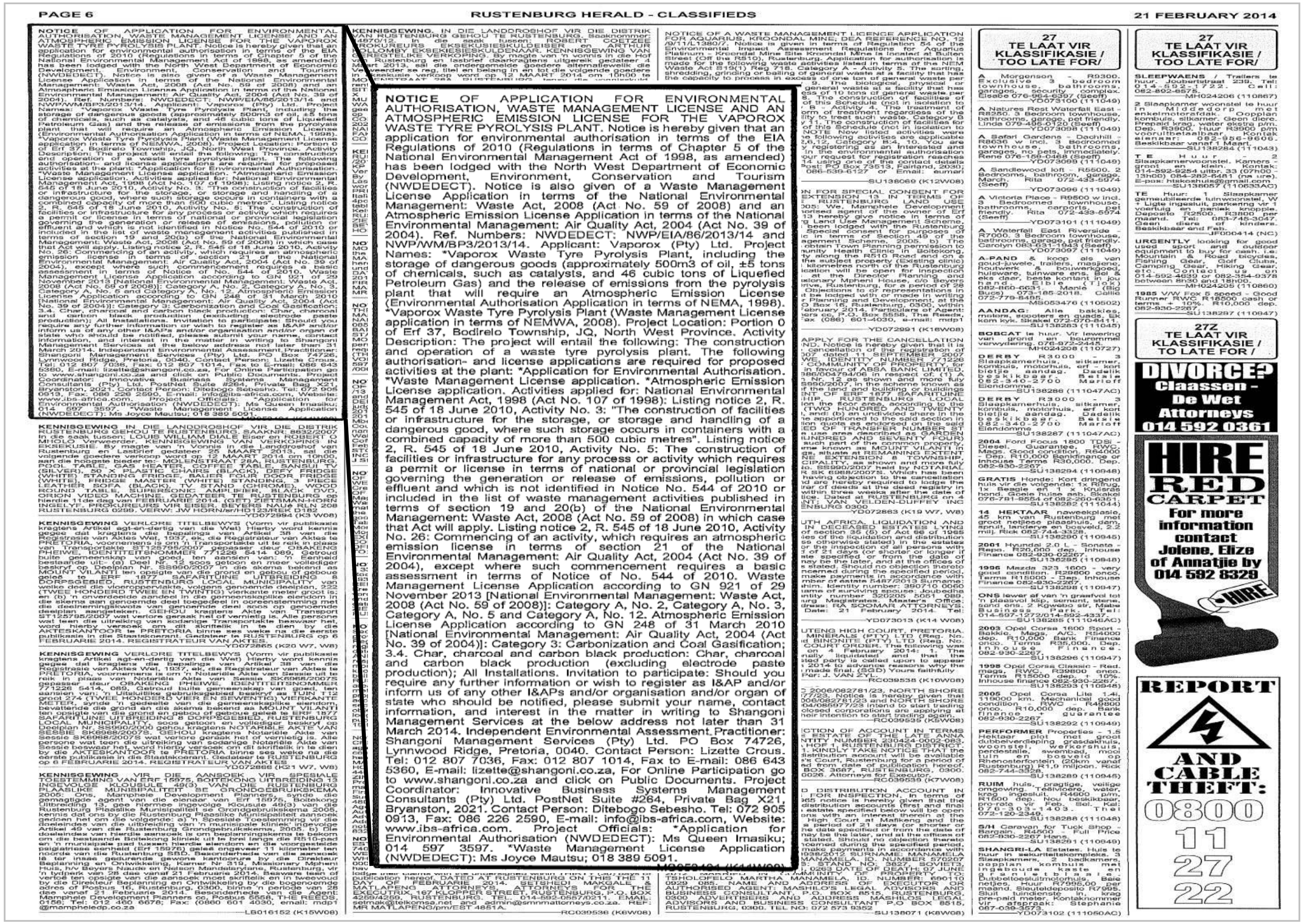
Notice is hereby given that an application for environmental authorisation in terms of the EIA Regulations of 2010 (Regulations in terms of Chapter 5 of the National Environmental Management Act of 1998, as amended) has been lodged with the North West Department of Economic Development, Environment, Conservation and Tourism (NWDEDECT). Notice is also given of a Waste Management License Application in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) and an Atmospheric Emission License Application in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). Ref. Numbers: NWDEDECT: NWP/EIA/86/2013 and NWP/WM/BP3/2013/14. Applicant: Vaporox (Pty) Ltd. Project Names:

• Vaporox Waste Tyre Pyrolysis Plant, including the storage of dangerous goods (approximately 500m3 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 (Environmental Authorisation Application in terms of NEMA, 1998).

• Vaporox Waste Tyre Pyrolysis Plant (Waste Management License application in terms of NEMWA, 2008). Project Location: Portion 0 of Erf 37, Bodirelo Township, JQ, North West Province. Activity Description: The project will entail the following: The construction and operation of a waste tyre pyrolysis plant. The following authorisation- and license applications are required for proposed activities at the plant: • Application for Environmental Authorisation. • Waste Management License application. • Atmospheric Emission License application. Activities applied for: National Environmental Management Act, 1998 (Act No. 107 of 1998): Listing notice 2, R. 545 of 18 June 2010, Activity No. 3: "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". Listing notice 2, R. 545 of 18 June 2010, Activity No. 5: 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 and 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply. Listing notice 2, R. 545 of 18 June 2010, Activity No. 26: 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 a basic assessment in terms of Notice of No. 544 of 2010. Waste Management License Application according to GN 921 of 29 November 2013 [National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)]: Category A, No. 2. Category A, No. 3. Category A, No. 5 and Category A, No. 12. Atmospheric Emission License Application according to GN 248 of 31 March 2010 [National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)]: Category 3: Carbonization and Coal Gasification; 3.4. Char, charcoal and carbon black production: Char, charcoal and carbon black production (excluding electrode paste production); All Installations. Invitation to participate: Should you require any further information or wish to register as I&AP and/or inform us of any other I&APs and/or organisation and/or organ of state who should be notified, please submit your name, contact information, and interest in the matter in writing to Shangoni Management Services at the below address not later than 31 March 2014. Independent Environmental Assessment Practitioner: Shangoni Management Services (Pty) Ltd. PO Box 74726, Lynnwood Ridge, Pretoria, 0040. Contact Person: Lizette Crous. Tel: 012 807 7036, Fax: 012 807 1014, Fax to E-mail: 086 643 5360, E-mail: lizette@shangoni.co.za, For Online Participation go to www.shangoni.co.za and click on Public Documents. Project Coordinator: Innovative Business Systems Management Consultants (Pty) Ltd. PostNet Suite #264, Private Bag X21, Bryanston, 2021. Contact Person: Ditebogo Sebesho. Tel: 072 905 0913, Fax: 086 226 2590, E-mail: info@ibs-africa.com, Website: www.ibs-africa.com. Project Officials: • Application for Environmental Authorisation (NWDEDECT): Ms Queen Imasiku; 014 597 3597. • Waste Management License Application (NWDEDECT): Ms Joyce Mautsu; 018 389 5091.

VAPOROX FEB 21(S)4045

Figure 24: Proof of placement of the newspaper advertisement in the Beeld newspaper



PAGE 6 RUSTENBURG HERALD - CLASSIFIEDS 21 FEBRUARY 2014

NOTICE OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION, WASTE MANAGEMENT LICENSE AND AN ATMOSPHERIC EMISSION LICENSE FOR THE VAPOROX WASTE TYRE PYROLYSIS PLANT. Notice is hereby given that an application for environmental authorisation in terms of the EIA Regulations of 2010 (Regulations in terms of Chapter 5 of the National Environmental Management Act of 1998, as amended) has been lodged with the North West Department of Economic Development, Environment, Conservation and Tourism (NWDEDECT). Notice is also given of a Waste Management License Application in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) and an Atmospheric Emission License Application in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). Ref. Numbers: NWDEDECT: NWP/EIA/86/2013/14 and NWP/WM/BP3/2013/14. Applicant: Vaporox (Pty) Ltd. Project Names: *Vaporox Waste Tyre Pyrolysis Plant, including the storage of dangerous goods (approximately 500m3 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 (Environmental Authorisation Application in terms of NEMA, 1998). *Vaporox Waste Tyre Pyrolysis Plant (Waste Management License application in terms of NEMWA, 2008). Project Location: Portion 0 of Erf 37, Bodirelo Township, JQ, North West Province. Activity Description: The project will entail the following: The construction and operation of a waste tyre pyrolysis plant. The following authorisation- and license applications are required for proposed activities at the plant: *Application for Environmental Authorisation. *Waste Management License application. *Atmospheric Emission License application. Activities applied for: National Environmental Management Act, 1998 (Act No. 107 of 1998): Listing notice 2, R. 545 of 18 June 2010, Activity No. 3: "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". Listing notice 2, R. 545 of 18 June 2010, Activity No. 5: 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 and 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply. Listing notice 2, R. 545 of 18 June 2010, Activity No. 26: 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 a basic assessment in terms of Notice of No. 544 of 2010. Waste Management License Application according to GN 921 of 29 November 2013 [National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)]: Category A, No. 2, Category A, No. 3, Category A, No. 5 and Category A, No. 12. Atmospheric Emission License Application according to GN 248 of 31 March 2010 [National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)]: Category 3: Carbonization and Coal Gasification; 3.4. Char, charcoal and carbon black production: Char, charcoal and carbon black production (excluding electrode paste production); All Installations. Invitation to participate: Should you require any further information or wish to register as I&AP and/or inform us of any other I&APs and/or organisation and/or organ of state who should be notified, please submit your name, contact information, and interest in the matter in writing to Shangoni Management Services at the below address not later than 31 March 2014. Independent Environmental Assessment Practitioner: Shangoni Management Services (Pty) Ltd. PO Box 74726, Lynnwood Ridge, Pretoria, 0040. Contact Person: Lizette Crous. Tel: 012 807 7036, Fax: 012 807 1014, Fax to E-mail: 086 643 5360, E-mail: lizette@shangoni.co.za, For Online Participation go to www.shangoni.co.za and click on Public Documents. Project Coordinator: Innovative Business Systems Management Consultants (Pty) Ltd. PostNet Suite #264, Private Bag X21, Bryanston, 2021. Contact Person: Ditebogo Sebesho. Tel: 072 905 0913, Fax: 086 226 2590, E-mail: info@ibs-africa.com, Website: www.ibs-africa.com. Project Officials: *Application for Environmental Authorisation (NWDEDECT): Ms Queen Imasiku; 014 597 3597. *Waste Management License Application (NWDEDECT): Ms Joyce Mautsu; 018 389 5091.

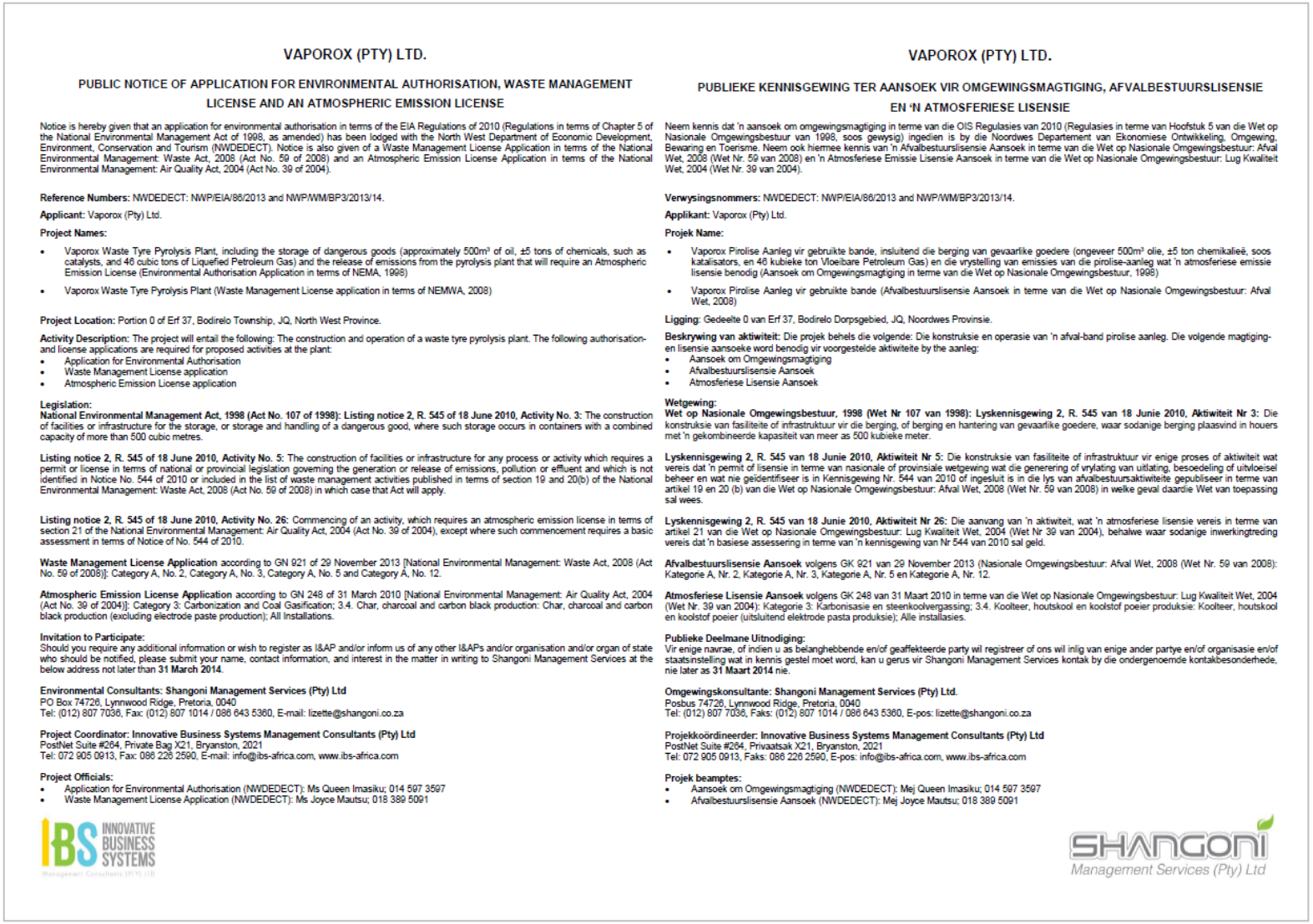
Figure 25: Proof of placement of the newspaper advertisement in the Rustenburg Herald newspaper

4.3.2.2Placement of site- and public notices

Notice was also given to Interested and Affected Parties (I&APs) by the placement of notice boards. Notice boards were placed at noticeable and conspicuous places. A copy of the site notice and photographs of the site notices are attached in Appendix E and are also given in the figures below.

Figure 26: Site notice 1 at the entrance gate to the proposed site

Figure 27: Site notice 2 on the perimeter fence of the proposed site



VAPOROX (PTY) LTD.

PUBLIC NOTICE OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION, WASTE MANAGEMENT LICENSE AND AN ATMOSPHERIC EMISSION LICENSE

Notice is hereby given that an application for environmental authorisation in terms of the EIA Regulations of 2010 (Regulations in terms of Chapter 5 of the National Environmental Management Act of 1998, as amended) has been lodged with the North West Department of Economic Development, Environment, Conservation and Tourism (NWDEDECT). Notice is also given of a Waste Management License Application in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) and an Atmospheric Emission License Application in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004).

Reference Numbers: NWDEDECT: NWP/EIA/86/2013 and NWP/WM/BP3/2013/14.

Applicant: Vaporox (Pty) Ltd.

Project Names:

- Vaporox Waste Tyre Pyrolysis Plant, including the storage of dangerous goods (approximately 500m³ 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 (Environmental Authorisation Application in terms of NEMA, 1998)
- Vaporox Waste Tyre Pyrolysis Plant (Waste Management License application in terms of NEMWA, 2008)

Project Location: Portion 0 of Erf 37, Bodirelo Township, JQ, North West Province.

Activity Description: The project will entail the following: The construction and operation of a waste tyre pyrolysis plant. The following authorisation- and license applications are required for proposed activities at the plant:

- Application for Environmental Authorisation
- Waste Management License application
- Atmospheric Emission License application

Legislation:
National Environmental Management Act, 1998 (Act No. 107 of 1998): Listing notice 2, R. 545 of 18 June 2010, Activity No. 3: 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.

Listing notice 2, R. 545 of 18 June 2010, Activity No. 5: 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 and 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.

Listing notice 2, R. 545 of 18 June 2010, Activity No. 26: 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 a basic assessment in terms of Notice of No. 544 of 2010.

Waste Management License Application according to GN 921 of 29 November 2013 [National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)]: Category A, No. 2, Category A, No. 3, Category A, No. 5 and Category A, No. 12.

Atmospheric Emission License Application according to GN 248 of 31 March 2010 [National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)]: Category 3: Carbonization and Coal Gasification; 3.4. Char, charcoal and carbon black production: Char, charcoal and carbon black production (excluding electrode paste production); All Installations.

Invitation to Participate:
Should you require any additional information or wish to register as I&AP and/or inform us of any other I&APs and/or organisation and/or organ of state who should be notified, please submit your name, contact information, and interest in the matter in writing to Shangoni Management Services at the below address not later than **31 March 2014**.

Environmental Consultants: Shangoni Management Services (Pty) Ltd
PO Box 74726, Lynnwood Ridge, Pretoria, 0040
Tel: (012) 807 7036, Fax: (012) 807 1014 / 086 643 5360, E-mail: lizette@shangoni.co.za

Project Coordinator: Innovative Business Systems Management Consultants (Pty) Ltd
PostNet Suite #264, Private Bag X21, Bryanston, 2021
Tel: 072 905 0913, Fax: 086 226 2590, E-mail: info@ibs-africa.com, www.ibs-africa.com

Project Officials:

- Application for Environmental Authorisation (NWDEDECT): Ms Queen Imasiku; 014 597 3597
- Waste Management License Application (NWDEDECT): Ms Joyce Mautsu; 018 389 5091

VAPOROX (PTY) LTD.

PUBLIEKE KENNISGEWING TER AANSOEK VIR OMGEWINGSMAGTIGING, AFVALBESTUURSLISENSIE EN 'N ATMOSFERIESE LISENSIE

Neem kennis dat 'n aansoek om omgewingsmagtiging in terme van die OIS Regulasies van 2010 (Regulasies in terme van Hoofstuk 5 van die Wet op Nasionale Omgewingsbestuur van 1998, soos gewysig) ingedien is by die Noordwes Departement van Ekonomiese Ontwikkeling, Omgewing, Bewaring en Toerisme. Neem ook hiermee kennis van 'n Afvalbestuurslisensie Aansoek in terme van die Wet op Nasionale Omgewingsbestuur: Afval Wet, 2008 (Wet Nr. 59 van 2008) en 'n Atmosferiese Emissie Lisensie Aansoek in terme van die Wet op Nasionale Omgewingsbestuur: Lug Kwaliteit Wet, 2004 (Wet Nr. 39 van 2004).

Verwysingsnommers: NWDEDECT: NWP/EIA/86/2013 and NWP/WM/BP3/2013/14.

Applikant: Vaporox (Pty) Ltd.

Projek Name:

- Vaporox Pirolise Aanleg vir gebruikte bande, insluitend die berging van gevaarlike goedere (ongeveer 500m³ olie, ±5 ton chemikalieë, soos katalisators, en 46 kubieke ton Vloeibare Petroleum Gas) en die vrystelling van emissies van die pirolise-aanleg wat 'n atmosferiese emissie lisensie benodig (Aansoek om Omgewingsmagtiging in terme van die Wet op Nasionale Omgewingsbestuur, 1998)
- Vaporox Pirolise Aanleg vir gebruikte bande (Afvalbestuurslisensie Aansoek in terme van die Wet op Nasionale Omgewingsbestuur: Afval Wet, 2008)

Ligging: Gedeelte 0 van Erf 37, Bodirelo Dorpsgebied, JQ, Noordwes Provinsie.

Beskrywing van aktiwiteit: Die projek behels die volgende: Die konstruksie en operasie van 'n afval-band pirolise aanleg. Die volgende magtiging- en lisensie aansoeke word benodig vir voorgestelde aktiwiteite by the aanleg:

- Aansoek om Omgewingsmagtiging
- Afvalbestuurslisensie Aansoek
- Atmosferiese Lisensie Aansoek

Wetgewing:
Wet op Nasionale Omgewingsbestuur, 1998 (Wet Nr 107 van 1998): Lyskennisgewing 2, R. 545 van 18 Junie 2010, Aktiwiteit Nr 3: Die konstruksie van fasiliteite of infrastruktuur vir die berging, of berging en hantering van gevaarlike goedere, waar sodanige berging plaasvind in houers met 'n gekombineerde kapasiteit van meer as 500 kubieke meter.

Lyskennisgewing 2, R. 545 van 18 Junie 2010, Aktiwiteit Nr 5: Die konstruksie van fasiliteite of infrastruktuur vir enige proses of aktiwiteit wat vereis dat 'n permit of lisensie in terme van nasionale of provinsiale wetgewing wat die generering of vrylating van uitlating, besoedeling of uitvloeisel beheer en wat nie geïdentifiseer is in Kennisgewing Nr. 544 van 2010 of ingesluit is in die lys van afvalbestuursaktiwiteite gepubliseer in terme van artikel 19 en 20 (b) van die Wet op Nasionale Omgewingsbestuur: Afval Wet, 2008 (Wet Nr. 59 van 2008) in welke geval daardie Wet van toepassing sal wees.

Lyskennisgewing 2, R. 545 van 18 Junie 2010, Aktiwiteit Nr 26: Die aanvang van 'n aktiwiteit, wat 'n atmosferiese lisensie vereis in terme van artikel 21 van die Wet op Nasionale Omgewingsbestuur: Lug Kwaliteit Wet, 2004 (Wet Nr 39 van 2004), behalwe waar sodanige inwerkingtreding vereis dat 'n basiese assessering in terme van 'n kennisgewing van Nr 544 van 2010 sal geld.

Afvalbestuurslisensie Aansoek volgens GK 921 van 29 November 2013 (Nasionale Omgewingsbestuur: Afval Wet, 2008 (Wet Nr. 59 van 2008): Kategorie A, Nr. 2, Kategorie A, Nr. 3, Kategorie A, Nr. 5 en Kategorie A, Nr. 12.

Atmosferiese Lisensie Aansoek volgens GK 248 van 31 Maart 2010 in terme van die Wet op Nasionale Omgewingsbestuur: Lug Kwaliteit Wet, 2004 (Wet Nr. 39 van 2004): Kategorie 3: Karbonisasie en steenkoolvergassing; 3.4. Koolteer, houtskool en koolstof poeier produksie: Koolteer, houtskool en koolstof poeier (uitsluitend elektrode pasta produksie); Alle installasies.

Publieke Deelmane Uitnodiging:
Vir enige **navrae**, of indien u as belanghebbende en/of geaffekteerde party wil registreer of ons wil inlig van enige ander partye en/of organisasie en/of staatsinstelling wat in kennis gestel moet word, kan u gerus vir Shangoni Management Services kontak by die ondergenoemde kontakbesonderhede, nie later as **31 Maart 2014** nie.

Omgewingskonsultante: Shangoni Management Services (Pty) Ltd.
Posbus 74726, Lynnwood Ridge, Pretoria, 0040
Tel: (012) 807 7036, Faks: (012) 807 1014 / 086 643 5360, E-pos: lizette@shangoni.co.za

Projekkoördineerder: Innovative Business Systems Management Consultants (Pty) Ltd
PostNet Suite #264, Privaatsak X21, Bryanston, 2021
Tel: 072 905 0913, Faks: 086 226 2590, E-pos: info@ibs-africa.com, www.ibs-africa.com

Projek beamptes:

- Aansoek om Omgewingsmagtiging (NWDEDECT): Mej Queen Imasiku; 014 597 3597
- Afvalbestuurslisensie Aansoek (NWDEDECT): Mej Joyce Mautsu; 018 389 5091

Figure 28: Wording of the notice board

4.3.2.3Notification Letter and Background Information Document

Notification letters and the Background Information Document (BID) developed for the proposed project provide background information pertaining to the project and are intended to inform I&APs of the project. The BID also includes a registration form which potential I&APs, stakeholders and organs of state are encouraged to complete in order to register as I&APs for the proposed project.

The Notification Letters and BID were made available to all landowners adjacent to the proposed site, as well as to all organs of state that may have jurisdiction over any aspect of the activity.

Copies of the notification letters and BID and proof of their distribution to the adjacent landowners and organs of state are attached under Appendix E. Proof of postage of the notification letters is given in the figures below. Further proofs are also attached under Appendix E.

List of REGISTERED LETTERS
Lys van GEREGISTREERDE BRIEWE
(with an insurance option/met 'n versekeringsopsie)
Full tracking and tracing/Volledige volg en spoor

Post Office

Name and address of sender:
Naam en adres van afsender: Shangoni Management Services (Pty) Ltd
PO BOX 74726 Lynnwood Ridge 0040

Enquiries/Navrae
Toll-free number
Tolvry nommer
0800 111 502

No	Name and address of addressee / Naam en adres van geadresseerde	Insured amount / Versekerde bedrag	Insurance fee / Versekeringsgeld	Postage / Posgeld	Service fee / Diensgeld	Affix Track and Trace customer copy / Plak Volg-en-Spoor-kliëntafskrif
1	Bojanala Platinum District Municipality PO Box 1993 Rustenburg 0300 Air Quality Officer - Fannie Maisa					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 025 ZA CUSTOMER COPY 301028R
2	Bojana Platinum District Municipality PO BOX 1993 Rustenburg 0300 Air Quality Officer - Ms Evenlyn Molotsi					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 918 ZA CUSTOMER COPY 301028R
3	Bojana Platinum District Municipality PO BOX 1993 Rustenburg 0300 Mr. R. Maluadzi					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 935 ZA CUSTOMER COPY 301028R
4	Bojana Platinum District Municipality PO Box 1993 Rustenburg 0300 Air Quality Official - Amanda Bubu					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 921 ZA CUSTOMER COPY 301028R
5	Department of Water Affairs Private bag X357 Hartebeespoort 0216 Sebenzile Ntshangase					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 895 ZA CUSTOMER COPY 301028R
6	Moses Kotane Local Municipality - Ward 10 Private bag X1011 Mogwase 0314 Cllr. Martha Lerato Zitha					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 904 ZA CUSTOMER COPY 301028R
7	Moses Kotane local Municipality Private bag X1011 Mogwase 0314 Sharon Rasepal					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 881 ZA CUSTOMER COPY 301028R
8	Mvelaphanda (Pty) Ltd t/a Bojanala Bus Services PO BOX 6019 Rustenburg 0300 Mr Albert Snyders (Adjacent land owner)					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 042 ZA CUSTOMER COPY 301028R
9	N.W. Dept of Agric and Rural Development Private bag X2039 Mmabatho 2735 HOD: Kgabi Mogajan					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 878 ZA CUSTOMER COPY 301028R
10	N.W Department of Finance Private bag X2060 Mmabatho 2735 HOD: Mr Macinde					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 011 ZA CUSTOMER COPY 301028R
	Total / Totaal	R	R	R	R	

Number of letters posted
Getal briewe gepos (10)

Signature of client
Handtekening van kliënt [signature]

Signature of accepting officer
Handtekening van aanneembeampte

Date stamp: WILLOW WAY POST OFFICE 21 FEB 2014 3 0041 — Datumstempel

The value of the contents of these letters is as indicated and compensation is not payable for a letter received unconditionally. Compensation is limited to R100,00. No compensation is payable without documentary proof. Optional insurance of up to R200,00 is available and applies to domestic registered letters only.

Die waarde van die inhoud van hierdie briewe is soos aangedui en vergoeding sal nie betaal word vir 'n brief wat sonder voorbehoud ontvang word nie. Vergoeding is beperk tot R100,00. Geen vergoeding is sonder dokumentere bewys betaalbaar nie. Opsionele versekering van tot R2 000,00 is beskikbaar en is slegs op binnelandse geregistreerde briewe van toepassing.

MASIQHAME PRINTERS 701248

List of REGISTERED LETTERS
Lys van GEREGISTREERDE BRIEWE
(with an insurance option/met 'n versekeringsopsie)
Full tracking and tracing/Volledige volg en spoor

Post Office

Name and address of sender:
Naam en adres van afsender: Shangoni Management Services (Pty) Ltd
PO BOX 74726 Lynnwood Ridge 0040

Enquiries/Navrae
Toll-free number
Tolvry nommer
0800 111 502

No	Name and address of addressee / Naam en adres van geadresseerde	Insured amount / Versekerde bedrag	Insurance fee / Versekeringsgeld	Postage / Posgeld	Service fee / Diensgeld	Affix Track and Trace customer copy / Plak Volg-en-Spoor-kliëntafskrif
1	N.W. Dept of Health Private bag X2068 Mmabatho 2735 HOD: Maj. Gen. Dr. M. Radebe					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 798 943 ZA CUSTOMER COPY 301028R
2	N.W. Dept of Human Settle, Public Saf and liaison Private bag X2145 Mmabatho 2735 HOD: Mr MI Kgantsi					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 798 912 ZA CUSTOMER COPY 301028R
3	N.W. Dept of local Gov and Traditional Affairs Private bag X2099 Mmabatho 2735 HOD: Mmamapula Motlogelwa					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 798 926 ZA CUSTOMER COPY 301028R
4	N.W. Dept of Public Works, Roads and Trans Private bag X2037 Mmabatho 2735 HOD: Mr. Makgothi Mobakgaue					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 798 890 ZA CUSTOMER COPY 301028R
5	North West Department of Social Dev Private bag X6 Mmabatho 2735 HOD: Advocate Matshidiso Cordelia Mogale					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 966 ZA CUSTOMER COPY 301028R
6	North West Dev. Corporation (Pty) Ltd PO BOX 1496 Mogwase 0314 MS Tebogo Kesidmang (Adjacent land owner)					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 039 ZA CUSTOMER COPY 301028R
7	Pilanesberg National Park PO Box 1201 Mogwase 0314 Park manager: Johnson Maoka					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 952 ZA CUSTOMER COPY 301028R
8	Vaalkop Dam Nature Reserve PO BOX 4486 Mmabatho 2735 Park manager: Mr M. Genki					REGISTERED LETTER (with a domestic insurance option) ShareCall 0860 111 502 www.sapo.co.za RD 942 799 949 ZA CUSTOMER COPY 301028R
9						
10						
	Total / Totaal	R	R	R	R	

Number of letters posted
Getal briewe gepos (8)

Signature of client
Handtekening van kliënt [signature]

Signature of accepting officer
Handtekening van aanneembeampte

Date stamp: WILLOW WAY POST OFFICE 21 FEB 2014 3 0041 — Datumstempel

The value of the contents of these letters is as indicated and compensation is not payable for a letter received unconditionally. Compensation is limited to R100,00. No compensation is payable without documentary proof. Optional insurance of up to R200,00 is available and applies to domestic registered letters only.

Die waarde van die inhoud van hierdie briewe is soos aangedui en vergoeding sal nie betaal word vir 'n brief wat sonder voorbehoud ontvang word nie. Vergoeding is beperk tot R100,00. Geen vergoeding is sonder dokumentere bewys betaalbaar nie. Opsionele versekering van tot R2 000,00 is beskikbaar en is slegs op binnelandse geregistreerde briewe van toepassing.

MASIQHAME PRINTERS 701248

Figure 29: Proof of postage of notification letters

4.3.3 I&AP Register

Once all adjacent landowners, organs of state and the public were notified of the proposed project, an I&AP Register (as also provided in Appendix E) was compiled. The table below provides an extract of the I&AP Register indicating the organs of state and other I&APs that have been registered.

Table 20: Registered I&APs

No.	Department	Name
Organs of State		
1	Moses Kotane Local Municipality	Sharon Rasepal
2	Moses Kotane Local Municipality	Ms S.R. Dince (Municipal Manager)
3	Moses Kotane Local Municipality – Ward 10	Cllr. Martha Lerato Zitha
4	Bojanala Platinum District Municipality	Mr R. Mulaudzi
5	Bojanala Platinum District Municipality	Air Quality Official - Amanda Bubu
6	Bojanala Platinum District Municipality	Air Quality Official - Ms Evelyn Molotsi
7	Bojanala Platinum District Municipality	Air Quality Official - Fannie Mnisi
8	North West Department of Agriculture and Rural Development	HOD: Dr Kgabi Mogajane
9	North West Department of Local Government and Traditional Affairs	HOD: Monnapula Motlogelwa
10	North West Department of Human Settlements, Public Safety and Liaison	HOD: Mr MI Kgantsi
11	North West Department of Public Works, Roads and Transport	HOD: Mr Makgothi Thobakgale
12	North West Department of Social Development	Advocate Matshidiso Cordelia Mogale
13	North West Department of Health	Maj. Gen. Dr M. Radebe
14	North West Department of Health	Mr O.M.R. Mokate
15	Department of Water Affairs	Sebenzile Ntshangase
16	South African Heritage Resources Agency	TBC
No.	**Interest/Company/Entity**	**Name**
Registered I&APs		
1	Park Manager- Pilanesberg National Park	Mr Johnson O. Maoka
2	Bojanala Platinum District Municipality	Mr Thapelo H. Mathekga
3	Adjacent land owner - North West Development Corporation (Pty) Ltd	Mrs Tebogo Kesiamang
4	Adjacent land owner - Mvelatrans (Pty) Ltd t/a Bojanala Bus Services	Mr Albert Snyders
5	Adjacent land owner - New Era Recycling (Part of the New Era Group)	Mr Danie Van Rooyen
6	Adjacent land owner - Durab Manufacturing	Mr Anton Jonker
7	Adjacent land owner - Four Tops Engineering Service CC	Mr Essau Motloung
8	Vaalkop Dam Nature Reserve	Park Manager: Mr M Setuki
9	North West Parks and Tourism Board - Pilanesberg National	Mr Steve Dell

No.	Department	Name
	Park	

Refer also to Appendix E for a detailed I&APs Register including contact information for all registered organs of state and I&APs.

4.3.4 Public meeting(s)

No public meeting has been held nor is one anticipated at present.

4.3.5 Access and opportunity to comment on written submissions

The draft Scoping Report was made available to I&APs and key stakeholders for review and commenting for a period of forty days (29 April to 17 June 2014). The report was also submitted to the North West Department of Rural, Environmental and Agricultural Development on the 25th of April 2014 to obtain their comments.

An electronic copy of the draft Scoping Report was also posted on Shangoni Management Services' website (www.shangoni.co.za) for public comment for the same review period of forty days.

4.3.6 Consultation with the relevant Authorities

4.3.6.1 Application form in terms of the NEMA, 1998

The applicable Environmental Authorisation application form under NEMA, 1998, was submitted to the North West Department of Rural, Environmental and Agricultural Development on the 17th of January 2014. A reference number (NWP/EIA/86/2013) was issued by NWDEDECT on the 7th of February 2014. The letter of acknowledgement indicating the above mentioned reference number is attached as Appendix G.

4.3.6.2 Authorities meeting(s)

No meetings have been held with any of the competent authorities nor are such meetings anticipated at present.

4.3.7 Further consultation with relevant Authorities

No further consultation has occurred.

4.3.8 Comments and Responses

All issues, comments and questions received from I&APs thus far have been summarised in the table below. Copies of the comments received have also been included in Appendix E.

Table 21: Comments and Responses Report

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
Mr O.M.R Mokate	North West Department of Health	11-03-2014	Fax	SUBJECT: ACKNOWLEDGEMENT LETTER Your application letter dated 21 February 2014, pertaining to an Environmental Authorisation, for both a Waste Management and an Atmospheric Emission License for the Vaporox Waste Tyre Pyrolysis Plant, received on 10 March 2014, is herewith acknowledged. Comments on the proposed township establishment will be mailed to your office on or before 11 April 2014.	Initial Response: Your letter dated 10 March 2014 and received by Shangoni Management Services on 11 March 2014 refers: We hereby confirm receipt of our letter and take note that comments from the North West Department of Health will be sent to Shangoni Management Services' offices on or before the 11th of April 2014. Formal Response: The Department's comments are noted. Please note, however, that this Application for Environmental Authorisation is not for a township establishment, but for a Waste Tyre Pyrolysis Plant.
Mr M.P Raedani	North West Department of Finance	09-04-2014	Post	RESPONSE ON THE OPPORTUNITY TO REGISTER OR NOT AS THE INTERESTED AND AFFECTED PARTY This letter serves to acknowledge receipt of your letter dated 21 February 2014 and also appreciate the opportunity to register as an interested or affected stakeholder. Unfortunately the Department of Finance will not be registering as an interested or	Your letter dated 18 March 2014 and received on the 9th of April 2014 refers: We hereby acknowledge receipt of your correspondence and take note that the North West Department of Finance will not be registering as an Interested and Affected Party for the above mentioned project.

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
				affected stakeholder.	
Mr Steve Dell	North West Parks & Tourism Board (Pilanesberg National Park)	29-04-2014	Email	Dear Ms Crous Our telephone conversation 29 April 2014, 11:00 refers. Thank you for the explanation of the process and products generated from waste tyre pyrolysis. As per your request I hereunder have the following questions which relate to environmental concerns for the area and river systems: 1. What is the main income generator from this process: scrap metal vs oil/carbon? 2. If the oil and carbon does not have a demand from industry, what will happen to this waste? 3. The area is prone to large storms with fast rain water runoff. What procedures and plans are in place for the safe storage on site storage of this oil and carbon, i.e. what are the containers and storage facilities to prevent contamination of this runoff into the	Response from applicant [Vaporox (Pty) Ltd]: Re: DRAFT SCOPING REPORT AVAILABLE FOR REVIEW: VAPOROX WASTE TYRE PYROLYSIS PLANT - NWDEDECT REF: NWP/EIA/86/2013; SMS REF: INN-NOR-13-09-02 We acknowledge receipt of you letter dated 29 April 2014 regarding the above subject matter and we wish to respond to your concerns as follows: 1. The oil and the carbon are the main income generator for the process. The scrap metal being the least income generator. 2. The oil and the carbon are in high demand in industry and will be sold in their totality. No waste is intended for this process. 3. The carbon will be stored in sealed bags in a warehouse and the oil will be stored in bulk storage tanks that will be installed on site. These tanks meet the SANS standard on storage of liquid flammable goods. Bund walls will be built around all tanks to contain any oil spillages that may occur. We really hope that we have allayed your concerns and

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
				area river system? 4. How dangerous are the emissions from this process i.r.o. the populated areas and a proclaimed protected area (Pilanesberg National Park) nearby? As I explained in my conversation, the industrial area of Mogwase surface rain runoff drainage system is into a stream that flows into the Elands River, which is a supplier of water to Vaalkop dam, thereafter into the Crocodile River. My concern is that if the oil and carbon cannot be utilised due to its lack of economic viability that it may intentionally or unintentionally find its way into this river system. Please contact me if further information is required regarding this situation.	hope you will not hesitate to contact us should you need further clarity or more information regarding this matter. Response from Shangoni Management Services: Initial Response: I hereby confirm receipt of your comments on the draft Scoping Report for the Vaporox Waste Tyre Pyrolysis Plant project (NWP/EIA/86/2013). Your comments will be included and addressed in subsequent reports for this project. Your will also be provided with all subsequent reports for review and further commenting. Formal response: 1. Please refer to response provided by applicant above. 2. Please refer to response provided by applicant above. 3. Please refer to response provided by applicant above. 4. The United States Environmental Protection Agency compiled a report on the atmospheric implications when burning tyres for fuel and tire pyrolysis (US EPA, 1991). The following was extracted from this report: • Air pollution implications of pyrolysis are minimal with correct design and operation, because most of the pyro-gas generated in the pyrolysis process is burned as fuel in the process. During burning, the organic compounds are destroyed. If complete combustion is

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
					assumed, the decomposition products are water, carbon dioxide, carbon monoxide, sulphur dioxide and nitrogen oxides (EPA, 1991). • Particulate matter is generated from 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. Operations such as screening, grinding and processing generate PM10 emissions. This can be controlled with dust collectors and a bag house. • The major source of Volatile Organic Compounds (VOCs) is from fugitive emissions, such as gas leakages from pump seals, pipe flanges, valve stems, drains and compressors. The composition of these fugitive emissions is a combination of “pure” pyro-gas (the primary constituents of pyro-gas are hydrogen, methane, ethane, propane and propylene) and non-condensed, light oils (components of light oils include toluene, benzene, hexane, styrene and xylene). Fugitive emissions can be significantly reduced by using components, such as pumps, valves and compressors that are specifically designed to minimise fugitive emissions (EPA, 1991). Fugitive emissions may also be reduced by training operators and mechanics on ways to reduce fugitive emission

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
					as well as maintaining good supervision and maintenance practices. • Shangoni is in the process of conducting an Atmospheric Impact Assessment for the proposed Vaporox Waste Tyre Pyrolysis plant. Modelled ground level concentrations of emissions from the proposed facility will be interpreted in terms of the National Ambient Air Quality Standards for criteria pollutants and International Health Guidelines for non-carcinogenic and carcinogenic pollutants. Recommendations for the control of these emissions will be based on the findings of the Atmospheric Impact Assessment. The Atmospheric Impact Assessment will be used to inform the draft and final Environmental Impact Assessment Reports for this project, in terms of the environmental risk assessment and mitigation measures that are required for atmospheric emissions that will be generated by the proposed plant.
Ms S.R. Dince (Municipal Manager)	Moses Kotane Local Municipality	06-05-2014	Email	RE: NOTIFICATION OF APPLICATION FOR ENVIRONMENTAL AUTHORISATION, WASTE MANAGEMENT LICENSE AND AN ATMOSPHERIC EMISSION LICENSE FOR THE VAPOROX WASTE TYRE PYROLYSIS PLANT	We hereby confirm receipt of your letter and take note of the comments that you have raised. We would like to respond as follows to your comments: Thank you for indicating the processes to be followed and the various applications that need to be applied for.

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
				The Moses Kotane Local Municipality: Environmental & Waste Management Department has received and reviewed your Application for Environmental Authorisation, Waste Management License and an Atmospheric Emission License. According to the application findings your project will need the following: • Scoping and Environmental Impact Assessment Process as required by Sections 26 of 35 of Government Notice R.543 of the EIA Regulations of 18 June 2010 (for the Environmental authorisation application and the Atmospheric Emission License application). • For the Waste Management License Application, a Basic Environmental Impact Assessment Process as required by Sections 21 to 25 of Government Notice R.543 of the EIA Regulations of 18 June 2010 will need to be conducted.	A Scoping and Environmental Impact Assessment Process (in support of an application for Environmental Authorisation and an Atmospheric Emission License) is being conducted by Shangoni Management Services for the Vaporox Waste Tyre Pyrolysis Plant. The Scoping and EIA process has been assigned the following reference number by the North West Department of Rural, Environmental and Agricultural Development: NWP/EIA/86/2013. A Basic Environmental Impact Assessment Process (in support of a Waste Management License Application) is also being conducted by Shangoni Management Services for the Vaporox Waste Tyre Pyrolysis Plant. The Basic EIA process has been assigned the following reference number by the North West Department of Rural, Environmental and Agricultural Development: NWP/WM/BP3/2013/14.

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
				However the municipality has no objection regarding the proposed Vaporox Waste Tyre Pyrolysis Plant. Hope you find the above in order.	
Mr Mabese Makhoana	North West Department of Health	14-05-2014	Email	SUBJECT: ACKNOWLEDGEMENT LETTER Your letter requesting comments dated 29 April 2014, pertaining to a Vaporox Waste Tyre Pyrolysis Plant, received on 08 May 2014, is hereby acknowledged. Comments on the proposed township establishment will be mailed to your office on or before 13 June 2014.	Initial Response: Good day Mabese I hereby acknowledge receipt of your letter dated 14 May 2014 in response to the draft Scoping Report for the following project: Vaporox Waste Tyre Pyrolysis Plant, including the storage of dangerous goods (approximately 500m^3 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 (NWP/EIA/86/2013). I further take note that comments from the North West Department of Health on this application will be mailed to Shangoni Management Services on or before the 13th of June 2014. Your comments will be included and addressed in the subsequent reports for this project. Further response: Please note that this Application for Environmental

Name	Company/ Department	Date received	Method of comment	Issue raised	Response
					Authorisation is not for a township establishment, but for a Waste Tyre Pyrolysis Plant.
Mr O.M.R. Mokate	North West Department of Health	24-06-2014	Email	SUBJECT: COMMENTS ON THE PROPOSE VAPOROX WASTE TYRE PYROLOSIS PLANT AT MOGWASE TOWNSHIP, MOSES KOTANE LOCAL MUNICIPALITY Subsequent to studying the electronic documents pertaining to a Vaporox Waste Tyre Pyrolysis Plant, received on 08 May 2014, herewith the Environmental Health Sub-directorate's comments: • As and when the plant starts operating, any process (e.g. waste tyre pyrolysis and the burning of diesel by the generator) that entails emissions that can be harmful to the health of the nearby community should adhere to the South African emissions standards, in order to prevent air pollution; and • Any chemicals and liquid waste resulting from the cleansing activities at the plant, should be disposed of in a manner that does not lead to ground water pollution.	Comments noted. An Atmospheric Emission License application will be submitted to the Bojanala Platinum District Municipality to ensure that the plant is operated in accordance with the provisions of the National Environmental Management: Air Quality Act, 2004, and does not cause pollution of the atmosphere. All chemical and liquid waste generated by the plant will be disposed of in a responsible manner at a suitably licensed disposal site.

4.3.9 Conclusions of the PPP

In conclusion, the Public Participation exercise has provided adequate information to enable an understanding of what the proposed project activities would entail and to address the concerns and comments received during the scoping process.

5. NEED AND DESIRABILITY FOR THE ACTIVITY

A need and desirability for this project is evident from the following perspectives:

5.1 Developer/Applicant

The proposed project will generate a source of income for the applicant, Vaporox (Pty) Ltd, and is therefore desirable from an economic point of view. In terms of the REDISA (Recycling and Economic Development Initiative of South Africa) Plan, it is proposed that waste tyre producers (manufacturers and importers) will be charged a waste management fee of R2.30 + VAT for every kilogram of new tyre rubber produced. These funds will then be used for the development and support of recyclers, such as Vaporox. Vaporox will also generate revenue from the selling of the products from the pyrolysis process, namely steel, purified oil and Carbon Black.

Obtaining Environmental Authorisation for the proposed pyrolysis plant and licensing the facility in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) will mean that the facility will be one of only a few waste tyre pyrolysis plants, licensed in terms of environmental legislation, in the area and Province. This legal compliance will ensure that the facility can operate for the foreseeable future without the risk of prosecution for non-compliance to the law. Together with registration as a Recycler with REDISA, the legal compliance should also ensure a supply of waste tyres to the facility from waste tyre producers.

5.2 Local community, District and Provincial Benefit

It is estimated that there are approximately 60 million legacy waste tyres in South Africa and approximately 11 million tyres are added to this total every year. These tyres are found in landfill sites, where they take up valuable space, as well as in stockpiles in residential, rural and industrial areas across South Africa. Many of the tyres are burnt, releasing liquids and noxious gases such as carbon monoxide and dioxins. In some rural areas, waste tyres are also burnt to generate heat, especially in winter months, resulting in health risks to those inhaling the resultant fumes (www.redisa.org.za).

Recycling of waste tyres is one way to eliminate the above mentioned problem and can be achieved through waste tyre pyrolysis. Local landfill sites will benefit from more landfill airspace being available for other waste types and people in the local, district and provincial areas will benefit from cleaner air and decreased health risks, as tyre burning will be prevented.

Local Community

The unemployment rate for the Moses Kotane Local Municipality was 37.9% according to the 2011 census (Statistics South Africa, 2011). The proposed project will generate approximately 20 new, direct employment opportunities and more than 30 new, indirect employment opportunities during the construction phase. During the operational phase, approximately 20 permanent employment

opportunities will be generated. These employment opportunities will act as a source of income for a number of households within the local municipal area. The proposed project will also stimulate other businesses, such as waste tyre collectors, especially as part of the REDISA Plan.

District and Provincial Benefit

The proposed project will form part of the country wide REDISA system and will assist in the establishment of REDISA. In doing so, the network of REDISA Transporters, Depots, Recyclers, Collection Points, Secondary Industries and Manufacturers/Importers will grow and be strengthened, leading to ever increasing employment opportunities. It is estimated that the REDISA Plan, through the establishment of the new waste tyre recycling industry, will create approximately 10 000 new employment opportunities (www.redisa.org.za).

6. IDENTIFIED ALTERNATIVES

The following definition of "alternatives" is given in the EIA Regulations of 18 June 2010: "alternatives", in relation to the proposed activity, *means different means of meeting the general purpose and requirements of the activity, which may include alternatives to-*

a) the property on which or location where it is proposed to undertake the activity;
b) the type of activity to be undertaken;
c) the design or layout of the activity;
d) the technology to be used in the activity;
e) the operational aspects of the activity; and
f) the option of not implementing the activity".

Typically, alternative assessments are conducted to assist in comparing various projects or attributes of projects that will occur. The most critical comparison is evaluating any proposed project against the No-Go option. The alternatives assessment then considers alternatives to project site selection for the proposed development; alternatives to layout of the development; and alternatives to construction methodologies and/or materials used for the development.

6.1 No-Go Option

This alternatives assessment was conducted using a simple cost-benefit analysis, through assessing various environmental attributes. These attributes can include physical (geology and soils, surface water quality and quantity, groundwater quality and quantity); biophysical (flora and fauna, sensitive environments); and social attributes (site of archaeological or cultural importance, land use issues, social health and welfare).

The impact of the each alternative was then evaluated in terms of whether it has a positive, negative, or no impact. In this instance, the impact is not evaluated in terms of significance but rather whether or not it will arise. Positive impacts are assigned a value of 1; no impact a value of 0; and a negative impact a value of -1.

By adding all of the attribute scores for each alternative, a suitability score is derived that indicates the preferred alternative. A total positive score indicates that the project benefits outweigh the potential negative impacts, while a total negative score indicates the project environmental costs outweigh the potential benefits. Essentially, the highest scoring alternative is then carried forward for full impact evaluation.

The potential impact of the preferred project option on environmental and socio-economic attributes identified during the assessment phase is evaluated against the potential impact of the No-Go option on the same attributes. The summary of this assessment is provided in the table below.

Table 22: Development vs. No-Go option

Attribute	Development Option	No-go Option
Physical environment		
Air Pollution	-1	0
Noise Pollution	-1	0
Water Quality	0	0
Water Quantity	0	0
Visual Aesthetics	1	-1
Biophysical environment		
Fauna and Flora	0	0
Sensitive Environments	0	0
Social environment		
Traffic	-1	0
Impact on property values	1	-1
Safety and security	1	-1
Local and regional economy	1	0
Infrastructure development	1	0
Total	**2**	**-3**

As can be seen in the table above, the development option (the Waste Tyre Pyrolysis plant) is preferred to the No-Go option (no use of the existing buildings at the site), as derived from comparative analysis. While the development option has negative impacts in terms of air and noise pollution and the generation of traffic, it also has benefits in terms of visual aesthetics (as the existing, derelict buildings will be fixed), property values, safety and security, infrastructure development and the local and regional economy. The positive social impacts outweigh the negative environmental impacts to give an overall positive score of “2”, whereas the No-Go Option results in a negative score of “-3”.

6.2 Alternatives considered

The following alternatives were compared using a qualitative assessment.

6.2.1 A: Activity alternatives

The proposed activity is the recycling and recovery of waste tyres through the use of a pyrolysis processes.

Currently, most tyres are disposed of to landfill or accumulate at various facilities or on vacant land where they are unmanaged. Alternative methods to dispose of, recycle or re-use the waste tyres include the following:

- **Alternative A1:** Tyres can be retreaded, whereby the remaining tread is removed and a new tread (rubber strip) is fused to the old "skeleton" of the tyre using vulcanisation. The quality of the retreaded tyre is, however, not high;
- **Alternative A2:** Tyres can be mechanically or cryomechanically milled/ground up and the rubber pieces used in other applications, such as for sport surfaces, carpets, playgrounds etc. If the rubber is ground up into a very fine powder, the powder can be used to reinforce new rubber products. These applications do not produce atmospheric emissions, but have a high energy usage and there is a limited market for the products;
- **Alternative A3:** It has often been attempted to reclaim scrap rubber products, but the process is difficult and costly. The quality of the reclaimed rubber is also not high and the re-selling of the reclaimed rubber as a raw material is therefore problematic; and
- **Alternative A4:** Pyrolysis presents an opportunity to produce valuable products from the waste tyres and can also result in less negative environmental impacts than for example, the burning of tyres or their disposal to landfill. The solid Char can be used as a smokeless fuel, to reinforce new rubber products or as activated Carbon. The oils can be used as fuels, a source of chemicals due to the oil's mixture of organic compounds, or as a feedstock for the petroleum industry. Gases from the pyrolysis process consist of non-condensable organics like CO, CO_2, H_2, H_2S, CH_4, C_2H_4 and C_3H_6, and can be used as a fuel for the pyrolysis process (Juma *et al.*, 2006).

Pyrolysis is seen as the most economically viable option at this stage and is also the type of recycling plant that the applicant would like to establish. The other alternatives are less viable as they are costly, have difficult processes and also do not always have proven markets for their products.

6.2.2 B: Location alternatives

Three location alternatives can be considered for this proposed project. The first is to construct the Waste Tyre Pyrolysis plant on an undeveloped property (Alternative B1), the second is to utilise a property with existing infrastructures suited for the proposed project (Alternative B2) and the third is to utilise a property with existing infrastructures, but which are not suited for the proposed project (Alternative B3).

Alternative B1: The use of an undeveloped property would entail the purchase or leasing of open land by the applicant and the development of the property from scratch. This would include the installation of all bulk services as well as the construction of the necessary buildings within which the pyrolysis plant would then be installed. This alternative would entail significant financial costs for site establishment, in addition to the costs for the pyrolysis plant itself, and is therefore not economically feasible. It is also possible that such an undeveloped site may lie within a Critical Biodiversity Area in

terms of the North West Biodiversity Conservation Plan and its development could therefore result in negative impacts in terms of fauna and flora loss.

Alternative B2: The use of a property with existing buildings which are suited to the proposed project is the preferred alternative and is the situation at the proposed/preferred site (25°16'12.40''; 27°16'25.36''). The proposed site has three existing buildings that can be used for the pyrolysis process and associated processes, such as the storage of chemicals and products (e.g. steel, oil and Carbon black). Most of the site is already in a disturbed site (where the buildings are situated) and an open area remains where waste tyres can be stored prior to processing. Existing bulk services exist to the property, although the bulk services supply system would need to be repaired. An existing road and access gate is also present at the proposed site and the site is located close to main access roads to Mogwase CBD.

Alternative B3: The use of a property with existing buildings that are not suitable to the proposed project, such as a property where the existing buildings were used for offices or as houses, is not a feasible alternative for the following reasons: The buildings would not be big enough nor designed for industrial use and would need to be demolished so that suitable buildings could be constructed. This would entail significant financial costs, in addition to the costs for the pyrolysis plant itself, and is therefore not economically feasible.

6.2.3 C: Site layout alternatives

On the proposed site, there are limited site layout alternatives that can be considered. The alternatives include which of the three existing buildings are used for the pyrolysis plant, the storage of raw materials, such as chemicals, and the storage of product, such as steel, Carbon black and oil. The ideal use of each of the three buildings is being considered as part of the planning phase for the project. It is anticipated that Buildings 1 and 3 will be used for storage purposes and Building 2 for the pyrolysis plant itself. As only one half of the site is still open space, this area will be used for the storage of waste tyres prior to their processing.

6.2.4 D: Process and Design alternatives

The Waste Tyre Pyrolysis process is a relatively new process and is to a certain extent still being perfected. A number of process alternatives are being considered by the applicant and plant designer and the process that will be followed at the proposed plant has not yet been finalised. Process alternatives include, for example, the way in which the feedstock (waste tyres) will be cleaned, by either using water or compressed air. Other alternatives include the way in which the feedstock will be introduced into the reactor, such as through a gravity feed system or a bottom feeding system, and the type of reactor that will be used, for example a horizontal or vertical reactor. Vertical reactors can be fluidized bed, entrained bed or fixed bed reactors. The process can also be a continuous or batch

process. All these alternatives are being considered during the current, conceptual design of the Waste Tyre Pyrolysis plant.

Currently, the Waste Tyre Pyrolysis Plant has been designed with a pipeline chimney stack of 4m (Alternative D1). The Atmospheric Impact Assessment conducted for this project has compared this stack height to the height calculated using the Good Engineering Practice (GEP) guidelines, namely 18.75m (Alternative D2). The results of this comparison are discussed in Sections 7.3.1. and 8.2.

7. ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Aims of Environmental Impact Assessment

Potential environmental impacts (biophysical) associated with the proposed Waste Tyre Pyrolysis Plant have been identified. The Environmental Impact Assessment (EIA) phase aims to adequately investigate and address all potentially significant environmental issues in order to provide the North West Department of Rural, Environmental and Agricultural Development with sufficient information to make an informed decision regarding the proposed project.

This part of the document therefore focuses on identification of the major potential impacts that the activities, processes and actions may have on the surrounding environment. It indicates the major impacts that these activities may have on the environmental components associated with the site, as required in terms of R.543 of the EIA Regulations, 2010.

The EIA aims to achieve the following:

- To provide a detailed assessment of the biophysical environments affected by the proposed project;
- To assess impacts on the study area in terms of environmental criteria; and
- To identify and recommend appropriate mitigation measures for potentially significant environmental impacts.

This EIR addresses the following:

- A detailed description of the proposed project;
- Detailed assessment of the impacts that are deemed to be potentially significant;
- Recommendations regarding the mitigation of significant impacts; and
- To meet the requirements and to comply with the necessary legislation and Acts.

Any specialist studies are combined into this consolidated report to allow for easy assessment of the potential aspects with associated impacts.

7.2 Environmental Impact Assessment Procedure

The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

Impact assessments should be conducted based on a methodology that includes the following:

- Clear processes for impact identification, predication and evaluation;
- Specification of the impact identification techniques;

- Criteria to evaluate the significance of impacts;
- Design of mitigation measures to lessen impacts;
- Definition of the different types of impacts (indirect, direct or cumulative); and
- Specification of uncertainties.

After all impacts have been identified, the nature of each impact can be predicted. The impact prediction will take into account physical, biological, socio-economic and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim at providing a basis from which the significance of each impact can be determined and appropriate mitigation measures can be developed.

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to the figure below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – Impact Prediction).

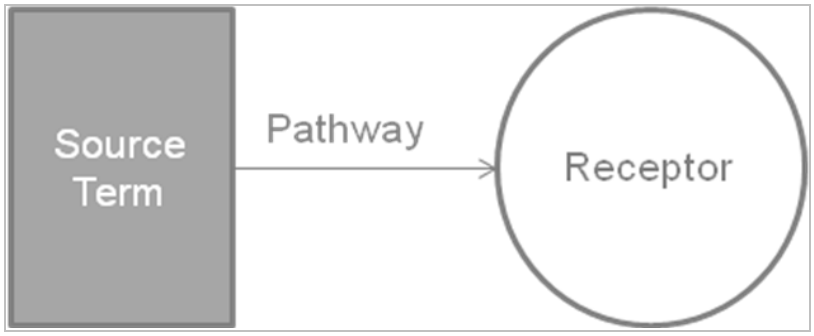


Figure 30: DWAs model for impact prediction (risk assessments)

Table 23 and Table 24 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 25 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

Table 23: Determination of Probability of the Impact

Frequency of Aspect / Unwanted Event	Score	Availability of pathway from the source to the receptor	Score	Availability of receptor	Score
Never known to have happened, but may happen	1	A pathway to allow for the impact to occur is never available	1	The receptor is never available	1
Known to happen in industry	2	A pathway to allow for the impact to occur is almost never available	2	The receptor is almost never available	2
< once a year	3	A pathway to allow for the impact to occur is sometimes available	3	The receptor is sometimes available	3
Once per year to up to once per month	4	A pathway to allow for the impact to occur is almost always available	4	The receptor is almost always available	4
Once a month - Continuous	5	A pathway to allow for the impact to occur is always available	5	The receptor is always available	5

Step 1: Determine the **PROBABILITY** of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor.

Table 24: Determination of Magnitude of impact

Source								Receptor			
Duration of impact	**Score**	**Extent**	**Score**	**Volume / Quantity / Intensity**	**Score**	**Toxicity / Destruction Effect**	**Score**	**Reversibility**	**Score**	**Sensitivity of environmental component**	**Score**
Lasting days to a month	1	Effect limited to the site. (metres);	1	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	1	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	1	Bio-physical and/or social functions and/or processes will remain unaltered.	1	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity	1
Lasting 1 month to 1 year	2	Effect limited to the activity and its immediate surroundings. (tens of metres)	2	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	2	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	2	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	2	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.	2
Lasting 1 – 5 years	3	Impacts on extended area beyond site boundary (hundreds of metres)	3	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	3	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	3	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	3	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).	3
Lasting 5 years to Life of Organisation	4	Impact on local scale / adjacent sites (km's)	4	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)	4	Toxic (e.g. diesel & Sodium Hydroxide)	4	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	4	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).	4
Beyond life of Organisation / Permanent impacts	5	Extends widely (nationally or globally)	5	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	5	Highly toxic (e.g. arsenic or TCE)	5	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	5	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, wetlands, protected habitats etc.)	5

Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors above.

Table 25: Determination of Severity of impact

ENVIRONMENTAL IMPACT RATING / PRIORITY					
	MAGNITUDE				
PROBABILITY	**1 Minor**	**2 Low**	**3 Medium**	**4 High**	**5 Major**
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Step 3: Determine the **SEVERITY** of the impact by plotting the averages that were obtained above for Probability and Magnitude in the table below.

7.3 Description of Environmental Impacts

The aim of this section of this EIA report is to provide information regarding the potential environmental impacts associated with the proposed activities. In order to provide background information and a framework for the environmental risk assessment, a description of the different phases of the project is provided below. Refer to the tables below for the impacts associated with the Waste Tyre Pyrolysis project.

Design and planning Phase

- Designing, planning and sourcing of the Waste Tyre Pyrolysis plant technology;
- Designing and planning of the waste tyre storage area;
- Designing and sourcing of the atmospheric emission abatement measures;
- Designing and sourcing of the storage vessels, such as for the storage of oil, chemicals and Liquefied Petroleum Gas;
- Designing and sourcing of the water storage vessels/containers;
- Designing or sourcing of the backup generator; and
- Compilation of plans for the restoration of existing roofs, buildings, floors, ablution facilities, electrical systems, pipeline systems (water and sewage) and geysers.

Construction and Installation Phase

- Fixing and revamping the existing buildings;
- Resurfacing or fixing existing concrete floors within the existing buildings;
- Replacement of vandalised electrical cables and stolen pipes;
- Replacement of all geysers;
- Restoration of all ablution facilities;

- Installation/construction of the Waste Tyre Pyrolysis plant and its associated infrastructures;
- Installation/construction of oil storage tanks and other storage structures, such as for the storage of chemicals, like catalysts, and end products, such as Carbon black;
- Installation of the backup generator;
- Installation/construction of the water storage tank(s);
- Demarcation or construction of the waste tyre storage area; and
- Concurrent rehabilitation of disturbed areas, where applicable.

Operational Phase

- The storage of waste tyres (onsite and possibly also off-site);
- The shredding of waste tyres to remove the steel within each tyre;
- The processing of the shredded tyres in the pyrolysis plant;
- The cleaning/scrubbing of gas produced during the pyrolysis process;
- The extraction of purified, water cooled oil;
- The extraction of Carbon (Char) and its further processing to Carbon black;
- The storage of removed steel;
- The storage of purified oil in storage tanks;
- The storage of Carbon black in silos and bags;
- The removal of product (steel, oil and Carbon black) from the site; and
- The pumping of sewage off site into the municipal sewage system.

Decommissioning Phase

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.

7.3.1 Impacts associated with the Waste Tyre Pyrolysis Plant (GN. No. R 545, Listing Notice 2 of 18 June 2010: Activity Numbers 3, 5 and 26)

Emissions from the proposed pyrolysis plant

To investigate the impact of the proposed waste tyre pyrolysis plant on the atmosphere, an Atmospheric Impact Assessment was conducted by Shangoni Management Services (Pty) Ltd. The assessment report also acts as the supporting document for the Atmospheric Emission License application that will be submitted to the Bojanala Platinum District Municipality. The full Atmospheric Impact Assessment report is attached under Appendix D.

One of the main environmental impacts from the pyrolysis of waste tyres is the generation of atmospheric emissions. Gases generated and potentially released into the atmosphere from the pyrolysis plant can contain a mixture of atmospheric pollutants. The potential pollutants include dioxins, furans, particulate matter (PM), oxides of nitrogen (NO_x), oxides of sulphur (SO_x), Hydrocarbon (HC) gases, Carbon Dioxide (CO_2), Volatile Organic and Carbon Monoxide (CO) (University of California Riverside, 2006). It is estimated that the pyrolysis of one (1) ton of waste tyres (including steel, which will not be the case for this project), produces ±0.1 ton of gas, of which the composition is mostly hydrogen and hydrocarbons (Fels & Pegg, unknown).

The Atmospheric Impact Assessment found that 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 (EPA, 1991). Combustion gases will be released from this burning process. '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 (H_2O), Carbon dioxide (CO_2), Carbon monoxide (CO), Sulphur dioxide (SO_2) and Nitrogen oxides (NO_x). 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.

The following pollutants were investigated during the Atmospheric Impact Assessment. SO_2, NO_2 and PM10 are criteria pollutants in terms of the National Ambient Air Quality Standards (NAAQS).

- Sulphur dioxide (SO_2);
- Nitrogen dioxide (NO_2);
- Particulate matter (PM10);
- Persistent Organic Pollutants (POPs); and
- Volatile Organic Compounds (VOC);

Persistent Organic Pollutants

Dioxins and Furans (PCDD/PCDF) are a group of chemically related compounds that are formed during combustion processes such as the incineration of waste steams containing chlorine, forest

fires, as well as industrial processes such as paper pulp bleaching and herbicide manufacturing. These compounds form part of a group of dangerous chemicals known as Persistent Organic Pollutants (POPs). Due to their chemical stability and ability to be absorbed by fatty tissues in the body, they last a very long time (their estimated half-life in the body is 7 to 11 years).

The generation of dioxin and furan emissions from the pyrolysis of waste tyres is, however, not expected. Waste tyres do not have a significant amount of chlorine and the absence or low levels of oxygen in the pyrolysis reactor vessel helps inhibit their formation. They are typically formed downstream of the combustion process when Hydrogenclorine in the flue gas reacts with oxygen to form chlorine and the chlorine subsequently reacts with hydrocarbon radicals. Small quantities of dioxins and furans were detected at a Shanghai WTPP (Tongji & ECU, 2008).

Excess pyro-gas from the pyrolysis process can be used to generate electricity or it can be flared to destroy Persistent Organic Pollutants (POPs).

Volatile Organic Compounds (VOCs)

VOC emissions will occur from leaks due to worn or loose packing around pump shafts and valve stems, from loose pipe connections (flanges), compressors, storage tanks, and open drains.

Particulate matter (PM10)

Fugitive particulates will escape during the handling and processing of char. Char contains carbon black, sulphur, zinc oxide, clay fillers, calcium and magnesium carbonates and silicates. Operations such as the screening, grinding and processing of char generate PM10 emissions that may escape to the atmosphere.

Ancillary operations such as the delivery of the waste tyres (vehicle entrained dust) will also cause particulate emissions.

During the Atmospheric Impact Assessment, the ADMS5 dispersion model was used to calculate short- and long-term concentrations and deposition fluxes of emissions from point-, line-, area- and volume- sources. The modelled ground-level concentrations for the criteria pollutants were compared to the National Ambient Air Quality Standards (NAAQS) and the non-criteria pollutants were interpreted in terms of the International Health Guidelines. The NAAQS provide an averaging period, a concentration threshold, a number of allowable exceedances of this threshold and a compliance date for each pollutant. The following table shows an example of the requirements in terms of the NAAQS for SO_2.

Table 26: Example of National ambient air quality standards for Sulphur dioxide (SO_2)

Averaging Period	Concentration (at 25°C and 101,3 kPa)	Allowable Frequency of Exceedance	Compliance Date

10 minutes	500µg/m3 (191 ppb)	526	Immediate
1 hour	350µg/m3 (191 ppb)	88	Immediate
24 hours	125µg/m3 (191 ppb)	4	Immediate
1 year	50µg/m3 (191 ppb)	0	Immediate
The reference method for the analysis of sulphur dioxide shall be ISO 6767			

The allowable frequency of exceedance means that an operation may, for example, exceed 500µg/m^3 (191 ppb) of SO_2 over the 10 minute averaging period, a total of 526 times. This is not a lot when one considers that there are 52 560 10-minute periods in one year. If a model output shows an exceedance of 1 to 100 over an area for once year, this would mean that the regulatory threshold of 50µg/m³ was exceeded for up to 100 out of the 8760 hours throughout the year. The model accounts for even the smallest exceedance of 50µg/m³, such as 50.001µg/m³, and these 100 exceedances may have taken place sequentially or intermittently throughout the year.

During the assessment, the following assumptions were used and the following limitations applicable:

- Since Waste Tyre Pyrolysis Plants are typically operated at a pilot or demonstration scale and very few active plants exist, emission data is limited. Values measured in a Shanghai Waste Tyre Pyrolysis Plant (Tongji & ECU, 2008) were used to estimate emissions of criteria pollutants from the pyrolysis gas combustion at the proposed Vaporox Waste Tyre Pyrolysis Plant, when pyro-gas is burnt as an energy source for the pyrolysis process;
- Estimated fugitive emissions from a generic pyrolysis plant with an economical plant capacity of 100 tons per day have been reported as 51.27 kg/day of Volatile Organic Compounds (VOCs) (EPA, 1993). These fugitive non-criteria emissions were modelled and ground level concentrations were compared to international sources;
- The proposed plant has been designed with a pipeline chimney height of 4m. No other design parameters (i.e. stack diameter, gas exit temperature, gas exit velocity, etc.) were available. A pollutant's release height (i.e. pipeline chimney height), plume rise (dependent on release temperature and exit velocity) and wind speed and direction affect the dispersion of a pollutant in the atmosphere and its subsequent ground level concentrations.A number of different scenarios were therefore modelled to illustrate the effect of different design parameters (refer to the table below for a summary of the different scenarios). Emissions were modelled from the pipeline chimney based on the following assumptions:
  - Vertical pipeline chimney with no stack cap;
  - Chimney tip diameter of 0.2m; and
  - Location of chimney pipeline was assumed at UTM coordinates, x: 3036093.93m and y: -2890742.72m.
- As a conservative approach, total values of Sulphur oxides (SO_x), Nitrogen oxides (NO_x) and Particulates, taken from the Shanghai Waste Tyre Pyrolysis Plant (Tongji & ECU, 2008), were modelled as Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Particulate matter (PM10), in

order to compare their ground level concentrations to the National Ambient Air Quality Standards;

- The operation of the Waste Tyre Pyrolysis Plant was modelled for a period of 24 hours a day over 365 days a year as a conservative approach;
- No on site meteorological data was available for this study. A Numerical Weather Prediction (NWP) meteorological data set for the year 2012 was used as a representative year; and
- It is important to bear in mind that the model outputs may be exaggerated and overstate ground level concentrations and/or exceedances under assumed worst case scenarios. These model outputs should be used as guides in determining high risk areas and be verified by actual monitoring.

Table 27: A summary of the different scenarios modelled

Scenario	Parameters modelled
A	4m stack height (design height), 2m/s exit velocity, 200°C exit gas temp
B	4m stack height (design height), 2m/s exit velocity, 600°C exit gas temp
C	4m stack height (design height), 6m/s exit velocity, 200°C exit gas temp
D	4m stack height (design height), 6m/s exit velocity, 600°C exit gas temp
E	4m stack height (design height), 10m/s exit velocity, 200°C exit gas temp
F	4m stack height (design height), 10m/s exit velocity, 600°C exit gas temp
G	18.75m stack height (Good Engineering Practice stack height), 2m/s exit velocity, 200°C exit gas temp
H	18.75m stack height (Good Engineering Practice stack height), 2m/s exit velocity, 600°C exit gas temp
I	18.75m stack height (Good Engineering Practice stack height), 6m/s exit velocity, 200°C exit gas temp
J	18.75m stack height (Good Engineering Practice stack height), 6m/s exit velocity, 600°C exit gas temp
K	18.75m stack height (Good Engineering Practice stack height), 10m/s exit velocity, 200°C exit gas temp
L	18.75m stack height (Good Engineering Practice stack height), 10m/s exit velocity, 600°C exit gas temp

By using 200°C for the exit gas temperature [a special arrangement in terms of GNR of 22 November 2013, category 8.1 (Thermal Treatment of General and Hazardous Waste)] as the determining factor and a conservative gas exit velocity of 6m/s, two of the above scenarios were chosen for further investigation in terms of their impacts on the atmosphere. These were the worst case Scenario C (stack height of 4m) and the Acceptable Scenario I (stack height of 18.75m). Modelled ground level concentrations for Scenario C and Scenario I were interpreted in terms of the National Ambient Air Quality Standards (NAAQS).

The following section summarises the evaluation of the maximum modelled ground level concentrations of criteria pollutants in terms of the NAAQS, for Scenario C and Scenario I, respectively. A description of all incidents of exceedance of the NAAQS identified during the evaluation/assessment is given and also shown in the figures below.

Table 28: Evaluation of simulated ground level concentrations should Scenario C be implemented

Pollutant	Averaging Period	Model output (µg/m³)	Model output (Exceedances)	NAAQS (µg/m³)	NAAQS (Exceedances)	Evaluation of concentrations	Evaluation of Exceedances
[1]Sulphur dioxide (SO_2)	10 minutes	256.44	262.45	500	526		
	1 hour	259.45	281.5	350	88	Refer footnote[2]	Refer footnote[2]
	24 hours	259.88	212.53	125	4	Refer footnote[2]	Refer footnote[2]
	1 year	259.45	316.72	50	0	Refer footnote[2]	Refer footnote[2]
[1]Nitrogen dioxide (NO_2)	1 hour	64.86	211.55	200	88		Refer footnote[2]
	1 year	64.86	305.58	40	0	Refer footnote[2]	Refer footnote[2]
[1]Particulate matter (PM10)	24 hours	8.12	0.99	75	4		
	1 year	8.10	144.65	40	0		Refer footnote[2]
	Exceed National Ambient Air Quality Standards (NAAQS) outside the site boundary						
	Exceed National Ambient Air Quality Standards (NAAQS) within the site boundary						
	Within National Ambient Air Quality Standards (NAAQS)						

[1] As a conservative approach total values of Sulphur oxide (SO_x), Nitrogen Oxides (NO_x) and Particulates, taken from the Shanghai WTPP (Tongji & ECU, 2008), were modelled as Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Particulate matter (PM10), in order to compare their ground level concentrations to the National Ambient Air Quality Satndards.

[2] It is important to bear in mind that the model outputs may be exaggerated and overstate ground level concentrations and/or exceedances under assumed worst case scenarios. These model outputs should be used as guides in determining high risk areas and be verified by actual monitoring.

Table 29: Evaluation of simulated ground level concentrations should Scenario I be implemented.

Pollutant	Averaging Period	Model output (µg/m³)	Model output (Exceedances)	NAAQS (µg/m³)	NAAQS (Exceedances)	Evaluation of concentrations	Evaluation of Exceedances
[1]Sulphur dioxide (SO_2)	10 minutes	12.31	0	500	526		
	1 hour	11.81	0.99	350	88		
	24 hours	11.61	0	125	4		
	1 year	11.81	230.64	50	0		Refer footnote[2]
[1]Nitrogen dioxide (NO_2)	1 hour	2.95	0	200	88		
	1 year	2.95	31.91	40	0		Refer footnote[2]
[1]Particulate matter (PM10)	24 hours	0.363	0	75	4		
	1 year	0.369	0	40	0		
	Exceed National Ambient Air Quality Standards (NAAQS) outside the site boundary						
	Exceed National Ambient Air Quality Standards (NAAQS) within the site boundary						
	Within National Ambient Air Quality Standards (NAAQS)						

Scenario C

For Scenario C, the following predicted ground level concentrations were found to be within the National Ambient Air Quality Standards (NAAQS):

- SO_2, for an averaging period of 10 minutes;
- NO_2,for an averaging period of 1 hour; and
- PM, for averaging periods of 1 hour and 24 hours.

Simulated ground level concentrations found above the National Ambient Air Quality Standards (NAAQS), include:

- SO_2, for an averaging periods of 1 hour, 24 hours and annual (Refer to Figure 24 and Figure 25);
- NO_2, for the annual averaging period (Refer to Figure 26); and
- PM, for the annual averaging period (Refer to Figure 27).

The frequency of allowable exceedances of the NAAQS for the following pollutants were exceeded:

- SO_2 over an averaging period of 1 hour (350µg/m³) was exceeded up to 281.5 times throughout the year. The concentration threshold was exceeded up to 50m south and 10m west of the boundary of the site (Refer to Figure 28 and footnote[2]);
- SO_2 over an averaging period of 24 hours (125µg/m³) was exceeded up to 212.53 times throughout the year. The concentration threshold was exceeded up to 50m north, 80m south and 30m west of the boundary of the site (Refer to Figure 29 and footnote[2]);
- SO_2 over an averaging period of a year (50µg/m³) was exceeded up to 316.72 times throughout the year. The concentration threshold was exceeded up to 450m north, 400m east, 450m south and 450 west of the boundary of the site (Refer to Figure 30 and footnote[2]);
- NO_2 over an averaging period of 1 hour (200µg/m³) was exceeded up to 211.55 times throughout the year. The concentration threshold was exceeded up to 30m south of the boundary of the site (Refer to Figure 31 and footnote[2]);
- NO_2 over an averaging period of a year (40µg/m³) was exceeded up to 305.58 times throughout the year. The concentration threshold was exceeded up to 100m north, 60m east, 140m south and 140m west of the boundary of the site (Refer to Figure 32 and footnote[2]); and
- PM10 over an averaging period of a year (40µg/m³) was exceeded up to 144.65 times throughout the year. The concentration threshold was exceeded up to 50m north, 50m south and 40m west of the boundary of the site (Refer to Figure 33 and footnote[2]).

Scenario I

For Scenario I, the predicted ground level concentrations of SO_2, NO_2 and PM were found to be within the National Ambient Air Quality Standards (NAAQS).

The frequency of allowable exceedances of the NAAQS for the following pollutants were exceeded:

- SO_2 (50µg/m³) was exceeded up to 230.64 times throughout the year. The concentration threshold was exceeded approximately 250m in all directions from the site boundary (Refer to Figure 34 and footnote[2]); and
- NO_2 (40µg/m³) was exceeded up to 31.91 times throughout the year. The concentration threshold was exceeded approximately 30m north and south of the site boundary (Refer to Figure 35 and footnote[2]).

Scenario C (4m pipeline chimney height) resulted in more exceedances of the National Ambient Air Quality Standards (NAAQS) than scenario I (18.75m pipeline chimney height). Exceedances of the NAAQS for both scenarios were found within close proximity to the site boundary. As per simulated results, no exceedances over the sensitive receptors (two schools and a clinic approximately 2.8km from the site) were identified.

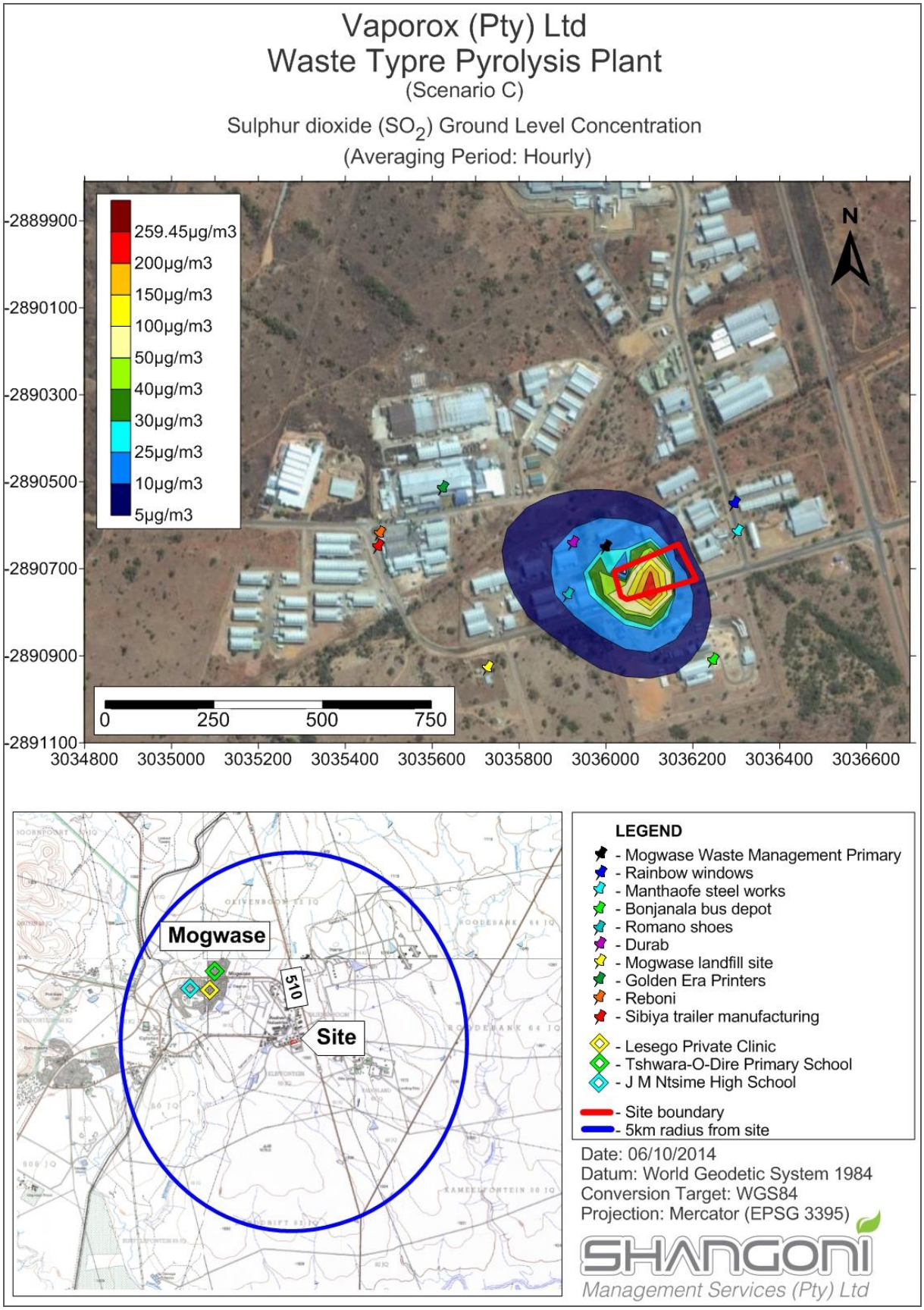


Figure 31: Sulphur dioxide (SO_2) ground level concentrations (Averaging period: Hourly)

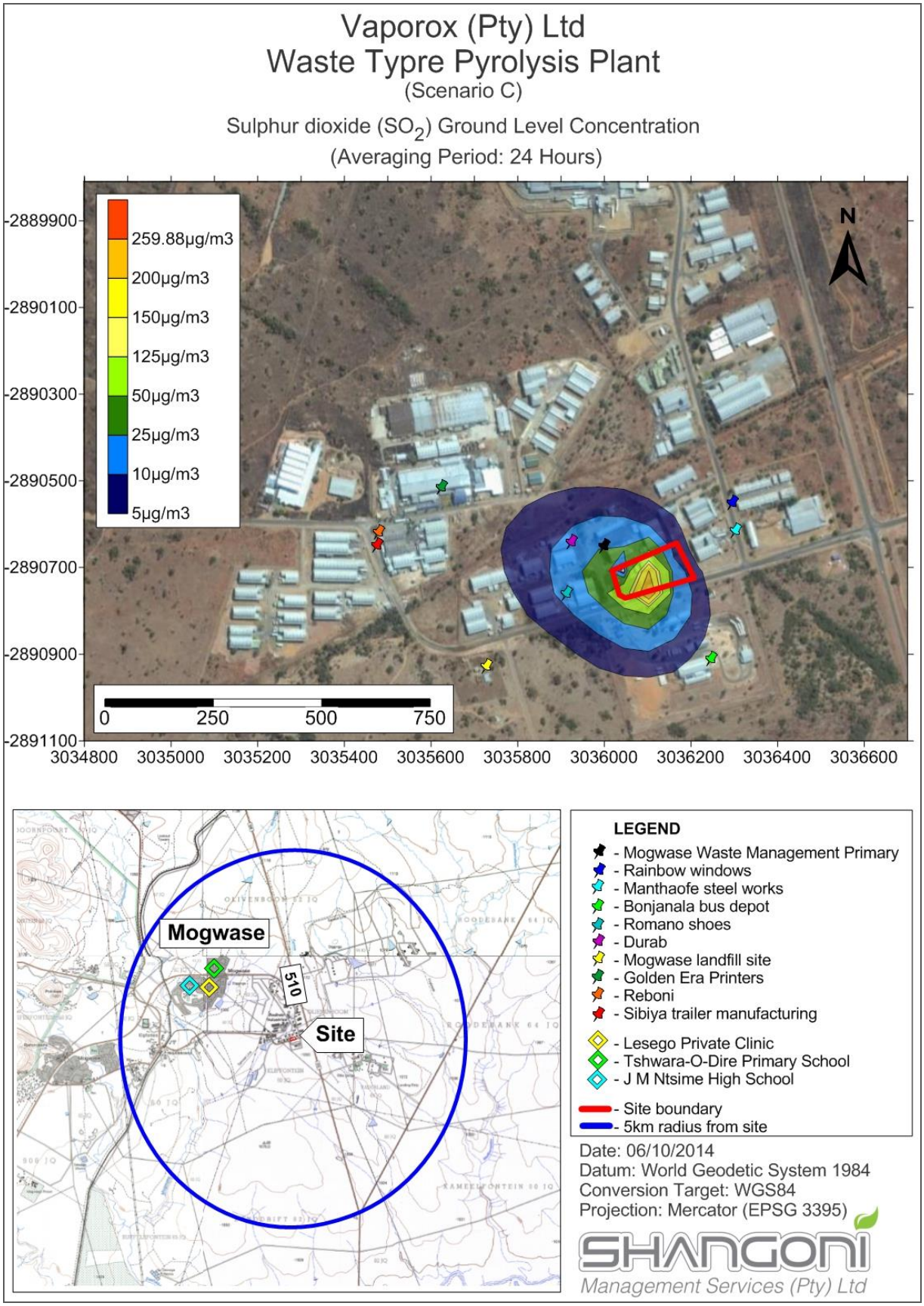


Figure 32: Sulphur dioxide (SO_2) ground level concentrations (Averaging period: 24 Hours)

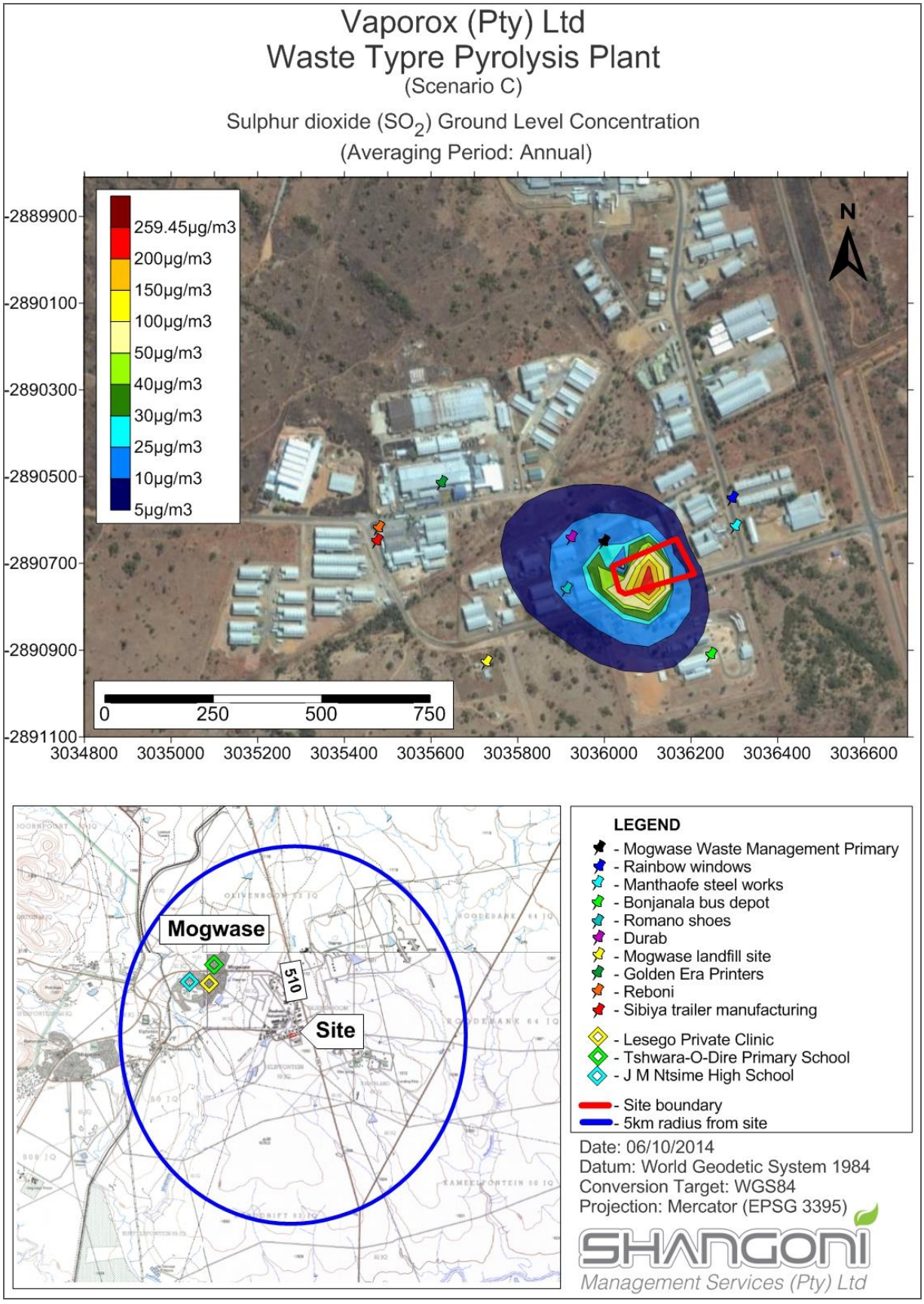


Figure 33: Sulphur dioxide (SO_2) ground level concentrations (Averaging period: Annual)

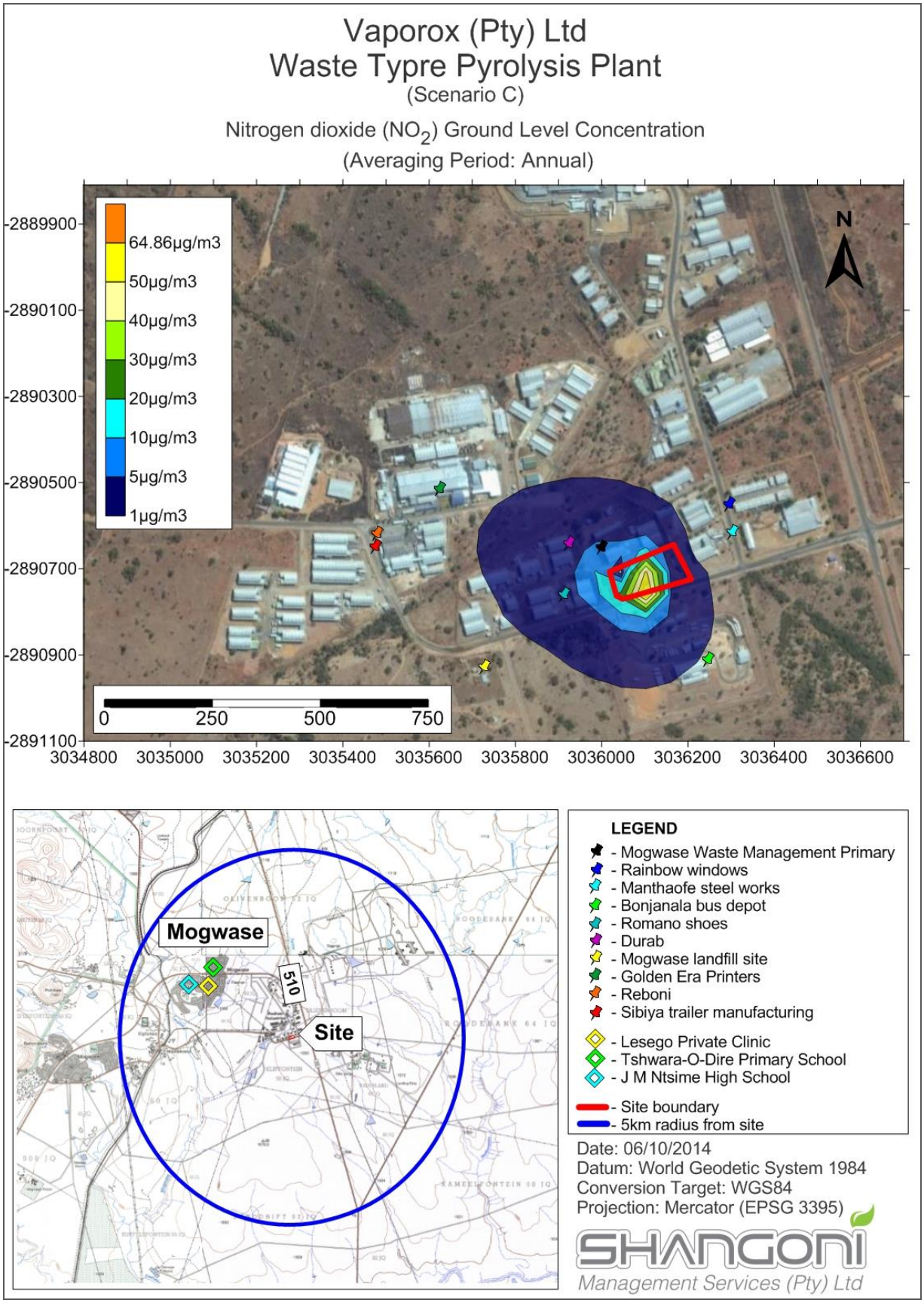


Figure 34: Nitrogen dioxide (NO_2) ground level concentrations (Averaging period: Annual)

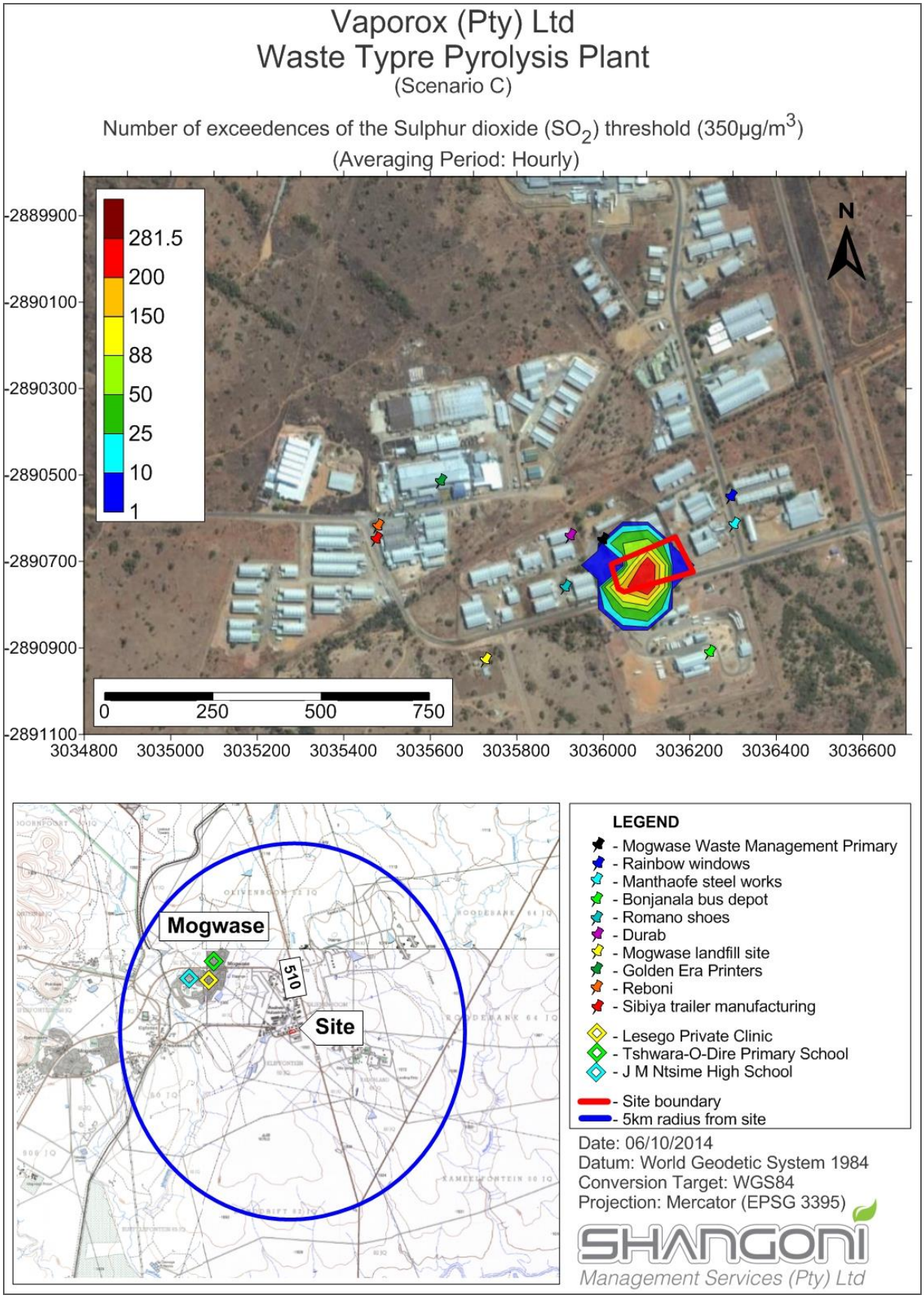


Figure 35: Number of exceedances of the Sulphur dioxide (SO_2) hourly threshold

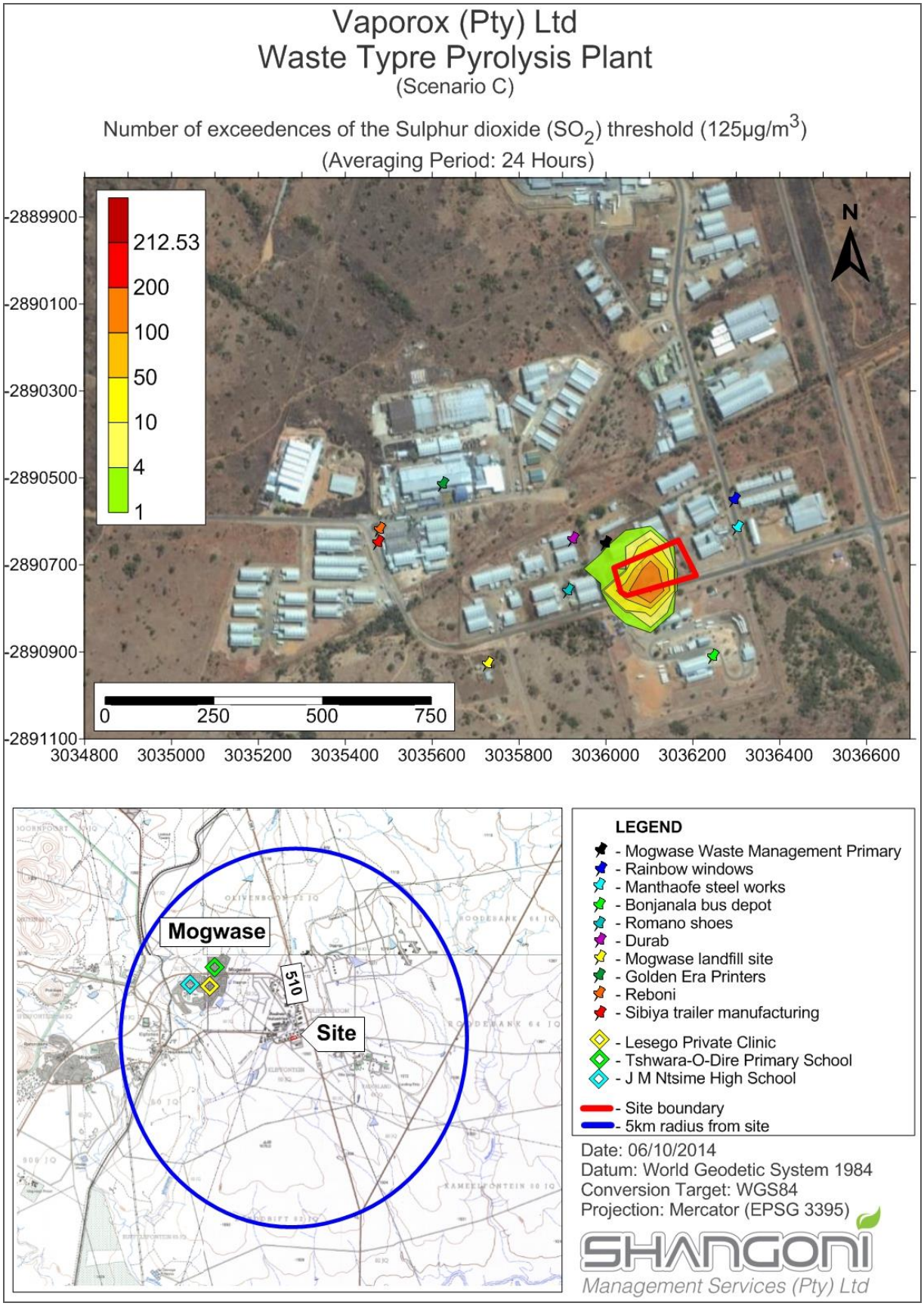


Figure 36: Number of exceedances of the Sulphur dioxide (SO_2) 24 hour threshold

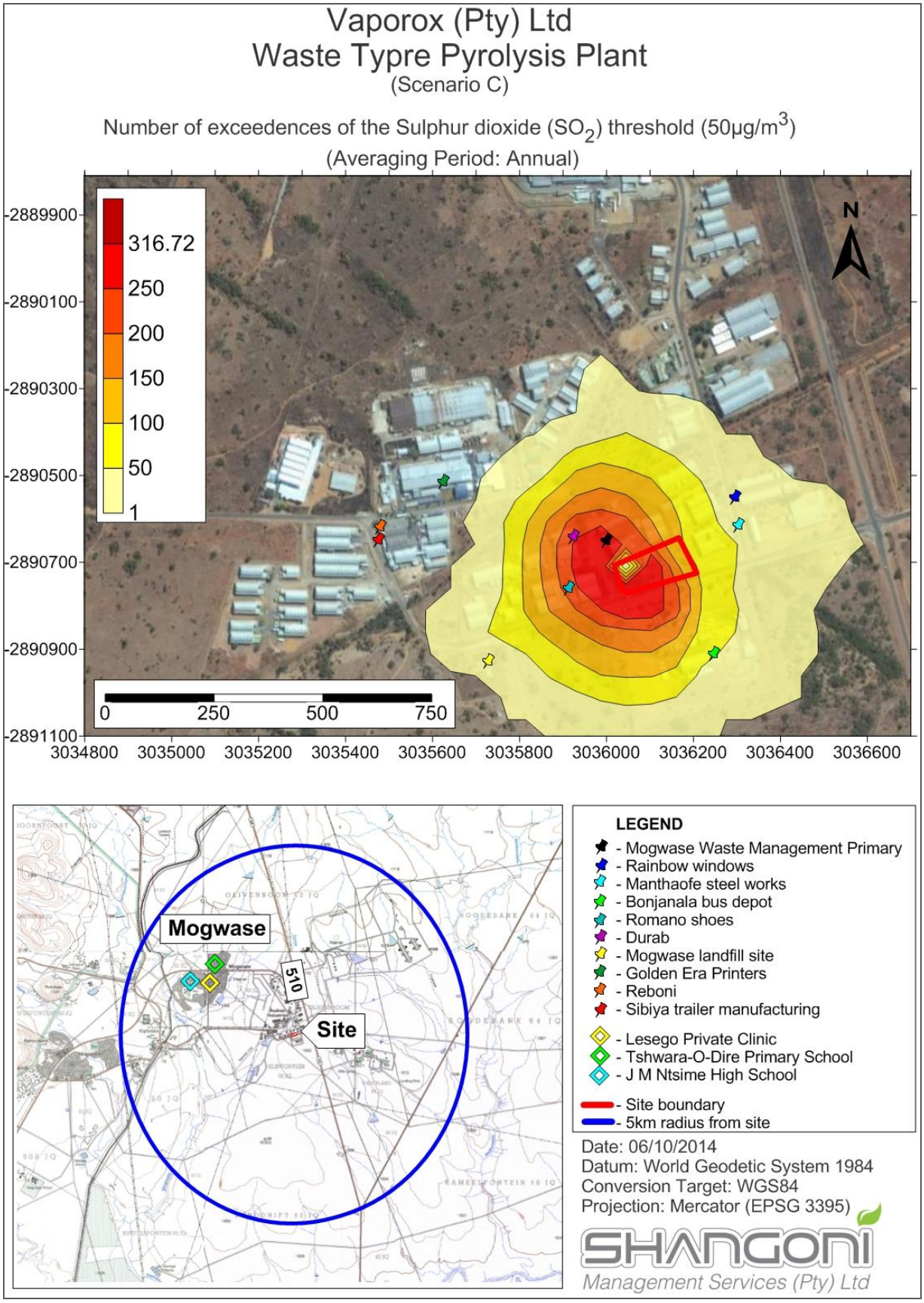


Figure 37: Number of exceedances of the Sulphur dioxide (SO_2) annual threshold

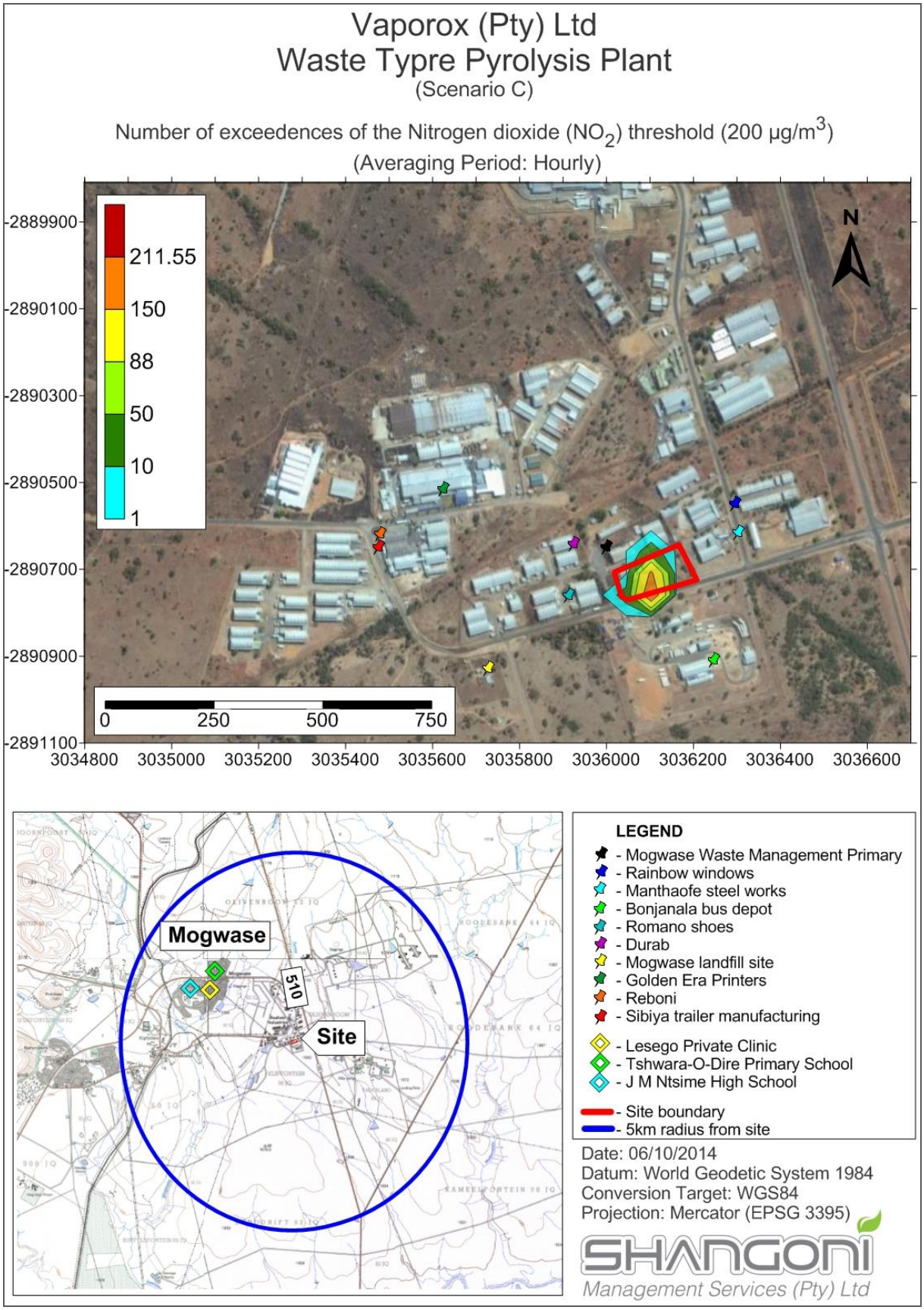


Figure 38: Number of exceedances of the Nitrogen dioxide (NO_2) hourly threshold

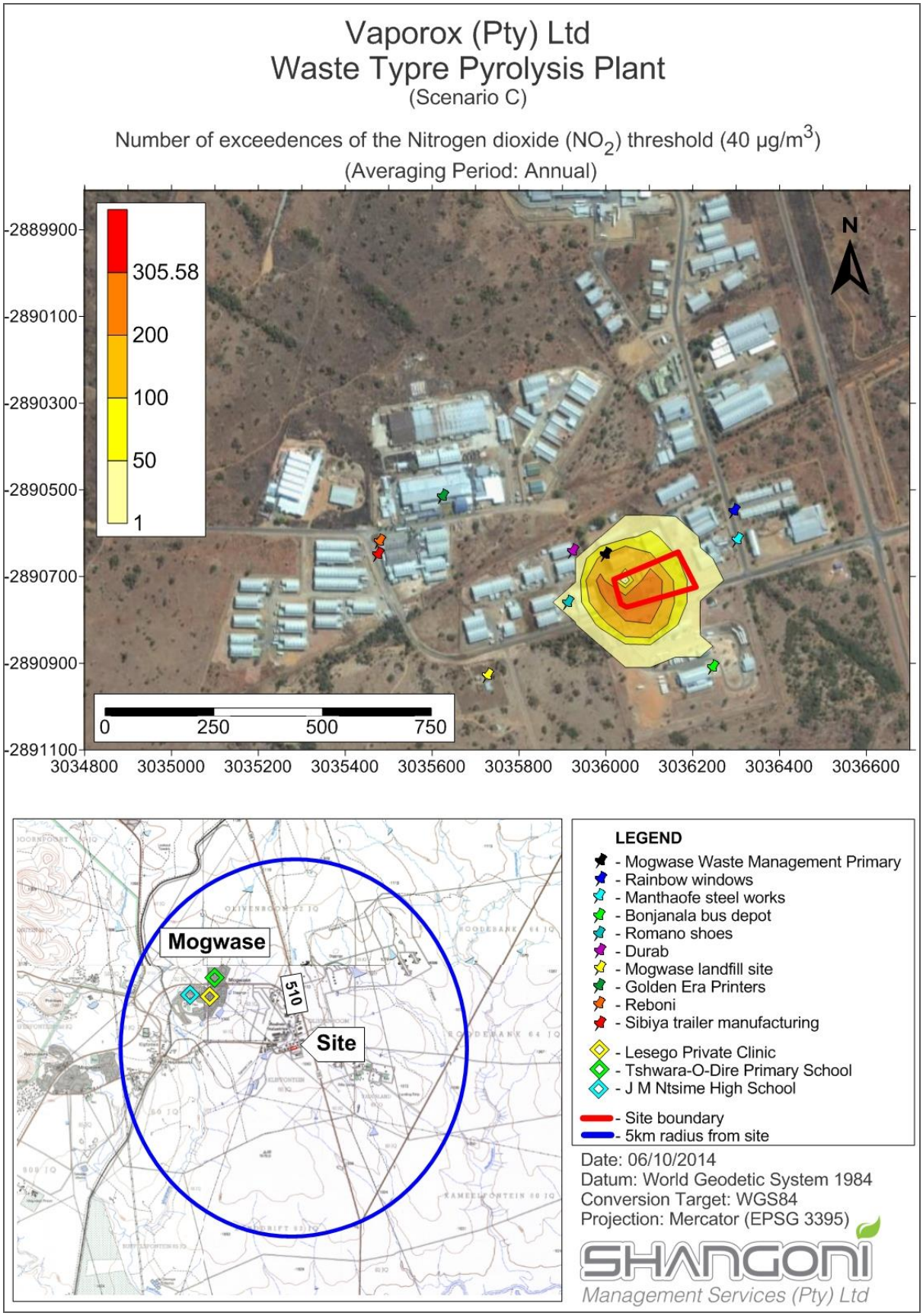


Figure 39: Number of exceedances of the Nitrogen dioxide (NO_2) annual threshold

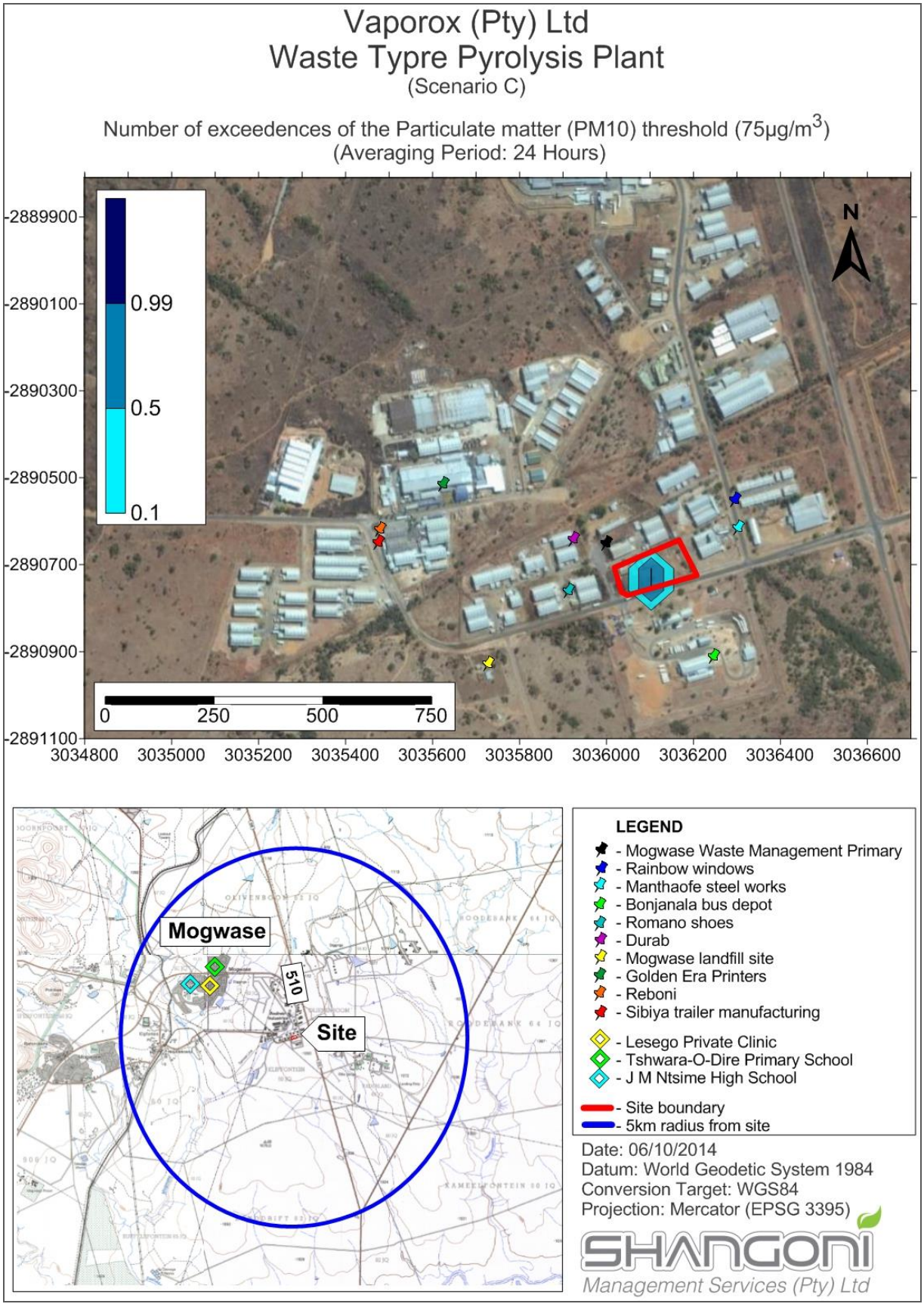


Figure 40: Number of exceedances of the Particulate matter (PM10) 24 hour threshold

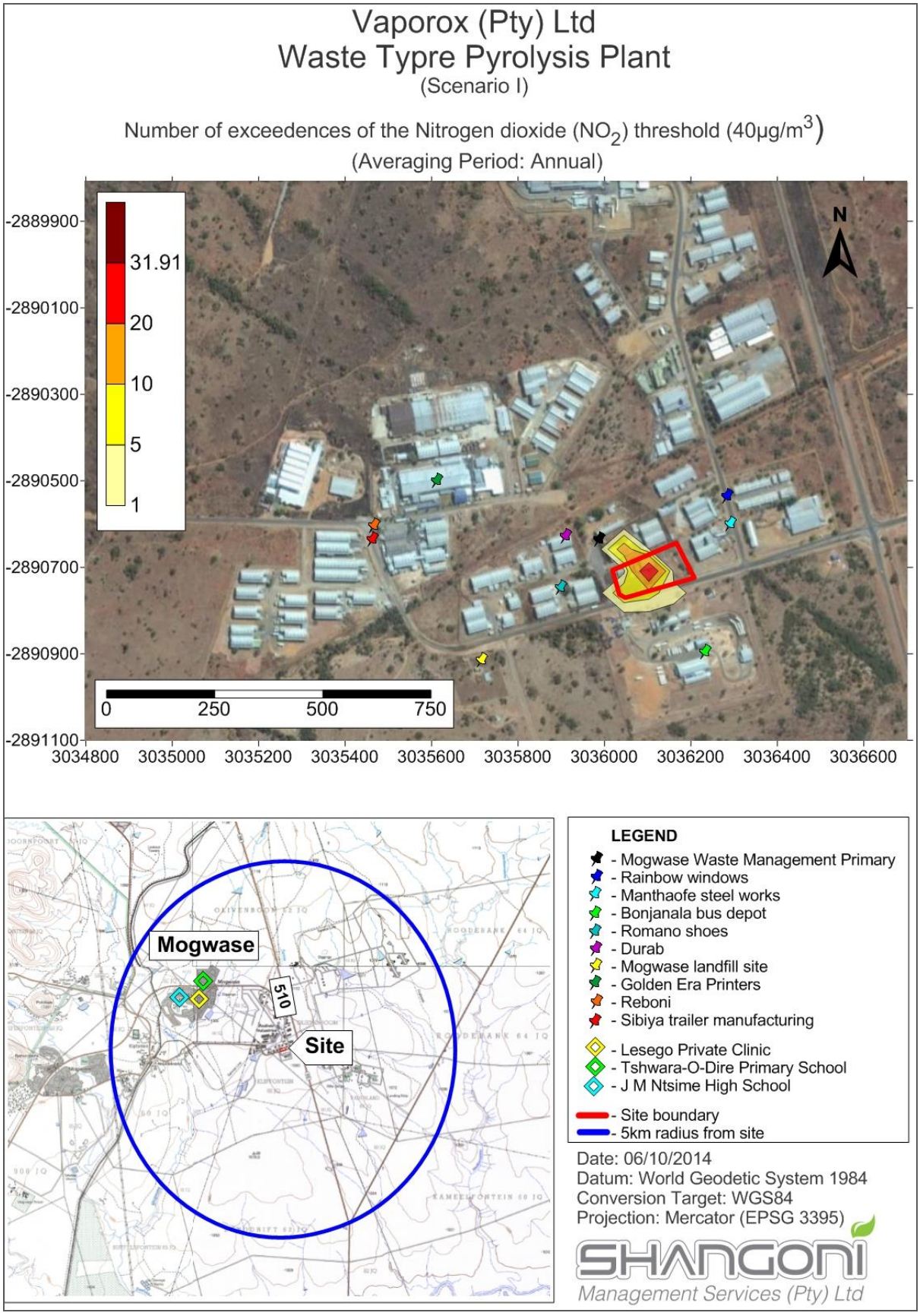


Figure 41: Number of exceedances of the Nitrogen dioxide (NO_2) annual threshold (Scenario I)

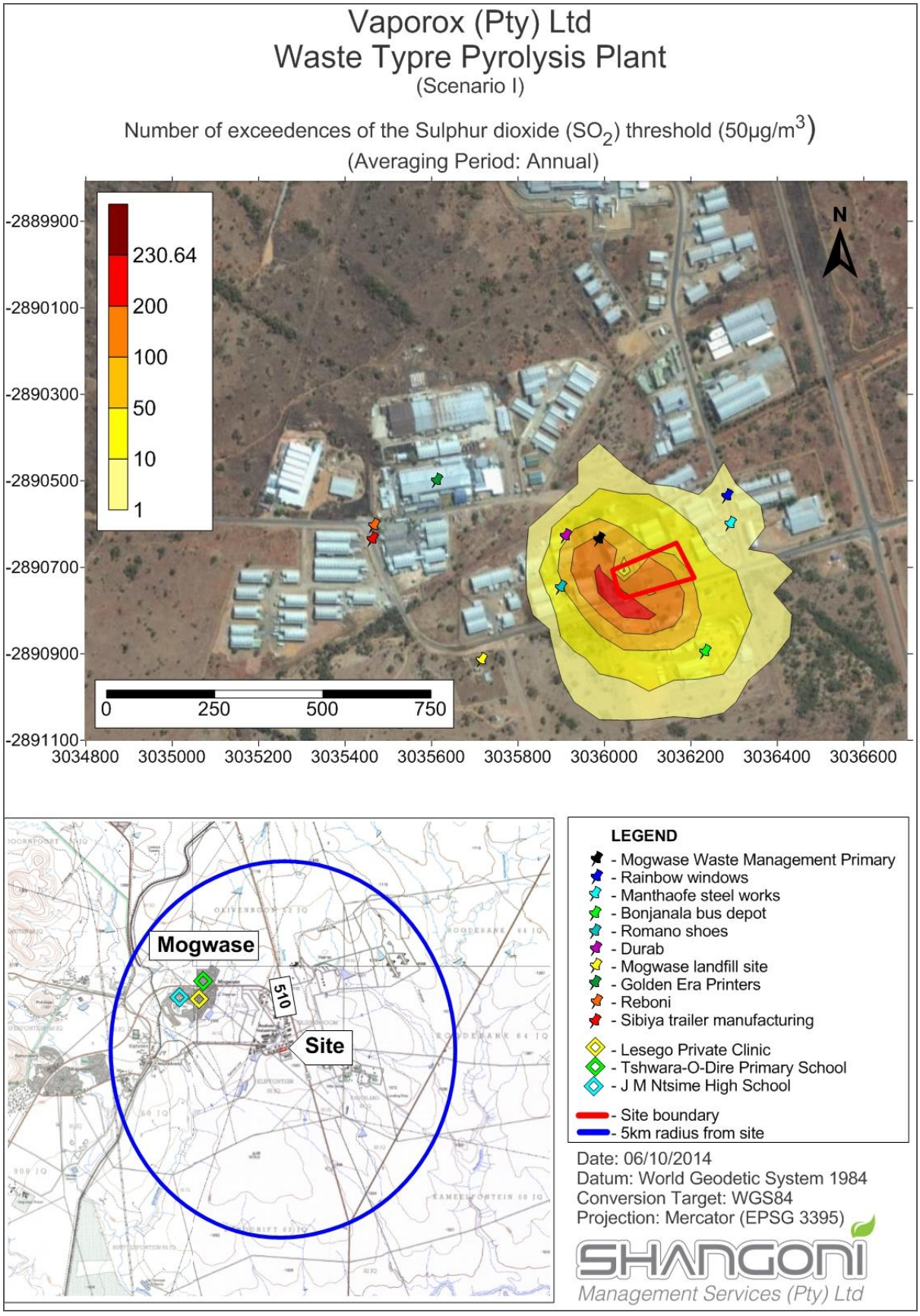


Figure 42: Number of exceedances of the Sulphur dioxide (SO_2) annual threshold (Scenario I)

The following section summarises the interpretation of the non-criteria pollutants in terms of International Health Guidelines.

Fugitive Volatile Organic Compound (VOC) emissions occur from leaks due to worn or loose packing around pump shafts and valve stems, from loose pipe connections (flanges), compressors, storage tanks, and open drains.

Standards for exposure to VOCs in industry do not exist. As a conservative approach, recommended exposure levels were therefore taken from the European Collaborative Action (ECA) Report No. 11: Guidelines for Ventilation Requirements in Buildings (http://www.pinchin.com/iaq/news/volatile-organic-compounds-and-office-environment). The model output should be used as a guide in determining high risk areas and be verified by actual monitoring.

The highest ground level concentration of VOCs, as a result of fugitive emissions of these pollutants from the Waste Tyre Pyrolysis Plant, was modelled as 407.38µg/m³. The European Collaborative Action's comfort threshold (<200µg/m³) is exceeded approximately 10m west from the site boundary (refer to Figure 36).

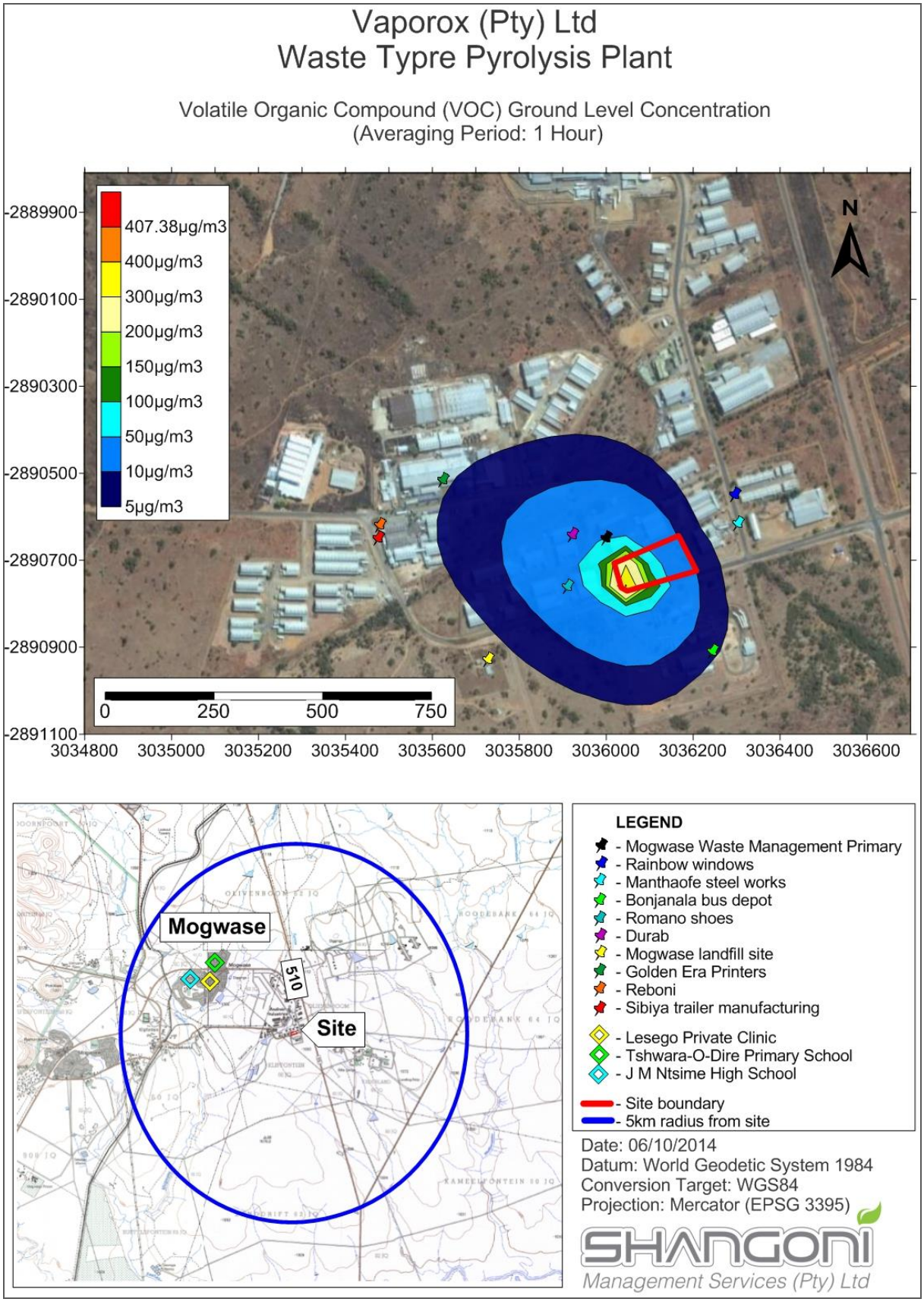


Figure 43: Volatile Organic Compound (VOC) ground level concentrations

Table 30: Environmental impact assessment: Atmosphere and Noise

Activity:

- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:

Construction Phase

- Vehicles not adhering to speed limits on the site.
- Ineffective dust suppression.
- Vehicle emissions released from additional construction vehicles and equipment used during the construction phase and clearance of vegetation.
- Noise generated by additional construction vehicles and equipment during the construction activities.

Operational Phase

- Atmospheric emissions from the Waste Tyre Pyrolysis Plant.
- Atmospheric emissions due to an inefficient emission abatement system.
- Atmospheric emissions from the diesel generator on site.
- Release of atmospheric emissions from potential burning of stockpiled tyres due to unsafe storage practices that result in the establishment of fires.
- Potential establishment of fires due to the inadequate storage of diesel and oil.
- Inadequate or ineffective storage of Carbon black and other products from the pyrolysis process.
- Inadequate storage of ash.
- Increased traffic flow to the site.
- Noise generated by the pyrolysis process and vehicles travelling to and from the facility.

Nature and significance of environmental impact

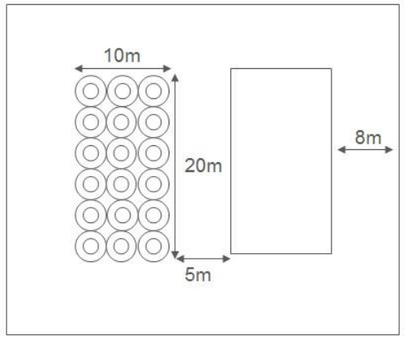
Impact Description	Risk rating (before mitigation)			Environmental Objective	Management / Mitigation / Monitoring Measures	Timeframe	Responsibility	Risk rating (after mitigation)			Applicable legislation / other documents
	Probability	Magnitude	Severity					Probability	Magnitude	Severity	
Construction Phase											
Degradation of ambient air quality due to dust generation. 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.	3	3	M	To minimise the impact of vehicles travelling to and from the site as well as loading and offloading activities on the ambient air quality.	• A dustcart needs to be onsite to water down dusty roads. • Speed bumps or traffic speed signs need to be erected to reduce speeding onsite that could result in the generation of dust. • Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for 'cleaner' exhaust emissions. • 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.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998 • NEM: AQA, 2004
Atmospheric pollution due to the release of emissions from vehicles as a by-product of the fuel combustion process.	3	3	M	To limit the generation of atmospheric emissions from construction vehicles.	• Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for 'cleaner' exhaust emissions. • Use cleaner, low Sulphur fuel, as far as possible.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998 • NEM: AQA, 2004

					• Unnecessary idling of engines must be avoided.						
According to Jorgensen & 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. 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. 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. 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.	4	3	H	To minimise noise generation during the construction phase.	• Schedule activities that will generate the most noise during times of the day that will result in least disturbance to adjacent industries. • 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. • Regular maintenance of vehicles and equipment. • All equipment and machinery should be fitted with adequate silencers. • Working hours should be restricted to daylight hours. • 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. • If work is to be undertaken outside of normal work hours permission must be obtained from the ECO and the facility manager. • No noisy work is to be conducted over the weekends or on public holidays. • The relevant stipulations of the Noise Control Regulations, 1992 (Government Notice No. 154 of 10 January 1992) must be adhered to. • 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.	During the construction phase.	• Construction contractor • ECO	3	3	M	• NEMA, 1998 • NEM: AQA, 2004 • OHSA, 1993 • Noise Control Regulations, 1992
Operational Phase											
Air pollution due to the release of emissions from the Waste Tyre Pyrolysis Plant. 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_2, NO_2 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	5	3	H	To minimise the release of atmospheric emissions from the Waste Tyre Pyrolysis Plant.	• 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). • The license conditions of the Atmospheric Emission License (if granted) must be adhered to. • Monitoring reports must be submitted to the licensing authority as stipulated in the Atmospheric Emission License. • All vented air must be directed upwards for efficient dispersion.	Life of operation	Facility Manager	5	2	M	• NEMA, 1998 • NEM: AQA, 2004

can be used to generate electricity, for example, using the micro-turbines that are being considered. Excess pyro-gas can also be flared. '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_2), Carbon monoxide (CO), Sulphur dioxide (SO_2) and Nitrogen oxides (NO_x). 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. 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. 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). 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). 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. 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. The Atmospheric Impact Assessment Report found that Scenario C (4m pipeline chimney height) resulted in **more** exceedances of the National Ambient Air Quality Standards					• The oil storage tank(s) must be operated according to SANS 10089-1:2008. **Fugitive emissions** • It is recommended that a Leak Detection and Repair program be developed and implemented. • Fugitive VOC emissions can be significantly reduced by using components (such as pumps, valves and compressors) specifically designed to minimise fugitive emissions (EPA, 1991). • 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. • Periodic sampling of VOCs (including Chlorobenzenes, HCB, PCBs, Benzene, Toluene, Xylenes, PAHs and NH_3) should take place to determine if the Leak Detection and Repair Program is sufficient in managing fugitive VOC emissions. • 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). • 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: ▪ Motivation for why the plant should be used for treatment of High Level POPs; ▪ A feasibility study showing that the plant is technically qualified; ▪ Planned date for commencement of the test and expected duration; ▪ Details on the waste to be co-processed during the test, including source, volume, composition etc.; ▪ 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; ▪ Extension of monitoring regime to include					

than Scenario I. Scenario C may also prove to be acceptable in practice, but is more likely to require abatement technology.					Chlorobenzenes, HCB, PCBs, Benzene, Toluene, Xylenes, PAHs and NH_3; and ▪ Monitoring and analysis to be conducted, the associated methodologies and independent parties responsible for monitoring. ▪ 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. • 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. • 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.						
The same impacts apply to Scenario I as given for Scenario C above. The Atmospheric Impact Assessment Report found that Scenario I (18.75m pipeline chimney height) resulted in **less** exceedances of the National Ambient Air Quality Standards than Scenario C. Scenario I is less likely to require abatement technology than Scenario C.	5	2	M		**Point source emissions** • 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. • 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. • 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. • 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			5	1	L	• NEMA, 1998 • NEM: AQA, 2004

					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. **Management** • 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. • 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. • 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.						
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_2), Carbon monoxide (CO), Particulate Matter (PM), Oxides of Nitrogen (NO_x) and Hydrocarbon emissions.	3	3	M	To minimise the release of atmospheric emissions from the diesel generator.	• Use cleaner, low Sulphur diesel as far as possible. • Ensure that the generator is correctly maintained as stipulated by the manufacturer and repaired when required. Optimal combustion will allow for 'cleaner' emissions. • Limit unnecessary idling of the generator.	Life of operation	Facility Manager	2	3	M	• NEMA, 1998 • NEM: AQA, 2004
Air pollution due to the release of emissions from tyre fires established on site. 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 biphenyles (PCBs) and heavy metals (lead and arsenic). A number of these gases are deemed to be carcinogenic.	3	4	H	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.	• 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. • A security attendant trained in fire prevention must be on site at all times. • The site manager must be on site at all times (when the facility is open/operational). • Adequate access for firefighting vehicles must be available to the waste tyre piles. • Maintain adequate stockpiles of cover material to smother fires. • The waste tyres must not be stored on steeply	Life of operation	Facility Manager	2	3	M	• NEMA, 1998 • NEM: AQA, 2004 • Waste Tyre Regulations, 2009

					graded surfaces or anywhere else where they may pose a significant environmental or fire risk. • 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. • No single pile of waste tyres may exceed a height of 3 metres, a length of 20 metres or a width of 10 metres. • All interior firebreaks between the waste tyre piles must be at least five metres wide. • 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. • All firebreaks must be at least 8 metres wide. • Waste tyre piles may not be located within 8 metres from a power line. • The following diagram gives an example of the correct waste tyre storage area design.  					
Nuisance and air degradation due to the generation of dust and particulates from the inadequate storage of ash, char and carbon black. 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.	4	3	H	To prevent the inadequate storage of ash that may be generated under abnormal conditions.	• No products may be stored in the open. All products must be stored within the designated product storage buildings. • Carbon black must be stored in impermeable, sealable bags within the designated storage building. • Ash must be stored in impermeable, sealable bags within the designated storage building and disposed of at a licensed hazardous landfill site. • Any “spilled” Carbon black must be removed using an industrial vacuum system and not swept as this will cause the powder to become airborne. • Should some of the char need to be disposed of, it must be taken to a suitable, licensed landfill site.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • NEM: AQA, 2004

					The char must be transported in sealed plastic bags to avoid the generation of fugitive particulate emissions (EPA, 1991).						
Nuisance and ambient air degradation due to the increased traffic flow to the site.	3	3	M	To minimise the impact of dust generated by the increased traffic frequency on the ambient air quality.	• A dustcart needs to be onsite to water down dusty roads. • Speed bumps or traffic speed signs need to be erected to reduce speeding onsite that could result in the generation of dust. • Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for 'cleaner' exhaust emissions. • 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.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • NEM: AQA, 2004
Disturbance and nuisance to adjacent receptors due to noise generated by the operational activities. 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.	4	2	M	To minimise the noise and nuisance generated by the operational activities.	• 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. • Regular maintenance of vehicles, the back-up generator and equipment. • All equipment and machinery should be fitted with adequate silencers. • 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. • If work is to be undertaken outside of normal work hours permission must be obtained from the ECO and the facility manager. • No noisy work is to be conducted over weekends or on public holidays. • The relevant stipulations of the Noise Control Regulations, 1992 (Government Notice No. 154 of 10 January 1992) must be adhered to. • 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.	Life of operation	Facility Manager	3	1	L	• NEMA, 1998 • NEM: AQA, 2004 • Noise Control Regulations, 1992
Decommissioning Phase											
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 31: Environmental impact assessment: General Environment

Activity:
- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:
- Lack of knowledge amongst workers and contractors in terms of how their actions may impact on the environment.

Nature and significance of environmental impact											
Impact Description	Risk rating (before mitigation)			Environmental Objective	Management / Mitigation / Monitoring Measures	Timeframe	Responsibility	Risk rating (after mitigation)			Applicable legislation / other documents
	Probability	Magnitude	Severity					Probability	Magnitude	Severity	
Construction Phase											
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.	3	2	M	To prevent harm to the environment by educating workers and contractors.	• 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. • 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. • The contractor is to maintain accurate records of any training undertaken. • The ECO shall monitor the contractor's compliance with the requirement to provide sufficient environmental awareness training to all site staff. • Training is to cover all aspects of the EMP and procedures to be followed. • All construction workers shall be issued with ID badges and clearly identifiable uniforms.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998 • OHSA, 1993
Operational Phase											
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.	3	3	M	To prevent harm to the environment by educating workers and contractors.	• All employees are required to attend onsite Environmental Awareness/Training prior to commencing work on site. • 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. • The facility manager is to maintain accurate records of any training undertaken. • Training is to cover all aspects of the EMP and procedures to be followed.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • OHSA, 1993

Decommissioning Phase	
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 32: Environmental impact assessment: Soil

Activity:

- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:

Construction Phase

- Loss of topsoil due to ineffective topsoil removal and storage.
- Soil erosion due to the clearance of vegetation.
- Inadequate concurrent rehabilitation.

Operational Phase

- Incorrect management of stormwater runoff.

Nature and significance of environmental impact

Impact Description	Risk rating (before mitigation)			Environmental Objective	Management / Mitigation / Monitoring Measures	Timeframe	Responsibility	Risk rating (after mitigation)			Applicable legislation / other documents
	Probability	Magnitude	Severity					Probability	Magnitude	Severity	
Construction Phase											
Degradation and loss of a valuable resource (topsoil), where degraded vegetation needs to be cleared for the waste tyre storage area.	3	3	M	To reduce the duration and extent of topsoil exposure so as to preserve it as a resource and protect it from erosion.	• Topsoil (top 150mm) is to be stockpiled in discrete areas and retained for future landscaping efforts around the waste tyre storage area. • Any sub-soil or rocks removed should also be stockpiled separately and be used during the rehabilitation. • Cleared vegetation should be used as a brush pack on topsoil stockpiles for erosion prevention. • Minimise the length and steepness of slopes. • 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. • Replace topsoil concurrent with construction, whenever possible. • Cordon off areas under rehabilitation using danger tape. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998

					access. • Aim to replace stockpiled topsoil to its original depth. • 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. • Compacted soil should be ripped to ensure effective re-vegetation. • Work necessary additives, as indicated by the soil analysis, into the soil. • Re-vegetation by indigenous grass species. • 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. • Soil stabilising measures could include rotovating in straw bales (at a rate of 1 bale/20m²), applying mulching or brush packing, or creating windbreaks using brush or bales.						
Operational Phase											
Soil erosion due to improper management of stormwater onsite.	3	2	M	To ensure adequate stormwater management and to prevent soil erosion.	• The site must have an adequate and effective stormwater management system in place. • Stormwater measures should be inspected on a regular basis in order to ensure that the structures are functional and not causing soil erosion. • Where necessary, place culverts underneath road foundations.	Life of operation	Facility Manager	2	1	L	• NEMA, 1998
Decommissioning Phase											
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 33: Environmental impact assessment: Soil, stormwater and groundwater pollution

Activity:

- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:

Construction Phase

- Incorrect management, storage and disposal of concrete and cement or spillages from equipment used for construction (e.g. cement mixers).
- Incorrect management, storage and disposal of chemicals.
- Incorrect management, storage and disposal of construction, general and hazardous waste.
- Unsanitary conditions on site.
- Incorrect management and disposal of contaminated wash water or wastewater.
- Leaking and/or spillages of fuels, greases and oils.

Operational Phase

- Incorrect management, storage and disposal of chemicals and fuels.
- Incorrect management, storage and disposal of general and hazardous waste.
- 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	Risk rating (before mitigation)			Environmental Objective	Management / Mitigation / Monitoring Measures	Timeframe	Responsibility	Risk rating (after mitigation)			Applicable legislation / other documents
	Probability	Magnitude	Severity					Probability	Magnitude	Severity	
Construction Phase											
Soil, stormwater and groundwater pollution due to spillages and/or improper handling-, storage-, mixing- or disposal- of cement and concrete.	3	3	M	To prevent the pollution of soil, stormwater and groundwater as a result of spillage, improper handling, storage, mixing or disposal of cement and concrete.	• Cement may only be mixed on an impermeable surface (not on bare soil). • 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. • Ready-mix trucks are not permitted to clean chutes on site. Cleaning into foundations or a dedicated cleaning pit is permitted. • 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. • Both used and unused cement bags are to be stored in weatherproof containers so as not to	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998

					be affected by rain or runoff. • 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. • 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.						
Soil, stormwater and groundwater pollution due to poor management and accidental spills of hazardous chemical substances including fuel, greases and oils used onsite.	3	3	M	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.	• Identify all hazardous chemical substances used onsite including fuel, greases and oils. • Obtain the material safety data sheet of each of hazardous chemical substance. • Material Safety Data Sheets for all hazardous chemical substances must be readily available on site. • 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. • Train staff on the use of chemicals in accordance with the risks as described in the material data sheets. • Keep a stock inventory register of all chemicals in the store. • Powders must be stored above liquids. • Proper storage of chemicals in a lockable, well ventilated building. • Ensure adequate access control for the storage area. • Storage areas for hazardous chemicals are to comply with standard fire safety regulations. • Safety signage including “No Smoking”, “No Naked Lights” and “Danger”, and product identification signs, are to be clearly displayed in areas housing chemicals. • 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. • Chemicals are to be properly labelled and handled in a safety conscious manner. • All personnel handling hazardous chemicals and hazardous materials are to be issued with the appropriate Personal Protective Equipment	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998

					(PPE). • Ensure that diesel, fuel and/or oil tanks are in a bunded area with capacity of holding 110% of the total storage volume. • The removal of only the daily-required amount of chemicals to be used from the shed. • 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. • Use of drip trays during filling of machinery or equipment. Drip trays should be emptied into secondary containers on a regular basis. • 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. • Immediately clean all spillage of fuels, lubricants and other petroleum based products. • The contaminated material must be disposed of in accordance with the waste management procedure. • No hazardous chemicals must be discarded in the sewage or stormwater system. • Soil contaminated with hazardous chemical substances shall be treated as hazardous waste and removed from site.					
Soil, stormwater and groundwater pollution due to poor waste management. Nuisance caused by odours and unsightly appearance of waste onsite.	4	2	M	To prevent soil, stormwater and groundwater pollution and nuisance due to poor waste management.	• Building and demolition waste must be disposed of at a licensed landfill site. Steel should be taken to a licensed recycling facility. • The management of waste must be in accordance with the stipulations of the municipal Solid Waste By-law (2013). • Installation of sufficient waste bins, skips or bulk containers. Containers must be present on site at all times. • All containers (bins, skips or bulk containers) shall be kept in a clean and hygienic manner. • Containers (bins, skips or bulk containers) utilised for the disposal of general and hazardous waste must be demarcated accordingly. • Waste material may only be temporarily stored at areas demarcated for such storage practices. • General waste shall be stored in a manner that prevents the harbouring of pests. • General waste material should always be stored or disposed of separately from hazardous waste	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998 • NEM:WA, 2008 • Moses Kotane Local Municipality Solid Waste By-law, 2013

					material (e.g. oil, diesel). • 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. • Skips or bulk containers should be removed to a licensed landfill site on a weekly basis or more often if required. • No littering is permitted and site clean-ups must regularly be undertaken.						
Soil, stormwater and groundwater pollution from unsanitary conditions onsite.	3	3	M	To prevent soil, stormwater and groundwater pollution from unsanitary conditions onsite.	• Sufficient ablution facilities shall be provided – minimum of 1 toilet per 15 workers. • The ablution facilities must be on impermeable surfaces. Functional, existing ablution facilities can be used. • 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. • Ablating anywhere other than in the toilets shall not be allowed. • Temporary ablution facilities are to be secured to prevent them from blowing or falling over. • The contractor shall ensure that any chemicals and/or waste from the ablution facilities is not spilled on the ground at any time. • Ablution facilities are to be serviced weekly or more frequently if required. • The contractor is to ensure that no spillage occurs and that the contents are removed from site on a regular basis. • Toilet paper must be provided at all times.	During the construction phase.	• Construction contractor • ECO	1	2	L	• NEMA, 1998 • Water and Sanitation By-laws, 2008
Soil and water pollution as a result of contaminated wash water entering the environment.	3	3	M	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.	• No washing of vehicles is permitted on site. • 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. • No wastewater/wash water may be disposed of on site, onto the soil or into any water body. • Runoff from washing activities is to be contained by berms or trenches.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998
Hydrocarbon pollution of soil, stormwater and groundwater due to the fuel-, grease- or oil spillages or leaking equipment and vehicles.	3	3	M	To prevent hydrocarbon pollution of soil, stormwater and groundwater through the spilling of fuel, grease or oil or leaking	• Equipment and vehicles are to be repaired immediately upon developing leaks. • Drip trays shall be supplied for all repair work undertaken on machinery on site.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998

				equipment and vehicles.	• Drip trays are to be utilised during greasing and re-fuelling of machinery and to contain incidental spills and pollutants. • 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. • 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. • Soil contaminated with hazardous substances, fuel or oil shall be treated as hazardous waste and removed from site. • 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. • All liquid fuels (petrol and diesel) are to be stored in tanks or containers with lids. • Inspect vehicles on entering the construction site to ensure that they are in sound condition to reduce the risk of oil or diesel spillages.						
Operational Phase											
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.	4	4	H	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.	Life of operation	Facility Manager	3	3	M	• NEMA, 1998
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.	3	3	M	To prevent and minimise soil, stormwater and groundwater pollution and nuisance due to poor waste management.	• 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). • The management of waste must be in accordance with the stipulations of the municipal Solid Waste By-law (2013). • The Waste Tyre Pyrolysis Plant must be registered on the South African Waste Information System. • All waste storage containers must comply with the conditions as stipulated in GNR. 926 of 29 November 2013.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • NEM:WA, 2008 • Moses Kotane Local Municipality Solid Waste By-law, 2013

					• 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. • An Emergency Preparedness Plan must be compiled in accordance with GNR. 926 of 29 November 2013. • Monitoring, auditing, reporting and record keeping must be conducted in accordance with GNR. 926 of 29 November 2013. • 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. • 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. • 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). • 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. • No littering is permitted and site clean-ups must regularly be undertaken.					
Soil, stormwater and groundwater pollution from unsanitary conditions onsite during operational activities.	3	3	M	To prevent soil, stormwater and groundwater pollution from unsanitary conditions onsite.	• Sufficient ablution facilities shall be provided – minimum of 1 toilet per 15 workers. • Functional, existing ablution facilities can be used. • Ablating anywhere other than in the toilets shall not be allowed. • Ablution facilities are to be serviced weekly or more frequently if required. • Toilet paper must be provided at all times.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • Water and Sanitation By-laws, 2008
Soil, stormwater and groundwater pollution as a result of contaminated wash water entering the environment during operational activities. Wash water will be generated when the waste tyres are	3	3	M	To prevent soil, stormwater and groundwater pollution by contaminated wash water.	• Cleaning the tyres using compressed air instead of water should be considered. • 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	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • Water and Sanitation By-laws, 2008

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.					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. • Wash water that cannot be re-used must also be disposed of at a licensed waste disposal site • 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. • All the requirements and conditions contained in the Water and Sanitation By-laws, 2008, must be adhered to. • 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. • 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: ▪ 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. ▪ It may not have a pH of less than 6.0 or greater than 9.5. ▪ It may not contain the following: ❖ Calcium carbide or radioactive waste or isotope. ❖ Yeast, yeast waste, molasses (spent or unspent), in excess of the amount permitted by the authorised official. ❖ Cyanogen compounds capable of liberating hydrogen cyanide on acidification. ❖ 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. ▪ 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. ▪ 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. ▪ 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. ▪ 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. ▪ 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. • The wash water delivery pipeline into the municipal sewage disposal system must be maintained in a proper condition and free from leaks. • No wastewater/wash water may be disposed of on site, onto the soil or into any water body. • Runoff from washing activities is to be contained by berms or trenches. • No washing of vehicles is permitted on site. • 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.						
Soil and groundwater pollution from leaking or broken sewerage pipes.	3	3	M	To prevent soil, stormwater and groundwater pollution from leaking or broken sewerage pipes.	• Ablution facilities should be maintained to prevent or minimise blockage and leakages. • 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. • 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.	Life of operation	Facility Manager	1	3	L	• NEMA, 1998

					• Toilets should have properly closing doors and be supplied with toilet paper.						
Contamination of clean stormwater runoff when the water runs through “dirty” areas on the site.	4	3	H	To ensure adequate stormwater management and to prevent the contamination of clean stormwater.	• The site must have an adequate and effective stormwater management system in place. • No hazardous chemicals or waste may be discarded in the stormwater system. • 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. • Where necessary, place culverts underneath road foundations.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998
Incorrect storage of waste tyres and shredded tyres resulting in soil, stormwater and groundwater pollution. 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). Should a fire become established at the waste tyre storage area, the burning tyres would decompose into the following: • Ash (typically containing carbon, zinc oxide, titanium dioxide, silicon dioxides); • Sulphur compounds such as carbon disulfide, sulphur dioxide, hydrogen sulphide; • Polynuclear aromatic hydrocarbons such as benzo(a)pyrene, chrysene, benzo(a)anthracene, etc.) in the oil that is produced; • Aromatic-, naphthenic- and paraffinic oils; • Particulates; • Various light-end aromatic hydrocarbons, such as toluene, xylene and benzene; and • Oxides of nitrogen and carbon (www.mfe.gov.nz). 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). The waste tyres will be stored in an area of up to 4 800m^2 prior to their processing in the pyrolysis plant.	3	4	H	To ensure that the waste tyres are stored in the correct manner so as to prevent environmental pollution, due to, for example, the release of oil from burning tyres.	• The waste tyre storage area must have an impermeable surface, such as a concrete slab. • The waste tyres must be stored in accordance with the stipulations in GNR. 926 of 29 November 2013. • The waste tyre storage facility must be registered within the competent authority within 90 days prior to the construction phase commencing. • The waste tyre storage facility must be designed in accordance with the stipulations in GNR. 926 of 29 November 2013. • The waste tyre storage facility must have correct access control and signage as stipulated in GNR. 926 of 29 November 2013. • The waste tyre storage facility must be operated as stipulated in GNR. 926 of 29 November 2013. • In accordance with the Waste Tyre Regulations (2009), the waste tyre storage area may not exceed 30 000m2. • 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. • 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. • A security attendant trained in fire prevention must be on site at all times. • The site manager must be on site at all times (when the facility is open/operational). • No single pile of waste tyres may exceed a height of 3 metres, a length of 20 metres or a width of 10 metres. • All interior firebreaks between the waste tyre	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • NEM:WA, 2008 • Waste Tyre Regulations, 2009

					piles must be at least five metres wide. • The storage area must be flat and hard packed. • The site must make provision for storm water management. • 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. • All firebreaks must be at least 8 metres wide. • Waste tyre piles may not be located within 8 metres from a power line. • The waste tyres must not be stored on steeply graded surfaces or anywhere else where they may pose a significant environmental or fire risk. • 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.						
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.	4	3	H	To ensure that the pyrolysis oil, steel and Carbon black is stored in a safe and responsible manner.	• 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 bunded area must be calculated after the volume of the other tanks below the bund wall (excluding the largest tank), has been deducted. • 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). • All tanks must be labelled to show their composition and tank capacity. Bund walls must be labelled to show their capacity. • The bund area must be equipped with an operational sump and pump system to collect any oil that may spill. • The bunded area must have adequate firefighting equipment installed to the satisfaction of the local authorities. • The steel that is removed from the tyres must be stored in containers prior to its removal off site. • The produced Carbon black must be stored in impermeable, sealable bags within the designated storage building.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998
Inadequate storage of ash may result in the leaching of zinc and sulphur when rain water infiltrates through the ash.	3	3	M	To prevent the inadequate storage of ash that may be	• No ash may be stored in the open. • Ash must be stored in impermeable, sealable	Life of operation	Facility Manager	1	3	L	• NEMA, 1998

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.				generated under abnormal conditions.	bags within the designated storage building and disposed of at a licensed hazardous landfill site. • The ash must be transported in sealed plastic bags.						
Decommissioning Phase											
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 34: Environmental impact assessment: Resources

Activity:
- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:

Construction Phase
- Inefficient and redundant use of valuable resources.

Operational Phase
- Leaking or broken water storage vessels.
- Leaking or broken water pipelines.
- Inefficient or ineffective operation of the backup generator.
- Inefficient or ineffective operation of the Waste Tyre Pyrolysis plant.

Nature and significance of environmental impact

Impact Description	Risk rating (before mitigation)			Environmental Objective	Management / Mitigation / Monitoring Measures	Timeframe	Responsibility	Risk rating (after mitigation)			Applicable legislation / other documents
	Probability	Magnitude	Severity					Probability	Magnitude	Severity	
Construction Phase											
Wastage or depletion of valuable resources like water and electricity due to inefficient or redundant usage. Water and electricity will be obtained from the municipality using existing bulk service connections to the site.	3	2	M	To prevent the wastage or depletion of valuable resources.	**General** • Ensure that all employees have been informed of the importance of natural resources (proper environmental training and awareness). • Regular site inspection by supervisors. **Water** • Regular inspection and maintenance of all water tanks, toilets, water pipes and taps.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998 • NWA, 1998

					• Leaking tanks, taps, toilets and pipes are to be repaired immediately. • Running water taps and pipes may not be left unattended. • All pipe, hose and tap connections are to be fitted with correct and appropriate plumbing fittings.						
Operational Phase											
Wastage or depletion of water from the municipal water supply due to leaking or broken water pipelines and water storage vessels.	3	2	M	To prevent the wastage or depletion of a valuable resource.	• Ensure that all employees have been informed of the importance of natural resources (proper environmental training and awareness). • Regular site inspection by supervisors. • Regular maintenance and inspection of the municipal water supply pipeline(s) to the site. • Monitoring of resource consumption to detect leakages as soon as possible. • Integrity tests must be conducted on water storage vessels as stipulated by the suppliers.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • NWA, 1998
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.	3	3	M	To ensure the efficient, long-term operation of the backup generator.	• Ensure that the generator is correctly maintained as stipulated by the manufacturer and repaired when required. Optimal combustion will allow for 'cleaner' emissions. • Limit unnecessary idling of the generator. • Only use the generator when required and use it as prescribed by the manufacturer.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998
Wastage or depletion of valuable resources, such as LPG and water, due to inefficient or ineffective operation of the Waste Tyre Pyrolysis plant.	3	2	M	To ensure efficient operation of the Waste Tyre Pyrolysis plant so that resources are used optimally.	• The pyro-gas from the pyrolysis process must burn to provide energy for the pyrolysis process. • Process Char into Carbon Black. • 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. • Cleaning the tyres using compressed air instead of water should be considered. • The metal that is separated from the waste tyres must be recycled.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998
Decommissioning Phase											
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 35: Environmental impact assessment: Workers' safety

Activity:

- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:

Construction Phase

- Inadequate training of employees or contractors on risks associated with construction activities.
- Safety hazards may occur if equipment is not handled in the correct manner.
- Employees not receiving the correct PPE for their specific responsibilities.
- Employees not adhering to safety rules implemented at the site.
- Construction of the LPG storage tank.
- Construction of the pyrolysis oil storage tank(s).

Operational Phase

- Inadequate training of employees or contractors on risks associated with operational activities.
- Safety hazards may occur if equipment is not handled in the correct manner.
- Employees not receiving the correct PPE for their specific responsibilities.
- Employees not adhering to safety rules implemented at the site.
- Storage of LPG on site.
- Storage of pyrolysis oil on site.

Nature and significance of environmental impact

Impact Description	Risk rating (before mitigation)			Environmental Objective	Management / Mitigation / Monitoring Measures	Timeframe	Responsibility	Risk rating (after mitigation)			Applicable legislation / other documents
	Probability	Magnitude	Severity					Probability	Magnitude	Severity	
Construction Phase											
Injury of employees and contractors working on site during the construction phase.	3	3	M	To ensure that contractors work in a safe working environment and are not injured.	• An emergency procedure, taking into consideration all potential emergencies, such as a fire outbreak, hazardous chemical spill, etc. should be compiled. • The contractor is to ensure that all employees, including sub-contractors and their employees, are trained on the emergency procedure. • Follow-up emergency training may be required from time to time as new subcontractors or crews commence work. • The contractor is to maintain accurate records of any emergency training undertaken.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998 • OHSA, 1993
Inadequate construction of the LPG storage tank can lead to failures during the operational phase.	3	3	M	To ensure that the LPG storage tank is constructed to the required specifications.	• 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).	During the construction phase.	• Construction contractor • ECO	1	3	L	• NEMA, 1998

Inadequate construction of the pyrolysis oil storage tank(s) can lead to failures during the operational phase.	3	3	M	To ensure that the pyrolysis oil storage tank(s) is/are constructed to the required specifications.	• 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). • 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. • 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.	During the construction phase.	• Construction contractor • ECO	1	3	L	• NEMA, 1998
Operational Phase											
Injury of employees working on site during the operation of the Waste Tyre Pyrolysis Plant.	3	3	M	To ensure that employees and contractors work in a safe working environment and are not injured.	• All employees must receive relevant, job-specific training and must be adequately qualified to work at the facility. • All employees must be provided with the correct PPE for the work that they conduct. This includes, for example, boots, overalls, masks and gloves. • Clean overalls must be provided to workers on a daily basis. • New masks must be provided on a daily basis if disposable masks are used. • An emergency procedure, taking into consideration all potential emergencies, such as a fire outbreak, hazardous chemical spill, etc. should be compiled. • All employees, including sub-contractors and their employees, must be trained on the emergency procedure. • Follow-up emergency training may be required from time to time as new subcontractors or crews commence work. • The facility manager is to maintain accurate records of any emergency training undertaken. • 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. • A safety valve must be installed to release any excess pressure build-up within the reactor	Life of operation	Facility Manager	2	2	L	• NEMA, 1998 • OHSA, 1993 • Environmental Regulations for Workplaces, 1987

					vessel. • 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. • The requirements of the Environmental Regulations for Workplaces, 1987, must be adhered to.						
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. 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. 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.	3	4	H	To ensure that the LPG is stored in a safe and responsible manner.	• A copy of the Safety Data Sheet (SDS) for LPG must be kept on site and the provisions in the SDS followed. • No smoking may take place in the vicinity of the LPG storage tank and signage indicating “No Smoking” must be displayed. • 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. • Employees must avoid breathing in the gas. • Employees must wear protective clothing such as goggles, gloves and face shields, to prevent eye, skin and face contact. • Protect the LPG storage tank from sunlight and place it in a secure or locked up location that is well ventilated. • Adequate firefighting equipment must be kept at the LPG storage tank. Use a suitable extinguishing media.	Life of operation	Facility Manager	2	3	M	• NEMA, 1998 • OHSA, 1993
The incorrect storage of the pyrolysis oil may lead to fires and harm to employees.	3	4	H	To ensure that the pyrolysis oil is stored in a safe and responsible manner.	• Adequate firefighting equipment must be kept at the pyrolysis oil storage tank(s). Use a suitable extinguishing media. • No smoking may take place in the vicinity of the storage tank(s) and signage indicating “No Smoking” must be displayed. • 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. • Place the oil storage tank(s) in a secure or locked up location.	Life of operation	Facility Manager	2	3	M	• NEMA, 1998 • OHSA, 1993
Decommissioning Phase											
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 36: Environmental impact assessment: Heritage

Activity:
- Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant.
- Operation of the Waste Tyre Pyrolysis Plant.

Aspect:
- Disturbance of artefacts or sites of cultural heritage (archaeological and historical) significance.

Nature and significance of environmental impact											
Impact Description	**Risk rating (before mitigation)**			**Environmental Objective**	**Management / Mitigation / Monitoring Measures**	**Timeframe**	**Responsibility**	**Risk rating (after mitigation)**			**Applicable legislation / other documents**
	Probability	**Magnitude**	**Severity**					**Probability**	**Magnitude**	**Severity**	
Construction Phase											
Construction activities may disturb or destroy sites, features or artefacts of archaeological and/or historical importance. As the open space on site which will be disturbed by the proposed development is less than 5 000m^2, 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.	1	3	L	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.	During the construction phase.	• Construction contractor • ECO	1	2	L	• NEMA, 1998 • NHRA, 1999
Operational Phase											
Operational activities may disturb or destroy sites, features or artefacts of archaeological and/or historical importance. 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.	1	3	L	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.	Life of operation	Facility Manager	1	2	L	• NEMA, 1998 • NHRA, 1999
Decommissioning Phase											
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 37: Environmental impact assessment: Infrastructure

Activity:											
• Construction activities, repair activities and the installation and assembly of the Waste Tyre Pyrolysis Plant. • Operation of the Waste Tyre Pyrolysis Plant.											
Aspect:											
• Wear of access roads and insufficient vehicle inspections.											
Nature and significance of environmental impact											
Impact Description	**Risk rating (before mitigation)**			**Environmental Objective**	**Management / Mitigation / Monitoring Measures**	**Timeframe**	**Responsibility**	**Risk rating (after mitigation)**			**Applicable legislation / other documents**
	Probability	**Magnitude**	**Severity**					**Probability**	**Magnitude**	**Severity**	
Construction Phase											
Wear of access roads, accidents on access roads, unpermitted transport of materials and/or loss of materials being transported on access roads.	4	2	M	To minimise the impact of an increase of traffic on access roads to the construction site.	• Ensure that all vehicles using access roads are roadworthy. • All loads are to be securely fastened when being transported. • All vehicles are to adhere to the tonnage limitation and acquire a permit as required. • All speed limits and other traffic regulations on the public roadways must be adhered to.	During the construction phase.	• Construction contractor • ECO	2	2	L	• NEMA, 1998
Operational Phase											
Wear of access roads, accidents on access roads, unpermitted transport of materials and/or loss of materials being transported on access roads.	4	2	M	To minimise the impact of an increase of traffic on access roads to the Waste Tyre Pyrolysis Plant.	• Apply the same mitigation measures as for the construction phase.	Life of operation	Facility Manager	2	2	L	• NEMA, 1998
Decommissioning Phase											
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										

Refer to Part 8 below for a summary on the key findings related to the Waste Tyre Pyrolysis Plant and its associated infrastructure.

7.3.3 Cumulative Impacts

Cumulative impacts refer to the situation where an activity may in itself not have a significant impact, but may become significant when added to the existing and potential impacts from similar or different activities in the area. The following potential cumulative impacts have been identified:

Table 38: Cumulative impacts

Impact: Air pollution and nuisance (generation of air emissions)	
Contributing aspects	Atmospheric emissions generated at the proposed pyrolysis plant will add to atmospheric emissions released by all other sources within the municipal area and beyond. The combined release of atmospheric emissions within the Bojanala Platinum District Municipality and the Waterberg District Municipality is governed in terms of the Waterberg-Bojanala National Air Shed Priority Area's Air Quality Management Plan
Impact: Environmental Noise	
Contributing aspects	Noise generated at the proposed pyrolysis plant will add to existing noise levels as generated by the other industries within the Bodirelo Industrial Site, Mogwase

8. ENVIRONMENTAL IMPACT STATEMENT

8.1 Summary of key findings

This application for Environmental Authorisation in terms of the National Environmental Management Act, 1998, and licensing in terms of the National Environmental Management: Air Quality Act, 2004, have been initiated to allow the construction and operation of the Vaporox Waste Tyre Pyrolysis Plant to be authorised in terms of the required environmental legislation.

The above mentioned authorisations will allow the plant to operate in a legally compliant manner in terms of the relevant environmental legislation in South Africa.

The following main negative impacts may arise from the proposed activity:

- Air pollution due to the release of emissions;
- Soil, stormwater and groundwater pollution;
- Nuisance due to noise and dust generation; and
- Harm to employees working at the pyrolysis plant.

8.2 Comparative assessment of positive and negative implications of the proposed activity and alternatives

Part 6 of this EIR contains a detailed investigation and assessment of the alternative options for the Waste Tyre Pyrolysis plant activities. The positive and negative implications of each alternative are also described in the table below. A comparison is done below to assess the positive and negative implications of the proposed activities compared with the no-go alternative. This should provide a fundamental consideration of the feasibility of the project.

Table 39: Comparison of the proposed preferred activities and the no-go option

	Positive Impacts	Negative Impacts/Aspects
Activity Alternative A1 – Retreading of tyres	• Retreading tyres allows the tyres to be re-used.	• The quality of the retreaded tyres is not good.
Activity Alternative A2 – Re-use of tyres in other applications	• Mechanically or cryomechanically milled/ground up tyres can be re-used in other applications, such as for sport surfaces, carpets, playgrounds etc. If the rubber is ground up into a very fine powder, the powder can be used to reinforce new rubber products.	• These processes have a high energy usage and there is a limited market for the products.

	Positive Impacts	Negative Impacts/Aspects
Activity Alternative A3 – Reclamation of tyres	• The scrap tyres can be reclaimed.	• The reclamation process is difficult and costly. The quality of the reclaimed rubber is also not high and the re-selling of the reclaimed rubber as a raw material is therefore problematic.
Preferred Alternative: Activity Alternative A4 – Waste Tyre Pyrolysis	• Pyrolysis is a viable option for the recycling or recovery of waste tyres and a number of pyrolysis plants are currently in operation worldwide. • The existing, derelict buildings at the proposed site will be repaired and upgraded and this will improve the visual/aesthetic character of the property. • The value of the proposed property will increase through the proposed development as the property is currently unused and the buildings are derelict. • Safety on site will improve once the property has been developed and is in use. • Employment opportunities will be created during the construction and operational phases of the project. • Stimulation of the local, district and provincial economies. • Infrastructure at the proposed site will be developed and improved. This includes bulk services' infrastructure.	• Atmospheric pollution from the Waste Tyre Pyrolysis plant and its associated processes. • Noise pollution due to activities at the Waste Tyre Pyrolysis plant. The plant will, however, be situated within an existing Industrial area. • Increased traffic will be generated to and from the site.
Location Alternative B1 – Developing an undeveloped site	• No positive impacts could be identified.	• The purchase or renting and development of an undeveloped property would entail significant financial costs and is not economically feasible. • Such an undeveloped site may also be located within a sensitive environment and fauna or flora of conservation concern could therefore be disturbed.
Preferred Alternative: Location Alternative B2 – Development of an existing site	• This location alternative is ideal as existing buildings and bulk service connections can be utilised. The financial costs are therefore less than developing an entirely new site.	• Money will need to be spent to repair and upgrade the buildings and infrastructure at the proposed/preferred site. • Money will need to be spent to

	Positive Impacts	Negative Impacts/Aspects
with suitable, existing infrastructure	• The proposed site is already in a disturbed state.	install/construct the Waste Tyre Pyrolysis plant.
Location Alternative B3 - Development of an existing site with unsuitable, existing infrastructure	• No positive impacts could be identified.	• The purchase of a property with existing, but unsuitable infrastructure would be more costly than buying an undeveloped property. • The purchase of a property with unsuitable, existing buildings would require these buildings to be demolished so that suitable buildings can be constructed. This would entail significant financial costs and is not economically feasible.
Site Layout Alternatives (C)	• Limited site layout alternatives exist at the preferred site. Optimal use will be made of the existing buildings and open areas to accommodate the Waste Tyre Pyrolysis Plant and its associated infrastructure.	
Process and Design Alternative D1 (Scenario C)	• This alternative may be acceptable in practice, although it is more likely to require abatement technology. • The applicant and Pyrolysis Plant manufacturer will consider all the applicable process and design alternatives and will design the plant and its processes for the optimal pyrolysis of the waste tyres.	• Exceedances of the NAAQS were observed within close proximity to the site boundary. • This alternative resulted in more exceedances of the NAAQS, as simulated in the Atmospheric Impact Assessment, than Alternative D2.
Process and Design Alternative D2 (Scenario I)	• This alternative resulted in less exceedances of the NAAQS, as simulated in the Atmospheric Impact Assessment, than Alternative D1. • The applicant and Pyrolysis Plant manufacturer will consider all the applicable process and design alternatives and will design the plant and its processes for the optimal pyrolysis of the waste tyres.	• Exceedances of the NAAQS were observed within close proximity to the site boundary.
No-Go Option	• No atmospheric emissions will be released from the sites. • No noise will be generated at the site. • No additional traffic to and from the site will be generated.	• The existing, derelict buildings at the proposed site will not be repaired and will remain a visual/aesthetic nuisance to surrounding receptors. • The value of the property will remain low if the site is not upgraded.

	Positive Impacts	Negative Impacts/Aspects
		• The security on site will not improve as the site will remain vacant and derelict. • No additional employment opportunities will be created and the local, district and provincial economies will not be stimulated.

As shown in the table above, the only viable Activity Alternative is Alternative A4 (Waste Tyre Pyrolysis), even though such a pyrolysis plant will have negative environmental impacts. The other activity alternatives are not viable as the processes are complicated, costly and do not have a proven market for their various products. In terms of the Location Alternatives, Alternative B2 (Development of an existing site with unsuitable, existing infrastructure) is the most viable option as this entails the least costs for the applicant in terms of developing a site for the pyrolysis plant. On the proposed site/property there are limited Site Layout Alternatives, but the existing buildings and open spaces are ideal for the pyrolysis operation that the applicant is proposing. The applicant and pyrolysis plant manufacturer will consider the process and design options for the plant and the final designs will be optimal for the pyrolysis of the waste tyres. The No-Go Option will not have any environmental impacts, but keeping the site in its current, derelict state will also not contribute towards any new employment opportunities, stimulation of economies or improvements to the visual character of the site.

9. CONCLUSION

Information has been provided to the North West Department of Rural, Environmental and Agricultural Development and interested and affected parties during the Scoping- and EIA Phases. Comments and concerns were received and integrated into this environmental impact assessment report. This document serves as the draft report to be considered by the registered I&APs and state departments. Should there be any comments received on this report within the notice period provided, these comments will be address in the final report that will be submitted to the competent authority, the North West Department of Rural, Environmental and Agricultural Development, for final perusal and decision making.

This EIA process has been carried out in accordance with the NEMA, 1998, and the Regulations there under.

The positive and negative impacts of all the alternatives have been identified and assessed in Chapter 6. The pyrolysis of waste tyres has been identified as the only viable Activity Alternative, even though such a plant will result in negative environmental impacts. The identified impacts/environmental risks to the environment as a result of the proposed Waste Tyre Pyrolysis Plant are mostly **Medium**. The impacts can, however, be mitigated to mostly **Low**, provided that the draft Environmental Management Programme, containing all proposed mitigation measures, is implemented. It is further important that the EMP must be viewed as a dynamic, working document that will be improved upon as and when required.

The construction of the pyrolysis plant on a site with existing infrastructure and bulk services was found to be the most viable option for the client in terms of the financial costs associated with establishing a site for the proposed plant. Designing the Waste Tyre Pyrolysis Plant with a stack height in line with Good Engineering Practice (18.75m) (Scenario I) is the preferred design alternative as it resulted in fewer exceedances than the current proposed stack height of 4m (Scenario C). Scenario C may, however, still prove to be acceptable in practice, although it is more likely to require abatement technology than Scenario I.

Positive impacts from the proposed project include the creation of new employment opportunities as well as the stimulation of local, district and provincial economies.

Based on the outcomes of the Environmental Impact Assessment, conducted as part of this full Scoping and Environmental Impact Assessment process, as well as the alternatives assessment, the following recommendations are made:

1. The proposed project/activity (the construction and operation of the Waste Tyre Pyrolysis Plant) should be authorised and allowed to proceed on the preferred site (25°16’12.40’’; 27°16’25.36’’), on condition that the proposed plant also obtains an Atmospheric Emission License.

2. The mitigation measures proposed in this report and the draft Environmental Management Programme must be implemented during all phases of the proposed project.
3. It is assumed that the mitigation measures proposed in this report and the draft Environmental Management Programme will be correctly implemented by the applicant and that they will be effective.
4. It is recommended that Scenario I be implemented for the pipeline chimney stack height of the proposed Waste Tyre Pyrolysis Plant.
5. A communications pathway must be established that would allow the designated ECO to accept and deal with stakeholder complaints.
6. Proposed mitigation measures should be incorporated as far as possible into the operational plan for the plant.
7. Strict monitoring and enforcement of requirements of the EMP must be undertaken to ensure that contractors and operators adhere to these requirements.