FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR HI-FOS (PTY) LTD PROPOSED PHOSPHORIC ACID PLANT, STANDERTON, MPUMALANGA FOR:

1. AN ENVIRONMENTAL AUTHORISATION IN TERMS OF SECTION 24(2) AND 24D OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO. 107 OF 1998) REFERENCE NUMBER 1/3/1/16/G45
2. AN ATMOSPHERIC EMISSIONS LICENCE IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (NO. 39 OF 2004).
3. A WATER USE LICENSE APPLICATION IN TERMS OF SECTION 21 OF THE NATIONAL WATER ACT (NO. 36 OF 1998).

REPORT 1 OF 1

Final

This Final Environmental Impact Assessment Report has been compiled for submission to authorities for decision-making

Compiled By

P.J. Tolksdorff
N. Maraschin

Job No

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Date

May 2017

Compiled For

Hi-Fos (Pty) Ltd

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PURPOSE OF THIS DOCUMENT

This document, the Final Environmental Impact Assessment Report (EIAR), presents the findings of the Environmental Impact Reporting phase, which is the second phase of the Scoping and Environmental Impact Reporting (S&EIR) process. The proponent, Hi-Fos (Pty) Ltd (Hi-Fos), is applying, by way of S&EIR for:

1. An environmental authorisation (EA) (1/3/1/16/G45) in terms of section 24(2) and 24D of the National Environmental Management Act (No. 107 of 1998) (NEMA).
2. An Atmospheric Emissions Licence (AEL) in terms of the National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA).
3. A Water Use License Application (WULA) in terms of section 21 of the National Water Act (No. 36 of 1998) (NWA).

In terms of the NEMA, Government Notice Regulation (GNR) 928 (as amended 7 April 2017) (Environmental Impact Assessment (EIA) Regulations), the proponent has appointed Terra Pacis Environmental (Pty) Ltd (Terra Pacis) as the independent environmental assessment practitioner (EAP) to undertake the S&EIR process. As required by relevant legislation, Terra Pacis made the Draft EIAR available for review, from 20 April 2017 to 22 May 2017, prior to submission to authorities

In accordance with the EIA Regulations, registered interested and affected parties (I&APs) were given the opportunity to verify that all the issues mentioned during the public participation process, have been addressed in the EIAR. The public participation process provided an opportunity for I&APs to participate on an informed basis and ensure their needs and requirements are considered and allows the decision-making authority to understand to what degree stakeholders are willing to accept and live with the trade-offs involved. After the Draft EIAR comment period, from 20 April 2017 to 22 May 2017 the report was updated with comments received.

In summary, this Final EIAR contains:

- a detailed description of the proposed development;
- a description of the need for and desirability of the proposed development and the identified feasible alternatives to the proposed activity;
- a description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- a summary of the findings of the specialist studies;
- a summary of the methodology used in determining the significance of potential impacts;
- a detailed assessment of all identified potential impacts;
- identified mitigation measures and the environmental management programme (EMPr);
- copies of all specialist reports has been appended to the Final EIAR; and
- any further information that will assist in decision-making by the authorities.

The Final EIAR will be submitted to the delegated lead authority responsible for authorising this project, in this case the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA), who will considering the findings in consultation with various other authorities and issue the environmental authorisation.

DISCLAIMER

The opinions expressed in this report have been based on the information supplied to Terra Pacis Environmental (Pty) Ltd (Terra Pacis) by Hi-Fos (Pty) Ltd (Hi-Fos). Terra Pacis has exercised all due care in reviewing the supplied information. Whilst Terra Pacis has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. Terra Pacis does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of Terra Pacis' investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which Terra Pacis had no prior knowledge nor had the opportunity to evaluate.

EXECUTIVE SUMMARY

INTRODUCTION

The proponent, Hi-Fos Pty Ltd (Hi-Fos), propose to construct and operate the following:

- Phosphoric Acid Plant.
- Calcium Ammonium Nitrate (CNX) Plant.
- Pure Mono Ammonium Phosphate (MAP 39) Plant.
- Mono Ammonium Phosphate (MAP 33) Plant.
- Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment).

and to move the Granular Fertilizer Blending Plant from Sonskyn (Pty) Ltd in Standerton to the proposed Phosphoric Acid Plant site (the site).

In order to construct and operate the abovementioned plants (collectively named the proposed Phosphoric Acid Plant) Hi-Fos, is applying, by way of Scoping and Environmental Impact Reporting (S&EIR) process for:

1. An environmental authorisation (EA) (1/3/1/16/G45) in terms of section 24(2) and 24D of the National Environmental Management Act (No. 107 of 1998) (NEMA).
2. An Atmospheric Emissions Licence (AEL) in terms of the National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA).
3. A Water Use License Application (WULA) in terms of section 21 of the National Water Act (No. 36 of 1998) (NWA).

In addition to the above, Hi-Fos need to comply with:

- Declaration of a small boiler as a controlled emitter and establishment of emission standards Government Notice Regulation (GNR) 831 (1 November 2013) issued in terms of the NEM:AQA.
- The Norms and Standards, GNR 926 (29 November 2013) issued in term of the National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA). GNR 926 (29 November 2013) provides minimum standards for the design and operation of new and existing waste storage facilities, without the need to undertake an EA process.

LEGAL FRAMEWORK

Environmental Authorisation

EA in terms of section 24(2) and 24D of the NEMA is required for the following listed activities identified in terms of GNR 983 (as amended 7 April 2017):

Activity 24: The development of a road-

(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or
(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters

but excluding a road–

(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;
(b) where the entire road falls within an urban area; or
(c) which is 1 kilometre or shorter.

EA in terms of section 24(2) and 24D of the NEMA is required for the following listed activities identified in terms of GNR 984 (as amended 7 April 2017):

Activity 4: The development and related operations 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.

Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding-

(i) activities which are identified and included in Listing Notice 1 of 2014;
(ii) activities which are 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 the National Environmental Management: Waste Act, 2008 applies; or
(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less; or
(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.

Atmospheric Emissions Licence Application

An AEL is required in terms of section 37 of the NEM:AQA in respect of the following activity identified in GNR 893 (22 November 2013). The activity reads as follows:

Category 7: Inorganic Chemicals Industry

Subcategory 7.2: Production of Acids.

Subcategory 7.3: Production of Chemical Fertilizer.

In addition to the above, Hi-Fos need to comply with; Declaration of a small boiler as a controlled emitter and establishment of emission standards Government Notice Regulation (GNR) 831 (1 November 2013) issued in terms of the NEM:AQA.

Water Use Licence Application

A Water Use Licence (WUL) is sought in terms of section 41 of the NWA for activities listed in section 21 of the NWA. The water uses read as follows:

Section 21(a): Taking water from a water resource.

Section 21(b): Storing water.

Section 21(e): Engaging in a controlled activity identified in section 37(1) or declared under section 38(1).

Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.

General Authorisation's (GA) replace the need for a water user to apply for a licence in terms of the NWA provided that the water use is within the limits and conditions of the General Authorisation. The applicability of GA's for the above water uses will be discussed with the Department of Water and Sanitation (DWS).

Waste Management License

Hi-Fos need to comply with the Norms and Standards, GNR 926 (29 November 2013) issued in term of the NEM:WA. The GNR 926 provides minimum standards for the design and operation of new and existing waste storage facilities, without the need to undertake an EA process. The activities read as follows:

Category C (Norms and Standards in terms of GNR 926 (29 November 2013)):

Activity 5(1): The storage of general waste at a facility that has the capacity to store in excess of $100m^3$ of general waste at any one time, excluding the storage of general waste in lagoons or temporary storage of such waste.

Activity 5(2): The storage of hazardous waste at a facility that has the capacity to store in excess of $80m^3$ of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.

Who are the Decision-making Authorities

The delegated lead authorities responsible for administering and implementation of the relevant legislation are:

1. The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) – delegated lead authority for authorisation of the application for EA for activities listed in terms of GNR 983 and 984 (as amended 7 April 2017);
2. Gert Sibande District Municipality - delegated lead authority for the authorisation the AEL for activities identified in terms of GNR 893 (22 November 2013); and

3. The DWS – delegated lead authority for the authorisation of a WUL.

LOCATION

The proposed Phosphoric Acid Plant site (the site) is located off R23 approximately 27km from Standerton on Portion 4 of the farm Holfontein 399 (S 26° 52‘ 11.25” E 29° 01‘ 51.79”) in the Mpumalanga Province. The proposed site falls within the jurisdiction of the Lekwa Local Municipality, which forms part of the greater Gert Sibande Municipality. Portion 4 of the farm Holfontein 399 surveyor general code is T0IS00000000039900004.

Although Portion 4 of the farm Holfontein 399 is currently zoned as agricultural, a historical brickworks (constructed in 1964, decommissioned in 1999), farm houses, a community settlement and other farming structures exist.

PROPOSED ACTIVITIES

The Phosphoric Acid Plant will comprise the following principle activities:

- Phosphoric Acid Plant.
- Calcium Ammonium Nitrate (CNX) Plant.
- Pure Mono Ammonium Phosphate (MAP 39) Plant.
- Mono Ammonium Phosphate (MAP 33) Plant.
- Granular Fertilizer Blending Plant.
- Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment).

PROCESS BEING FOLLOWED

The S&EIR process as detailed in the GNR 982 (as amended 7 April 2017) (Environmental Impact Assessment (EIA) Regulations) and depicted in below entails in summary the following:

- Public participation process as described in chapter 6;
- Compilation of a Scoping Report in accordance with regulation 22(b);
- Compilation of an Environmental Impact Assessment Report (EIAR) in accordance with regulation 23(3);
- Undertaking of specialist studies reports in accordance with regulation 23(5); and
- The compilation of an Environmental Management Programme (EMPr) in accordance with regulation 23(4).

The EIAR includes specialist studies and the EMPr and will provide sufficient information to facilitate decision-making by the delegated lead authorities responsible for authorising this project, in this case the DARDLEA.

SPECIALIST STUDIES

The following specialist studies were identified for this project and can be found in the attached appendices:

- Technical Review (Appendix 3).
- Environmental Noise Specialist Study (Appendix 17).
- Atmospheric Impact Report (Appendix 16).
- Archaeological Impact Assessment (Appendix 5).
- Soil Investigation (Appendix 4).

MOST PRESSING ISSUES AND CONCERNS RAISED

From the responses received there have been some concerns raised by the stakeholders regarding the proposed Phosphoric Acid Plant. The issues raised thus far have been documented in the Comment Response Report attached Appendix 13. The most pressing issues raised thus far are related to surface water, ground water, air quality, noise and social impacts.

IMPACT ASSESSMENT

The essence of any EIA process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that *"development must be socially, environmentally and economically sustainable…and requires the consideration of all relevant factors…."*. In addition, the preventative principle is required to be applied, i.e. that the disturbance of ecosystems and loss of biological diversity are to be *"… avoided, or … minimised and remedied"* and *"disturbance of the landscape and the nation's cultural heritage is avoided and where it cannot be altogether avoided is minimised and remedied"*.

Therefore, negative impacts on the environment and on people's environmental rights (in terms of the Constitution) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures". "Reasonable measures" implies that *"every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment"*.

In assessing the environmental feasibility of the proposed Phosphoric Acid Plant, as well as determining reasonable mitigation measures which are required to be implemented in order to minimise potential impacts associated with the project, the requirements of all relevant environmental legislation has been considered, including, *inter alia*, those of:

- National Environmental Management Act 107 of 1998.
- National Environmental Management: Air Quality Act 39 of 2004.
- National Environmental Management: Biodiversity Act 10 of 2004.
- National Environmental Management: Waste Act 59 of 2008.
- National Water Act 36 of 1998.
- National Heritage Resources Act 25 of 1999.
- National Road Traffic Act 93 of 1996.

- Water Services Act 108 of 1997.
- Hazardous Substances Act 15 of 1973.
- Explosives Act 26 of 1956.
- Occupational Health and Safety Act 85 of 1993.

The conclusions of this Final EIAR are the result of intensive and comprehensive studies and specialist assessments, which began in 2016. These studies were based on issues identified within the Scoping Phase, as well as the parallel process of public participation. The public participation process has made every effort to include representatives of all stakeholders in the study area.

Based on the specialist studies undertaken within this Final EIAR, both benefits and negative impacts are anticipated as a result of the proposed Phosphoric Acid Plant. The benefits (contained in Section 5.4.3, Section 6 and Section 13) associated with the proposed Phosphoric Acid Plant predominantly pertain to the social environment and economic benefits. However, the direct negative impacts (contained in Section 11 and Section 13) of the proposed Phosphoric Acid Plant are presented in this Final EIAR, although significant in identified sensitive areas, are considered to be acceptable from a holistic environmental perspective. Thus, if the DARDLEA consider the impacts to be of such an unacceptable level that the proposed Phosphoric Acid Plant should not be built, then the social and economic benefits anticipated to be derived from the project will be lost.

The recommendations arising from this Final EIAR focus predominantly on the role and implementation of the EMPr (contained in Appendix 18). The specialist studies identified areas and issues which are addressed by the EMPr for all phases of the project, and the application of the EMPr is considered to be key in achieving appropriate environmental management standards.

Should the proposed Phosphoric Acid Plant be approved by the DARDLEA, the finalisation of the design must take the requirements of the EMPr into consideration.

DOCUMENT REVIEW

The Draft EIAR was available to stakeholders and authorities for review, prior to finalisation and submission of the report for review by the DARDLEA. All stakeholders and authorities were allocated 30 days (from 20 April 2017 to 22 May 2017) to review the Draft EIAR before the Final EIAR (incorporating comments received during the review period) was submitted to the DARDLEA for review and consideration.

WAY FORWARD

The Final EIAR will be made available for stakeholder review and be submitted to the DARDLEA, who will considering the findings in consultation with various other authorities and will issue a decision on whether EA, the AEL and the WUL will be granted. Once a decision has been reached the appeal process will be followed.

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1.1 Overview of the Applications Being Made

1.1.1 Environmental Authorisation

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Activity 5(2): The storage of hazardous waste at a facility that has the capacity to store in excess of 80m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.

1.2 Who are the Decision-making Authorities

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1. The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) – delegated lead authority for authorisation of the application for EA for activities listed in terms of GNR 983 and 984 (as amended 7 April 2017);
2. Gert Sibande District Municipality - delegated lead authority for the authorisation the AEL for activities identified in terms of GNR 893 (22 November 2013); and
3. The DWS – delegated lead authority for the authorisation of a WUL.

1.3 Who is the Proponent?

Sonskyn Kunsmis (Pty) Ltd (Sonskyn) supply liquid fertilisers to farms in the area of Standerton Mpumalanga. In this regard, Sonskyn purchase raw materials from suppliers throughout Southern Africa to produce the liquid fertilizer. One of the raw materials is phosphoric acid, which is becoming increasingly difficult to procure.

Thus, Sonskyn have registered a new entity Hi-Fos, who is investigating the construction and operation of a Phosphoric Acid Plant. Hi-Fos will supply phosphoric acid to Sonskyn in addition to supplying fertilisers to farms in the area of Standerton Mpumalanga.

1.3.1 Location

The proposed Phosphoric Acid Plant site (the site) is located off R23 approximately 27km from Standerton on Portion 4 of the farm Holfontein 399 (S 26° 52‘ 11.25” E 29° 01‘ 51.79”) in the Mpumalanga Province. The proposed site falls within the jurisdiction of the Lekwa Local Municipality, which forms part of the greater Gert Sibande Municipality. The location of proposed site is illustrated in Figure 1 and Figure 2. Portion 4 of the farm Holfontein 399 surveyor general code is T0IS00000000039900004.

Although Portion 4 of the farm Holfontein 399 is currently zoned as agricultural, a historical brickworks (constructed in 1964, decommissioned in 1999), farm houses, a community settlement and other farming structures exist (Figure 3).

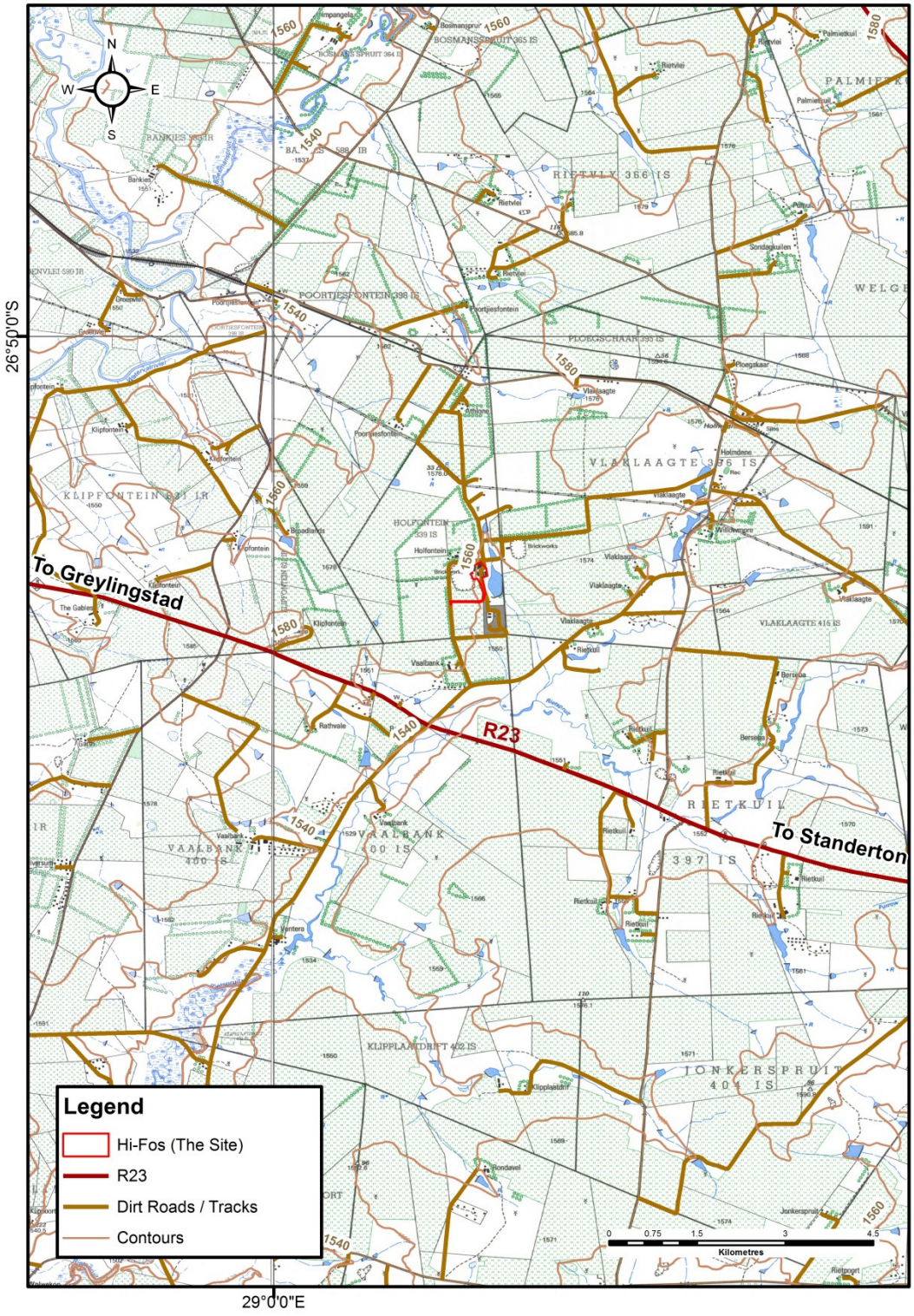

Figure 1: Map indicating the location of the proposed Phosphoric Acid Plant site

Terra Pacis environmental

Client Code	Date Drawn	Scale	Data Sources	Datum
SON001	2017-04-04	1:20,000	Topocadastral Mapsheets 2628DD 2629CC	WGS 1984
Project Code 2.2015	Authors P Tolksdorff			Projection UTM 35 S

Figure 2: Map indicating the location of the proposed Phosphoric Acid Plant site

Figure 3: Photographs of the proposed Phosphoric Acid Plant site

1.4 Who is the Environmental Assessment Practitioner?

In terms of the Environmental Impact Assessment (EIA) Regulations (GNR 982 (7 April 2017)), Hi-Fos has appointed Terra Pacis Environmental (Pty) Ltd (Terra Pacis) as the independent Environmental Assessment Practitioner (EAP).

As the EAP, Terra Pacis has no vested interest in the project, and their appointment does not place any obligation on the EAP to recommend the approval of the proposed Phosphoric Acid Plant. In providing the services, Terra Pacis shall exercise the degree of skill, care and diligence normally exercised by EAPs in similar circumstances. Terra Pacis reserves the right to recommend changes to a development, should this be considered necessary in order to fulfil reasonable environmental protection.

1.4.1 Background Information

Terra Pacis provides environmental consulting and project management services. While our primary focus is in South Africa, we are also active in Zambia and Tanzania. We have provided expertise and undertaken projects for both the public and private sectors. Our aim is to provide a one-stop environmental service to clients, thereby, complementing their product, services and processes.

Terra Pacis provides comprehensive integrated environmental management services. Since its establishment in 2005, Terra Pacis has provided expertise and undertaken a variety of projects ranging from those of a strategic nature to site-specific projects, including the obtaining of all relevant environmental permits and authorisations. This range of environmental management experience has enabled Terra Pacis to provide key inputs into small and large development initiatives.

For further information related to Terra Pacis please visit Terra Pacis' website at www.terrapacis.co.za.

1.4.2 B-BBEE Status

Terra Pacis holds a B-BBEE status of "Level Four Contributor" and have 100% procurement recognition.

1.4.3 Mission Statement

Terra Pacis is committed to working with business, government and the community to promote environmental management, conservation and sustainable development through responsible custodianship. By implementing this Terra Pacis strives to obtain a balance, make a difference and raise awareness.

1.4.4 Company Ethos

Terra Pacis understand the need for objective, impartial, independent and practical advice from all professional team members. The journey with Terra Pacis entails a transparent process with our clients based on factual information, commercial awareness and proactive intervention if and when required.

Terra Pacis is committed to:

- Building trust with our clients and the staff who deliver our services.
- Supporting and sharing of knowledge in order to optimise our product and output.
- Offering quality in all aspects of our service.
- A “hands-on” approach.
- Taking ownership and responsibility.
- Encouraging pride in our company, our work and our clients and demonstrate our passion for constant improvement.

Values:

- Honesty and Trust.
- Commitment, Pride and Passion.
- Accountability.
- Growth and Development.
- Sustainability.

Terra Pacis believes that through achieving a balance between environmental conservation and sustainable development, environmental integrity can be achieved and biological diversity restored, preserved and ultimately perpetuated.

1.4.5 Professional Affiliations and Registrations

- IAP2 - International Association for Public Participation.
- IAIAsa - International Association for Impact Assessment (South Africa).
- IWMSA - The Institute of Waste Management of Southern Africa.
- IEMA - The Institute of Environmental Management and Assessment (In progress).

1.4.6 Project Team

We have provided a short summary of the qualifications and experience of our team members below. Curriculum vitae are attached in Appendix 2.

Paula Tolksdorff (BTech: Engineering Civil Urban, National Higher Diploma: Civil Engineering and National Diploma)

Paula Tolksdorff, a Civil Engineering Technologist, has over 15 years experience in management of the civil and environmental components in the mining, civil and industrial sectors. In addition to this, she has more than ten years experience in the environmental field and is in the process of acquiring her MSc in Environmental Management from the North West University, Potchefstroom. Her experience includes project management and compilation of S&EIRs, Water Use License applications, the design, construction and implementation of water balances, contaminated and uncontaminated water drainage analysis, implementation of Environmental Management Systems aligned to ISO14001, and undertaking mine Environmental Management Programme reports. Paula is Managing Director of Terra Pacis.

Nicoletta Maraschin (Msc Geography)

Nicoletta Maraschin graduated from the University of the Witwatersrand with an Msc in Geography in 2016. Nicoletta is currently a Junior Environmental Consultant at Terra Pacis. Nicoletta's roles and responsibilities include compilation of Basic Assessment reports and S&EIRs

Tim Knights (BSc Hons, Chemical Engineering)

Tim Knights is a graduate Chemical Engineer with 48 years experience in the Chemical Process Industry, with 20 years in environmental technology and management in a very broad spectrum of studies in industrial developments. He has a great depth of experience in commissioning, investigations and production in petroleum refining, chlor-alkali fertiliser, explosives, iron and steel and acetylene chemicals plants.

Nicolette von Reiche (BEng Hons., Tribology, Advanced Fluid Mechanics, Advanced Heat Transfer, Numerical Thermo-flow)

Nicolette von Reiche has over ten years of experience in air quality and noise impact assessment and management. She is currently employed as a principal consultant by Airshed Planning Professionals (Pty) Ltd and involved in the compilation of emission inventories, air pollution mitigation and management plans, atmospheric dispersion simulation and air pollution impact assessments as well as licensing applications.

Jaco van der Walt (BA [Masters] Archaeology)

Jaco van der Walt from Heritage Contracts and Archaeological Consulting CC has been actively involved as a professional archaeologist within the heritage management field in southern Africa for the past 15 years. Jaco acted as council member for the Association of Southern African Professional Archaeologists (ASAPA Member #159) in the Cultural Resource Management (CRM) portfolio for two years (2011 – 2012). Jaco was also a Research Associate with the University of Johannesburg from 2011 – 2013. He is well respected in his field and published in peer reviewed journals and presented his findings on various national and international conferences.

2. DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT STRUCTURE

2.1 Structure of the Draft Environmental Impact Assessment Report

The structure of this Draft Environmental Impact Assessment Report (EIAR) is as follows:

Section 1: Introduction
Section 2: Draft Environmental Impact Assessment Report Structure
Section 3: Regulatory Context
Section 4: Process to be Followed
Section 5: Description of the Proposed Activities
Section 6: Need and Desirability
Section 7: Receiving Environment
Section 8: Public Participation Process
Section 9: Analysis of Stakeholders
Section 10: Most Pressing Comments
Section 11: Specialist Studies
Section 12: Impact Assessment Methodology
Section 13: Impact Assessment
Section 14: Environmental Management Programme
Section 15: Conclusion
Section 16: Undertaking or Affirmation by the Environmental Assessment Practitioner

2.2 Content of the Draft Environmental Impact Assessment Report

The content of the Draft EIAR must comply, in terms of content, with regulation 23(3) of the EIA Regulations. In Table 1, the requirements as set out in EIA Regulations Appendix 3, are correlated with the sections in this report.

Table 1: Content of the Draft Environmental Impact Assessment Report

Requirements in terms of the EIA Regulations		Section in this report
3(1)(a)	Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section 1.4 Who is the Environmental Assessment Practitioner?
3(1)(b)	the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 1.3.1 Location
3(1)(c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 1.3.1 Location Section 5 Description of the Proposed Activities
3(1)(d)	A description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Section 3 Regulatory Context Section 5 Description of the Proposed Activities
3(1)(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 3 Regulatory Context
3(1)(f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 6 Need and Desirability
3(1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5.4 Alternatives Considered
3(1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- aa) can be revered; bb) may cause irreplaceable loss of resources; and cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration	Section 5.4 Alternatives Considered Section 7 Receiving Environment Section 8 Public Participation Process Section 12 Environmental Impact Assessment Methodology Section 13 Impact Assessment Section 15 Environmental Management Programme

	and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	
3(1)(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 12 Environmental Impact Assessment Methodology Section 13 Impact Assessment
3(1)(j)	An assessment of each identified potentially significant impact and risk, including- i) cumulative impacts; ii) the nature, significance and consequences of the impact and risk; iii) the extent and duration of the impact and risk; iv) the probability of the impact and risk occurring; v) the degree to which the impact and risk can be reversed; vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and vii) the degree to which the impact and risk can be mitigated;	Section 13 Impact Assessment
3(1)(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 11 Specialist Studies
3(1)(l)	An environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (i) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 13.4 Impact Assessment Summary
3(1)(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 11 Specialist Studies Section 15 Environmental Management Programme
3(1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation	Section 12.8 Final Proposed Alternative which respond

	measures identified through the assessment;	Impact Assessment
3(1)(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 11 Specialist Studies Section 14 Environmental Management programme
3(1)(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 11 Specialist Studies Section 13 Impact Assessment
3(1)(q)	A reasoned opinion as to whether the proposed 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;	Section 16 Conclusion Section 17 Opinion on whether the Activity should be Authorised
3(1)(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Not Applicable
3(1)(s)	An undertaking under oath or affirmation by the EAP in relation to - (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Section 18 Undertaking or Affirmation by the Environmental Assessment Practitioner
3(1)(t)	Where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not Applicable
3(1)(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	Not Applicable Section 8.3.6 Deviations from Approved Scoping Report and Plan of Study
3(1)(v)	Any specific information that may be required by the competent authority; and	None requested.
3(1)(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	
3(2)	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	

3. REGULATORY CONTEXT

3.1 The Constitution of the Republic of South Africa (No. 108 of 1996)

Since 1994 South African legislation, including environmental legislation, has undergone a large transformation and various new laws and policies was promulgated with a strong emphasis on environmental concerns and the need for sustainable development. The Constitution of the Republic of South Africa (No. 108 of 1996) (the Constitution), the supreme law in South Africa, contains far reaching clauses relevant to environmental rights.

The environmental rights are guaranteed in section 24 of the Constitution, and states that:

Everyone has the right -

a. *to an environment that is not harmful to their health or well-being; and*
b. *to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -*
   i. *prevent pollution and ecological degradation;*
   ii. *promote conservation; and*
   iii. *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*

Section 24 of the Constitution has implications for all environmental policies and legislation and the implementation thereof. In keeping with this right, "sustainable development" should be strived towards, which means that biophysical, social and economic considerations should be taken into account (Steyn, 1999[1]).

The Constitution on its own cannot ensure the effective management of the environment and natural resources, thus numerous acts have been promulgated or devised to comply with the requirements contained in the Constitution.

3.2 National Environmental Management Act (No. 107 of 1998)

The NEMA can be regarded as the most important piece of general environmental legislation. It provides a framework for environmental law reform and covers three areas, namely:

- land, planning and development;
- the use and conservation of natural and cultural resources; and
- pollution control and waste management.

The NEMA is based on the concept of sustainable development. The objective of the NEMA is to provide for co-operative environmental governance through a series of principles relating to:

- the procedures for state decision-making on the environment; and
- the institutions of state which make those decisions.

The NEMA principles serve as:

- a general framework for environmental planning;
- guidelines according to which the state must exercise its environmental functions; and
- a guide to the interpretation of the NEMA itself and of any other law relating to the environment.

[1] Steyn, R. 1999. A new era of environmental legislation – forthcoming in Vision. Bowman Gilfillian Inc.

3.2.1 The National Environmental Management Act Principles

Some of the most important principles contained in the NEMA are that:

- environmental management must put people and their needs first;
- development must be socially, environmentally and economically sustainable;
- there should be equal access to environmental resources, benefits and services to meet basic human needs;
- there should be responsibility for the environmental health and safety consequences of a policy or activity through its lifestyle;
- government should promote public participation when making decisions about the environment;
- communities must be given environmental education, where environmental awareness is raised and knowledge is shared;
- workers must be informed of any potential dangers and they have the right to refuse to do work that is harmful to their health or to the environment;
- decisions must be taken in an open and transparent manner and there must be access to information;
- the role of youth and women in environmental management must be recognised and their full participation must be promoted;
- the person or company who causes pollution, environmental degradation and consequent adverse health effects must pay to remedy these problems caused;
- the environment is held in trust by the state for the benefit of all South Africans; and
- the utmost caution should be used when permission for new developments is granted.

3.2.2 Applicability of the National Environmental Management Act

In terms of section 24F of the NEMA, no person may commence an activity listed in terms of sections 24(2)(a) or (b) of the NEMA (listed activity) without an EA issued in terms of the NEMA. GNR 983, 984 and 985 published in terms of the NEMA (as amended 7 April 2017) set out the listed activities that cannot be undertaken without an EA.

GNR 984 identifies those activities for which a basic assessment (BA) must be undertaken in accordance with the procedure set out in GNR 982; GNR 983 identifies those activities for which a S&EIR process must be undertaken in accordance with the procedure set out in GNR 982; and GNR 985 identifies geographical areas in respect of which EA must be applied for by undertaking the BA process. It must be noted that GNR 984 and GNR 985 pertains to those activities which are deemed to have a lesser environmental impact whilst those listed in GNR 983 have a more significant impact on the environment and accordingly, a more detailed and extensive level of assessment is required.

EA in terms of section 24(2) and 24D of the NEMA is required for the following listed activities identified in terms of GNR 983 (as amended 7 April 2017):

Activity 24: The development of a road-

(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or
(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters

but excluding a road–

(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;
(b) where the entire road falls within an urban area; or
(c) which is 1 kilometre or shorter.

EA in terms of section 24(2) and 24D of the NEMA is required for the following listed activities identified in terms of GNR 984 (as amended 7 April 2017):

Activity 4: The development and related operations 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.

Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding-

(i) activities which are identified and included in Listing Notice 1 of 2014;
(ii) activities which are 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 the National Environmental Management: Waste Act, 2008 applies; or
(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less; or
(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.

An application for an EA will be made to the DARDLEA.

3.3 National Environmental Management: Waste Act (No. 59 of 2008)

On 1 July 2009 the NEM:WA, came into operation. The NEM:WA repealed section 20 of the Environment Conservation Act (No. 73 of 1989) (ECA) and introduced new provisions regarding the licensing of waste management activities.

In terms of the NEM:WA the Minister of the Department of Environmental Affairs (DEA) may publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. Furthermore, the NEM:WA prohibits any person to commence, undertake or conduct a waste management activity except in accordance with:

- the requirements or standards determined in terms of the NEM:WA for that activity, and
- a waste management licence issued in respect of that activity, if a license is required.

The NEM:WA can be regarded as legislation that governs all waste activities in South Africa. It provides a framework for environmental reform related to waste activities namely:

- protection of health and the environment by providing reasonable measures for the prevention of pollution, ecological degradation and for securing ecologically sustainable developments;
- provision for institutional arrangements and planning matters;
- provision for national norms and standards for regulating the management of waste by all spheres of government;
- provision for specific waste management measures;
- licensing and control of waste management activities;
- remediation of contaminated land;
- provision for the national waste information system; and
- provision for compliance and enforcement.

3.3.1 The Objectives of the National Environmental Management: Waste Act

The objectives of the NEM:WA, in summary, are to:

- protect human health and wellbeing as well as the environment;
- to ensure that people are aware of the impact of waste on their health, wellbeing and the environment;
- to provide for compliance; and
- to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and wellbeing.

3.3.2 Applicability of the National Environmental Management: Waste Act

In terms of section 19(1) of the NEM:WA, the Minister, in GNR 921 (29 November 2013), published a list of waste management activities that have, or are likely to have a detrimental effect on the environment. In terms of section 20(b) of the NEM:WA no person my commence, undertake or conduct a waste management activity, except in accordance with a waste management licence issued in respect of that activity, if a licence is required.

GNR 921 (29 November 2013) differentiates between Category A, Category B and Category C waste management activities. Category A waste management activities are those which require

the conducting of a BA process as stipulated in the GNR 982 (7 April 2017) as part of the waste management licence application. Category B waste management activities are those that require the conducting of an S&EIR process stipulated in the GNR 982 (7 April 2017) as part of the waste management licence application. Category C waste management activities require that the Norms and Standards for the storage of waste be applied without the need to undertake an EA process. GNR 926 (29 November 2013) listed activities applicable to the proposed Phosphoric Acid Plant were identified as:

Category C (Norms and Standards in terms of GNR 926 (29 November 2013)):

Activity 5(1): The storage of general waste at a facility that has the capacity to store in excess of 100m^3 of general waste at any one time, excluding the storage of general waste in lagoons or temporary storage of such waste.

Activity 5(2): The storage of hazardous waste at a facility that has the capacity to store in excess of 80m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.

3.4 National Environmental Management: Air Quality Act (No. 39 of 2004)

On 1 April 2010 the NEM:AQA was fully enacted. The NEM:AQA repealed the former Atmospheric Pollution Prevention Act (No. 45 of 1965) and all its amendment acts in full.

The NEM:AQA allows for national, provincial and local air quality standards to be established as well as the declaration of priority areas. In addition, the NEM:AQA requires that Air Quality Management Plan (AQMP) form part of the environmental implementation plan or environmental management plans to be prepared by national departments or the Province as required by Chapter 3 of the NEMA. Furthermore, the NEM:AQA requires municipalities to include an AQMP into its integrated development plan (IDP).

The NEM:AQA requires the Minister of the DEA to publish a list of activities which results in atmospheric emissions which may have a detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. The NEM:AQA requires that an AEL be obtained for such listed activities. Such a list of activities was published in GNR 893 (22 November 2013) promulgated in terms of section (21)(i)(b) of the NEM:AQA.

3.4.1 The Objectives of the National Environmental Management: Air Quality Act

The objectives of the NEM:AQA can be summarised as follows:

- protection of the environment by providing reasonable measures for the protection of the quality of the air in the country;
- protection of the environment by the prevention of air pollution and ecological degradation;
- protecting the environment by securing ecologically sustainable development while promoting justifiable economic and social development; and

- to give effect to section 24(b) of the Constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

3.4.2 Applicability of the National Environmental Management: Air Quality Act

Section 22 of the NEM:AQA states that "*no person may without a provisional atmospheric emission licence or an atmospheric emission licence conduct an activity listed on the national list anywhere in the Republic; or listed on the list applicable in a province anywhere in that province*".

GNR 893 of 22 November 2013 provides the list of activities resulting in atmospheric emissions which have or may have a significant detrimental effect on, *inter alia*, the environment and the Minimum Emission Standards (MES) for these activities as contemplated in section 21 of the NEM:AQA. The scheduled processes, in terms of these regulations, applicable to the proposed Phosphoric Acid Plant were identified as:

Category 7: Inorganic Chemicals Industry

Subcategory 7.2: Production of Acids.

Subcategory 7.3: Production of Chemical Fertilizer.

An application for an AEL will be made to the Gert Sibande District Municipality.

In addition to the above, Hi-Fos need to comply with; Declaration of a small boiler as a controlled emitter and establishment of emission standards Government Notice Regulation (GNR) 831 (1 November 2013) issued in terms of the NEM:AQA.

3.4.3 Declared Priority Area

The site is located approximately 27km from Standerton, situated within the Lekwa Local Municipality. This area forms part of the declared Highveld Priority Area (HPA), declared in terms of section 18(1) of the NEM:AQA during 2007. Figure 4 was taken from the Air Quality Management Plan for the Highveld Priority Area[2] and comprises a locality map indicating the extent of the HPA, which covers 31 106km^2, which includes parts of Gauteng and Mpumalanga Provinces. The Highveld area in South Africa is associated with poor air quality with elevated concentrations of criteria pollutants occurring as a result of the high concentration of industrial and non-industrial sources.

[2] Zunckel, Naiker, Raghunandan, Fischer, Crouse, Ebrahim, Carter. 2010. Air Quality Management Plan for the Highveld Priority Area.

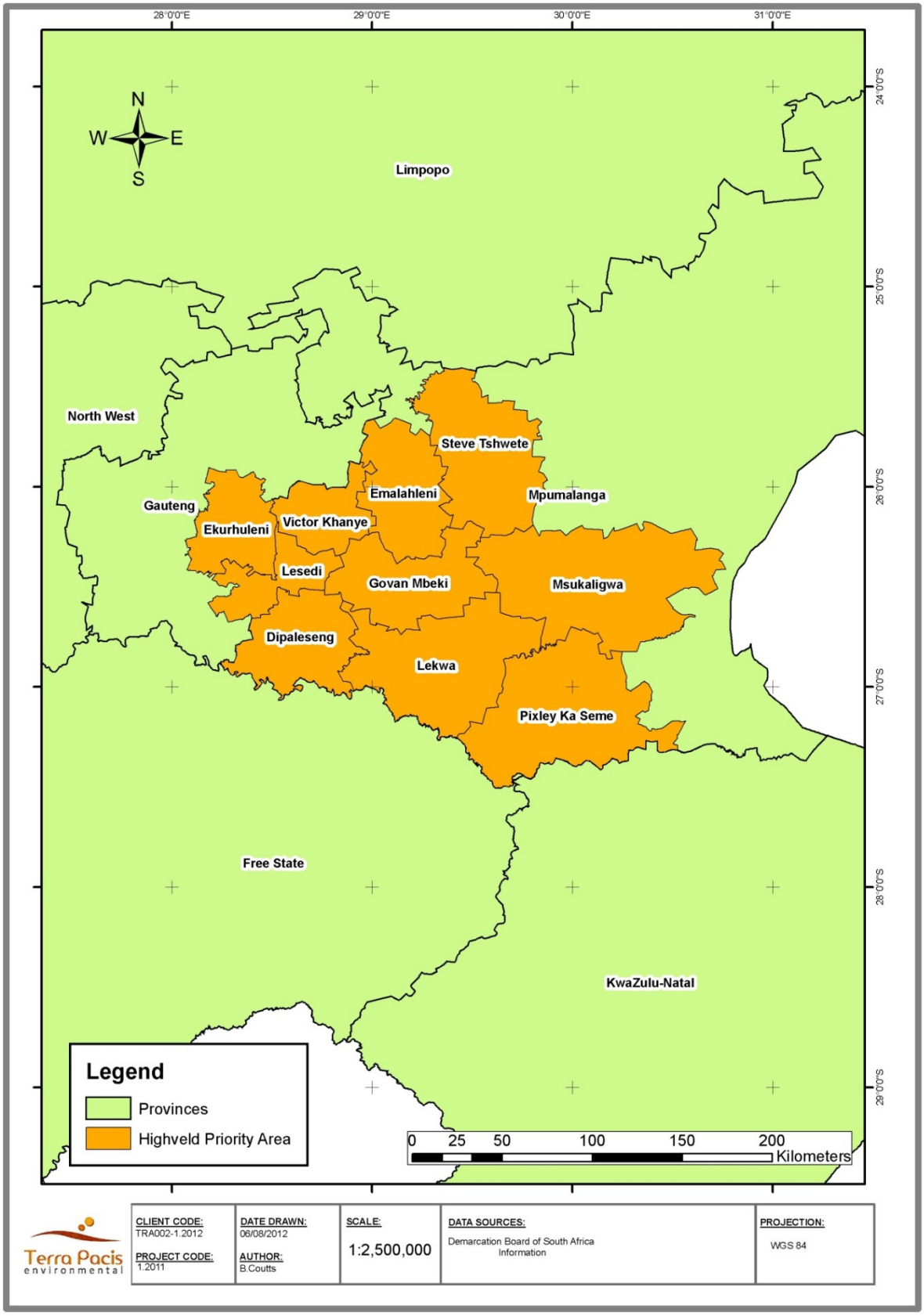

Figure 4: Locality map indicating the extent of the Highveld Priority Area

3.5 National Water Act (No. 36 of 1998)

In terms of the NWA, the national government, acting through the Minister of the DEA, is the public trustee of South Africa's water resources, and must ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The Minister of the DEA is responsible to ensure that water is allocated equitably and used beneficially in the public interest, while promoting environmental values. The national government, acting through the Minister of the DEA, has the power to regulate the use, flow and control of all water in South Africa.

The majority of the provisions of the NWA came into effect on 1 October 1998 and at the same time various provisions of the Water Act (No. 54 of 1956) (WA) were repealed. The remaining provisions of the NWA commenced on 1st January 1999 and 1 October 1999 (and the remaining provisions of the WA were repealed).

The most fundamental departure from the WA is the removal of the concept of water as private property. Instead, water will be made available through user licences, which may be issued for a maximum period of forty years, subject to renewal. A priority of users has been established for the allocation of licences, with the environment near the top of the list of priorities.

Section 21 of the NWA indicates that "water use includes":

- taking water from a water resource;
- storing water;
- impeding or diverting the flow of water in a water course;
- engaging in a stream flow reduction activity contemplated in section 36;
- engaging in a controlled activity which has either been declared as such or is identified in section 37(1);
- discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- disposing of waste in a manner which may detrimentally impact a water resource;
- disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- altering the bed, banks, course or characteristics of a water course;
- removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- using water for recreational purposes.

3.5.1 Applicability of the National Water Act

In terms of section 22 of the NWA, no person may undertake a water use as set out in section 21 of the NWA (water use) without a WUL issued in terms of the NWA unless –

- such water use falls within the ambit of a water use as set out in schedule 1 to the NWA, which pertains to the use of water for, *inter alia*, domestic use or small gardening;

- such water use falls within the ambit of an existing lawful water use in terms of section 34 of the NWA, which pertains to a water use which has taken place at any time during a period of two years prior to the commencement of the NWA, being 1 October 1998;
- such water use falls within the ambit of a general authorisation issued in terms of section 39 of the NWA (General Authorisation); or
- the Minister of DWS has dispensed with the requirement for a WUL in terms of section 22(3) of the NWA.

A WUL is sought in terms of section 41 of the NWA for activities listed in section 21 of the NWA. The water uses read as follows:

Section 21(a): Taking water from a water resource.

Section 21(b): Storing of water.

Section 21(e): Engaging in a controlled activity identified in section 37(1) or declared under section 38(1).

Section 21(g): Disposing of waste in a manner, which may detrimentally impact on a water resource.

General Authorisation's (GA) replace the need for a water user to apply for a licence in terms of the NWA provided that the water use is within the limits and conditions of the General Authorisation. The applicability of GA's for the above water uses will be discussed with the Department of Water and Sanitation (DWS). An application for a WUL will be made to the DWS.

3.6 National Heritage Resources Act (No. 25 of 1999)

In terms of section 38 of the National Heritage Resources Act (No. 25 of 1999) (NHRA) the following developments require a Phase 1 Archaeological Impact Assessment prior to proceeding with construction:

- Any development or other activity which will change the character of a site:
  - exceeding 5 000m^2 in extent; or
  - involving three or more existing erven or subdivisions thereof; or
  - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  - the costs of which will exceed a sum set in terms of regulations by South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority;
  - the re-zoning of a site exceeding 10 000m^2 in extent; or
  - any other category of development provided for in regulations by the SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

3.6.1 Applicability of the National Heritage Resources Act

The proposed Phosphoric Acid Plant will exceed 5 000m^2 in extent and change the character of the site. For this reason, a Phase 1 Archaeological Impact Assessment was required for the proposed Phosphoric Acid Plant.

3.7 Occupational Health and Safety Act (No. 85 of 1993)

The Occupational Health and Safety Act (No. 85 of 1993) (OHSA) makes provisions that address the health and safety of persons working at the site. The OHSA addresses amongst others the:

- safety requirements for the operation of plant machinery;
- protection of persons, other than persons at work, against hazards to health and safety, arising out of or in connection with the activities of persons at work;
- establishment of an advisory council for occupational health and safety; and
- provision for matters connected therewith.

3.7.1 Applicability of the Occupational Health and Safety Act

The OHSA is applicable and states that any person:

- undertaking work on any premises shall ensure as far as is reasonably practicable that nothing about the manner in which the work is conducted makes it unsafe or creates a risk to health; and
- undertaking upgrades or developments for use at work or on any premises shall ensure as far as is reasonably practicable that nothing about the manner in which it is erected or installed makes it unsafe or creates a risk to health when properly used.

Thus, the OHSA is applicable to the proposed Phosphoric Acid Plant .

3.8 Other Guidelines

The following guidelines were considered when drafting this report:

- (10 October 2012) Guideline on the Implementation of the Environmental Impact Assessment Regulations.
- GNR 807 (10 October 2012) Public Participation in the Environmental Impact Assessment Process.
- GNR 891 (20 October 2014) Guideline on Need and Desirability.
- Mpumalanga State of the Environment Report 2003.
- Gert Sibande District Municipality Integrated Development Plan 2016-2017.
- Gert Sibande District Municipality Spatial Development Framework 2014.
- Lekwa Local Municipality Integrated Development Plan 2016-2017.

4. PROCESS TO BE FOLLOWED

The S&EIR process as detailed in the EIA Regulations and depicted in Figure 5 below entails in summary the following:

- Public participation process as described in chapter 6;
- Compilation of a Scoping Report in accordance with regulation 22(b);
- Compilation of an Environmental Impact Assessment Report (EIAR) in accordance with regulation 23(3);
- Undertaking of specialist studies reports in accordance with regulation 23(5); and
- The compilation of an Environmental Management Programme (EMPr) in accordance with regulation 23(4).

4.1 Public Participation Initiation Phase

During this phase, public participation activities commence. This includes the compilation of necessary background information documents (BIDs), advertisements, site notices, and notification letters. During this phase, the registered interested and affected parties (I&APs) (stakeholders) details are captured into a stakeholder database and the comments raised captured in a Comment Response Report.

4.2 Scoping Phase

Scoping is the process for determining issues and concerns related to the project and involves consultation with the stakeholders and authorities. In addition, the Scoping phase includes the identification of required specialist studies and potential environmental aspects for further investigation. The Scoping phase outlines the plan for the EIA phase and facilitates the input from stakeholders and authorities to inform the EIA process. In addition, the Scoping Report will:

- Include details of the EAP responsible for preparing the report and the expertise of the EAP to carry out the scoping procedures.
- Identify all legislation and guidelines that have been considered in the preparation of the Scoping Report.
- Describe the existing and proposed activities and reasonable alternatives, including the advantages and disadvantages of the alternatives.
- Describe the property on which the activities are to take place.
- Describe the need and desirability of the activities.
- Describe the environment (at a screening level) that may be affected by the activities and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the activities.
- Describe the environmental issues and potential impacts, including cumulative impacts that have been identified.

- Indicate the methodology that will be adopted in assessing the potential impacts that have been identified, including any specialist studies or specialised processes that will be undertaken.
- Detail the public participation initiation phase for the S&EIR process in terms of chapter 6 of the EIA Regulations.
- Include a plan of study for the EIAR which sets out the proposed approach to the EIA phase.
- An undertaking under oath or affirmation by the EAP.

4.2.1 Stakeholder Review prior to Submission

The Draft Scoping Report is made available to stakeholders and authorities for review, prior to finalisation and submission of the report for review by the DARDLEA. All stakeholders and authorities are allocated 30 days to review the Draft Scoping Report before the Final Scoping Report (incorporating comments received during the review period) is submitted to the DARDLEA for review.

4.2.2 Submission and Decision-making

The DARDLEA is allocated 43 days to review the Final Scoping Report. If the DARDLEA accepts the final scoping report within 43 days, such may be with or without conditions, and will advise the applicant to proceed or continue with a task contemplated within the plan of study for EIA. However, the DARDLEA may, at this point, refuse EA.

4.3 Environmental Impact Assessment Phase

The objective of the EIA phase is to determine the policy and legislative context within which the activity is located and to describe the need and desirability of the proposed activity in the context of the preferred location. The impacts and risks need to be determined through an assessment process, which is inclusive of cumulative impacts. The nature, significance and consequence of the impacts will be determined and the degree to which they can be reversed and may cause irreplaceable loss of resources. The assessment process must identify suitable measures to avoid, manage or mitigate identified impacts and identify the residual risks that need to be managed and monitored. The compilation of an EIAR is in accordance with regulation 23(3) in the EIA Regulations.

The EIAR will include:

- Details of the EAP who prepared the report and the expertise of the EAP to carry out the S&EIR process.
- A detailed description of the existing and proposed activities.
- A description and a map of the property on which the activities are undertaken and the location of the activities on the property.

- A description of the environment that may be affected by the activities and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by such.
- Details of the public participation process conducted, including:
    - steps undertaken in accordance with the plan of study;
    - lists of persons, organisations and organs of state that were registered as I&APs (stakeholders);
    - a summary of comments received, issues raised by stakeholders, the date of receipt of these comments and the response of the EAP to those comments; and
    - copies of any representation and comments received from stakeholders.
- A description of the need and desirability of the activities.
- A description of any identified alternatives that are feasible and reasonable, including the advantages and disadvantages that the activities or alternatives will have on the environment and on the community that may be affected by the activities.
- A summary of the methodology used in determining the significance of potential impacts.
- A description and comparative assessment of all alternatives identified during the S&EIR process.
- A summary of the findings of the specialist studies.
- A description of all environmental issues that were identified during the S&EIR process, and assessment of significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.
- A description and assessment of the significance of any environmental impacts, including:
    - cumulative impacts that may occur as a result of the undertaking of the activities or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the activities;
    - the nature of the impact;
    - the extent and duration of the impact;
    - the probability of the impact occurring;
    - the degree to which the impact can be reversed;
    - the degree to which the impact may cause irreplaceable loss of resources; and
    - the degree to which the impact can be mitigated.
- A description of any assumptions, uncertainties and gaps in knowledge.
- A reasoned opinion as to whether the activities 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.
- An environmental impact statement containing the key findings and a comparative assessment of the positive and negative implications of the activities.
- An EMPr containing the aspects contemplated in regulation 23(4) of the EIA Regulations.
- Copies of all specialist reports complying with regulation 23(5) of the EIA Regulations.
- Any specific information required by the competent authority and any other matters required in terms of section 24(4)(a) and (b) of the NEMA.

- An undertaking under oath or affirmation by the EAP in relation to:
    - the correctness of the information provided in the reports;
    - stakeholders and I&APs comments and inputs must be included;
    - the inclusion of inputs and recommendations from specialist reports where relevant; and
    - any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs.

4.3.1 Specialist Studies

The following specialist studies have been identified:

- Technical Review.
- Environmental Noise Specialist Study.
- Atmospheric Impact Report.
- Archaeological Impact Assessment.
- Soil Investigation.

4.3.2 Environmental Management Programme

The EMPr will contain the following information:

- Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by the EIA Regulations, including environmental impacts or objectives in respect of:
    - planning and design;
    - pre-construction and construction activities;
    - operation or undertaking of the activities;
    - rehabilitation of the environment; and
    - closure, where relevant.
- A detailed description of the aspects of the activities that are covered by the EMPr.
- An identification of the persons who will be responsible for the implementation of the measures.
- Proposed mechanisms for monitoring compliance with and performance assessment against the EMPr and reporting thereon.
- As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures.
- A description of the manner in which it intends to:

- modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
- remedy the cause of pollution or degradation and migration of pollutants;
- comply with any applicable provisions of the NEMA regarding closure, where applicable; and
- comply with any provisions of the NEMA regarding financial provisions for rehabilitation, where applicable.

- Time periods within which the measures contemplated in the EMPr must be implemented.
- The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.
- An environmental awareness plan describing the manner in which:
  - the proponent intends to inform his or her employees of any environmental risk which may result from their work; and
  - risks must be dealt with in order to avoid pollution or the degradation of the environment.
  - Where appropriate, closure plans, including closure objectives.

4.3.3 Stakeholder Review prior to Submission

The Draft EIAR is made available to stakeholders and authorities for review, prior to finalisation and submission of the report to authorities for review by the DARDLEA. All stakeholders and authorities are allocated 30 days to review the Draft EIAR before the Final EIAR (incorporating comments received during the review period) is submitted to the DARDLEA for review.

4.3.4 Submission and Decision-making

The DARDLEA must, within 107 days of receipt of the Final EIAR and EMPr in writing grant EA in respect of all or part of the activity applied for; or refuse EA. On having reached a decision, the DARDLEA must, in writing and within five days:

- provide the applicant with the decision;
- give reasons for the decision to the applicant; and
- where applicable, draw the attention of the applicant to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations (GNR 993 (8 December 2014)), if such appeal is available in the circumstances of the decision.

The applicant must, in writing, within fourteen days of the date of the decision on the application ensure that:

- all registered I&APs are provided with access to the decision and the reasons for such decision; and
- the attention of all registered I&APs is drawn to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations (GNR 993 (8 December 2014)), if such appeal is available in the circumstances of the decision.

4.4 Atmospheric Emission Licence Application Process

The AEL application in terms of section 37 of the NEM:AQA will be submitted to the Gert Sibande District Municipality and will include the technical information obtained from the Technical Review and Air Quality Impact Assessment. Kindly note that there are no legislated decision-making timeframes in terms of the NEM:AQA, however, 60 days is typical.

4.5 Water Use Licence Application Process

A WUL will be sought from the DWS in terms of section 41 of the NWA for activities listed in section 21 of the NWA. The compilation and submission of the WUL application forms will be as per the guidelines provided by the Department of Water and Sanitation (DWS). Kindly note that there are no legislated decision-making timeframes in terms of the NWA.

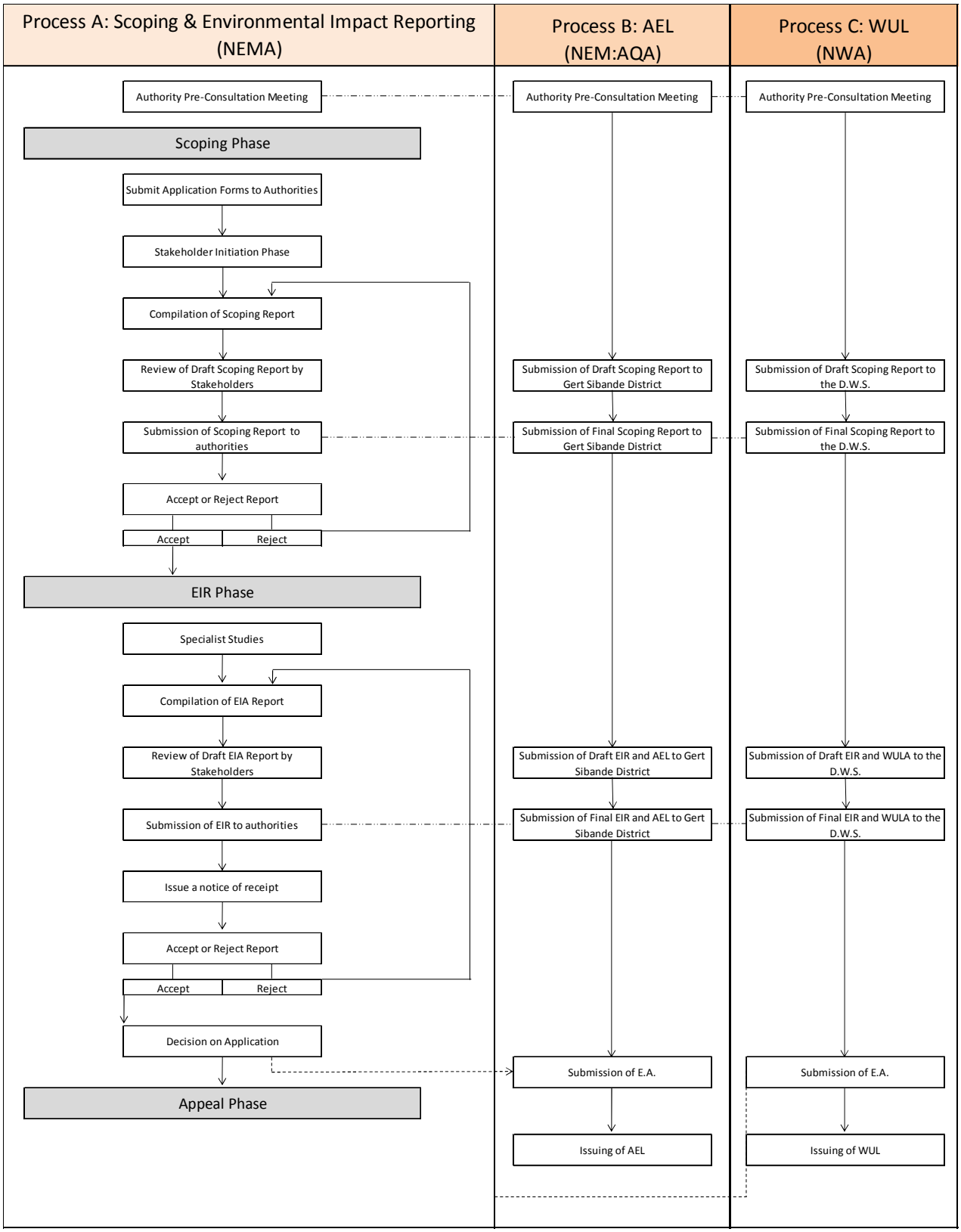

Figure 5: The Scoping and Environmental Impact Report Process

5. DESCRIPTION OF THE PROPOSED ACTIVITIES

The Phosphoric Acid Plant will comprise the following principle activities:

- Phosphoric Acid Plant.
- Calcium Ammonium Nitrate (CNX) Plant.
- Pure Mono Ammonium Phosphate (MAP 39) Plant.
- Mono Ammonium Phosphate (MAP 33) Plant.
- Granular Fertilizer Blending Plant.
- Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment).

The abovementioned plants are collectively named the proposed Phosphoric Acid Plant.

5.1 Construction Phase

The construction of the proposed Phosphoric Acid Plant is expected to be undertaken over a period of 10 to 14 months. The construction phase of the development will involve the following aspects:

- Erection of perimeter fences;
- Site preparation and clearance;
- Construction of foundation and civil works;
- Storm-water management measures;
- Installation of bulk services;
- Waste management;
- Transport of equipment to site; and
- Construction of the proposed Phosphoric Acid Plant (as described below).

5.2 Operational Phase

The information used for the purpose of this section was taken from the Phosphoric Acid Plant Technical Review (Knights, 2017)[3] as attached in Appendix 3.

5.2.1 Phosphoric Acid Plant

Trailblazer Technologies (Pty) Ltd (TBT), a chemical engineering design company, approached Hi-Fos with the Nitrophos Process technology in this regard. The proposed Phosphoric Acid Plant would produce phosphoric acid from phosphate rock sourced from Phalaborwa and nitric acid from

[3] Knights, T. 2017. Hi-Fos (Pty) Ltd, Phosphoric Acid Plant Standerton. Technical Review Final Draft. Johannesburg. Knights Environmental.

Sasol. The proposed Phosphoric Acid Plant is illustrated in Figure 6 and described in further detail below.

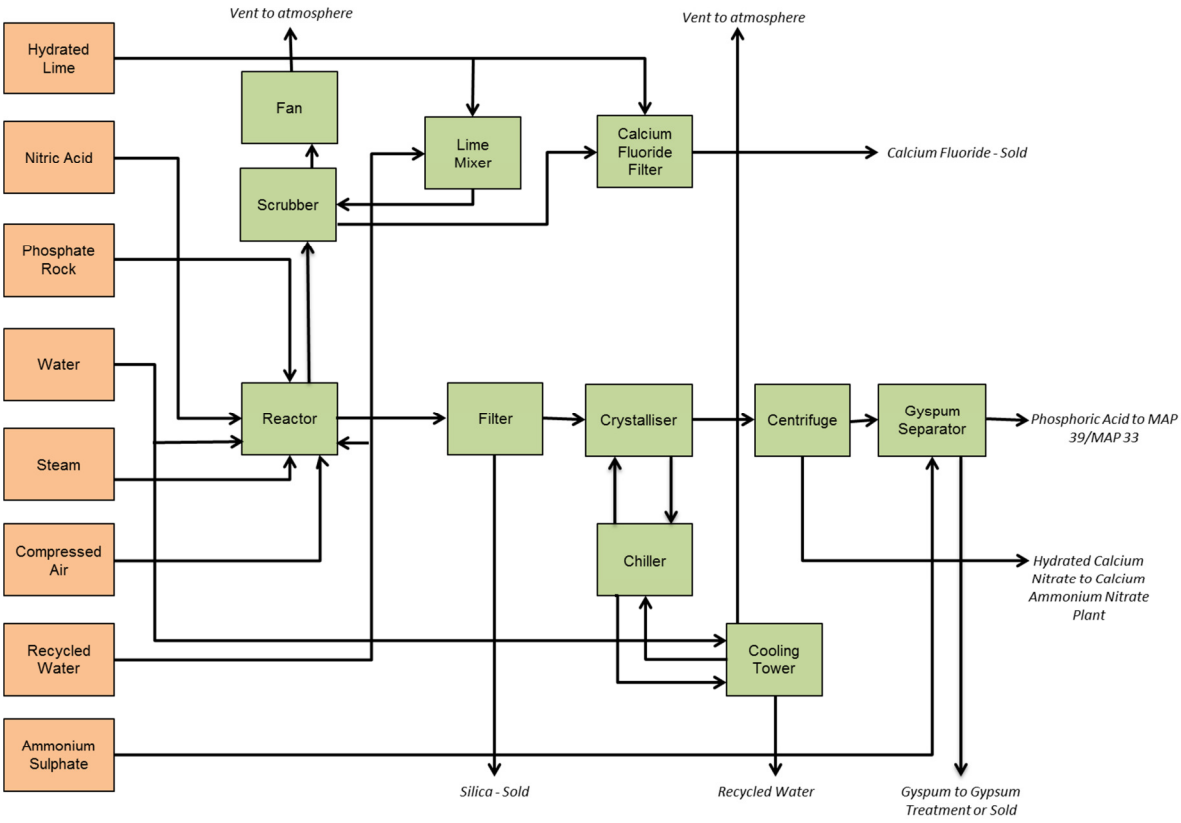

Figure 6: Phosphoric Acid Plant Process

5.2.1.1 *Charging the Reactor*

The nitric acid and water are fed to the reactor to dilute the nitric acid from 58% to 52% in situ. The phosphate rock is added to the reactor at the same time.

5.2.1.2 *The Phosphoric Acid Reaction*

The mix is heated with live steam injection from the boiler and the phosphate rock powder is dissolved in the nitric acid solution. The mix is aerated by air from the compressor system. The aeration is to remove the hydrofluoric acid (HF) generated from the fluoride in the rock. The phosphoric acid reactors will operate on a continuous basis.

The reaction mix is then cooled to 35℃ using cooling water through a graphite heat exchanger. The reactors are continuous stirred tank reactors (CSTR), 20m^3 in capacity, manufactured from polypropylene reinforced with glass fibre resin on the outside. They are equipped with an air sparge and steam injection equipment as well as a rubber-lined stainless steel (SS) stirrer.

5.2.1.3 Scrubber

The off gases from the reactor containing hydrogen fluoride gas (HF) are drawn by a fan into an alkaline scrubber to absorb the HF. In the scrubber, the off gases are scrubbed with calcium hydroxide solution.

The scrubber is a void column equipped with sprays throughout its length. It is manufactured of polypropylene. The number of sprays will be determined so that the concentration of HF in the exit stream will be well within the prescribed specification of 5 parts per million (ppm) volume/volume (v/v).

Solid Calcium Fluoride (CaF_2) crystals are formed in the alkaline scrubber by the reaction of the HF with the calcium hydroxide solution.

5.2.1.4 Solid Calcium Fluoride Filtration

The calcium hydroxide solution is circulated through the scrubber and then passes to the CaF_2 filter. This is a plate and frame filter, which removes the CaF_2 crystals.

The insoluble product CaF_2 that is filtered off is bagged for sale as a raw material.

5.2.1.5 Chiller and Centrifuge

The phosphoric acid reaction products pass to a second stage of cooling to 4℃ in the crystalliser. This is achieved by a graphite heat exchanger and a chiller. At this temperature, the calcium nitrate with four molecules of water of crystallisation (CN4) crystallizes out.

The CN4 crystals are separated in a decanter centrifuge and are stored for further processing (See CNX and CNL below).

5.2.1.6 Gypsum Separator

There is residual calcium nitrate remaining in the phosphoric acid leaving the decanter centrifuge. The phosphoric acid, with the residual calcium nitrate, is passed into a vessel and mixed with the stoichiometric required quantity of ammonium sulphate. The calcium component is removed from the phosphoric acid by precipitation with the use of ammonium sulphate to produce calcium sulphate (gypsum) and ammonium nitrate. The ammonium nitrate remains in solution in the phosphoric acid.

The precipitated gypsum is removed by pumping the phosphoric acid mix to a plate and frame filter. The gypsum is removed as a wet filter cake and either treated or sold.

5.2.1.7 Product Phosphoric Acid

The remaining acidic liquor is the product phosphoric acid containing 12% Phosphorus (P) at a pH of about 1. The phosphoric acid product is stored for further use.

5.2.2 *Calcium Ammonium Nitrate (CNX) Plant*

The calcium nitrate (CN4), as produced by the Phosphoric Acid Plant, has a low melting point and is difficult to handle. It may have application as a liquid fertiliser (calcium nitrate liquid (CNL)) but will be converted to calcium ammonium phosphate (CNX) in the CNX Plant. CNX has a higher melting point and no significant handling problems. CNX Plant is illustrated in Figure 7 and described in further detail below.

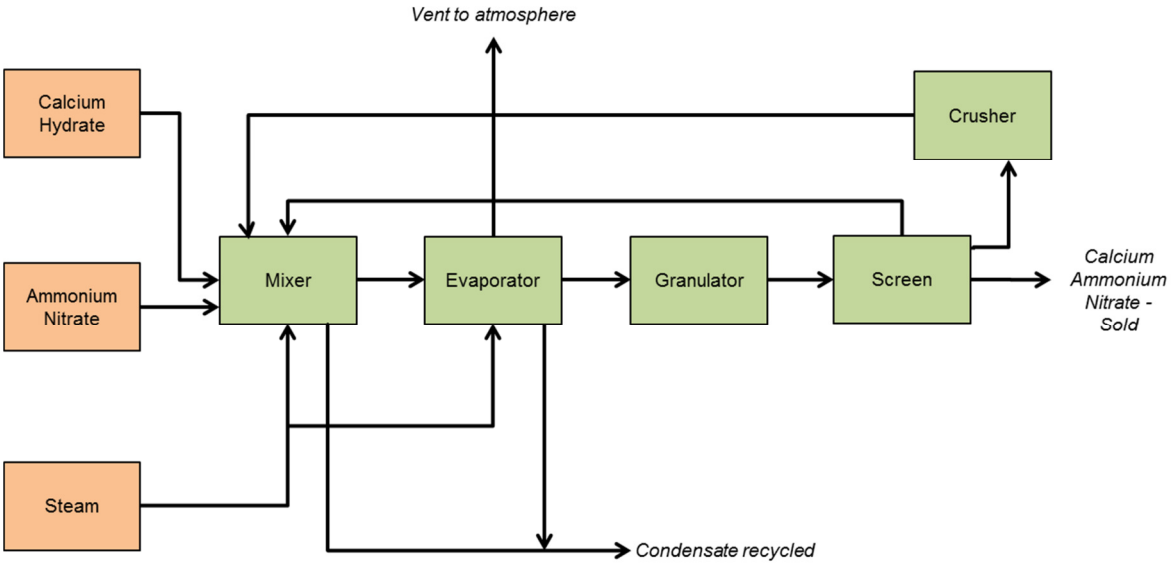

Figure 7: Calcium Ammonium Nitrate (CNX) Plant

CN4 from the Phosphoric Acid Plant contains 30% water because of its water of crystallization. CN4 has a low melting point of <50°C, which will cause handling problems in the market place. The heat of the sun will cause it to solidify. Due to the high water content, higher transport costs will be incurred. CNX contains 15% water and has a much higher melting point (90°C). Therefore, the CN4 will be converted to CNX.

In the CNX process, the CN4 is put into a mixer and heated with steam to greater than 127°C. Ammonium nitrate is added to give a concentration of 6%. The compounds combine to form calcium ammonium nitrate. The CN4 mixture passes to an evaporator to reduce the water content to 15%, where two CNX molecules have three molecules of water of crystallization.

The liquid calcium ammonium nitrate is then sprayed into a granulation pan; the CNX granules are then screened; the oversize material is crushed and fed with the undersize material to the granulator.

The desired size of CNX granules are then bagged and sold.

The CNX plant will run continuously, although the feed make-up mixing equipment will be duplicate batch constituted. ie there will be two systems running alternately. This will ensure quality control.

5.2.3 *Pure Mono Ammonium Phosphate (MAP 39) Plant*

The phosphoric acid produced by the Phosphoric Acid Plant is combined with anhydrous ammonia to produce mono ammonium phosphate (MAP 39) for sales. By-products from the process are magnesium ammonium phosphate (MagAmP) solution and the mother liquor from the crystalliser, which are fed to the MAP 33 process. The MAP 39 Plant is illustrated in Figure 8 and described in further detail below.

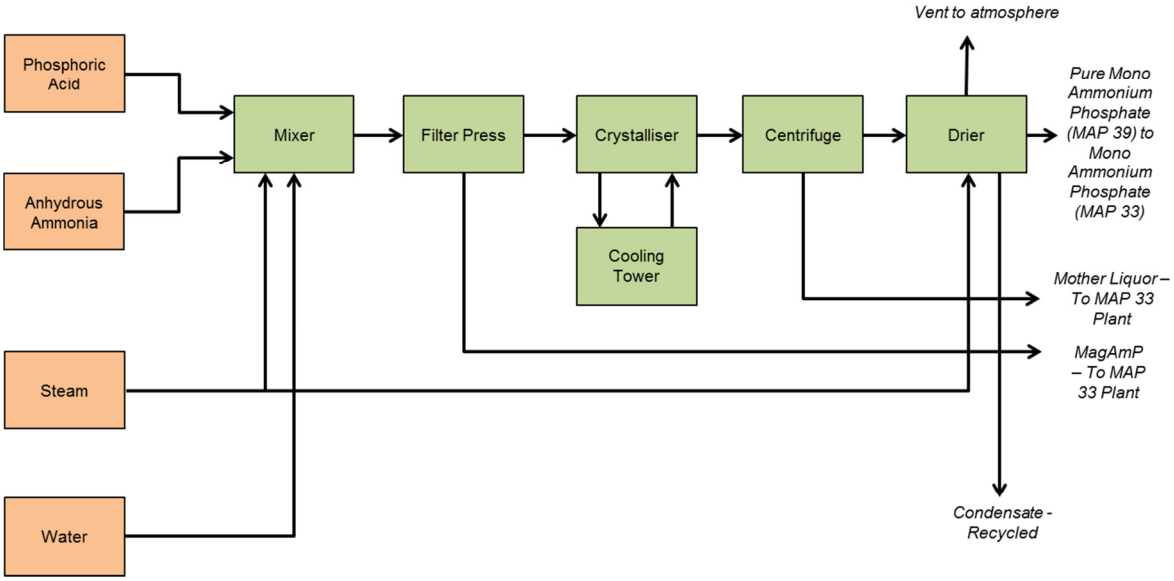

Figure 8: Pure Mono Ammonium Phosphate (MAP 39) Plant

Pure mono ammonium phosphate is produced by injecting anhydrous ammonia into a mixing vessel containing phosphoric acid. Water is added to give the correct concentration and live steam is injected to heat the mix to the reaction temperature. During this process, MagAmP is precipitated. The MAP 39 Plant will operate on a batch basis as the production is small.

The reaction mix is filtered to remove the MagAmP, which then passes to the mono ammonium phosphate (MAP 33) plant as a raw material. Refer to MAP 33 below.

The filtrate is cooled by a heat exchanger and MAP 39 crystals are formed before passing to a centrifuge. The crystals, which then pass to a drier to produce the final product, are bagged for sale.

The remaining filtrate (mother liquor) from the centrifuge passes to the Mono Ammonium Phosphate (MAP 33) Plant for further processing. Refer to MAP 33 below.

5.2.4 *Mono Ammonium Phosphate Plant (MAP 33)*

In the MAP 33 process, the mother liquor and the MagAmP from the MAP 39 process are blended with phosphoric acid and anhydrous ammonia to form MAP 33 solution. The MAP 33 solution is fed to a spray drier and a granulator to produce granular MAP 33 for blending into granular fertiliser formulations. The MAP 33 Plant is illustrated in Figure 9 and described in further detail below.

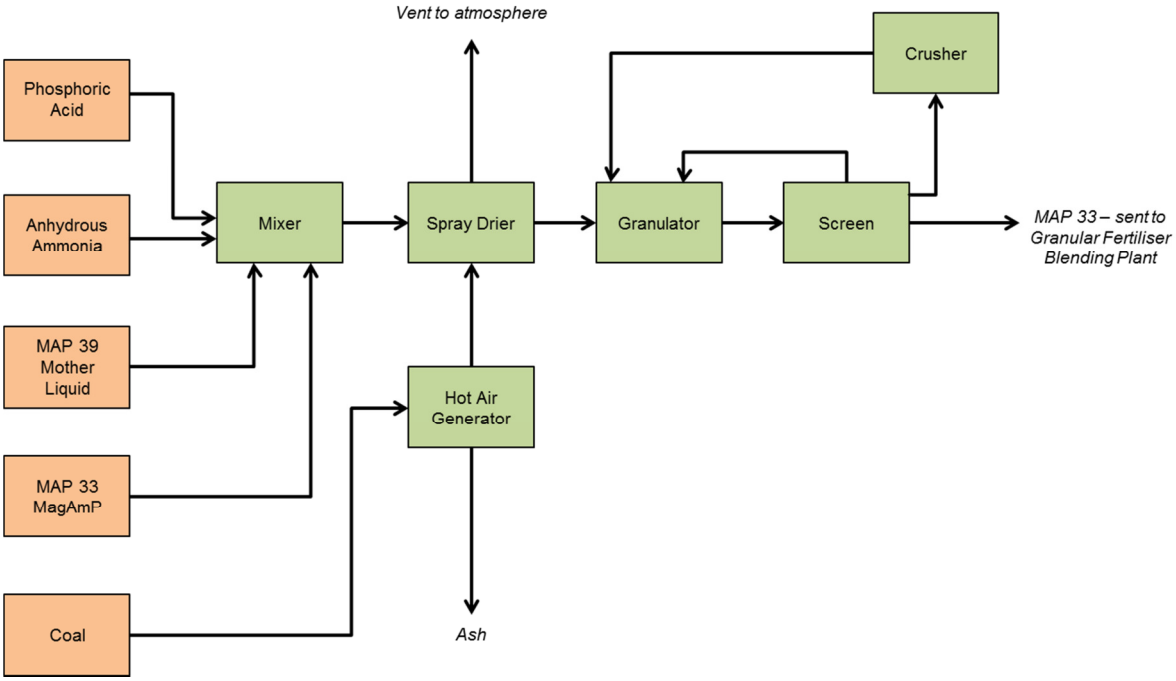

Figure 9: Mono Ammonium Phosphate (MAP 33) Plant

Mono ammonium phosphate (MAP 33) granular is produced by injecting liquid anhydrous ammonia into a vessel containing phosphoric acid, and mother liquor and MagAmP from the MAP 39 Plant. The resultant dilute MAP solution is fed to a spray dryer. In this equipment, a mechanical atomizer generates a fine mist of MAP solution to enable the water content to be evaporated.

The evaporation air for the spray dryer is produced by a coal fired hot air generator. A hot air generator is a hearth burning coal, making flue gas at about 450℃. Because this is fertilizer manufacture, there is no necessity in keeping the product pristine, so some fly ash entering with the flue gas will not present a problem. The spray drier gets inlet gas at 450℃ from the burner and the feed is atomized into this hot gas stream, where the water evaporates and leaves a dry powder. The outlet temperature is usually about 100℃. The MAP 33 Plant will operate on a continuous basis as the will use a spray drier.

The MAP powder from the spray dryer is fed to a pan granulator; the MAP 33 granules are then screened, bagged and fed to the Granular Fertilizer Blending Plant (refer to the Granular Fertilizer Blending Plant). The oversize is crushed and re-screened. The undersize are fed back to the granulator.

5.2.5 Granular Fertilizer Blending Plant

The existing Granular Fertiliser Blending Plant will be relocated from the Standerton site. The MAP 33, potash, urea and limestone ammonium nitrate (LAN) granules are blended according to the required recipe to produce the various fertiliser blends required for the market. Weighed quantities of these fertilisers, for a specific formulation, are placed into a rotating drum to mix. The blended granular fertilisers are then bagged for sale. The Granular Fertiliser Blending Plant will be a batch

operation at the start but could change to continuous if the volumes increase. The Granular Fertiliser Blending Plant is illustrated in Figure 10 below.

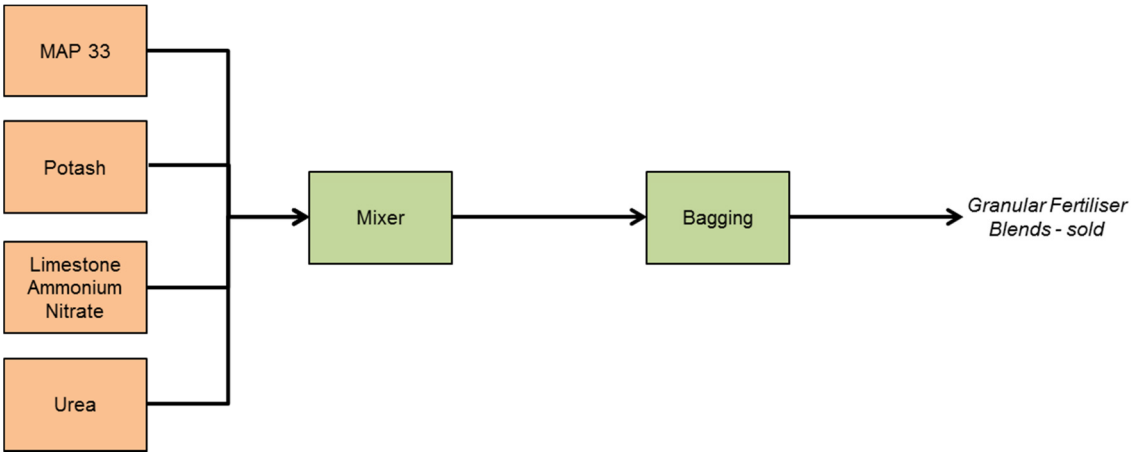

Figure 10: Granular Fertiliser Blending Plant

5.2.6 Auxiliary Processes

5.2.6.1 Raw Materials storage and Handling

The process will cater for three to four days' storage of raw materials.

Liquid raw materials

Nitric acid will arrive in tankers containing 30t of nitric acid. Offloading will take place inside an area surrounded by a spill bund so that any spillage from coupling up is captured within the area. Should spillage occur, such will be recycled to the process. The tanker is coupled up by flexible hoses with Camflex couplings to a pump, which pumps the nitric acid to an 80t stainless steel storage tank. The storage tank will be located in an area, which will be bunded to contain the contents of the full tank, plus 10%. Ullage air from the tank will vent to atmosphere through a lime filter to remove any oxides of nitrogen in the ullage air. Spent lime from the filter will be recycled to the process.

Anhydrous ammonia will arrive by road in the supplier's tanker. The tanker is connected to the plant high pressure steel storage tank, 30t located on a concrete floor. The liquid ammonia will be pumped to the plant storage tank.

Ammonium nitrate. The ammonium nitrate delivery system is very similar to that for nitric acid. A tanker containing 30t of ammonium nitrate arrives from Sasol, Secunda. Offloading will take place inside an area surrounded by a spill bund so that any spillage from coupling up is captured within the area. Should spillage occur, such will be recycled to the process. The tanker is coupled up by flexible hoses with Camflex couplings to a pump, which pumps the ammonium nitrate to a 50t stainless steel storage tank. The storage tank will be located in an area, which will be bunded to contain the contents of the full tank, plus 10%. Ullage air from the tank will vent to atmosphere.

Solid raw materials

Raw material trucks will drive into the storage building and stop adjacent to the storage bay and discharge the load into the bay and then the truck will drive out. The building will have an entrance at one end, and exit at the other, so that the truck can drive through. The exit and entrance will be equipped with plastic slats, so that the vehicle can drive through easily and dust will be contained inside the building. The raw material stockpiles will be neatened by means of a front-end loader.

Phosphate rock. The phosphate rock will be delivered in a side discharge enclosed truck containing 33 tons (t) in bulk. The phosphate rock arrives as crushed material, which has a coarse powdery consistency. It is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release.

Hydrated lime. Hydrated lime arrives as a full 30t load, delivered in 1t bags. These bags will be stored on a concrete slab under cover.

LAN arrives as granules ready for blending into granular fertilisers. The LAN is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release

MAP. The MAP arrives as granules ready for blending into granular fertilisers. The MAP is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release.

Potash. The potash arrives as powder and is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release.

Ammonium Sulphate. The ammonium sulphate arrives as sugar like crystals. The ammonium sulphate is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and avoid any dust release.

Urea arrives as granules ready for blending into granular fertilisers. The urea is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and avoid any dust release. Dust release will be unlikely because of the granular nature of the material.

5.2.6.2 Boiler

The boiler will be a fully automatic chain-grate stoker type package unit from a reliable supplier. It will generate 2t of steam per hour at 10 bar, the equivalent of 1 230kW. The boiler will be fuelled with 244kg of coal per hour.

Soft water required for the boiler will be generated at ion exchange plant. Raw water will be treated by this plant to make the boiler feed water of the required quality. Every few days the ion exchange plant must be regenerated and this will cause a production of a blowdown. When regenerating an ion exchange column there will be an excess of regenerant needed (often up to 50% excess). This excess goes out into the regen solution and the rinse water for disposal. It means that all excess water will be acceptable for disposal to irrigation without having to be monitored for quality or diverted to some other waste storage. Potassium will also present in the softened water but will be eliminated in blowdowns so it too will either go to the reactor or to disposal.

Much of the blowdown water from the Hi-Fos cooling tower and boiler water will be recycled to the main phosphate reactor so that all the dissolved solids will report to the product phosphoric acid. However, there is an imbalance caused mainly by the rinse water from the ion exchange plant that will remove the calcium content of the raw water (9 000m^3/y).

For this water to be used in irrigation in the adjoining farmland the regenerant that will be used will be potassium chloride (in place of the usual sodium chloride). This means that the treated waters will be sodium, calcium and magnesium free while the regenerant stream and the required rinse waters will be sodium free but will be rich in potassium, calcium and magnesium making this an ideal water for use in irrigating nearby vegetable gardens.

Thus, what would normally be an unusable waste water will be turned into a productive resource.

5.2.6.3 Cooling Tower

The cooling tower will be installed to cool the reaction product from boiling to 35℃ and to dissipate the energy from the chiller plant that cools the reaction product to 4℃. The evaporation will use 2.7m^3 of water per hour.

5.2.6.4 Chiller System

The chiller will consist of a standard 150kW compressor system, using ammonia in a standard refrigeration cycle. The chiller will cool a glycol brine solution, which in turn, will cool the contents of the crystallizer to 4℃, causing the CN4 to crystallize out for separation on a continuous centrifuge. The ammonia used will be refrigerant grade and of a purer quality to that used as a raw material. The ammonia will be delivered separately by the chiller vendor.

5.2.6.5 Compressor and Air Injection

The water ring compressor will deliver 60m³ of air per hour of air at 0.3 bar. The compressed air will pass to the phosphoric acid reactor sparge, where it will strip the HF gas from the reactor contents. The stripped gases will pass from the reactor through to the scrubber where the HF will be removed.

5.2.6.6 Product Storage and Handling

The **phosphoric acid product** will pass from the centrifuge and be pumped into a 27 000-liter product storage tank. From there it will be used on site or pumped into road tankers for delivery to the Sonskyn in Standerton or to alternative customers. The tanker is coupled up by flexible hoses with Camflex couplings to a pump, which pumps the phosphoric acid into the road tanker. The tanker is parked inside an area surrounded by a spill bund so that any spillage from coupling up is captured within the area. That spillage will be recycled to the process. The storage tank will be located in an area which will be bunded to contain the contents of the full tank, plus 10%.

Calcium nitrate (CN4) product can be stored in bulk bags but this could cause problems because of its low melting point. Alternatively, it can be melted at 50℃ and pumped to bulk storage for delivery to a CN4 liquid user in the explosives and agriculture industries. If the CN4 is intended to be sold as a more suitable product, then it will be passed into a vessel where it will be melted by a steam coil and then pumped into a heated tanker. After that it will be transported to the customer. A more likely process is that the CN4 will be converted to CNX (refer above). This product has a high melting point and less water of crystallization. The CN4 can be bagged and sold as a fertilizer.

Calcium fluoride (CaF_2) is formed in the scrubber circuit as and is filtered out and forms a wet filter cake. It is bagged and then dispatched to customers.

Calcium ammonium nitrate (CNX) is a dry granular solid, screened to a specific size range. It is bagged and then dispatched to consumers.

The **pure mono ammonium phosphate** (MAP 39) is a dry crystalline granular solid screened to a specific size range. It is bagged and then dispatched to consumers.

Mono ammonium phosphate (MAP 33) is a regular granular solid screened to a specific size. It is bagged and then dispatched to consumers.

5.2.6.7 By-Product/Waste Storage

Boiler ash is discharged from the boiler and stored in a bunded area to contain such. The ash will then be loaded onto a truck dispatched to a 3rd party.

The wet **silica** material is discharged from the reactor products filter and stored in a bunded area to contain any free moisture that may be present. The silica will be loaded onto a truck and dispatched to a 3rd party.

Gypsum. The wet gypsum is discharged from the gypsum separator and stored in a bunded area to contain any free moisture that may be present. It may be sold in which case the gypsum will be loaded onto a truck and dispatched to a 3rd party.

5.2.6.8 Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment)

As an alternative to sales the gypsum may be treated. The Hi-Fos process will produce 8 200 tpaof gypsum dihydrate as a by-product that needs to be converted into saleable fertilizer for use by dry land farming operations. A suitable product will be a granule that can be added into fertilizer blends which will be beneficial for the acidifying the soil and adding some organics at the same time. The Gypsum Treatment is illustrated in Figure 11 below.

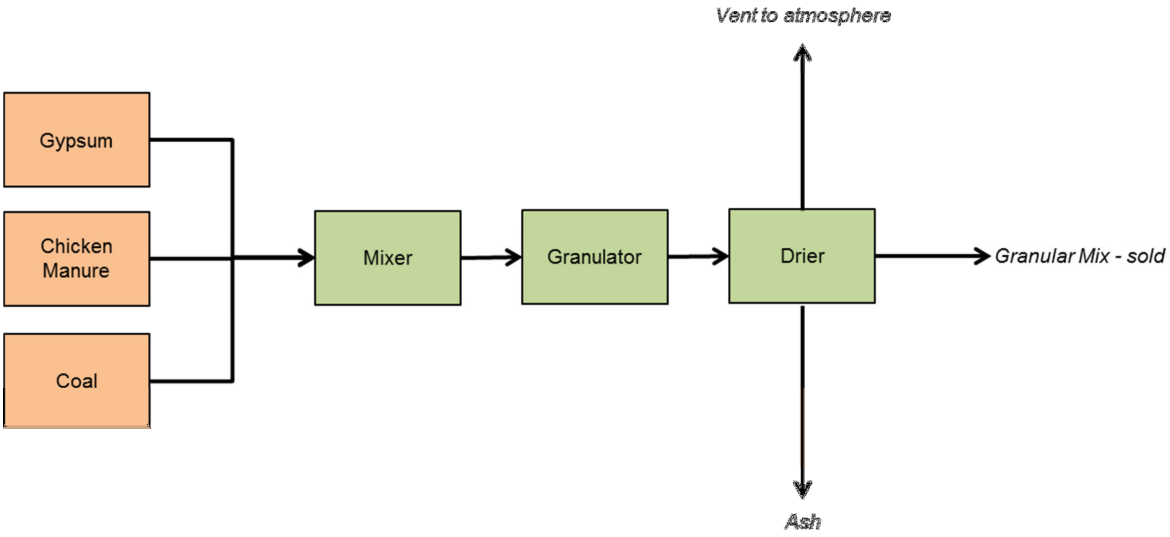

Figure 11: Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment)

In this gypsum granulation process, dried chicken manure that has been treated by the suppliers with MAP from the Hi-Fos process to give a pH4, will be brought to the site in bulk trailers and stored in a bin in the granulation building. This will be moved by front-end loader to the gypsum granulation plant where it will be mixed with the filter cake from the gypsum filter.

The mixer will be a robust machine known as a blunger. This paste will be fed to a paddle-mixer which makes it into granules that are then fed to a drier. The dried granules are screened, the oversize particles are passed through rollers set at a 4 mm gap to break them into product size and rescreened, the undersize goes back to the blunger for regranulation.

As the manure will be acidic in formulation (see spec sheet) it will be almost odourless. A valuable additive that assists in granulation is chicken manure and supplies some fulvic acid useful in the soil as a chelating agent. The Hi-Fos product will be a 30% mixture of chicken manure with the by-product gypsum at 70% and this whole blend will be granulated and dried in a rotary kiln heated with a coal fired hearth. Any dust from the exit gases will be recovered in a cyclone and fed back into the feed mixing plant. This will give over 10 000tpaorganic based sulphate containing granule.

5.2.7 Plant Layout

The layout of the proposed Phosphoric Acid Plant is illustrated in Figure 12 and Figure 13.

Figure 12: Site Layout

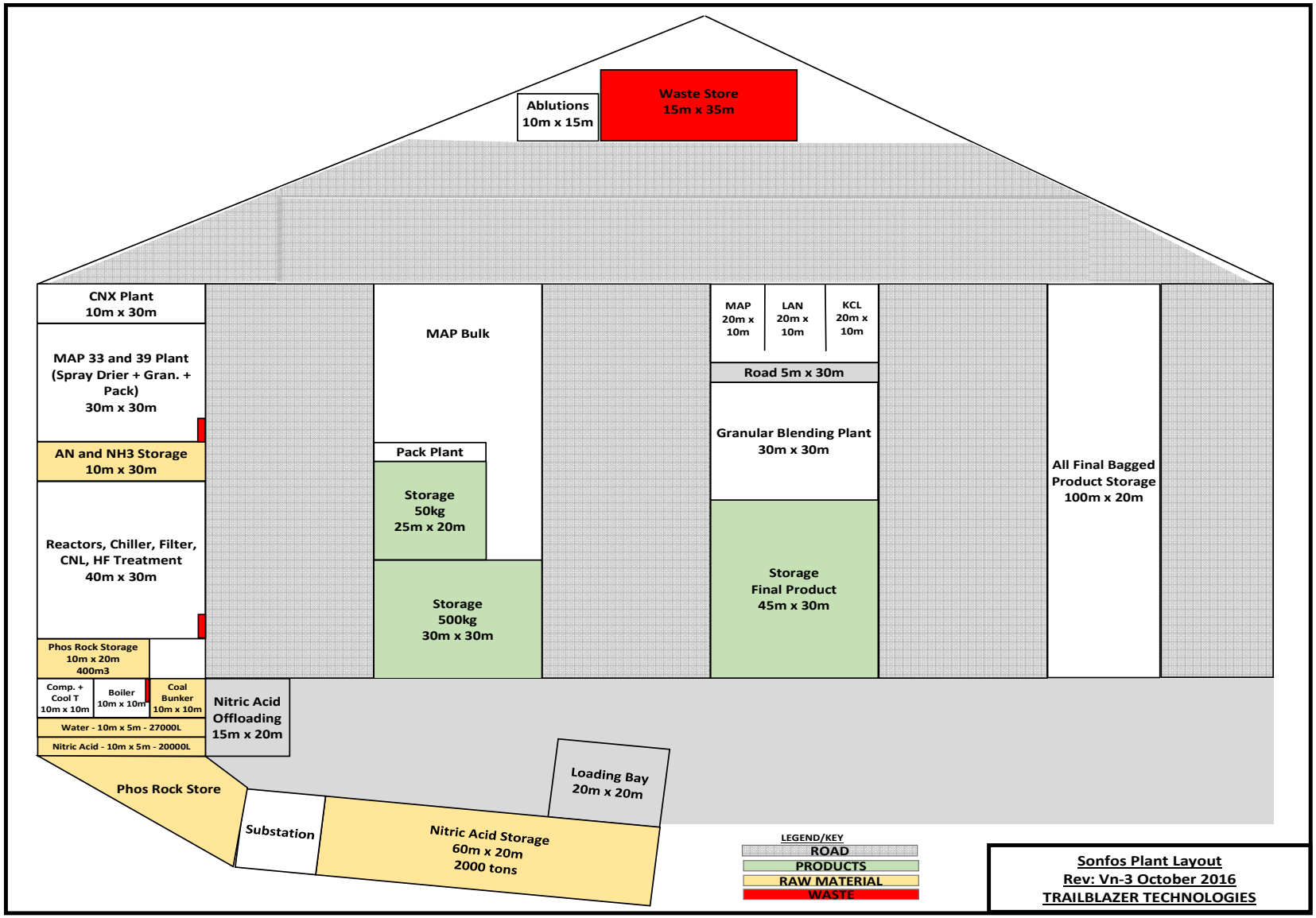

Figure 13: Detailed Site Layout

5.2.8 Project Phases

The objective is to build the proposed Phosphoric Acid Plant in phases with the initial production being half the design rate then increasing as noted in Table 2 below. The basis of this is to produce phosphoric acid at the rate of 4 000tpa as P.

Table 2: Proposed Phosphoric Acid Plant Phases

Year	Phosphoric Acid tpa	Calcium Ammonium Nitrate (CNX) tpa	Mono Ammonium Phosphate (MAP 39) tpa	Mono Ammonium Phosphate (MAP 33) tpa	Granular Fertiliser Blend tpa
Plant Design	38 716	39 468	3 005	9 857	21 963
2018	19 358	19 734	1 502	4 929	10 981
2019	23 230	23 681	1 803	5 914	13 178
2020	27 101	27 627	2 103	6 900	15 374
2021	30 973	31 574	2 404	7 886	17 570
2022	34 844	35 521	2 704	8 872	19 767
2023	38 716	39 468	3 005	9 857	21 963

5.2.9 Operating Hours

The proposed Phosphoric Acid Plant design will be around 5500 hours per annum using a three-shift system excluding Sunday operations.

5.2.10 Plant Design

There are no complex engineering processes involved in the proposed Phosphoric Acid Plant design. Should there be a breakdown during Plant operation, the Plant will be shut down to fix the problem without there being significant disruption to operation.

5.2.11 Materials of Construction

The proposed Phosphoric Acid Plant will be constructed mainly from polypropylene which is resistant to the process materials. Most of the vessels, equipment and pipework will constructed of polypropylene. It is a strong plastic and resistant to all the chemicals involved in the process.

Exceptions to this are stainless steel 304, which will be used for the CNX section and the MAP 33 spray drier.

5.2.12 Service Provision

5.2.12.1 Water Supply

Water will be supplied to the proposed Phosphoric Acid Plant from the disused clay quarry and farm dam via a water reticulation network.

5.2.12.2 Sewerage

Ablution facilities will be utilised by staff working at the proposed Phosphoric Acid Plant. The effluent generated from these ablution facilities will be treated via a waste water treatment plant. Treated effluent will be recycled to the proposed Phosphoric Acid Plant.

An alternative is to transport the waste water to Standerton for treatment at the Municipal Sewage Works.

5.2.12.3 Storm Water Management

Storm water falling on the proposed Phosphoric Acid Plant site will be collected via bund walls and sumps. The collected water will be used in the Plant.

5.2.12.4 Electricity

Electricity for the operation of the proposed Phosphoric Acid Plant will be received from the existing Eskom electrical grid.

5.2.12.5 Waste Management

Domestic waste generated on site will be taken to the Lekwa Local Municipality disposal site.

5.3 Decommissioning Phase

A risk based closure assessment will be undertaken approximately three years prior to closure of the operation to identify the ideal scenario for closure planning. A multidisciplinary closure team will be established in order to identify different aspects that need to be considered for closure. An application will be submitted to the relevant government department, which will include a closure plan. The closure plan will provide a framework of planned activities in the pre-closure, closure and post closure phases.

5.4 Alternatives Considered

The EIA Regulations states that information on reasonable alternatives should be given during the Scoping phase. The following alternatives have been considered and are discussed in more detail below:

- Location alternatives;
- Process alternatives; and
- No-go alternative.

5.4.1 Location Alternatives

The two sites that were considered were Farm Vlakfontein 386, Portion 93 and Holfontein 399, Portion 4.

The site selected as discussed below is Farm Holfontein 399, Portion 4.

5.4.1.1 Farm Vlakfontein 386, Portion 93

This Farm Vlakfontein 386, Portion 93 is located off the R546, approximately 8km from Standerton on Portion 93 of the Farm Vlakfontein 386 in the Mpumalanga Province. This site alternative proved less favourable:

- as it is a Greenfields (undeveloped land) site;
- electricity provision is unavailable; and
- there is a hazard associated with vehicles accessing the R546.

5.4.1.2 Farm Holfontein 399, Portion 4

The second site is located off the R23, approximately 27km from Standerton, located within the Lekwa Local Municipality on Portion 4 of the Farm Holfontein 399 in the Mpumalanga Province. This site alternative proved to be more favourable:

- as it is a Brownfields (previously developed land) site;
- is currently supplied with electricity; and
- there is no hazard with vehicles accessing the R53.

5.4.2 Process Alternatives

Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals Ammonia, Acids and Fertilisers dated December 2006 (http://www.jrc.es/pub/english.cgi/0/733169/) refers "*the nitrophosphate process for producing NPK (nitrogen (N), phosphorus (P) and potassium (K)) grades is characterised by the use of nitric acid for rock phosphate digestion and the subsequent cooling of the digestion solution in order to separate out most of the calcium ions from the solution as calcium nitrate crystals*". The nitrophosphate process is the favoured process for manufacturing phosphoric acid.

An alternative to nitric acid is the use of sulphuric acid. The major disadvantage of using sulphuric acid is the large quantities of phosphor-gypsum that are produced for which there is a limited market.

5.4.3 No-Go Alternative

The no-go alternative must be considered in light of the need for and the desire of the proposed Phosphoric Acid Plant. The positive and negative implications to the proponent, the community,

the local economy and the biophysical environment must be considered, should Hi-Fos not be allowed to construct and operate the proposed Phosphoric Acid Plant. These are discussed in more detail below.

5.4.3.1 The Proponent and Local Economy

Soil naturally contain many nutrients like nitrogen, phosphorous, calcium, and potassium. These nutrients allow plants to grow. When soil nutrients are missing or in short supply, plants suffer from nutrient deficiency and stop growing. When the nutrient level is too low, the plants cannot function properly and cannot produce the food necessary to feed the population.

Once crops are harvested for human consumption, the natural supply of nutrients in the soil must be replenished. This is why farmers add nutrients to their soil. Nutrients can be added from a variety of sources—organic matter, chemical fertilisers, and even by some plants. These maintain the soil fertility, so the farmer can continue to grow nutritious and healthy crops.

Farmers utilise fertilisers because these substances contain plant nutrients such as nitrogen, phosphorus, and potassium. Fertilisers are simply plant nutrients applied to agricultural fields to supplement required elements found naturally in the soil.

It is estimated that in 2013, Mpumalanga contributed some R269.9 billion in current prices or some 7.6% to the Gross Domestic Product (GDP) of South Africa. Agriculture contributed 8.6% of the GDP, R23.2 billion. The proposed Phosphoric Acid Plant falls within the Gert Sibande District Municipality that contributed 41.6% to the agricultural GDP, R9.7 billion.[4] The proposed Phosphoric Acid Plant will produce fertiliser to support the commercial agricultural industry in the Gert Sibande District Municipality. Furthermore, the proposed Phosphoric Acid Plant will contribute towards employment.

If the proposed Phosphoric Acid Plant was not to continue, Hi-Fos would not produce:

- fertiliser to support the commercial agricultural industry in the Gert Sibande District Municipality; or
- the phosphoric acid required by Sonskyn.

The consequence to Sonskyn would be business interruption, financial loss and ultimate closure.

5.4.3.2 The Community

For this project, the no-development option would mean not undertaking the proposed rezoning of the site, and subsequently, the construction and operation of the proposed Phosphoric Acid Plant. If the construction and operation of the proposed Phosphoric Acid Plant does not take place, job opportunities for the local community, as contractors and sub-contractors are appointed, will not be realised. In addition, the opportunity for skills transfer, and/or possible skill development will not

[4] Economic Analysis, Socio-Economic Review & Outlook of Mpumalanga, 2014, Mpumalanga Province

occur. Furthermore, should Hi-Fos not produce the phosphoric acid required by Sonskyn, the consequence to Sonskyn would be business interruption, financial loss and ultimate closure.

5.4.3.3 The Environment

For this project, the no-development option would mean not undertaking the proposed rezoning of the site, and subsequently, the construction and operation of the proposed Phosphoric Acid Plant. The no-go alternative will entail leaving the site in its present state, where disturbed ecological and hydrological ecosystems exist.

6. NEED AND DESIRABILITY

Soil naturally contain many nutrients like nitrogen, phosphorous, calcium, and potassium. These nutrients allow plants to grow. When soil nutrients are missing or in short supply, plants suffer from nutrient deficiency and stop growing. When the nutrient level is too low, the plant cannot function properly and cannot produce the food necessary to feed the population.

Once crops are harvested for human consumption, the natural supply of nutrients in the soil must be replenished. This is why farmers add nutrients to their soil. Nutrients can be added from a variety of sources—organic matter, chemical fertilisers, and even by some plants. These maintain the soil fertility, so the farmer can continue to grow nutritious and healthy crops.

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7. RECEIVING ENVIRONMENT

7.1 Climate

7.1.1 Data Collection

The information used for the purpose of this section was taken from the Mpumalanga State of the Environment Report 2003 (Mpumalanga DACE, 2003[5]), the Meteo Blue climatic database[6], The EIA for the Proposed N17 Toll Road 2002[7], Air Quality Impact Report Setlabotsha Project (EIA, 2016)[8].

7.1.2 Regional Description

Standerton is located within the Mpumalanga Province, which experiences hot and wet summers (10 times more rain than the winter months) and mild to cool winters with low precipitation. Winters are predominately dry however, some rain does occur. The annual average rainfall is 767mm, with most rainfall occurring between October and March and heavy rainfall in the form of thunderstorms. Drought cycles are a natural phenomenon in Mpumalanga with cycles lasting one to two years. The average daily temperatures range between 14.8°C in winter (June) to 24°C in summer (January).

7.1.3 Site Description

The site is subject to the climatic conditions, which are discussed below.

7.1.4 Precipitation

The site is located 27km from Standerton, within the Lekwa Local Municipality. The closest weather station to the site is located in Standerton. The climatic data from the Standerton weather station represents the climatic conditions experienced at the site. Table 3 represents the average monthly rainfall data for the period of 30 years (approximately 1985-2015). This rainfall data indicates that the average annual rainfall for the site over the period 1985-2015 is 39.3mm.

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[5] Mpumalanga DACE, 2003. Mpumalanga State of the Environment Report. Mpumalanga Department of Agriculture, Conservation and Environment, Nelspruit.

[6] Meteo Blue Climatic Data, 2016.Website: https://www.meteoblue.com/en/weather/forecast/modelclimate/standerton_south-africa_952747

[7] L & W Environmental, 2002. Environmental Impact Assessment (EIA) for the Proposed N17 Toll Road, Proposed Rehabilitation and Upgrading of the N17 from Springs to Ermelo and Proposed Construction of New Sections between Leandra and Leven Station, at Trichardt and Bethal, Mpumalanga Province.

[8] Kijani Green Energy, 2016. Air Quality Impact Report Setlabotsha Project – EIA, Mpumalanga Province.

Table 3: Average monthly rainfall for the Standerton Weather Station from 1985-2015

Months	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	69	45	43	23	8	5	2	7	17	67	80	88

7.1.5 Ambient Temperature

For the period 2010-2015, temperatures for mean monthly averages at the Standerton weather station are represented in Table 4. The warmest period is usually between December/January, where the maximum temperatures average above 26°C, whilst June/July is the coldest with daytime temperatures averaging 17°C and overnight temperatures dropping below freezing. Mean maximum temperatures peak at 28°C during the February month, with the mean minimum temperatures dropping to 1°C during June and July for the period 1985-2015.

Table 4: Temperatures for the Standerton weather Station from 1985-2015

Months	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Maximum °C (T_{max})	28	27	26	24	21	18	18	21	25	26	27	27
Minimum (T_{min}) °C	13	13	12	9	5	1	1	4	8	11	12	13
Mean (T_{avg}) °C	19.2	18.7	17.8	15.3	11	8.6	7.8	11.4	14.5	16.8	17.6	18.8

7.1.6 Surface Wind Field

The annual average wind speed and direction measured at the Standerton weather station is presented in Figure 14 for the period 1985-2015. As a result of the anticyclonic circulation, the surface winds are predominately north to north-westerly, with easterly winds being the second most frequent. Wind speeds during the night tend to be low and calm, with significant differences in daytime and night-time wind speeds.

During the summer months in Standerton (December to February), an increase in the frequency of easterly winds reflects the influence of easterly wave systems. During the winter months (July to August), the prevailing winds are from the northwest, which is a result of the enhanced influence of westerly wave disturbances. Autumn and winter months are associated with a greater frequency of calm wind conditions, whilst the least number of calm wind conditions occur during the spring and summer months.

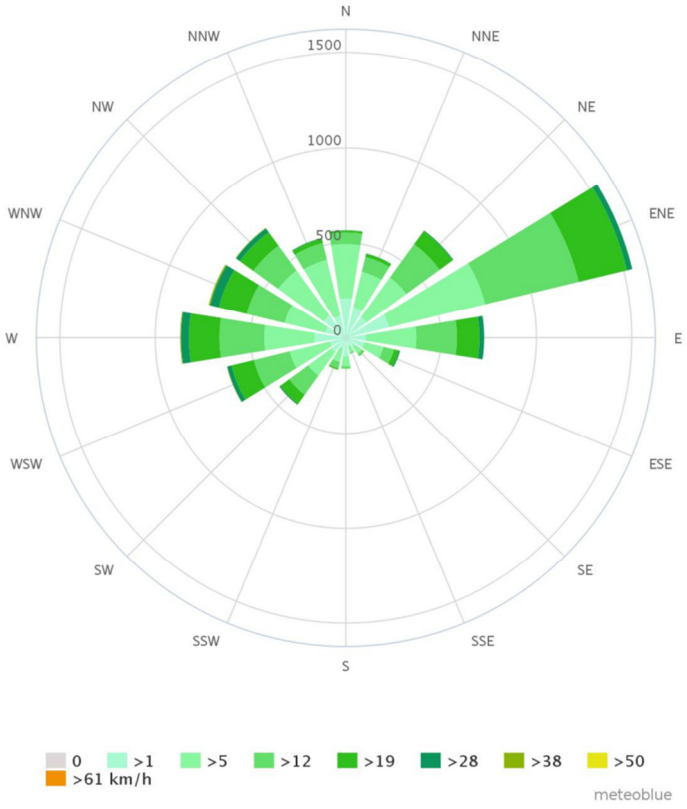

Figure 14: Wind rose for Standerton, which shows the hours per year the wind blows from the indicated direction

7.2 Geology

7.2.1 Data Collection

The information was taken from the Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys 2013[9], Revised Environmental Scoping Report for the proposed Combined Cycle Gas Turbine (CCGT) Power Plant in the Amersfoort Area, Mpumalanga Province[10], The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006)[11].

[9] Terra Pacis, 2013. Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys, Mpumalanga Province.

[10] Bohlweki SSI Environmental, 2008. Revised Environmental Scoping Report for the proposed Combined Cycle Gas Turbine (CCGT) power plant in the Amersfoort Area: Final Project of Eskom Holdings Limited, Mpumalanga Province.

[11] Mucina, L. and Rutherford, M.C. 2006. Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. Southern African National Biodiversity Institute, Pretoria.

7.2.2 Regional Description

The predominant geology underlying the Mpumalanga Province comprises mainly of the Karoo Supergroup, which covers two thirds of South Africa. The thickness of the Karoo Supergroup strata varies, with it being extremely thin in the North to roughly 300m in the Standerton area. The other geological formations that occur in the region comprise of the quartzite ridges of the Witwatersrand Supergroup and the Transvaal Supergroup comprising the Pretoria Group as well as the Selons River Formation of the Rooiberg Group. The Karoo Supergroup can be divided into the Dwyka, Ecca and Beaufort Groups.

The Karoo Supergroup hosts sediments carbonaceous shales, sandstone and mudstone and the coals of the extensive Ecca Group. The Karoo Supergroup contains dolerite intrusions, which are commonly found in this type of terrain and represent the roots of the volcanic system and are presumably the same age as the extrusive lavas. Standerton is located within the southern part of Mpumalanga and comprises mainly of the Ecca Group, which is representative of the Mpumalanga Province. The Ecca Group is described below in more detail.

7.2.2.1 Ecca Group

The sedimentary rocks of the Vryheid and Volksrust Formations comprise the Ecca Group. The Ecca Group overlies the Dwyka Formation gradationally and is largely comprised of sandstone, mudstone, shale, siltstone, and coal seams. These are deposited in an extensive landlocked basin experiencing only rare marine incursion.

7.2.2.2 Dwyka Group

The rocks of the Dwyka Group in the Mpumalanga Province were deposited during late Carboniferous to early Permian times by glacial processes. The underlying rocks, especially in the north, display well-developed striated glacial pavements in places. The group consists mainly of marine diamictites and tillite, which is generally massive with little jointing but may be stratified in places. The Dwyka diamictite consist of angular to rounded clasts of basement rock embedded in a clay and silt matrix Subordinate rock types include conglomerate, sandstone rhythmite and mudstone. In certain parts of the Karoo Supergroup the diamictite display distinctive ‘tombstone’ morphology as a result of selective weathering along axial-plane cleavage.

7.2.3 Site Description

The underlying geology of the site, 27km from Standerton, is representative of the Ecca Group Vryheid Formation as illustrated in Figure 15.

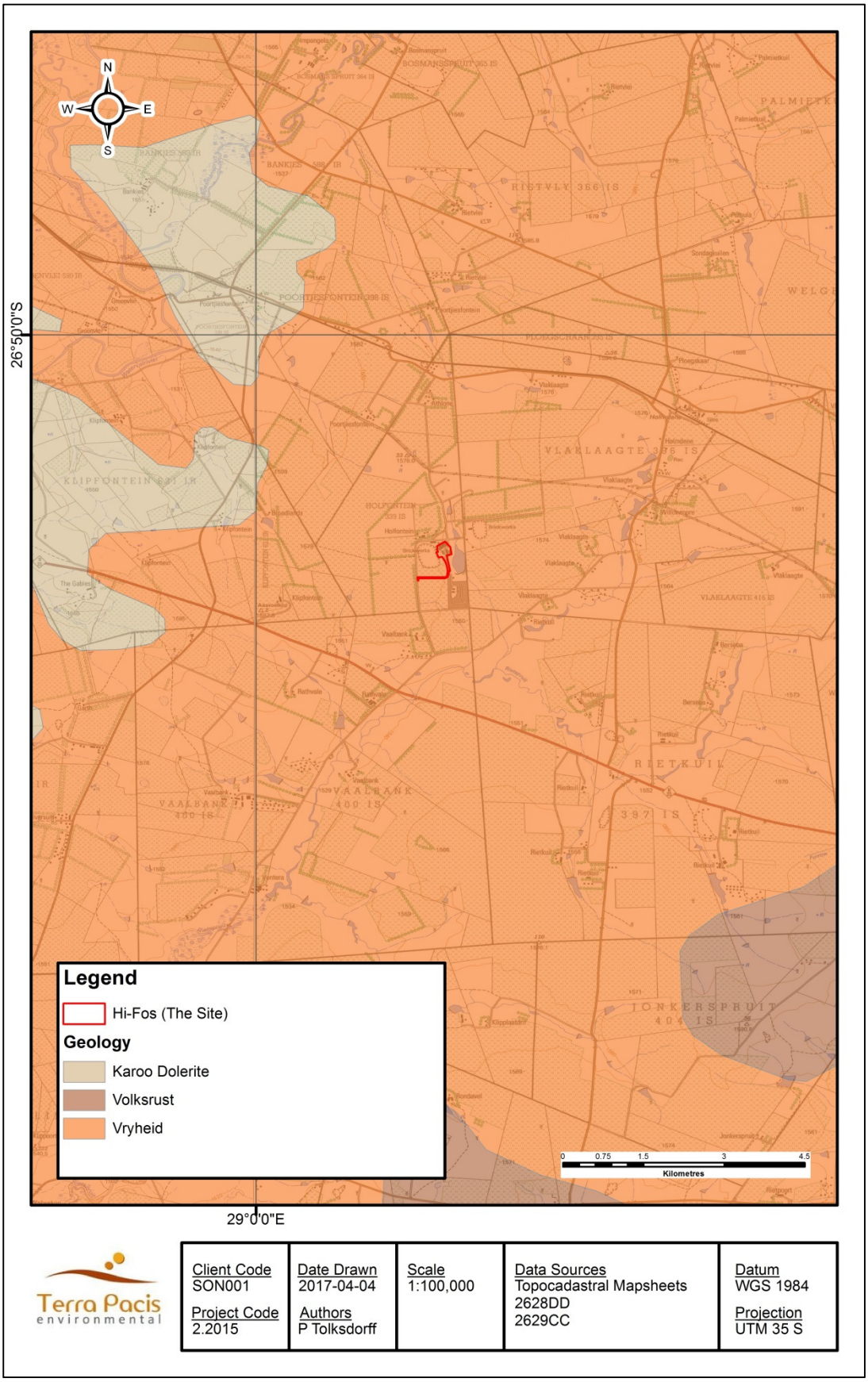

Figure 15: Underlying Site Geology

7.3 Topography

7.3.1 Data Collection

Information was taken from the Mpumalanga State of the Environment Report 2003 (Mpumalanga DACE, 2003)[5], Mpumalanga Agricultural Education and Training Report[12], Lekwa Municipality Integrated Development Plan (IDP) For Financial Year 2013/2014 (Final IDP 2013/2014)[13].

7.3.2 Regional Description

The Mpumalanga Province can be split into two broad topographical zones, namely the high lying grassland savannah of the Highveld escarpment and the subtropical Lowveld plains. The topography of the Mpumalanga Province varies considerably from 1300-1780 meters above mean sea level (mamsl.). The Highveld stretches eastward from Delmas until it rises up the mountain peaks and deep valleys of the escarpment in Belfast in the northeast and plunges down to the low-lying area at the boarder of Mozambique to the Lowveld.

The topography surrounding Standerton in the Lekwa Local Municipality is typical of the topography found on the Highveld Plateau. Slightly to moderately undulating plains typifies the Highveld plateau. The area is relatively flat, which has resulted in several pans and wetlands occurring with occasional ridges and rocky outcrops. The Lekwa Local Municipality area contains several important koppies, with the most important being Standerskop located in Standerton and is also recognised as a conservation area. Other koppies that were recognised in the area are:

- Spioenkop – to the east of Thuthukani.
- Potberg – southwest of Standerton.
- Joubertskop – southwest of Standerton.

7.3.3 Site Description

The site is located within the Lewka Local Municipality, which forms part of South Africa's elevated inland plateau in the Grassland Biome ecosystem. The topography is relatively flat or gently undulating, ranging from 1500-1800mamsl as illustrated Figure 16.

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[12] Mhlangu E.E. and Sekgota, M.G.B, Department of Agriculture, Conservation and Environment. Mpumalanga Agricultural Education and Training Report, National Strategy on Education and Training for Agriculture and Rural Development, Mpumalanga Province.

[13] Lekwa Municipality Integrated Development Plan (IDP) for Financial Year 2013/2014. Lekwa Local Municipality.

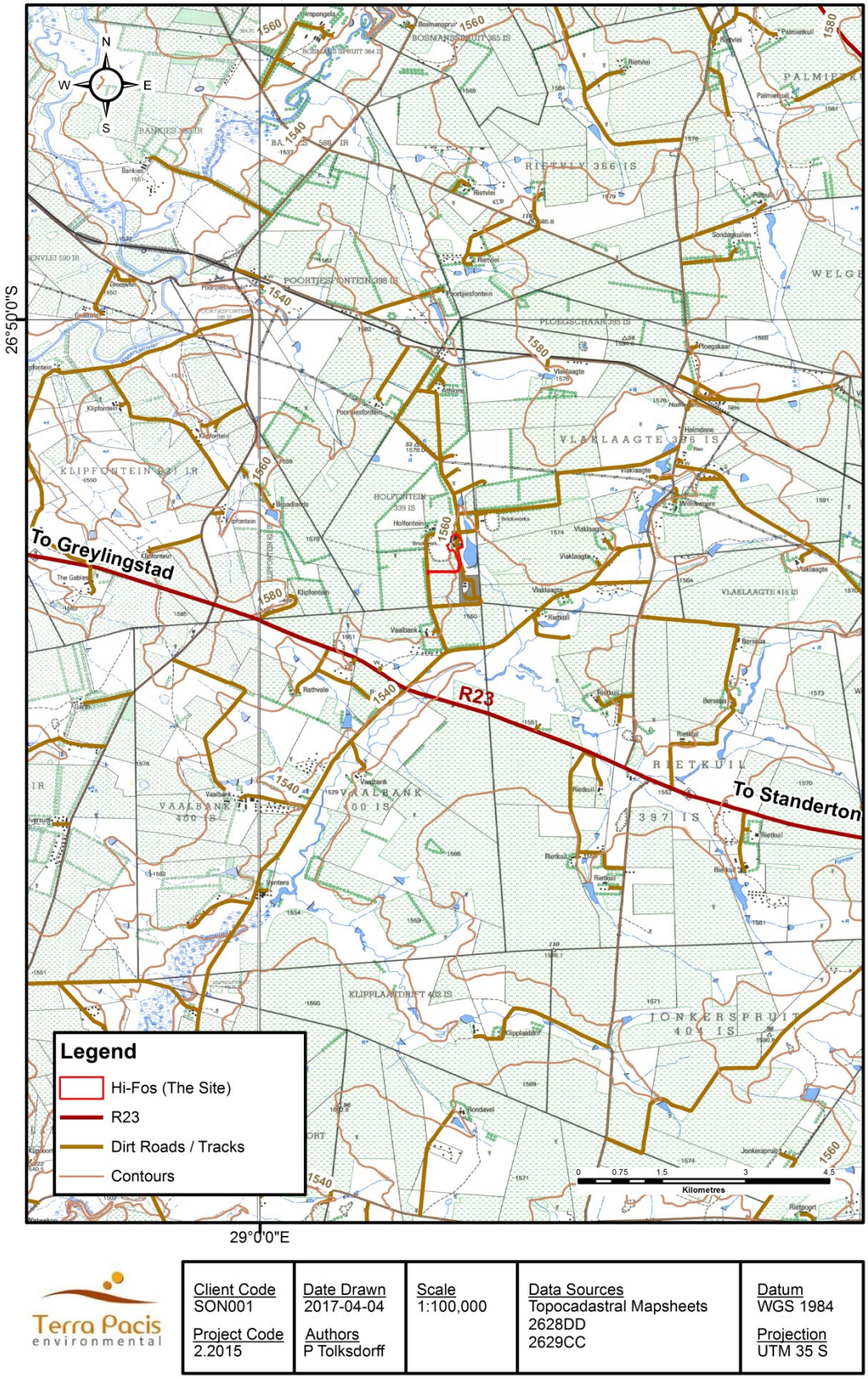

Figure 16: Topography

7.4 Soil and Land Capability

7.4.1 Data Collection

Information was taken from the Mpumalanga Agricultural Education and Training Report[12], The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006)[11], Goldi – A division of Astral Operations Limited, 2015[14], Soil Investigation by KBK Engineers (Pty) Ltd[15].

7.4.2 Regional Description

The predominant soil are mostly derived from the geology of the Mpumalanga Province and are predominately shale, sandstone or mudstone of the Karoo Supergroup (as illustrated in Figure 17). The soil that occur in the Karoo Supergroup are deep, reddish on flat plains. The generalised soil profile in Standerton is as follows:

- Colluvial soil;
- Residual dolerite;
- Deeper residual dolerite; and
- Weather siltstone.

The land capability is derived from the soil and climate in the Mpumalanga Province. The diversity of soil, climate and topography in the province enables the production of a wide variety of agricultural activities. Crops that are grown in the Lowveld include citrus and subtropical fruits, whilst the Highveld produces the summer grains, which consist of maize, sunflower and grain sorghum.

Land degradation as a result of coal mining in the Mpumalanga Province has affected the land capability. This is evident in the reduced amount of arable land available for agricultural practices.

7.4.3 Site Description

Although the site is zoned agricultural, a historical brickworks (constructed in 1964, decommissioned in 1999) is situated on the site. The historical brickworks has impacted the soil structure and fertility.

KBK Engineers (Pty) Ltd (KBK Engineers) undertook a soil investigation on the site of the Proposed Phosphoric Acid Plant, as attached in Appendix 4[15] and summarised in Section 11.1. The soil profiles, of both test pits dug 2m, in the north and south of the proposed Phosphoric Acid Plant site were very similar. The position of the test pits is shown in Figure 18. The mean soil

[14] Shangoni Management Services (Pty) Ltd, 2015. Goldi – A Division of Astral Operations Limited, Goldi Farm Composting Site – S24G Application, Standerton.

[15] KBK Engineers (Pty) Ltd, 2015. Soil Profile Proposed Warehouse Site, Holfontein Portion 4, Holmdene.

profile of the northern test pit consists of dark brown slicken sided active silty clay up to a depth of approximately 1.2m. The mean soil profile of the southern test pit differed slightly to the northern test pit, as the colour of the clayey soil becomes grey at approximately 1.8m. There was no evidence of a water table, although the moisture content of the soil was relatively high.

A layer of brick paving from the old brickworks covered the area where the northern test pit was excavated thus the moisture fluctuation to the soil was curbed. The southern test pit had no cover (brick paving) and it was expected that the soil in this area could have been somewhat dryer due to the time of the year and the exposure to evaporation. However, the moisture content in both the northern and southern test pits were similar, which means that the expected differential movement of subsoil between the northern and southern side will be limited.

The laboratory results note a plasticity index (PI) of 12 in the northern test pit, and a PI of 20 in the southern test pit. The PI is a range of moisture in which a soil remains in a plastic state while passing from a semisolid state to liquid state. Soil with a high PI tend to be clay, and those with a low PI tend to be silt; a PI of 0 indicates non-plastic soil that contains little or no silt and clay. Although the silty/clayey content is quite high with 80% and 72% passing through the 0.075mm sieve, the activity (capacity to retain water) of the soil in the southern and northern test pits can be classified as low to medium.

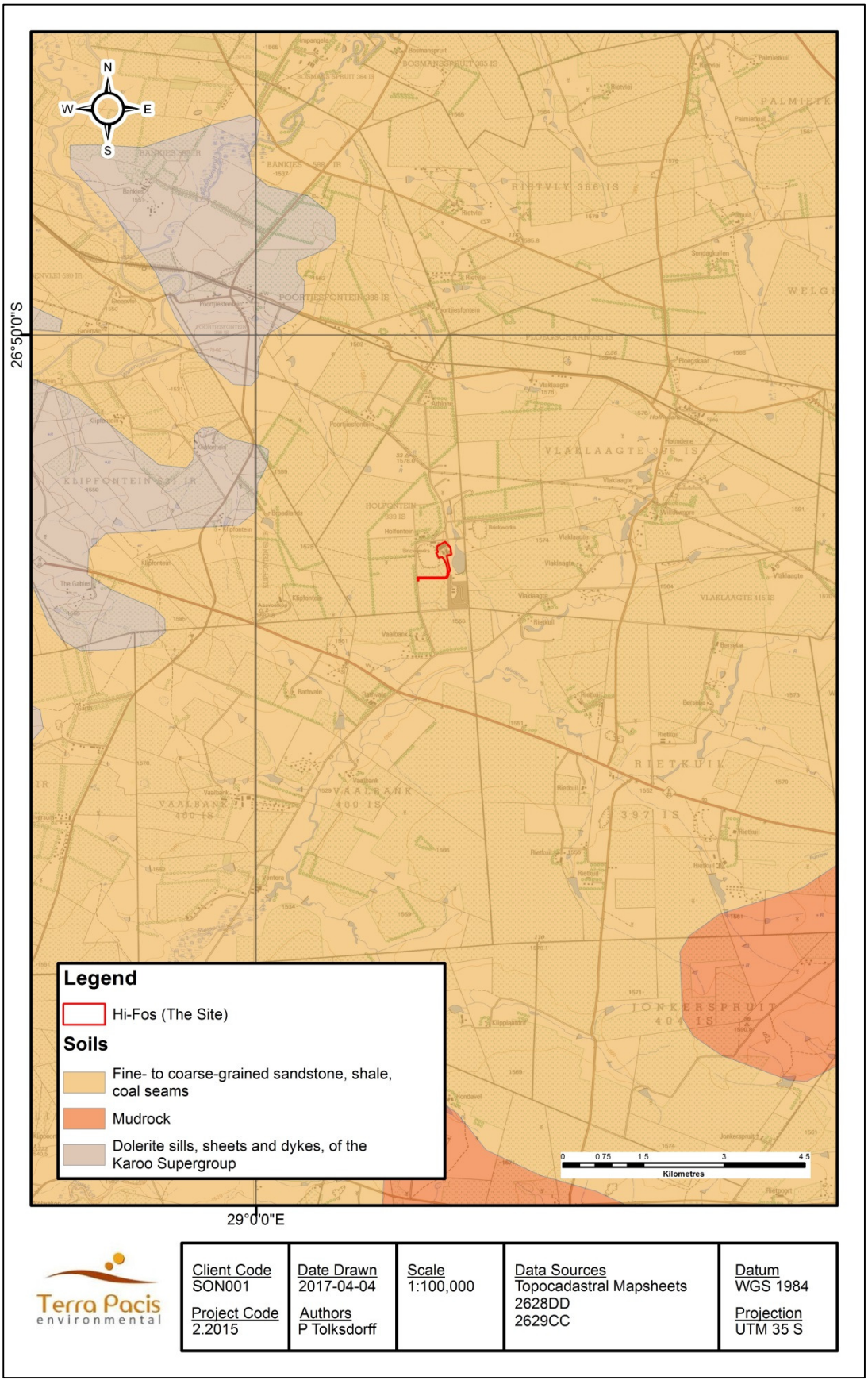

Figure 17: Regional Soil Profile

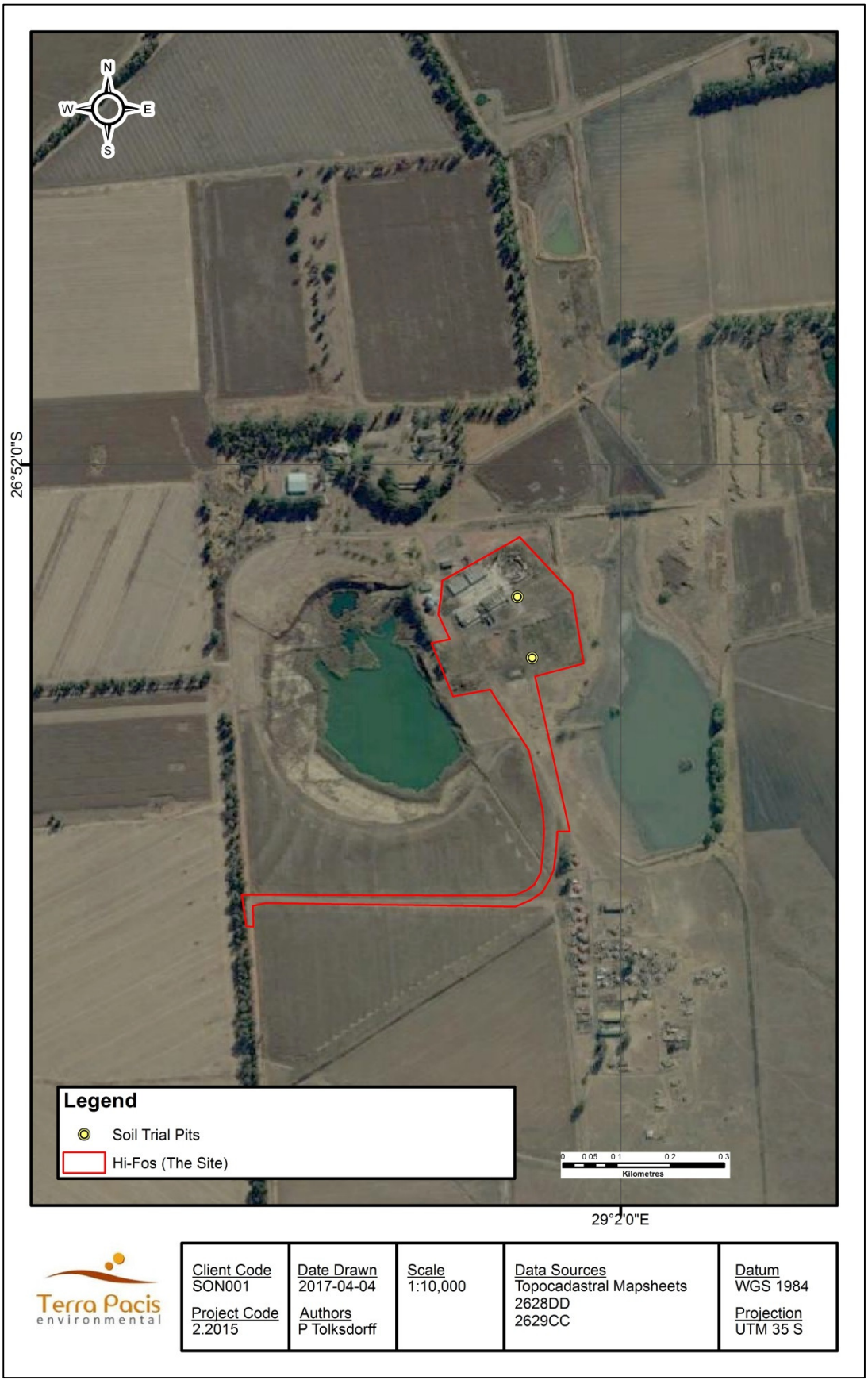

Figure 18: Site Soil Test Pits

7.5 Land Use

7.5.1 Data Collection

This information was taken from the Kipower (Pty) Ltd Environmental Impact Assessment, 2016[16], The Mpumalanga State of the Environment Report 2003[3] (Mpumalanga DACE, 2003)[5], South African Land Cover 2013 (ArcGIS)[17].

7.5.2 Regional Description

The Mpumalanga Province land use is dominated by agriculture, mining and power generation. The agricultural practices include maize and sunflower farming whilst coal mining is the predominant industrial activity in the area. The major land uses in Standerton are cultivated land, urban zones and mines (as illustrated in Figure 19).

7.5.3 Site Description

Although the site is zoned agricultural, a historical brickworks (constructed in 1964, decommissioned in 1999) is sited there. The historical brickworks has impacted the soil structure and fertility and in turn altered the land use. The area surrounding the site is characterised by historical brickworks activities, cultivated commercial fields, farm housing and community dwellings.

[16] Jones & Wagener Engineering & Environmental Consultants. Kipower (Pty) Ltd, 2016. Environmental Impact Assessment Process for the Proposed Matla-Glockner Lopp-in and Loop-out 400 kv Transmission Lines to Connect the Kipower IPP Power Plant to the National Grid, Delmas, Mpumalanga Province.

[17] ArcGIS, 2016. South African Land Cover

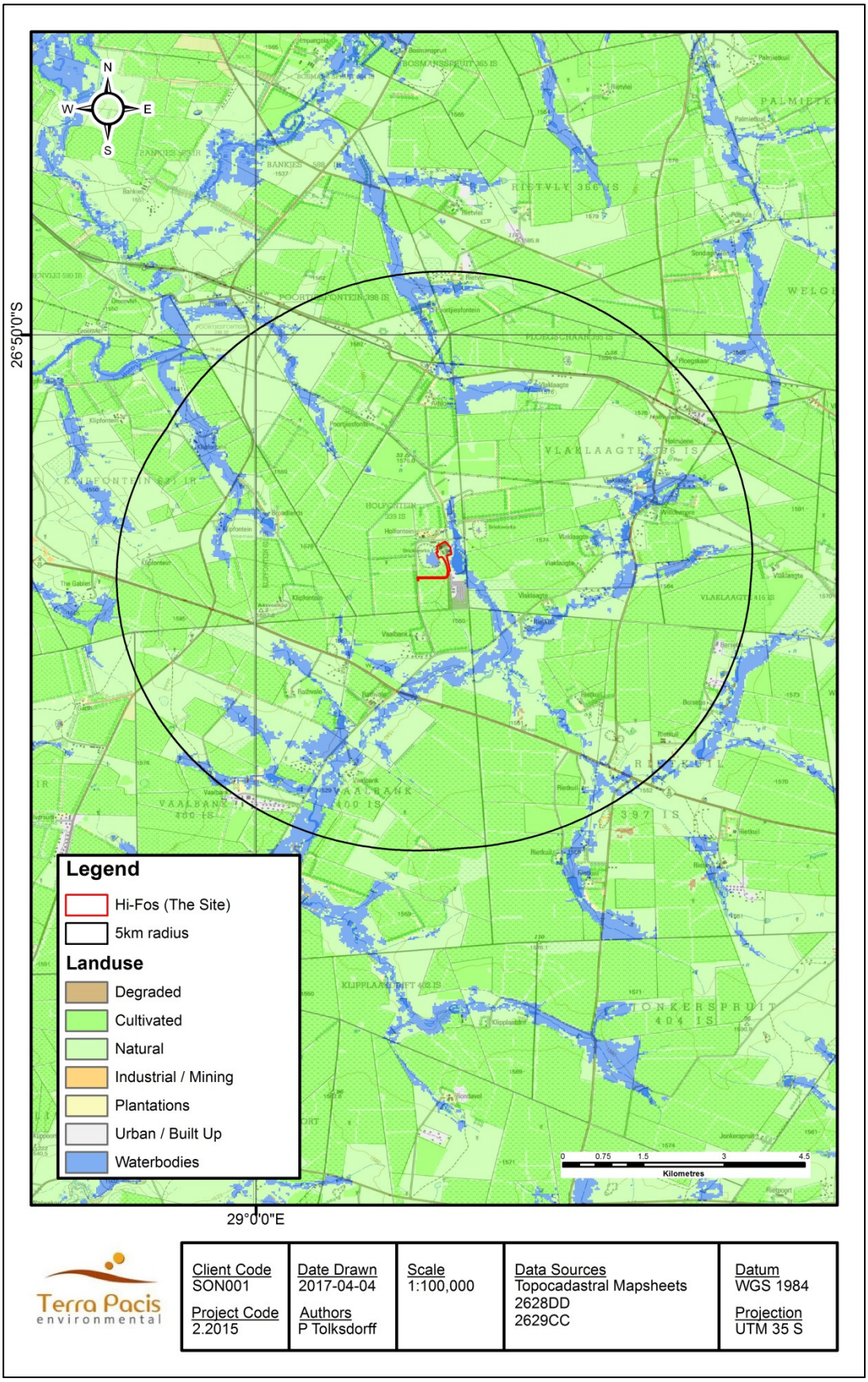

Figure 19: Regional Land Use

7.6 Flora

7.6.1 Data Collection

Information was taken from The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006)[11], the Kipower (Pty) Ltd Environmental Impact Assessment, 2016[16].

7.6.2 Regional Description

The Mpumalanga Province is situated mainly on the Grassland Biome, which is known as the Highveld. The Highveld stretches eastwards, until it rises to towards the mountain peaks and deep valleys of the escarpment in the northeast. The Grassland Biome consists of a high biodiversity, which includes a variety of grass species, some scattered rocky outcrops, forbs, shrubs as well as a few wood species.

Standerton occurs within the Grassland Biome where grass species dominates, with scattered shrubs within the grassland and geophytes occur abundantly. Two sub-types of vegetation occur within Standerton and are as follows:

- Soweto Highveld Grassland; and
- Frankfort Highveld Grassland.

7.6.2.1 Soweto Highveld Grassland

The vegetation that dominates this grassland is short to medium high dense tussock and is dominated by *Themeda triandra* and other prominent grasses such as *Andropogon appendiculatus, Brachiaria serrate, Cymbopogon pospischilii, Elionurus muticus, Eragrostis* species, *Heteropogon contortus* and *Setaria* species. The grass diversity is relatively high along with the diversity of geophytes and herb species. Some of the more common low shrubs scattered within the grassland include *Anthispermum* species, *Felicia muricata* and *Ziziphus zeyheriana.* There are scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops that interrupt the continuous grassland.

The conservation status of this vegetation type is endangered, with only small patches statutorily conserved or privately conserved. Almost half of the area has been transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have become flooded with dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal, Willem Brummer) and the erosion in this area is generally low.

7.6.2.2 Frankfort Highveld Grassland

The Frankfort Highveld Grassland occurs marginally in Mpumalanga, in the south and southeast of the Vaal Dam in the Vicinity of Heilbron, Frankfort and Vrede. This area is characterised by flat to slightly undulating and undulating terrain and the grassland is dominated by the vegetation types

Eragrostis curvula and *Themeda trianda,* accompanied by *Eragrostis capensis, Eragrostis plana, Eragrostis racemosa, Cymbopogon pospischilii, Elionurus muticus* and *Aristida junciformis.*

This grassland has a vulnerable conservation status, with no statuary conservation areas. Over a third of this area has been transformed by cultivated land, mostly maize farming, or has been flooded by dams (Vaal Dam). The erosion in this grassland is very low.

7.6.3 Site Description

A historical brickworks (constructed in 1964, decommissioned in 1999) is located on the site and has impacted the vegetation. During a site visit, it was observed that the footprint is covered with concrete floors and brick paving. The footprint is scattered with alien invasive plant species, such as *Bidens pilosa*, otherwise known as blackjacks.

7.7 Fauna

7.7.1 Data Collection

Information was taken from the Mpumalanga Biodiversity Conservation Plan Handbook (Ferrar and Lotter, 2007)[18], Lekwa Municipality IDP for Financial Year 2013/2014 (Final IDP 2013/2014)[13].

7.7.2 Regional Description

The Mpumalanga Province has a variety of mammal biodiversity with 45 formal Protected Areas (PAs), with an additional 115 informal PAs comprising private land committed to conservation. Many of the PAs located within Mpumalanga have a wide variety of game, including the “big 5” animals (lion, leopard, buffalo, elephant and rhino). The Kruger National Park is located within the Mpumalanga Province and makes up 70% of the total PAs within the area.

There are two formal conservation areas that are located within the Lekwa Local Municipality and these make up 4% of the total municipality, these are:

- The Reitvaal Conservancy.
- The Bloukop Nature Reserve.

7.7.3 Site Description

As a consequence of historical brickworks (constructed in 1964, decommissioned in 1999) and agricultural activities on the site, limited faunal species are likely to occur within the area. Faunal

[18] Ferrar, A.A. & Lotter, M.C. 2007. Mpumalanga Biodiversity Conservation Plan Handbook. Mpumalanga Tourism and Parks Agency, Nelspruit.

and avian species that have been noted on the site include rabbit, rodent, black-backed jackal, grey duiker, porcupine, hedgehog, mongoose, bush pig, birds of prey and flamingo.

7.8 Surface Water

7.8.1 Data Collection

Information was taken from the dataset from the DWS, Lekwa Municipality IDP for Financial Year 2013/2014 (Final IDP 2013/2014)[13], Development of an Integrated Water Quality Management Plan for the Vaal River System (2009)[19], Classification of significant water resources in three Vaal Water Management Areas (Newsletter No. 1 2011)[20], Revisiting Rietspruit: Land Cover Change and Water Quality in South Africa (2000)[21].

7.8.2 Regional Description

Four of southern Africa's major river systems are located within the Mpumalanga Province. Nearly half of Mpumalanga (53%) drains into the Olifants River system, The Orange River system (Vaal River), Inkomati River system (Crocodile, Sabie, Sand and Komati Rivers) and Pongola River system (Usutu River).

The Lekwa Local Municipality is located within the Upper Vaal Water Management Area (WMA). The Upper Vaal WMA lies in the eastern interior of South Africa. In the Upper Vaal WMA, 80% of the requirements for water are by the industrial, urban and mining sectors, with 9% for irrigation and 7% for power generation.

The most important river in the Lekwa Local Municipality is the Vaal River and it flows in a westerly direction through Standerton. Other rivers in the area include the Waterval River, which is to the west of the municipal area, and the Klip River, which forms part of the southern municipal boundary between Lekwa and the Free State before its confluence with the Vaal River.

The Grootdraai Dam is situated in the upstream of Standerton and is a major impoundment within the WMA. This dam is primarily used for flow attenuation and water supply. Pans and palustrine marsh wetlands occur in the Lekwa Local Municipality area. Due to the relative flat topography of the municipal area, there are several non-perennial and perennial pans scattered throughout the area (as illustrated in Figure 20).

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19 Department of Water and Forestry (DWAF), 2009. Development of an Integrated Water Quality Management Plan for the Vaal River System, Water Quality Management Strategy, Mpumalanga Province.

[20] Department of Water Affairs (DWA), 2011. Classification of significant water resources in three Vaal Water Management Areas (Newsletter No. 1), South Africa.

[21] Pamela, S.S., Silberbauer, M., Moolman, J. and Howman, A., 2000. Revisiting Rietspruit: Land Cover Change and Water Quality in South Africa. Proceedings of the ICRSE 28TH International Symposium on Remote Sensing of Environment and the Third AARSE Symposium, Cape Town.

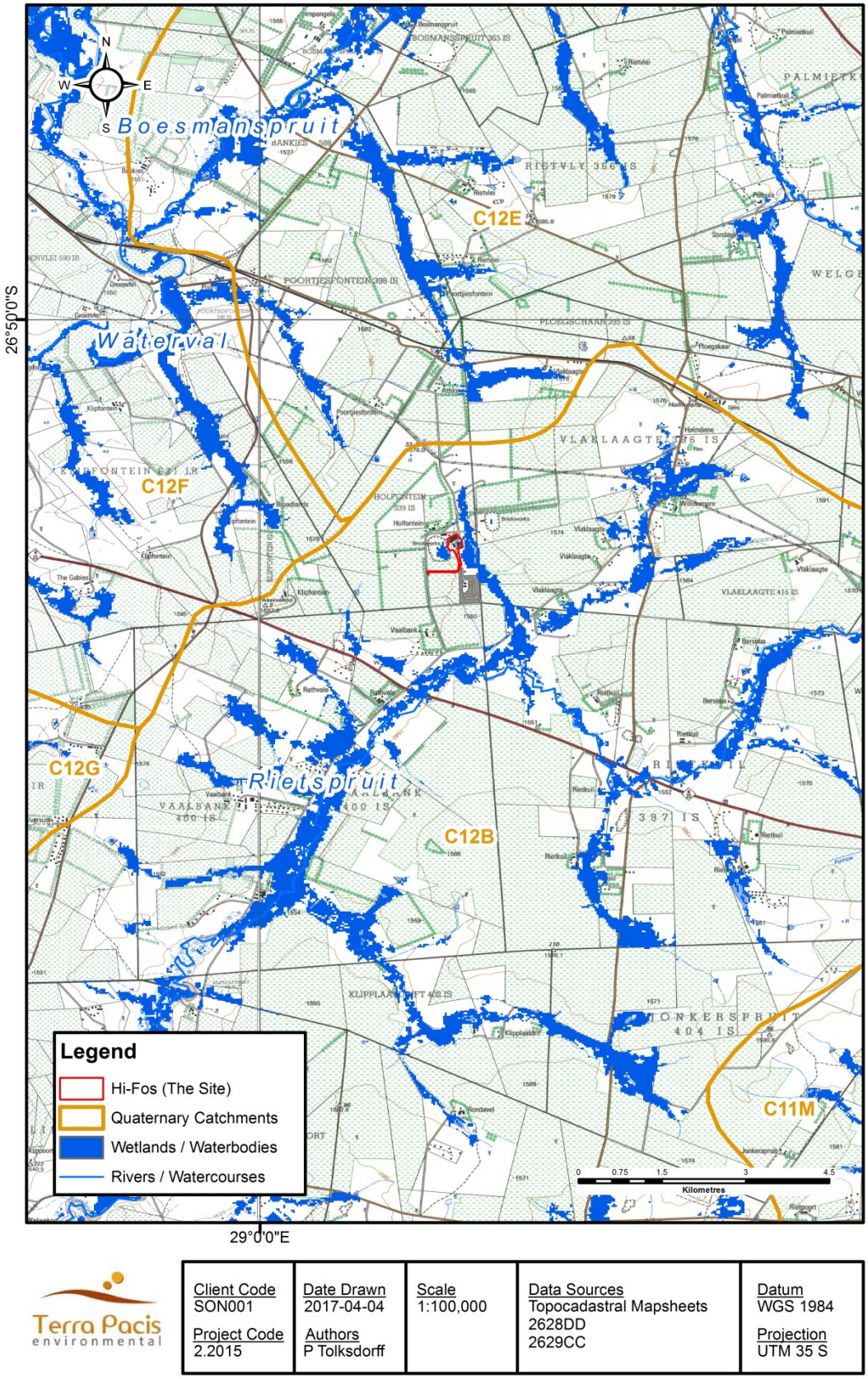
7.8.3 Site Description

The site lies within the C12B quaternary drainage region (as illustrated in Figure 20). Located about 2km south of the site is the Rietspruit (as illustrated in Figure 20), which is a sub-catchment of the Vaal River catchment. Surface water on the site consist a farm dam and a disused clay quarry.

7.8.4 Surface Water Quality

The Department of Water Affairs and Forestry (DWAF) conducted a water quality assessment on thee Vaal River System, which is the main river system that flows through Standerton just south of the site. The Upper Vaal WMA has been highly altered by catchment and land developments such as extensive urban areas, industrial development, agriculture, power generation and coal mining. The most severe impacts from these land developments are irrigation return flow, mining and urban runoff into the Upper Vaal WMA. The water quality within the Upper Vaal River is of fairly good quality, however, the Total Dissolved Solids (TDS) are increasing, which decreases the aesthetic value of the water. Eutrophication in the form of algal blooms and the proliferation of water hyacinths has also caused the water quality of the Vaal River System to decrease.

The water quality in the Rietspruit, to the south of the site, contains elevated nutrients and salt levels due to the high agricultural activity that surrounds the area. Runoff from these agricultural activities is a major concern and a major reason for the deteriorated water quality. High nutrients also suggest some sort of raw effluent that is entering the river upstream.



Terra Pacis environmental

Client Code	Date Drawn	Scale	Data Sources	Datum
SON001	2017-04-04	1:100,000	Topocadastral Mapsheets 2628DD 2629CC	WGS 1984
Project Code 2.2015	Authors P Tolksdorff			Projection UTM 35 S

Figure 20: Water Bodies and Drainage Catchments

7.9 Groundwater

7.9.1 Data Collection

Information was taken from the Mpumalanga Groundwater Master Plan (DWAF, 2008)[22], the Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys 2013[9].

7.9.2 Regional Description

The groundwater characteristics are characterised by the geology of the Mpumalanga Province. The geology of the province influences the movement of the groundwater and is described below for the Ecca and Dwyka Groups and dolerite dykes. An important feature with regards to the ground water resources of the Upper Vaal WMA is the large dolomitic aquifers, which extend in the north-western part of the WMA.

7.9.2.1 Ecca Group

The rocks in this group were formed during the Permian Erathem, which was an extremely wet period and coal deposits formed throughout this region. The Ecca Group consists mainly of shale, which varies in thickness from 1500m in the south to 600m in the North. The shales are very dense and often overlooked as significant sources of groundwater. However, there are areas where large quantities of water are pumped daily from the boreholes.

The deltaic sandstones represent some of the Ecca sediments in which it is expected to find high-yielding boreholes. However, this is not the case as it has been found that sandstone permeability is very low and does not hold a large amount of water. The main reason for this is that sandstone is often poorly sorted with the primary porosities being lowered considerably by diagenesis, which is the physical conversion of sediment into sedimentary rock.

7.9.2.2 Dwyka Group

The Dwyka diamictite and shale have very low hydraulic conductivity, and virtually no primary voids. The Dwyka Group constitutes a very low-yielding fractured aquifer and water is confined within narrow discontinuities like joints and fractures. Therefore, the Dwyka diamictite and shale tend to form aquitards rather than aquifers. The Dwyka sediments were deposited mainly under marine conditions, therefore, the water in these aquifers tend to be saline. Exploitable aquifers thus only exist at a few locations in the Karoo Basin, where sand and gravel were deposited on beaches or where the Dwyka Group was fractured significantly.

[22] Department of Water Affairs and Forestry, 2008. Mpumalanga Groundwater Master Plan, Mpumalnaga Province

7.9.2.3 Dolerite Dykes

Dolerite dykes are vertical to sub-vertical discontinuities that, in general, represent thin, linear zones of relatively higher permeability, which act as conduits for groundwater flow within the aquifer. The dolerite dykes act as semi- to impermeable barriers to the movement of groundwater and are the preferred drilling target for groundwater in the Karoo Supergroup. These aquifers, which typically lie between a solid dyke and the saturated, low permeability country rock, are formed by the increase in permeability of the contact zone as a result of the effects of induration and crushing associated with the intrusion of the dyke.

7.9.3 Site Description

Groundwater, in the Karoo Supergroup, on site is abstracted from boreholes, which provides water to farm housing and community dwellings.

7.10 Air Quality

7.10.1 Data Collection

The Air Quality Impact Report Setlabotsha Project (EIA, 2016)[8], Mpumalanga DALA Air Quality Monitoring Network, 2010[23], the Highveld Priority Area Air Quality Management Plan Executive Summary, 2010[24], the Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys 2013[9].

7.10.2 Regional Description

The HPA, was declared as a priority airshed area on 23 November 2007. This area was demarcated as a priority area due to the poor air quality and elevated concentrations of criteria pollutants from industrial and non-industrial sources of air pollution. The HPA covers an area of 31 106km^2, which includes parts of Gauteng and Mpumalanga Provinces, with a single metropolitan municipality, three district municipalities, and nine local municipalities.

The biggest contributors to emissions within the HPA are industrial resources, which account for 89% of PM_{10}, 90% of NO_x and 99% of SO_2 (PM refers to dust or particulate matter (PM) with a diameter smaller than ten micrometres (µm)). NO_x refers to substances consisting of one nitrogen (N) atom and a variable amount of oxygen (O) atoms, whilst SO_2 is sulphur dioxide consisting of one sulphur (S) atom and two O atoms. These three emissions are of particular interest as they pose a high health risk when inhaled in high concentrations.

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[23] Gondwana Environmental Solutions, 2010. Mpumalanga DALA Air Quality Monitoring Network, Mpumalanga Province.

[24] Department of Environmental Affairs (DEA), 2010. Highveld Priority Area Air Quality Management Plan Executive Summary, South Africa.

The major contributors of emissions from industrial sources in the HPA are listed below:

- Coal mining.
- Power generation.
- Brick manufacturers.
- Primary metallurgical operations.
- Secondary metallurgical operations.
- Brick manufacturers.
- Petrochemical industry.
- Mpumalanga Industrial Sources (excluding the above).

In the town of Standerton, relatively low SO_2 hourly exceedances were recorded, whilst no exceedances of SO_2 were recorded on the daily standard. Industrial emissions in Standerton peaked during the day between 08:00-12:00, which is indicative of industrial emissions. PM_{10} is a pollutant of concern in Standerton, which indicates high dust or particular matter.

7.10.3 Site Description

The current impacts to the site air quality are associated with farming practices that typical comprise dust or PM.

7.11 Visual

The historical brickworks (constructed in 1964, decommissioned in 1999) has impacted visually on the character of the site. Structures associated with the brickwork can be visually seen some distance from the site (Figure 21).

Figure 21: Photograph of the Historical Brickwork

7.12 Cultural Heritage

As a consequence of historical brickworks (constructed in 1964, decommissioned in 1999) and agricultural activities on the site cultural heritage may have been lost. Heritage Contracts and Archaeological Consulting (HCAC) undertook a phase 1 heritage impact assessment to confirm any heritage sightings. During the assessment, no evidence of archaeological features or artefacts recorded within the proposed site area. Refer to Section 11.2 for a summary of the assessment and Appendix 5[25] for the full report.

7.13 Socio-Economic

7.13.1 Data Collection

Information was taken from the Statistics South Africa: Local Municipality[26].

7.13.2 Regional Description

7.13.2.1 Population Size

The population density for the Lekwa Local Municipality from the census count of 2011 was 115 662 persons, which is an increase from 103 265 people in 2001. From 2001 to 2011 the population growth rate was 1.13%. Statistics on the various population groups during 2011 were as follows:

- Black Africa: 84.2%.
- Coloured: 2.9%.
- Indian/Asian: 1.2%.
- White: 11.4%.
- Other: 0.3%.

7.13.2.2 Gender and Age Group Analysis

The age structure of Lekwa Local Municipality demonstrates an atypical pattern. In 2011, there was an equal size of the population in the age groups between 0-4 and 20-24. These results indicate that the population levels are stabilising over time, with stable levels of fertility. The percentage females (50.10%) were slightly higher than that of males (49.90%). There is an unusual larger population of males than females between the ages 0-24.

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[25] Heritage Contracts and Archaeological Consulting, 2016. Archaeological Impact Assessment for the Proposed Phosphoric Acid Plant, Standerton, Mpumalanga.

[26] Statistics South Africa. Website: http://www.statssa.gov.za/?page_id=993&id=lekwa-municipality.

Table 5 demonstrates the distribution of age groups and it is evident that the largest percentage of people in the area falls within the age group category 15-65.

Table 5: Age Group Analysis taken from the Census Report in 2011

Age Group (Years old)	Percentage
0 to 14	28.6%
15 to 64	66.4%
65+	5%

7.13.2.3 Literacy and Education

The census report from 2001-2011 in the Lekwa Local Municipality demonstrates improvements in education. According to the census in 2001, approximately 19.5% of the population over the age of 20 had no form of schooling and this was reduced to 11.2% by 2011. This indicates an improvement in the educational attainment by 8.3% over the 10-year period. A marked increase in primary school education attainment has been noted 2001 and 2011. A significant increase from 2001 to 2011 has been noted in the percentage of pupils attaining a matric. Further to this, there has been a significant increase of 4.9% of individuals over the age of 20 attaining some form of higher education compared to the periods of 2001 (5.4%) and 2011 (10.3%). Table 6 demonstrates the literacy and education percentages.

Table 6: Literacy and Education Percentages

Education	Percentage
No schooling aged 20+	11.2%
Higher education aged 20+	10.3%
Matric aged 20+	11.2%

7.13.2.4 Labour Force and Unemployment

The unemployment rate in 2001 was 36.6% and 25.9% in 2011, which demonstrates a reduction in the percent unemployed in the district between 2001 and 2011. The employment for males still remains higher than females at 19.5% unemployment rate for males and 33.9% for females.

7.13.2.5 Municipal Wards

Lekwa Local Municipality has a total of 15 wards. The site is located in Ward 15 of the Lekwa Local Municipality.

8. PUBLIC PARTICIPATION PROCESS

Public participation as defined by Canter (1996)[27] is a continuous two way communication process aimed at promoting full public understanding of the processes and mechanisms through which

[27] Canter, L.W. 1996. Environmental Impact Assessment, 2nd Edition. McGraw-Hill Inc

environmental problems and needs are investigated and solved by the responsible agency. It is aimed at keeping the public informed about the status and progress of the studies conducted and the implications of the project thereof as well as document all issues, comments and concerns voiced by the public and their preferences regarding resource use and alternative development or management strategies and any other information and assistance relative to the decision.

The stakeholder engagement process as it is referred to by the DEA is a *"…process leading to a joint effort by stakeholders, technical specialists, the authorities and the proponent who work together to produce better decisions than if they had acted independently...".* The process aims at improving *"...communication between stakeholders – including the proponent – in the interest of facilitating better decision-making and or sustainable development...".*

Sustainable development requires some level of trade-off between economic growth, social equity and ecological integrity. The public participation process provides an opportunity for I&APs to participate in an informed basis and ensure their needs and requirements are considered and allows the DARDLEA to understand to what degree stakeholders are willing to accept and live with the trade-offs involved (Information Series 3, Integrated Environmental Management Information Series, 2002[28]).

The objectives of the public participation process for the project can thus be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the existing and proposed activities.
- Clearly outline the scope of the project, including the scale and nature of the existing and proposed activities.
- Identify viable project alternatives that will assist the relevant authorities in making an informed decision.
- Identify shortcomings and gaps in existing information.
- Identify key concerns, raised by I&APs that should be addressed in the subsequent specialist studies.
- Highlight the potential for environmental impacts, whether positive or negative.
- To inform and provide the public with information and an understanding of the existing and proposed activities, issues and solutions.

8.1 The Roles and Responsibilities of the Stakeholder

Registered I&APs (stakeholders) have the right to bring to the attention of the competent authority any issues that they believe may be of significance to the consideration of the application.

The rights of stakeholder are qualified by certain obligations, namely:

[28] Department of Water and Environmental Affairs. 2002. Information Series 3: Public Participation, Integrated Environmental Management Information Series.

- Stakeholders must ensure that their comments are submitted within the timeframes that have been approved by the DEA, or within any extension of a timeframe agreed by the proponent, EAP or competent authorities.
- Serve a copy of the comments submitted directly to the competent authorities, the proponent or the EAP.
- Disclose to the EAP any direct business, financial, personal or other interest that they might have in the approval or refusal of the application.

The roles of stakeholders in a public participation process usually include one or more of the following:

- Assisting in the identification and prioritisation of issues that need to be investigated.
- Making suggestions on alternatives and means of preventing, minimising and managing negative impacts and enhancing project benefits.
- Assisting in or commenting on the development of mutually acceptable criteria for the evaluation of decision options.
- Contributing information on public needs, values and expectations.
- Contributing local and traditional knowledge.
- Verifying that their issues have been considered.

In order to participate effectively, stakeholders should:

- Become involved in the process as early as possible.
- Register as a stakeholder.
- Advise the EAP of other stakeholders who should be consulted.
- Contribute towards the design of the public participation process (including timeframes) to ensure that it is acceptable to all stakeholders.
- Follow the process once it has been accepted.
- Read the material provided and actively seek to understand the issues involved.
- Give timeous responses to correspondence.
- Be respectful and courteous towards other stakeholders.
- Refrain from making subjective, unfounded or ill-informed statements.
- Recognise that the process is confined to issues that are directly relevant to the application.

8.2 Approach to Public Participation

Our approach to public participation is based on the following principals:

- Undertake meaningful and timely participation with I&APs.
- Focus on important issues during the S&EIR process.
- Undertake due consideration of alternatives.
- Take accountability for information used.

- Encourage co-regulation, shared responsibility and a sense of ownership over the project lifecycle.
- Apply "due process" particularly with regard to public participation as provided for in the EIA Regulations.
- Consider the needs, interests and values of I&APs.

8.3 Methodology

Public participation varies given the technical nature of the activity, the geographical location, extent, duration, intensity and frequency of potential impacts associated with the existing and proposed activities, as well as the capacity of the receptive community to participate in the project. The processes outlined below are specific to this study.

8.3.1 Identification of I&APs

I&APs were identified through several mechanisms. These included:

- Networking with local business owners, farmers associations, non-governmental agencies, community based organisations, and local council representatives.
- Advertising in the press, placement of community notices, and distribution of BIDs (discussed separately).
- Researching and reviewing of other studies undertaken in the area.

All I&APs identified were registered on the stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the proposed Phosphoric Acid Plant, in addition to efforts to notify and identify I&APs at a geographical level. I&APs were identified at the horizontal (geographical) and vertical extent (organisations level). Refer to Appendix 6 for a list of stakeholders captured in the project database[29].

8.3.2 Creating Awareness – Initiation

8.3.2.1 Newspaper Advertisements

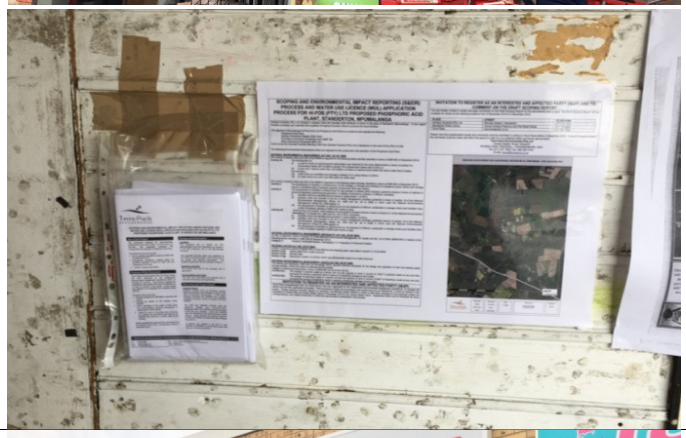
Advertisements, announcing the project, inviting I&APs to register and announcing the availability of the Draft Scoping Report, were placed in the local publication: Cosmos News, on the 2 November 2016, Standerton Advertiser on the 11 November 2016. A third advertisement was placed in the national publication, The Star, on 4 November 2016. Refer to Appendix 7 for copies of the newspaper advertisements.

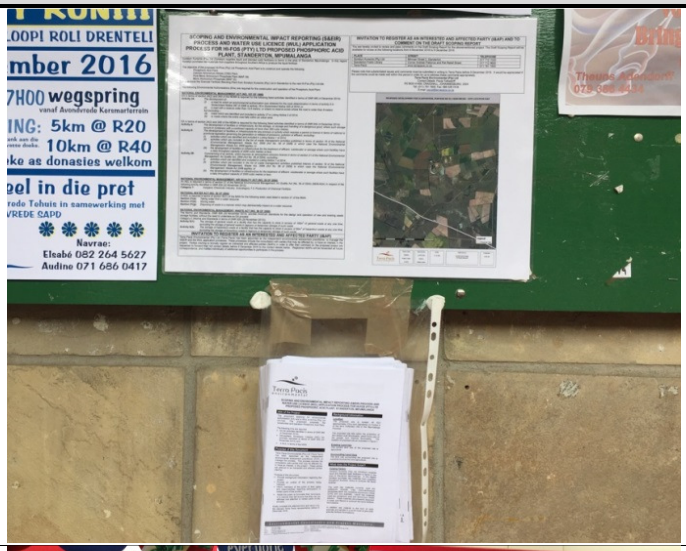
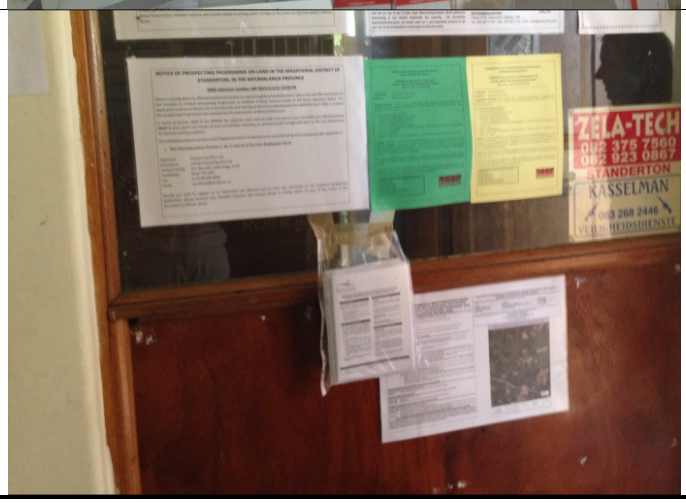
[29] Please note that full details of stakeholders have not been included in the public report in order to ensure that privacy is not compromised. A full database is held at Terra Pacis' Johannesburg Office for perusal if required.

8.3.2.2 Community and Site Notices

In total seven English colour notices, announcing the proposed Phosphoric Acid Plant and inviting I&APs to register and comment on the Draft Scoping Report, were erected on 2 November 2012 at the following six public places, and as indicated in Table 7 below.

Table 7: Community and Site Notices

Area	Place	Photo
Standerton	Super Spar	 
Standerton	Pick 'n Pay	

Area	Place	Photo
		
Standerton	Shopright	
Standerton	Standerton Public Library	

Area	Place	Photo
Holfontein Farm 399, Portion 4	Community	 
Holfontein Farm 399, Portion 4	Farm access road	

For a copy of the community and site notices please refer to Appendix 8.

8.3.2.3 Background Information Document

The purpose of a BID is to provide stakeholders with introductory information on the application, the S&EIR process and the public participation process. The BID also provides I&APs who are interested in the project with the opportunity to register as stakeholders by way of completing the registration sheet distributed with the BID. Information on the registration sheet has been used to register stakeholders on a database so that they will receive all future project-related information and invitations to meetings. The registration sheet includes a section for comments and issues, which allows stakeholders an opportunity to provide the EAP with written comments and feedback.

In total 250 BIDs were produced and distributed by hand delivery. For a copy of the BID please refer to Appendix 9 and for copies for emails sent refer to Appendix 10.

8.3.3 Draft Scoping Report Review

The Draft Scoping Report was made available for public comment from the 9 November 2016 to the 9 December 2016. This provided stakeholders and I&APs with an opportunity to comment on the draft report and raise their issues and concerns.

Stakeholders on the database were notified via email of the availability of the Draft Scoping Report for comment. The draft report was available at the following public places:

- Sonskyn Kunsmis (Pty) Ltd (Minnaar Street 2, Standerton);
- Standerton Public Library (Corner Andries Pretorius and Piet Retief Street);
- Farm Community Hall (Portion 4 of the Farm Holfontein 399); and
- Terra Pacis (website).

Refer to Appendix 10 for a copy of the notification that was sent to stakeholders.

8.3.4 Final Scoping Report Submission

All comments and concerns raised during the Draft Scoping Report review period, were documented in the Final Scoping Report. The Final Scoping Report was submitted to the DARDLEA for review and decision-making on 13 December 2016. Stakeholders were also notified of the availability for the Final Scoping Report.

Refer to Appendix 11 for a copy of the notification that was sent.

8.3.5 Acceptance of the Final Scoping Report

A letter of review and acceptance was received from the DARDLEA on the 20 February 2007. The letter indicated that the Scoping phase had been successfully completed and that the project team may proceed with the EIA phase. Please refer to Appendix 12 for a copy of the acceptance letter.

8.3.6 Deviations from Approved Scoping Report and Plan of Study

There are no deviations from the scoping report and plan of study as submitted to the DARDLEA on 13 December 2016.

8.3.7 Ongoing Communication

Throughout the process the EAP has communicated with authorities and stakeholders by means of telephone, email, fax and registered mail. All comments received through the process have been documented in the Comment Response Report. This method of communication will be continued throughout the process until a decision is reached by the DARDLEA.

8.3.8 Comment Response Report

Comments and concerns raised during the public participation process during and the EIA process have compiled into a Comment Response Report refer to Appendix 13. Individual response letters to comments and concerns raised have been posted via registered mail as attached in Appendix 15.

8.3.9 Availability Draft Environmental Impact Assessment Report

The Draft EIAR was available for public comment from the 20 April 2017 to 22 May 2017. This provides stakeholders and I&APs with an opportunity to comment on the draft report and raise their issues and concerns.

Stakeholders on the database were notified via email, sms and post of the availability of the Draft EIAR for comment. The draft report is available at the following public places:

- Sonskyn Kunsmis (Pty) Ltd (Minnaar Street 2, Standerton);
- Standerton Public Library (Corner Andries Pretorius and Piet Retief Street);
- Farm Community Hall (Portion 4 of the Farm Holfontein 399); and
- Terra Pacis (website).

Advertisements were placed on the 18th April 2017 in the Standerton Advertiser and The Star and on the 19th April 2017 in the Cosmos News notifying stakeholders and I&APs of the availability of the Draft EIAR for comment.

Refer to Appendix 14 for a copy of the emails and letters that were sent to stakeholders.

8.3.10 Focus Group Meeting

A Farm Community focus group meeting is scheduled for the 2 May 2017, 15h00 at the Farm Community Hall (Portion 4 of the Farm Holfontein 399). Stakeholders on the database were notified via sms and post of the focus group meeting, which was attended by 71 people.

Refer to Appendix 15 for a copy of the letters that were sent to stakeholders, minutes of the meeting and presentations. In addition Individual response letters to comments and concerns raised have been posted via registered mail as attached in Appendix 15.

8.3.11 Comments received on the Draft Environmental Impact Assessment Report

Comments raised during the Draft EIAR review period have been documented in the Final EIAR and included in the Comment Response Report refer to Appendix 13.

8.3.12 Final Environmental Impact Assessment Report

The Final EIAR has been made available for stakeholder review and be submitted to the DARDLEA, who will considering the findings in consultation with various other authorities and will issue a decision on whether EA, the AEL and the WUL will be granted. Once a decision has been reached the appeal process will be followed.

9. ANALYSIS OF STAKEHOLDERS

9.1 Who are the Stakeholders?

Through networking and advertising, 102 I&APs have registered on the proposed Phosphoric Acid Plant. Refer to Table 8 for a breakdown of the stakeholders registered on the database and Appendix 3 for a list of stakeholders captured in the project database [29].

Table 8 : Breakdown of the stakeholders registered on the database

Representative Sector	Further Explanation	No. of I&APs on Database
Government departments.	All tiers of government e.g. National Government, Provincial Government, Local Government, and parastatal organisations such as ESKOM.	12
Business and consultants.	Local and neighbouring businesses dependant on or affected by activities. Representatives of consulting organisations that provides services in the area.	5
Non-governmental organisations and community based organisations.	Churches, Agricultural Unions, Community Forums and Environmental Non-Government Organisations (NGOs).	0
General public.	Farmers in the area, and individuals who may have an interest in the project.	85

9.2 What is the Stakeholders Capacity to Participate?

The BID's, advertisements, site notices and reports were distributed in English and it is the EAPs opinion that all those on the database have sufficient understanding to participate in the process. Two translators were present at the Farm Community focus group meeting.

10. MOST PRESSING ISSUES

From the responses received there have been some concerns raised by the stakeholders regarding the proposed Phosphoric Acid Plant. The issues raised thus far have been documented in the Comment Response Report attached Appendix 13. The most pressing issues raised thus far are related to surface water, ground water, air quality, noise and social impacts.

11. SPECIALIST STUDIES

The results of the specialist studies that have been used to inform the impact assessment and decision-making process are summarised below.

11.1 Soil Investigation

KBK Engineers undertook a soil investigation on the site of the Proposed Phosphoric Acid Plant, as attached in Appendix 4[15].

11.1.1 Study Approach and Methodology

The soil investigation work undertaken in October 2016 included the excavation of test pits (also known as a trail pits or inspection pits). This method of investigation is a highly effective way of obtaining data on the subsurface soil and rock conditions, which underlie a site. It allows for the various soil and rock types to be logged, the soil to be sampled and a preliminary assessment of the groundwater regime to be made. KBK Engineers with a thorough understanding of geology and soil mechanics supervised the test pit investigations and the samples collected went to AccuTest for laboratory testing. Based on the fieldwork and laboratory data, recommendations are made for foundations and site drainage.

11.1.2 Results

11.1.2.1 Soil Profile

The soil profiles, of both test pits dug 2m, in the north and south of the proposed Phosphoric Acid Plant site were very similar. The position of the test pits are shown in Figure 18. The mean soil profile of the northern test pit consists of dark brown slicken sided active silty clay up to a depth of approximately 1.2m. The mean soil profile of the southern test pit differed slightly to the northern test pit, as the colour of the clayey soil becomes grey at approximately 1.8m. There was no evidence of a water table, although the moisture content of the soil was relatively high.

A layer of brick paving from the old brickworks covered the area where the northern test pit was excavated thus the moisture fluctuation to the soil was curbed. The southern test pit had no cover (brick paving) and it was expected that the soil in this area could have been somewhat dryer due to the time of the year and the exposure to evaporation. However, the moisture content in both the northern and southern test pits were similar, which means that the expected differential movement of subsoil between the northern and southern side will be limited.

The laboratory results note a PI of 12 in the northern test pit, and a PI of 20 in the southern test pit. The PI is a range of moisture in which a soil remains in a plastic state while passing from a semisolid state to liquid state. Soil with a high PI tend to be clay, and those with a low PI tend to be silt; a PI of 0 indicates non-plastic soil that contains little or no silt and clay. Although the silty/clayey content is quite high with 80% and 72% passing through the 0.075mm sieve, the activity (capacity to retain water) of the soil in the southern and northern test pits can be classified as low to medium.

11.1.2.2 Proposed Foundations

The load of the proposed Phosphoric Acid Plant foundations is calculated for a building 25m wide, portal frames at 5m centres with 5m high sheeting covered sides. The maximum load of the proposed Phosphoric Acid Plant development was calculated to be approximately 50kN. The load on the soil will be 35kPa if a 1.2m x 1.2m concrete base is constructed.

If the sheeting covered sides are replaced with brickwork, the point load of portal frames will stay more of less the same, with the load of a 5m high brick wall being 24.2kN/m. The load on the soil from the brickwork will be 58kPa with a foundation width of 0.6, and 32kPa for a foundation with a width of 0.75m. The load will become approximately 70kPa if the maximum load of the loads noted above is doubled.

11.1.2.3 Floodline

Google Earth was used to calculate a rainfall catchment area of approximately 450 hectares (ha) for the proposed Phosphoric Acid Plant. With a rainfall intensity of approximately 120mm/hour with a 1 in 100 year rainfall occurrence a maximum flow of 60m^3/s can be expected. This flow relates to a high water mark approximately 75m from the middle of the lowest point of the waterway or approximately 65m from the edge of the proposed Phosphoric Acid Plant.

11.1.3 Conclusions

According to the South African National Standards (SANS) 10161, the safe bearing capacity of soft sandy clays varies between 50 and 100kPa when submerged. Therefore, it is safe to assume that the insitu soil is capable to support the proposed Phosphoric Acid Plant with either sheeting covered or brick wall sides. However, it is important that the moisture content be kept stable. In order to prevent or curb severe moisture change in the subsoil and the subsequent differential expansion/contraction, adequate storm water drainage must be ensured.

The floodline calculations certified that a flood with an interval occurrence of 1 in 100 years will not have an influence on the proposed Phosphoric Acid Plant.

11.2 Archaeological Impact Assessment

Archaeological Impact Assessment (AIA) for the Proposed Phosphoric Acid Plant was undertaken by Heritage Contracts and Archaeological Consulting (HCAC), as attached in Appendix 5[25].

11.2.1 Study Approach and Methodology

The aim of the AIA or Heritage Impact Assessment (HIA) is to identify cultural heritage sites, document, and assess their importance within local, provincial and national context as per the NHRA. It serves to assess the impact of the proposed Phosphoric Acid Plant on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that may be required to assist the developer in managing any discovered heritage resources in a responsible manner.

11.2.1.1 Phase 1 - Desktop Study

Conduct a brief desktop study where information on the area is collected to provide a background history of the area.

11.2.1.2 Phase 2 - Physical Survey

Conduct a field study to: a) systematically survey the proposed Phosphoric Acid Plant site (study area) to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record Global Positioning System (GPS) points identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the study area.

11.2.1.3 Phase 3 - Reporting

Report on the identification of anticipated and cumulative impacts the proposed Phosphoric Acid Plant activity may have on the identified heritage resources for all 3 phases of the project; construction, operation and decommissioning. Consider alternatives, should any significant sites be impacted adversely by the proposed Phosphoric Acid Plant. Ensure that all studies and results comply with heritage legislation and the code of ethics and guidelines of Association of South African Professional Archaeologists (ASAPA).

To assist the Hi-Fos (Pty) Ltd (the developer) in managing any discovered heritage resources in a responsible manner, and to protect, preserve, and develop such within the framework provided by the NHRA.

11.2.1.4 Assumptions and Limitation

Due to the fact that most cultural remains occur below surface, the possibility exists that some features or artefacts may not have been discovered/recorded during the field survey. The possible occurrence of unmarked/informal grave sites and other cultural material cannot be excluded. This study did not assess intangible issues.

11.2.2 Results

11.2.2.1 Phase 1 Desktop Study - Historical and Archaeological Background of the Study Area

Archaeological and Historical Information Available

This section will endeavour to give an account of the history of the regional and district in which the proposed Phosphoric Acid Plant is located.

Historiography and Methodology

Sources for the history of the area surrounding the study area include secondary source material, maps, electronic sources and archival documents.

Historical Background of the Area

The Stone Age is divided in Early; Middle and Late Stone Age, namely the ESA, MSA and LSA. Stone was widely used to make implements with an edge, a point or a percussion surface. Stone Age artefacts include tools, which are used by the earliest modern humans of South Africa. Very few ESA sites are on record for Mpumalanga and there are no sites dating to this period are expected in the study area. An example where ESA tools have been discovered in Mpumalanga is at Maleoskop on the farm Rietkloof, which is one of only a handful of such sites in Mpumalanga.

The MSA has not been extensively studied in Mpumalanga, but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district. This cave was excavated twice in the 1960s by Louw and later by Eloff. The MSA layers show that the cave was repeatedly frequented over a long period. Lower layers have been dated to over 40 000 Before Present (BP), while the top layers date to approximately 27 000 BP (Esterhuysen and Smith in Delius, 2007). MSA material is found widely across South Africa and some MSA manifestations can be expected in the study area.

The LSA began at around 20 000 years BP. This period was marked by numerous technological innovations and social transformations within these early hunter-gatherer societies. These homosapiens may be regarded as the first modern inhabitants of Mpumalanga, known as the San or Bushmen. The San were a nomadic people who lived together in small family groups and relied on hunting and gathering of food for survival. Evidence of their existence is to be found in numerous rock shelters throughout the Eastern Mpumalanga, where some of their rock art is still visible. A number of these shelters have been documented throughout the Province (Schoonraad in Barnard, 1975; Bornman, 1995 and Delius, 2007). These include areas such as Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg and Ohrigstad.

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age (EIA): Most of the first millennium AD.
- The Middle Iron Age (MIA): 10th to 13th centuries AD
- The Late Iron Age (LIA): 14th century to colonial period.

The Iron Age is characterised by the ability of these early humans to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. No sites dating to the EIA or MIA have been recorded or are expected in the study area. The same can be said for the Later Iron Age period, where the study area is situated outside the southern periphery of distribution of LIA settlements in Mpumalanga. This phase of the Iron Age (AD 1600-1800's) is represented by various tribes including Ndebele, Swazi, BaKoni, Pedi marked by extensive stonewalled settlements found throughout the Mpumalanga escarpment.

Iron Age sites have been identified to the north of the area, around Bethal (Geskiedenisatlas van Suid-Afrika 1999: 6-7). These all are dated to the LIA. It is also known that the early trade routes did not run through this area (Geskiedenisatlas van Suid-Afrika 1999: 9).

By the start of the nineteenth century no major African tribes seem to have settled very close to where study area is located today, however the Phuthing Tribe was prominent in the area to the north thereof. (Geskiedenisatlas van Suid-Afrika 1999: 10)

In a few decades, the sociographic nature of the then Transvaal province would go under a radical change. The Difaqane (Sotho), or Mfekane ("the crushing" in Nguni) was a time of bloody upheavals in Natal and on the Highveld, which occurred around the early 1820's until the late 1830's (Geskiedenisatlas van Suid-Afrika 1999: 109-115). These upheavals occurred in response to heightened competition for land and trade, and caused population groups like gun-carrying Griquas and Shaka's Zulus to attack other tribes (Geskiedenisatlas van Suid-Afrika 1999: 14; 116-119). Mzilikazi and his raiders had moved from the Northern Nguni area to the area north of the Vaal River by 1821. It has been recorded that the Ndebeles first attacked the Phuthing tribe, which in turn migrated to the south of the Vaal River and joined groups of Southern Sotho speakers. The Phuthing and Southern Sotho tribes moved westward and northward and started raiding Tswana communities in the surrounding area. The Phuthing were commanded first by Chief Tshane, and later Ratsebe. As the Phuthing, under Ratsebe, moved eastwards along the Vaal River, they collided with Mzilikazi's Ndebele once more. Mzilikazi's men finally took the Phuthing and other raiding groups captive in 1823 (Geskiedenisatlas van Suid-Afrika 1999: 110-111). It is unlikely that these events would have had a great influence on the study area; however, it is still important to understand the social dynamics of the larger area.

During the time of the Difaqane, a northwards migration of European settlers from the Cape was also taking place. Some travellers, missionaries and adventurers had gone on expeditions to the northern areas in South Africa – some as early as in the 1720's. Robert Scoon was one of the adventurers who formed part of a group of Scottish travellers and traders who had travelled the northern provinces of South Africa in the late 1820s and early 1830s. Scoon had gone on two long expeditions in the late 1820s and once again ventured eastward and northward of Pretoria in 1836. During the latter journey, Scoon passed by the area, which is now known as Witbank (Geskiedenisatlas van Suid-Afrika 1999: 13, 116-121).

By the late 1820's, a mass-movement of Dutch speaking people in the Cape Colony started advancing into the northern areas. This was due to growing feelings of dissatisfaction caused by economical and other circumstances in the Cape. This movement later became known as the Great Trek.

The first Voortrekker groups of Hans van Rensburg and Louis Tregardt also passed close to this area (Geskiedenisatlas van Suid-Afrika 199: 13-14). The first European farmers only settled here during the late 1850's.

This migration resulted in a massive increase in the extent of that proportion of modern South Africa dominated by people of European descent (Ross 2002: 39). As can be expected, the movement of Europeans into the northern provinces would have a significant impact on the African people who populated the South Africa. By 1860, the population of Europeans in the central Transvaal was already very dense and the administrative machinery of their leaders was firmly in place. Many of the policies that would later be entrenched as legislation during the period of apartheid had already been developed (Geskiedenisatlas van Suid-Afrika 1999: 170).

The discovery of diamonds and gold in the northern provinces had very important consequences for South Africa. After the discovery of these resources, the British, who at the time had colonized the Cape and Natal, had intensions of expanding their territory into the northern Boer republics. This eventually led to the Anglo-Boer War, which took place between 1899 and 1902 in South Africa, and which was one of the most turbulent times in South Africa's history. Even before the outbreak of war in October 1899, British politicians, including Sir Alfred Milner and Mr. Chamberlain, had declared that should Britain's differences with the Zuid-Afrikaanse Republiek result in violence, it would mean the end of republican independence. This decision was not immediately publicised, and as a consequence, republican leaders based their assessment of British intentions on the more moderate public utterances of British leaders. Consequently, in March 1900, they asked Lord Salisbury to agree to peace on the basis of the status quo ante bellum. Salisbury's reply was, however, a clear statement of British war aims (Du Preez 1977).

The Anglo-Boer war also affected the area in which the study area is located. In A Gazetteer of the Second Anglo-Boer War. 1899-1902., it is noted that the Bethal District to the north of the study area, provided a commando for the Boer forces. Among those on commando were Commandant P. J. Greyling, Commandant D. J. J. Breytenbach and Commandant H. S. Grobler. Lieutenant-General J. D. P. French commanded the British forces in this district. French's march towards the Bethal District stretched over an area of 173 miles of country destitute of supply depots, and he was therefore obliged to travel with a company of 155 wagons drawn by 1 480 oxen. The journey proved to be a very hard one, as the grazing lands had not recovered from the winter draughts and provided little nourishment for the oxen. It was French's intention to move on a broad front with Mahon and Gordon's brigades in advance and Dickson's brigade and the convoy in the rear. Mahon reach Geluk on 12th October 1900, and Gordon and Dickson marched towards the Komati River on the following day. Mahon was however driven back by Tobias Smuts, who attacked the regiment with a thousand men of the Ermelo and Carolina Boer commandos. French was also constantly harassed on the flanks and front, but was able to reach Ermelo by 18th October 1900. By that time, the regiment had lost 500 oxen due to starvation and exhaustion. French moved onwards in the direction on Bethal, while being constantly attacked by Boer guerrilla forces. Bethal was occupied on the 20th of October 1900 and French ended his march at Heidelberg on the 26th October 1900. Bethal was never regularly garrisoned during the occupation. In the fortnight, French had suffered about 100 casualties, and had lost 320 horses, 1230 oxen and 55 wagons, while only 49 Boers surrendered voluntarily and only 9 men had been taken captive. (Jones, H. M. & Jones G. M. 1999 p. 17; The Times History of the War in South Africa 1899-1902 1907: 48-49)

Previous Studies

Limited previous AIA or HIA studies are on record for the study area. The following two studies consulted fall in the immediate vicinity of the study area; Van Schalkwyk (2007) and Van Vollenhoven (2016). Van Schalkwyk (2007) recorded historical buildings and Van Vollenhoven (2016) recorded graves.

Consultation

Mr. A.B. Bowker was interviewed and confirmed his grandfather commenced with the brickworks during 1964. Additional buildings and structures were constructed by his father during 1979 with the works being closed in 1999. Mr. A.B. Bowker noted that he was unaware of any graves or sites of heritage value/significance within the study area.

Genealogical Society of South Africa and Google Earth

Neither the Genealogical Society nor the monuments database at Google Earth (Google Earth also include some archaeological sites and historical battlefields) have any recorded sites in the study area.

11.2.2.2 Phase 2 Physical Survey - Description of Site

The farm Holfontein and surrounding properties are commercial farms with their main focus being the production of maize. During the time of the site visit the ploughing of fields and planting of crops were observed.

The study area is approximately 5ha in size and is situated approximately 300m south-east of the main farmstead on the farm Holfontein, with the Holfontein Dam on the eastern side and a quarry on the western side. The area slopes gently towards the Rietspruit; situated approximately 2km to the south of the study area. Majority of the study area is overgrown with scattered grass and alien invasive plant species. As a result of recent rains, water was observed in the south-eastern corner of the study area as the dam had extended into this area.

The derelict remains of the historical clay brickworks (constructed in 1964, decommissioned in 1999) occupy the northern section of the study area. This facility occupies most of the northern quarter of the study area. It consists of various buildings and structures used during the brick manufacturing process. These include workshops and yards for the moulding and shaping of the bricks, drying ovens for drying of the bricks and extensive kilns for the firing of the bricks. A large tower assisted in achieving the precise temperature during the firing of the bricks. The material for the manufacturing of the bricks was extracted from a clay quarry to the west of the study area. A large section of the study area is paved with bricks, which were manufactured on site. These structures are not of any heritage significance and no further action is necessary for this aspect.

Two fenced off farm silos are situated in the north-western corner of the study area and will remain part of the current farming operations. An operational pump station, at the Holfontein Dam, just outside the southern extent of the study area was constructed some 20 to 30 years ago.

During the field survey, there was no evidence of graves or cemeteries in the study area.

No Stone Age sites associated with caves, outcrops/hills and river courses are known to exist or to have been recorded in the study area possibly due to the lack of raw material suitable for knapping. Similarly, there has been no Iron Age material recorded in the study area or within any of the other surveys conducted in the immediate vicinity of the study area (Van Schalkwyk 2007 and Van Vollenhoven 2016).

11.2.3 Conclusions and Recommendations

11.2.3.1 Phase 3 - Reporting

HCAC was appointed to assess the study area in terms of the archaeological component of Section 35 of the NHRA as part of the EIA for the project. The results of the report demonstrate that there are and no archaeological features or artefacts recorded within the study area, thus no mitigation prior to construction is recommended in terms of Section 35 for the proposed Phosphoric Acid Plant to proceed.

In terms of the built environment of the area (Section 34 of the NHRA) no standing structures older than 60 years occur within the study area.

In terms of Section 36, of the NHRA, no burial sites were recorded in the study area. However if any graves are identified it is recommended that a qualified archaeologist is contacted for an assessment of the graves and the impact of the proposed Phosphoric Acid Plant thereon.

The study area is surrounded by commercial agricultural developments and no significant cultural landscapes or viewscapes were noted during the fieldwork.

Due to the lack of significant heritage features in the study area, there is, from an archaeological point of view, no reason why the project cannot commence based on approval from SAHRA.

Due to the subsurface nature of archaeological remains and the fact that graves can occur anywhere on the landscape, it is recommended that a chance find procedure is implemented for the project as part of the EMPr.

11.2.3.2 Chance Find Procedure

In the unlikely event that during construction any possible finds such as stone tool scatters, possible graves or fossil remains are made, the construction operations must stop and a qualified archaeologist contacted for an assessment of the find.

It is recommended that chance find procedure be put in place during the construction period as described below.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures. Personnel must be inducted to ensure they are fully aware of the procedures regarding a chance find as discussed below.

- If during the construction, operations or decommissioning phases of the proposed Phosphoric Acid Plant, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site manager will inform the Environmental Control Officer (ECO) of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the find and required reporting of such.

11.3 Air Quality

An Atmospheric Impact Report was undertaken by Airshed Planning Professionals (Pty) Ltd (Airshed), as attached in Appendix 16[30].

11.3.1 Study Approach and Methodology

The main objective of the study was to determine the potential air quality impact on the atmospheric environment and sensitive receptors. Furthermore, acid and chemical fertiliser being listed activities under the NEM:AQA, the proposed Phosphoric Acid Plant will require an AEL and authorities may request an Air Impact Report (AIR) to accompany the AEL application.

To meet the study objective, the following tasks were included in the Scope of Work:

- A review of project and technical process information.
- An analysis of regional climate and atmospheric dispersion potential of the project area.
- A review of legal requirements (emission limits, ambient air quality standards and inhalation health criteria).
- A desktop analysis and assessment of existing (baseline) pollutant levels relevant to the assessment.
- The establishment of an emissions inventory for gaseous and particulate emissions for pollutants regulated for specific listed activities and emitted during the optional phase and fugitive dust from the construction phase.
- Atmospheric dispersion simulations in accordance with regulations regarding for dispersion modelling.
- A human health risk and nuisance (odour and dust) impact screening assessment based on dispersion simulation results.
- Identification of suitable mitigation and management measures.

[30] Airshed Planning Professionals (Pty) Ltd, 2016. Atmospheric Impact Report for the Hi-Fos (Pty) Ltd Phosphoric Acid Plant Project, Standerton.

- An AEL application form.
- An AIR in the format prescribed by the DEA.

11.3.1.1 Limitations and Assumptions

The following important assumptions and limitations to the emissions inventory should be noted:

- The assessment was limited to criteria pollutants for which emission factors are available and pollutants regulated by minimum emission standards. These include airborne particulates (TSP (Total Suspended Particulates), PM_{10} (Thoracic particulate matter with an aerodynamic diameter of less than 10µm), and $PM_{2.5}$ (Thoracic particulate matter with an aerodynamic diameter of less than 2.5µm)), carbon monoxide (CO), oxides of nitrogen (NO_x), sulphur dioxide (SO_2), hydrofluoric acid/hydrogen fluoride (HF), ammonia (NH_3) and total volatile organic compounds (TVOC) gaseous pollutants.

11.3.2 Results

11.3.2.1 Atmospheric Dispersion Simulation Methodology

The impact of the proposed Phosphoric Acid Plant on the atmospheric environment was determined through simulation of ambient pollutant concentrations and dustfall rates. Simulated air quality impacts represent only those associated with the Phosphoric Acid Plant.

South African Regulations Regarding Air Dispersion Modelling (GNR 533, 11 July 2014) provide guidance on the use of a tiered approach in defining the levels of assessment required in a modelling application. This Code of Practice also recommends a number of dispersion models to be used in regulatory applications in South Africa. This requires a modeller to assess the application and identify which model would best provide the essential information to the regulatory authority with the detail and accuracy required in the application. Air quality assessments can vary in their level of detail and scope, which in turn is determined by the objectives of the modelling effort, technical factors and the level of risk associated with the project emissions.

Dispersion models simulate ambient pollutant concentrations and dustfall rates as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources. Increasing reliance has been placed on concentration estimates from models as the primary basis for environmental and health impact assessments, risk assessments and emission control requirements. It is therefore important to carefully select a dispersion model for the purpose.

11.3.2.2 Dispersion Model Selection

Gaussian-plume models are best used for near-field applications where the steady-state meteorology assumption is most likely to apply. One of the most widely used Gaussian plume model is the United States Environmental Protection Agency (US EPA) AERMOD model that was

used in this study. AERMOD is a model developed with the support of AERMIC, whose objective has been to include state-of the-art science in regulatory models (Hanna, Egan, Purdum, & Wagler, 1999). AERMOD is a dispersion modelling system with three components, namely: AERMOD (AERMIC Dispersion Model), AERMAP (AERMOD terrain pre-processor), and AERMET (AERMOD meteorological pre-processor).

AERMOD is an advanced new-generation model. It is designed to predict pollution concentrations from continuous point, flare, area, line, and volume sources. AERMOD offers new and potentially improved algorithms for plume rise and buoyancy, and the computation of vertical profiles of wind, turbulence and temperature however retains the single straight line trajectory limitation. AERMET is a meteorological pre-processor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters. AERMAP is a terrain pre-processor designed to simplify and standardise the input of terrain data for AERMOD. Input data includes receptor terrain elevation data. The terrain data may be in the form of digital terrain data. The output includes, for each receptor, location and height scale, which are elevations used for the computation of air flow around hills.

A disadvantage of the model is that spatial varying wind fields, due to topography or other factors cannot be included. Input data types required for the AERMOD model include: source data, meteorological data (pre-processed by the AERMET model), terrain data and information on the nature of the receptor grid.

Version (version 7.12) of AERMOD and its pre-processors were used in the study.

11.3.2.3 Meteorological Requirements

Use was made of hourly surface data for the period January 2014 to December 2016 from the Grootdraaidam station situated approximately 27km east of the site. Upper air meteorological data was extrapolated by AERMET.

11.3.2.4 Source Data Requirements

The AERMOD model is able to model point, jet, area, line and volume sources. Sources of the proposed Phosphoric Acid Plant were modelled as follows:

- Scrubber, evaporator, drier and boiler stacks – modelled as point sources;
- Crushing and screening – modelled as volume sources;
- Materials handling – modelled as one combined area source; and
- Unpaved roads – modelled as area sources.

Summary of Emissions

Source group contributions to estimated annual average emissions are summarised in Table 9 and the contribution to PM_{10} emissions graphically presented in Figure 22. Vehicle entrained dust and stack emissions contribute most notably to overall PM emissions.

Table 9: Source group contributions to estimated annual average emissions

Source groups and emissions in t/a	TSP	PM_{10}	$PM_{2.5}$	F as HF	NO_x as NO_2	NH_3	CO	SO_2	TVOC
Crushing	2.96	0.296	0.148	-	-	-	-	-	-
Materials handling	2.18	1.03	0.156	-	-	-	-	-	-
Screening	1.18	0.888	0.444	-	-	-	-	-	-
Stack emissions	12.5	12.5	6.75	0.468	26	3.67	9.43	89.5	0.141
Vehicle entrained dust	124	35.5	3.55	-	-	-	-	-	-
Total	143	50.2	11	0.468	26	3.67	9.43	89.5	0.141

Figure 22: Source group contributions to estimated annual average PM emissions

11.3.2.5 Simulation Domain

The dispersion of pollutants expected to arise from current operations was simulated for an area covering 5km (east-west) by 5km (north-south) with proposed activities located centrally. The area was divided into a grid matrix with a resolution of 100m. The nearest community areas/residences were included as air quality sensitive receptors (AQSR) (Figure 23). AERMOD calculates ground-level (1.5m above ground level) concentrations and dustfall rates at each grid and discrete receptor point.

Table 10: Simulation domain

South-western extent	699 358 m; 7 023 818 m
North-eastern extent	704 358 m; 7 028 818 m
Projection	Grid: UTM Zone 35 Datum: WGS 84
Resolution	100 m

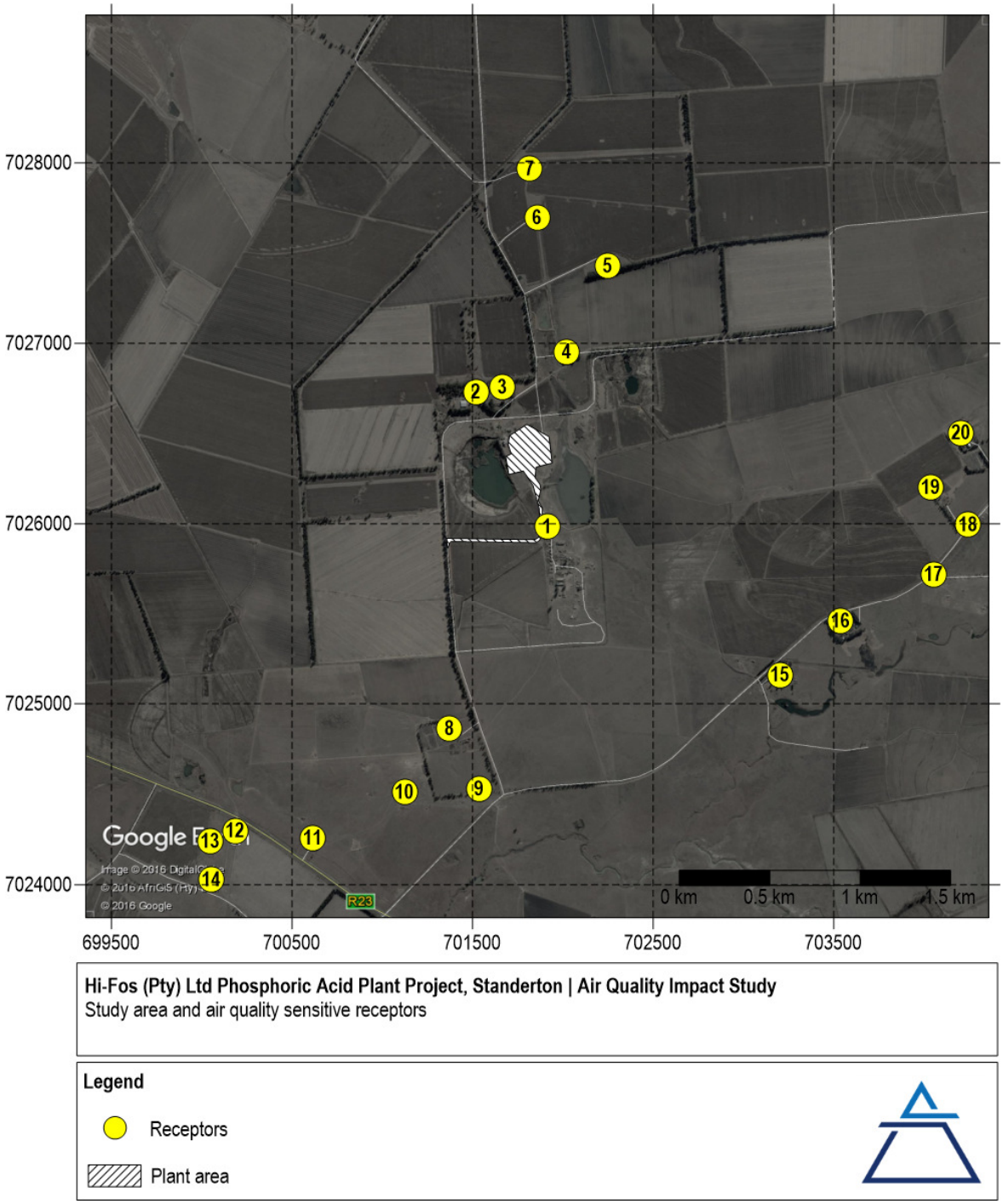


Figure 23: Air quality sensitive receptors included in dispersion simulations

11.3.2.6 Presentation of Results

Dispersion simulations were undertaken to determine hourly, daily and annual average ground level concentrations and dustfall rates for each of the pollutants considered in the study as well as the frequency at which short term criteria are exceeded. Averaging periods were selected to facilitate the comparison of predicted pollutant concentrations to relevant ambient air quality and inhalation health criteria as well as dustfall regulations.

Results are presented in tabular and isopleth form. Tabulated results are included to facilitate an initial impact screening to identify pollutants of concern. For pollutants flagged during this initial screening, isopleths are provided. An isopleth is a line on a map connecting points at which a given variable (in this case concentration or dustfall) has a specified constant value. This is analogous to contour lines on a map showing terrain elevation.

Certain short term air quality limits (i.e. 1-hour and 24-hour) allow the exceedance of certain limit values for 1% of the time per calendar year. For compliance assessment purposes, therefore, the 99th percentile of 1-hour and 24-hour average pollutant concentrations is presented. It should be noted that ambient air quality criteria apply to areas where the Occupational Health and Safety regulations do not apply, thus outside the property or lease area. Ambient air quality criteria are therefore not occupational health indicators but applicable to areas where the public has access i.e. off-site. If a frequency of exceedance is not specified, the second highest or 99.99^{th} percentile of concentration is reported.

11.3.2.7 Analysis of Emissions' Impact

Table 11 summarises simulated pollutant concentrations and dustfall rates at the most affected receptors. It was found that ambient CO, HF, NH_3, NO_2, $PM_{2.5}$, SO_2, as well as TVOC concentrations are within assessment criteria at the most affected air quality sensitive receptors. Gaseous emissions from the plant were found to impact more notably at receptors 1 and 2, the community to the south and farmstead to the north.

Simulated PM_{10} concentrations may however exceed the 24-hour NAAQS at nearby receivers with the highest impact as receptor 8, a farmstead close to the access road and up to approximately 850m from this road. Isopleths of simulated 1-year average and 24-hour average concentrations are included in Figure 24 and Figure 25. To address such impacts, efforts should be made to minimise vehicle entrained dust from the access road.

Both odour and dustfall nuisance are expected to be within impact criteria. The maximum dustfall rate at the community south of the project is expected to be 326 mg/m^2-day.

Table 11: Simulated maximum 1-hour, 24-hour and 1-year average pollutant concentrations

Pollutant	Index	Unit	Impact	Assessment criteria	Simulation result at most affected receptor	Receptor
CO	99th percentile of 8-hour average concentrations	µg/m^3	Health	10 000	2.42	1
	99th percentile of 1-hour average concentrations	µg/m^3	Health	30 000	4.34	1
HF	Annual average	µg/m^3	Health	14	0.0127	2
	99.99th percentile of 1-hour average concentrations	µg/m^3	Health	16.4	1.49	2
NH_3	Annual average	µg/m^3	Health	500	0.104	2
	99.99th percentile of 1-hour average concentrations	µg/m^3	Health	1 184	14.8	2
	98th percentile of 1-hour average concentrations	µg/m^3	Odour nuisance	3000	0.95	2
		ou_E/m^3		1.5	negligible	2
NO_2[(a)]	Annual average	µg/m^3	Health	40	0.643	1
	99th percentile of 1-hour average concentrations	µg/m^3	Health	200	12	1
PM_{10}	Annual average	µg/m^3	Health	40	35.3	1
	99th percentile of 24-hour average concentrations	µg/m^3	Health	75	134[(c)]	8
$PM_{2.5}$	Annual average	µg/m^3	Health	20	5.38	1
	99th percentile of 24-hour average concentrations	µg/m^3	Health	40	15.1	8
SO_2	Annual average	µg/m^3	Health	50	2.17	1
	99th percentile of 24-hour average concentrations	µg/m^3	Health	125	15.2	1
	99th percentile of 1-hour average concentrations	µg/m^3	Health	350	27.3	1
TVOC	Annual average	µg/m^3	Health	5[(b)]	0.00342	1
TSP (Dustfall)	Highest monthly dustfall rate	mg/m^2-day	Nuisance	600	326	1

Notes:
(a) All NOx assumed to be NO_2
(b) NAAQS for benzene used as impact indicator
(c) Exceeds impact criteria

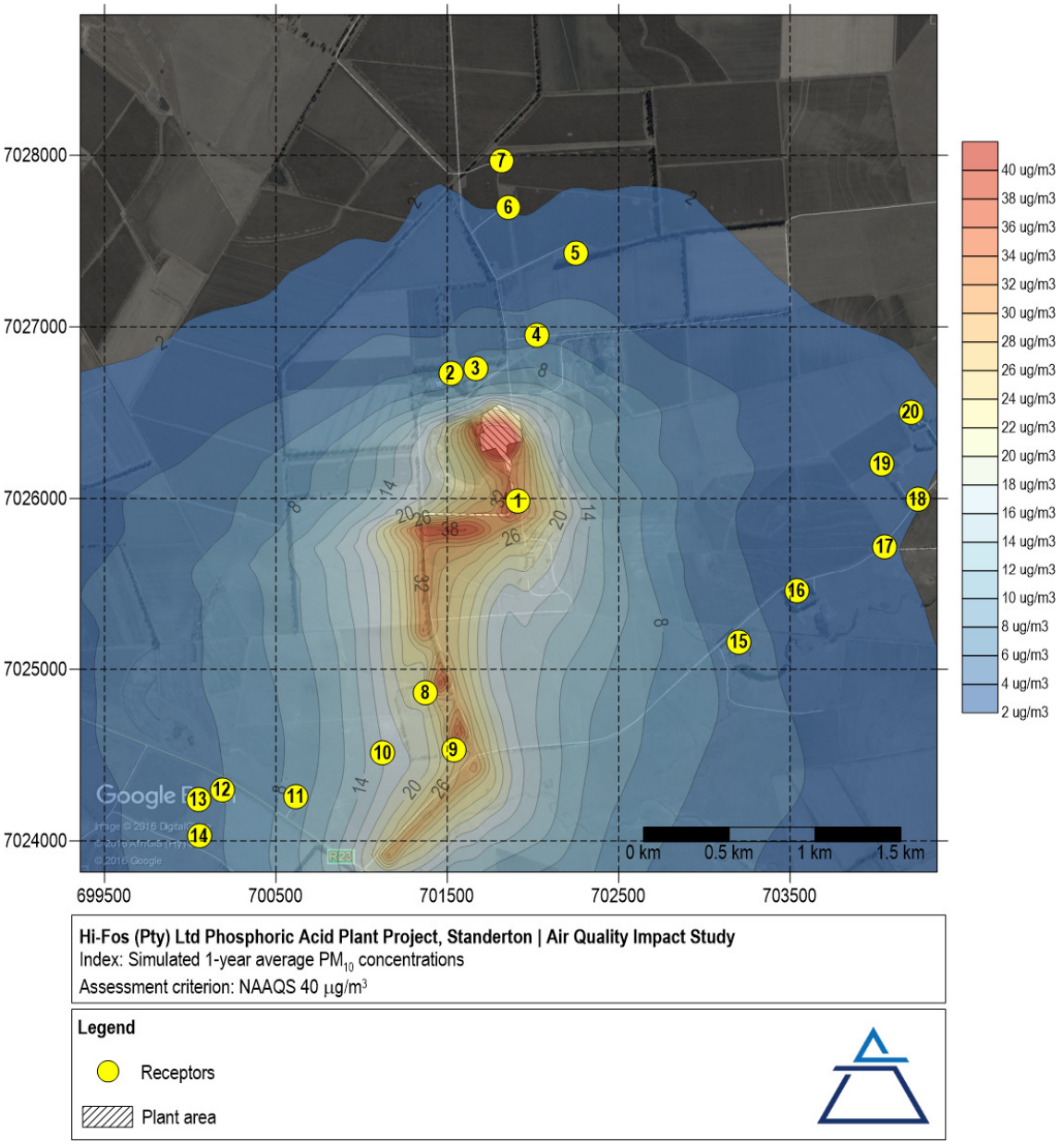


Figure 24: Simulated annual average PM_{10} concentrations

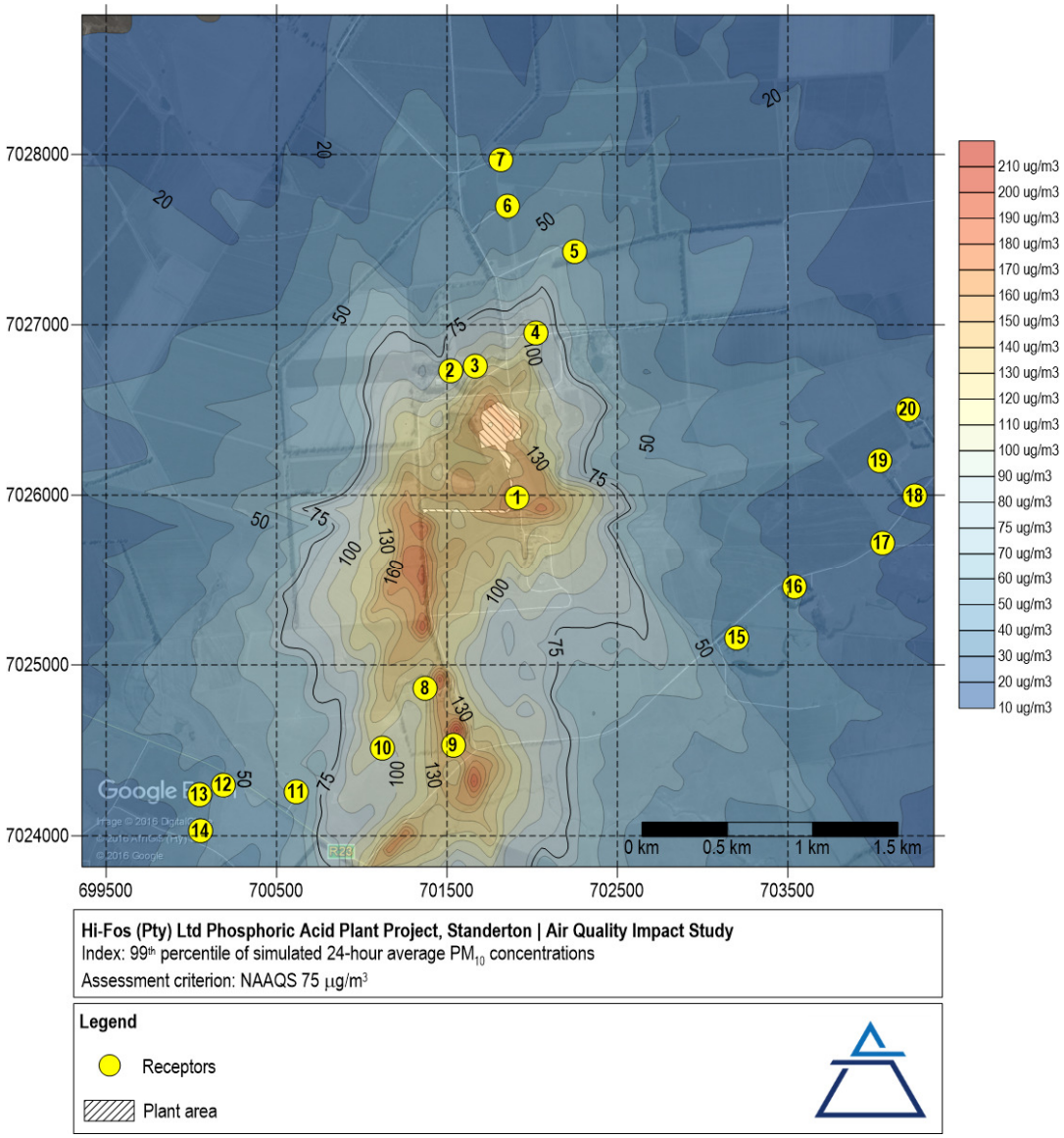


Figure 25: 99th percentile of simulated 24-hour average PM_{10} concentrations

11.3.3 Recommendations

Planned and recommended air quality management measures are summarised in Table 12. More detail on measures available for mitigating dust from unpaved roads as well as ambient air quality monitoring is provided hereafter.

Table 12: Planned and recommended air quality management measures

	Source/area of application	Planned/proposed measure	Expected reduction efficiency (if applicable)
Mitigation measures	Phosphoric acid plant reactor emissions	Alkaline scrubber.	HF emissions will be reduced to below 5 mg/Nm^3.
	Gypsum treatment coal fired kiln	Cyclone for removal of particulate matter from off-gas.	PM emissions will be reduced to below 50 mg/Nm^3.
	Material handling, truck off-loading, product	Enclosure, all these activities will occur within a	Efficiency expected to be approximately 70%.

	Source/area of application	Planned/proposed measure	Expected reduction efficiency (if applicable)
	bagging	building with entrances covered by slats to retain dust.	
	Vehicle entrained dust	Measures to reduce vehicle entrained dust from the unpaved access rod must be considered. It must include either level 2 watering (>2 l/m^2-day), water in combination with chemical dust suppressants, or paving. Refer to Section 11.3.3.1 for more information.	Efficiency of 90% required.
Stack emission testing and reporting	All point sources	Annual emissions testing or as per the requirements that will be stipulated in the AEL.	Not applicable.
Ambient air quality monitoring	Project boundary and nearby sensitive receptors	Dustfall and PM_{10} monitoring is recommended. Refer to Section 11.3.3.2 for more information.	Not applicable.

11.3.3.1 Dust Control Options for Unpaved Roads

Three types of measures may be taken to reduce emissions from unpaved roads:

- Measures aimed at reducing the extent of unpaved roads, e.g. paving;
- Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds; and
- Measures aimed at binding the surface material or enhancing moisture retention, such as wet suppression and chemical stabilization (Cowherd, Muleski, & Kinsey, 1988).

The main dust generating factors on unpaved road surfaces include:

- Vehicle speeds;
- Number of wheels per vehicle;
- Traffic volumes;
- Particle size distribution of the aggregate;
- Compaction of the surface material;
- Surface moisture; and
- Climate.

According to research conducted by the Desert Research Institute at the University of Nevada, an increase in vehicle speed of 10 miles per hour resulted in an increase in PM_{10} emissions of between 1.5 and 3 times. A similar study conducted by Flocchini (Flocchini, Cahill, Matsumura, Carvacho, & Lu, 1994) found a decrease in PM_{10} emissions of 42±35% with a speed reduction from 40km/hr to 24km/hr (Stevenson, 2004). The control efficiency obtained by speed reduction can be calculated by varying the vehicle speed input parameter in the predictive emission factor equation given for unpaved roads. An evaluation of control efficiencies resulting from reductions in

traffic volumes can be calculated due to the linear relationship between traffic volume, given in terms of vehicle kilometres travelled, and fugitive dust emitted. Similar affects will be achieved by reducing the truck volumes on the roads.

Water sprays on unpaved roads is the most common means of suppressing fugitive dust due to vehicle entrainment at mines, but it is not necessarily the most efficient means (Thompson & Visser, 2000). Thompson and Visser (2000) developed a model to determine the cost and management implications of dust suppression on mine haul roads using water or other chemical palliatives. The study was undertaken at 10 mine sites in Southern Africa. The model was first developed looking at the re-application frequency of water required for maintaining a specific degree of dust palliation. From this the cost effectiveness of water spray suppression could be determined and compared to other strategies. Factors accounted for in the model included climate, traffic, vehicle speed and the road aggregate material. A number of chemical palliative products, including hygroscopic salts, lignosulponates, petroleum resins, polymer emulsions and tar and bitumen products were assessed to benchmark their performance and identify appropriate management strategies. Cost elements taken into consideration included amongst others capital equipment, operation and maintenance costs, material costs and activity related costs. The main findings were that water-based spraying is the cheapest dust suppression option over the short term. Over the longer term however, the polymer-emulsion option is marginally cheaper with added benefits such as improved road surfaces during wet weather, reduced erosion and dry skid resistance (Thompson & Visser, 2000).

Chemical suppressant has been proven to be affective due to the binding of fine particulates in the road surface, hence increasing the density of the surface material. In addition, dust control additives are beneficial in the fact that it also improves the compaction and stability of the road. The effectiveness of a dust palliative includes numerous factors such as the application rate, method of application, moisture content of the surface material during application, palliative concentrations, mineralogy of aggregate and environmental conditions. Thus, for different climates and conditions you need different chemicals, one chemical might not be as effective as another under the same conditions and each product comes with various advantages and limitations of each own. In general, chemical suppressants are given to achieve a PM_{10} control efficiency of 80% when applied regularly on the road surfaces (Stevenson, 2004).

There is however no cure-all solution but rather a combination of solutions. A cost-effective chemical control programme may be developed through establishing the minimum control efficiency required on a particular roadway, and evaluating the costs and benefits arising from various chemical stabilization practices. Appropriate chemicals and the most effective relationships between application intensities, reapplication frequencies, and dilution ratios may be taken into account in the evaluation of such practices. One of the main benefits of chemical stabilisation in conjunction with wet suppression is the management of water resources (MFE, 2001).

Spillage and track-on from the surrounding unpaved areas may result in the deposition of materials onto the chemically treated or watered road resulting in the need for periodic “housekeeping” activities (Cowherd, Muleski, & Kinsey, 1988). In addition, the gradual abrasion of the chemically treated surface by traffic will result in loose material on the surface, which would have to be controlled. The minimum frequency for the reapplication of watering or chemical stabilizers thus

depends not only on the control efficiency of the suppressant but also on the degree of spillage and track-on from adjacent areas, and the rate at which the treated surface is abraded. The best way to avoid dust generating problems from unpaved roads is to properly maintain the surface by grading and shaping for cross sectional crowing to prevent dust generation caused by excessive road surface wear (Stevenson, 2004).

11.3.3.2 Dustfall and PM_{10} Monitoring Recommendations

Given the potential impact of fugitive dust on nearby sensitive receptors it is recommended that a dustfall monitoring network be established by placing dustfall samplers compliant with National Dust Control Regulations (NDCR) GNR 827. Dustfall samplers are to be placed on the boundary of the proposed Phosphoric Acid Plant (in the four main wind directions) at the community south of the site and at one receptor adjacent to the access road. Dustfall sampling should commence before construction and continue throughout the life of the project.

For dustfall, the NDCR specifies that the method to be used for measuring dustfall and the guideline for locating sampling points shall be ASTM D1739 (1970), or equivalent method approved by any internationally recognized body. The ASTM method covers the procedure of collection of dustfall and its measurement and employs a simple device consisting of a cylindrical container (not less than 150 mm in diameter) exposed for one calendar month (30 ±2 days). Even though the method provides for a dry bucket, de-ionised (distilled) water can be added to ensure the dust remains trapped in the bucket.

The bucket stand includes wind shield at the level of the rim of the bucket to provide an aerodynamic shield. The bucket holder is connected to a 2m galvanized steel pole, which is either planted and cemented or directly attached to a fence post. This allows for a variety of placement options for the fallout samplers. Two buckets are usually provided for each dust bucket stand. Thus, after the first month, the buckets are exchanged with the second set.

Collected samples are sent to an accredited laboratory for gravimetric analysis. At the laboratory, each sample will be rinsed with clean water to remove residue from the sides, and the contents filtered through a coarse (>1 mm) filter to remove insects and other course organic detritus. The sample is then filtered through a pre-weighed paper filter to remove the insoluble fraction. This residue and filter are dried, and gravimetrically analysed to determine total dustfall.

In addition to dustfall sampling, it is recommended that PM_{10} sampling be conducted during construction, the first year of operation, as well as during production ramp or when investigating complaints.

Ambient PM_{10} (and $PM_{2.5}$) concentrations can be determined through the use a MiniVol sampler. In summary, the monitoring methodology is as follows:

- The MiniVol sampler is programmed to draw air over a pre-weighed filter at a constant rate over a 24-hour period.
- At an interval of 1 in 2 days or 1 in 3 days, the used filter is removed, a new filter put in place, the battery exchanged (each MiniVol is equipped with two batteries) and the MiniVol re-programmed.

- The used filter is removed from the filter holder assembly in a clean environment and sealed in its dish.
- At each exchange, the date, location, filter number, pump run time etc. need to be noted in the data sheet that will be sent to the laboratory with the sealed samples for analysis.

11.4 Environmental Noise Specialist Study

Environmental Noise Specialist Study for the proposed Phosphoric Acid was undertaken by Airshed Planning Professionals (Pty) Ltd (Airshed), as attached in Appendix 18[31].

11.4.1 Study Approach and Methodology

The main objective of the noise specialist study was to determine the potential impact on the acoustic environment and noise sensitive receptors (NRs). To meet the above objective, the following tasks were included in the Scope of Work:

- A review of available technical project information.
- A review of the legal requirements and applicable environmental noise guidelines.
- A study of the receiving (baseline) acoustic environment, including:
  - The identification of NRs from available maps and field observations;
  - A study of environmental noise attenuation potential by referring to available weather records, land use and topography data sources; and
  - Determining representative baseline noise levels through the analysis of sampled environmental noise levels obtained from surveys conducted in March 2017.
- An impact assessment, including:
  - The establishment of a source inventory for proposed activities.
  - Noise propagation simulations to determine environmental noise levels as a result of the proposed Phosphoric Acid Plant.
  - The screening of simulated noise levels against environmental noise criteria.
- The identification and recommendation of suitable mitigation measures and monitoring requirements.
- Determining impact significance.
- The preparation of a comprehensive specialist noise impact assessment report.

[31] Airshed Planning Professionals (Pty) Ltd, 2016. Environmental Noise Specialist Study for the Hi-Fos (Pty) Ltd Phosphoric Acid Plant Project, Standerton.

11.4.1.1 Limitations and Assumptions

The following limitations and assumptions should be noted:

- Since a detailed stationary and mobile equipment list will only be available once the proposed Phosphoric Acid Plant detailed design has been finalised, sound power levels could not be determined for individual noise generating components. Instead, use was made of the default noise "emission factors" for heavy industrial, light industrial and commercial areas as developed by the EC WG-AEN and published in their *Good Practice Guide for Strategic Noise Mapping and the Production of Associated Data on Noise Exposure* (EC WG-AEN, 2006).
- Estimates of road traffic were made given raw material consumption and production rates and assumed truck capacities, vehicle speeds and road conditions. Trucks were assumed to have a payload of 30t and to travel at 60km/h.
- The mitigating effect of buildings, walls and infrastructure acting as acoustic barriers were conservatively not taken into account.
- The quantification of sources of noise was limited to the operational phase of the plant. Construction phase activities are expected to be similar or even less significant and its impacts only assessed qualitatively.
- Although other existing sources of noise within the area were identified, such sources were not quantified but were taken account during the survey.

11.4.2 Results

11.4.2.1 Baseline Noise Survey and Results

Day- and night-time noise measurements were conducted on 2nd January and 3rd March 2017 at the four locations shown in Figure 26. Survey sites were selected taking into consideration proposed activities, NRs (shown in Figure 27), accessibility and safety.

During the day, the temperatures were in the high twenties and low thirties and the sky was somewhat overcast. The wind was slight to moderate (1 to 3m/s) and mostly from the north-east. During the night, temperatures ranged between 14°C and 16°C with almost no cloud cover. Wind speeds were lower than during the day and from the north-east.

In the assessment of sampled and simulated noise levels, reference was made to the International Finance Corporation (IFC) noise level guidelines (NLGs) for residential, institutional and educational receptors (55 dBA during the day and 45dBA during the night) since these are applicable to nearby NRs. The IFC's 3dBA increase in noise level criterion was used to determine the potential for noise impact.

The baseline acoustic environment was described in terms of the location of NRs, the ability of the environment to attenuate noise over long distances, as well as existing background and baseline noise levels. The following was found:

- The closest NRs include a community approximately 450m south of the proposed Phosphoric Acid Plant and farmsteads close to the proposed access road.
- Atmospheric conditions are more conducive to noise attenuation during the day.
- On average, noise impacts are expected to be more notable to the south-east and west during the day and to the west during the night.
- There are no natural terrain features that would provide acoustic shielding to the closets receptors.
- Farming activities, road and rail traffic, domesticated animals, birds and insects are the main contributors to the acoustic environment of the area.
- Representative background noise levels were determined as being 44.3dBA during the day and 42.9dBA during the night. These levels were applied in the estimation of the extent to which noise levels increase as a result of the base and project scenarios.

Figure 26: The location of noise survey points

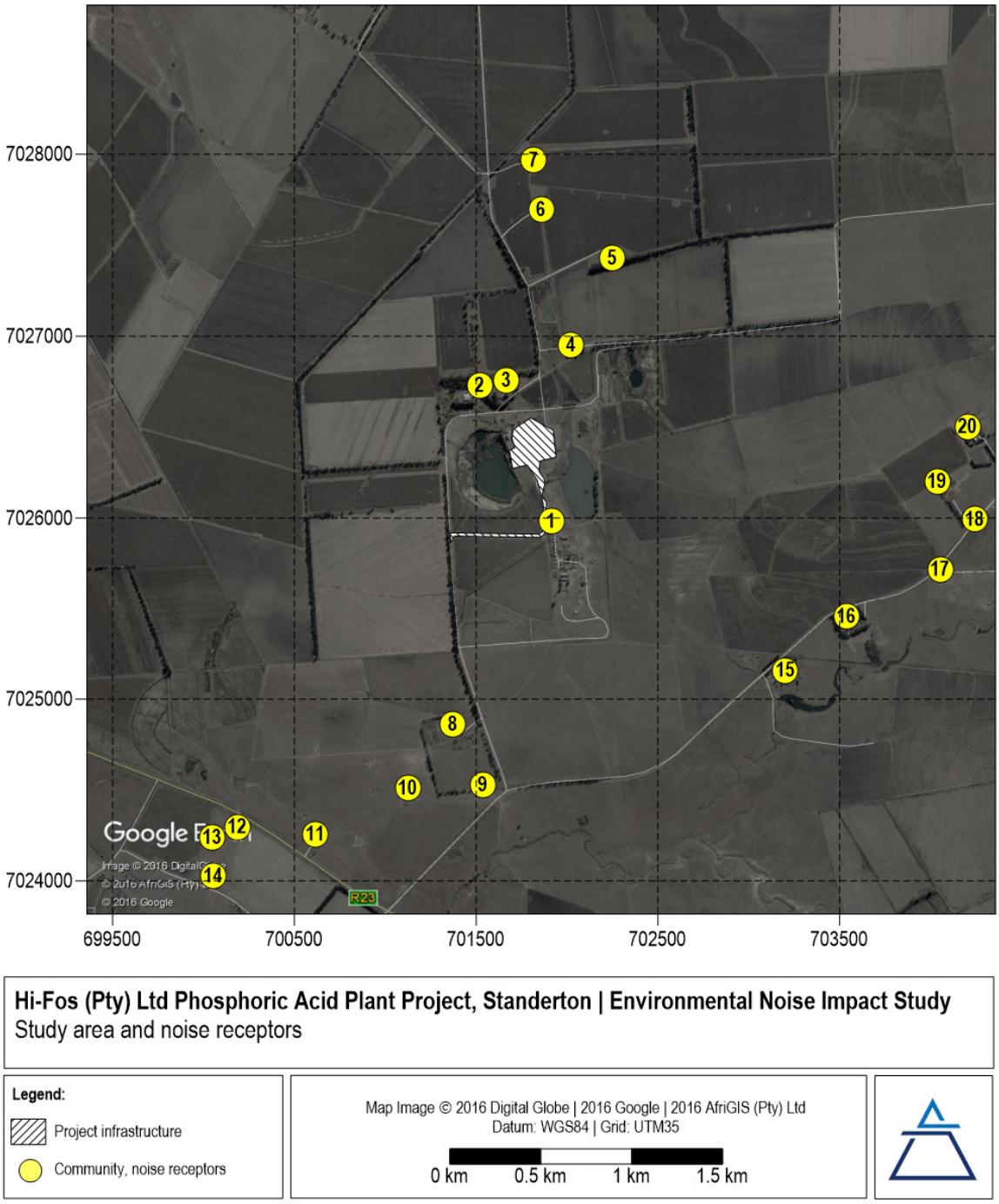


Figure 27: Location of noise receptors

11.4.2.2 Noise Sources and Sound Power Levels

Given the complexity of the proposed Phosphoric Acid Plant complex and number of noise generating components/activities and limited plant design information, an approach was adopted wherein emissions were included as area wide noise emissions.

The European Commission established a Working Group for the Assessment of Environmental to Noise (WG-AEN) who published a position paper in 2006. The WG-AEN "Good Practice Guide for Strategic Noise Mapping and the Production of Associated Data on Noise Exposure", provides

default sound power levels (L_W's) for different types of industry, to be used when sufficient information for a detailed noise emissions inventory is not available. Default L_W's of 60dBA/m^2 during the day and 45dBA/m^2 during the night were applied to the ablutions. The default L_W of 60dBA/m^2 for light industrial areas during both the day- and night was applied to all storage and bunker areas The default L_W of 65dBA/m^2 for heavy industries was applied to the CNX Plant, MAP 33 and MAP 39 Plant, Phosphoric Acid Plant, compressor and cooling area, boiler, etc. These factors were applied to take into account all materials handling, feeders, feed hoppers and conveyors, electrical motors, motor driven pumps and fans, pumping and compressed air noise, loading etc.

Traffic associated with the delivery of raw materials and transport of products were calculated as approximately 2.2 return trips per hour. It is the number of trips required to transport 18.4t of raw materials per hour, 0.5t of solid and liquid wastes, and 13.8t of product per hour. The calculation assumed an average truck capacity of 30t. It was further assumed that trucks will travel at a seed of 60km/h.

The reader is reminded of the non-linearity in the addition of L_W's. If the difference between the sound power levels of two sources is nil the combined sound power level is 3 decibels (dB) more than the sound pressure level of one source alone. Similarly, if the difference between the sound power levels of two sources is more than 10dB, the contribution of the quietest source can be disregarded (Brüel & Kjær Sound & Vibration Measurement A/S, 2000). Therefore, although some sources of noise could not be quantified, the incremental contributions of such sources are expected to be minimal given that the majority of sources are considered in the source inventory and noise emission factors.

The source inventory and estimated L_W's as established using the approach detailed in above is summarised in Table 13.

Table 13: Noise source inventory for the proposed Phosphoric Acid Plant

Source name	Source type	L_WA (dBA)		L_WA/m^2 (dBA/m^2)		Lm,E, 25 from the road, 4 m above ground (dBA)	
		Day	Night	Day	Night	Day	Night
CNX Plant	Area (300m^2)	89.8	89.8	65	65		
MAP 33 and 39 Plant	Area (900m^2)	94.5	94.5	65	65		
Ammonium Nitrate (AN) and NH_3 Storage	Area (300m^2)	84.8	84.8	60	60		
Phosphoric Acid Plant	Area (1200m^2)	95.8	95.8	65	65		
Phosphate Rock Storage	Area (200m^2)	83	83	60	60		
Compressor and Cool Tower	Area (100m^2)	85	85	65	65		
Boiler	Area (100m^2)	85	85	65	65		
Coal Bunker	Area (100m^2)	80	80	60	60		
Water	Area (50m^2)	77	77	60	60		
Nitric Acid	Area (50m^2)	77	77	60	60		

Nitric Acid Off-loading	Area (300m^2)	84.8	84.8	60	60		
Nitric Acid Storage	Area (1 200m^2)	90.8	90.8	60	60		
Loading Bay	Area (400m^2)	86	86	60	60		
Storage 50 kg	Area (500m^2)	87	87	60	60		
Storage 500 kg	Area (900m^2)	89.5	89.5	60	60		
MAP	Area (200m^2)	88	88	65	65		
Limestone Ammonium Nitrate (LAN)	Area (200m^2)	88	88	65	65		
Storage	Area (200m^2)	88	88	65	65		
Granulation Blend Plant	Area (900m^2)	94.5	94.5	65	65		
Storage Final Product	Area (1 350m^2)	91.3	91.3	60	60		
Bagged Product Storage	Area (2 000m^2)	93	93	60	60		
Ablutions	Area (150m^2)	81.7	66.7	60	45		
Waste Store	Area (525m^2)	87.2	87.2	60	60		
Phosphate Rock Store	Area (485m^2)	86.8	86.8	60	60		
Substation	Area (275m^2)	84.4	84.4	60	60		
MAP Bulk	Area (1 442m^2)	91.6	91.6	60	60		
Pack Plant	Area (86m^2)	79.3	79.3	60	60		
Access Road	Road (3 810m)					54.7	54.7

11.4.2.3 Noise Propagation and Simulated Noise Levels

The propagation of noise likely to be generated during the operational phase of the proposed Phosphoric Acid Plant was calculated with CadnaA in accordance with ISO 9613 and RLS-90. Meteorological and site specific acoustic parameters along with source data, were applied in the model. Results are presented in tabular form Table 14 and isopleth form (Figure 28 to Figure 31).

Simulations of the proposed Phosphoric Acid Plant's operations during the day (06:00 to 22:00), indicate levels within the guideline of 55dBA for residential, institutional and educational receptors at all nearby NRs. During the day, noise generated by the proposed Phosphoric Acid Plant and traffic will be most notable at the community south of the site (NR01), and farmsteads NR02, NR03, NR08 and NR09. At NR01 the increase in day-time noise levels of 8.1dBA may lead to 'little' to 'medium' community reaction with sporadic complaints.

As a result of atmospheric conditions less conducive to noise attenuation and stricter guidelines, night-time noise impacts (22:00 to 06:00) will be more notable. Simulations show that the night-time guideline of 45dBA will likely be exceeded at the community (NR01), and farmstead NR09 predominantly as a result of heavy vehicle traffic. At NR01 and NR09 the increases in night-time noise levels of 9.3dBA and 5.3dBA respectively, may lead to 'little' to 'medium' community reaction with sporadic complaints.

Table 14: Simulation results at NRs

Receptor	Noise levels as a result of the proposed Phosphoric Acid Plant (dBA)		Increase in ambient noise levels above the baseline as a result of the proposed Phosphoric Acid Plant (dBA)	
	Day-time	Night-time	Day-time (Baseline 44.3 dBA)	Night-time (Baseline 42.9 dBA)
NR01	51.7	51.7(a)	8.1(a)	9.3(a)
NR09	46.7	46.7(a)	4.4(a)	5.3(a)
NR08	42.6	42.6	2.2	2.9
NR03	40.7	41.0	1.6	2.2
NR02	39.0	39.6	1.1	1.7
NR10	37.5	37.5	<1	<1
NR04	35.4	35.4	<1	<1
NR11	31.3	31.3	<1	<1
NR05	27.2	27.3	<1	<1
NR12	25.6	25.6	<1	<1
NR06	25.0	25.3	<1	<1
NR13	24.1	24.1	<1	<1
NR14	23.8	23.8	<1	<1
NR15	23.4	23.5	<1	<1
NR07	21.4	21.8	<1	<1
NR16	18.5	18.5	<1	<1
NR17	-80.2	-80.2	NLG	NLG
NR18	-80.2	-80.2	NLG	NLG
NR19	-80.2	-80.2	NLG	NLG
NR20	-80.2	-80.2	NLG	NLG

Notes:

(a) Exceeds NLG

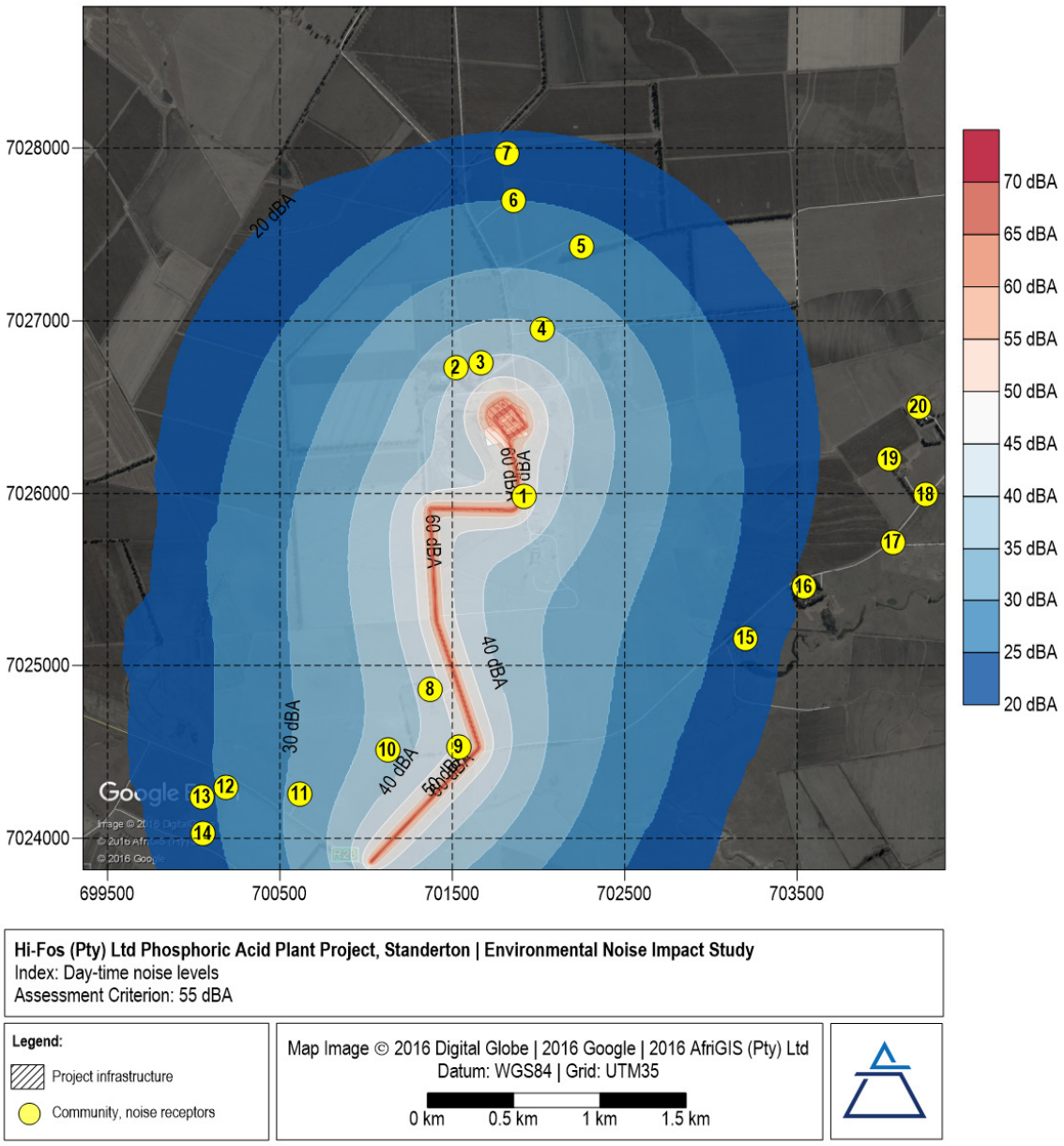


Figure 28: Simulated day-time noise levels

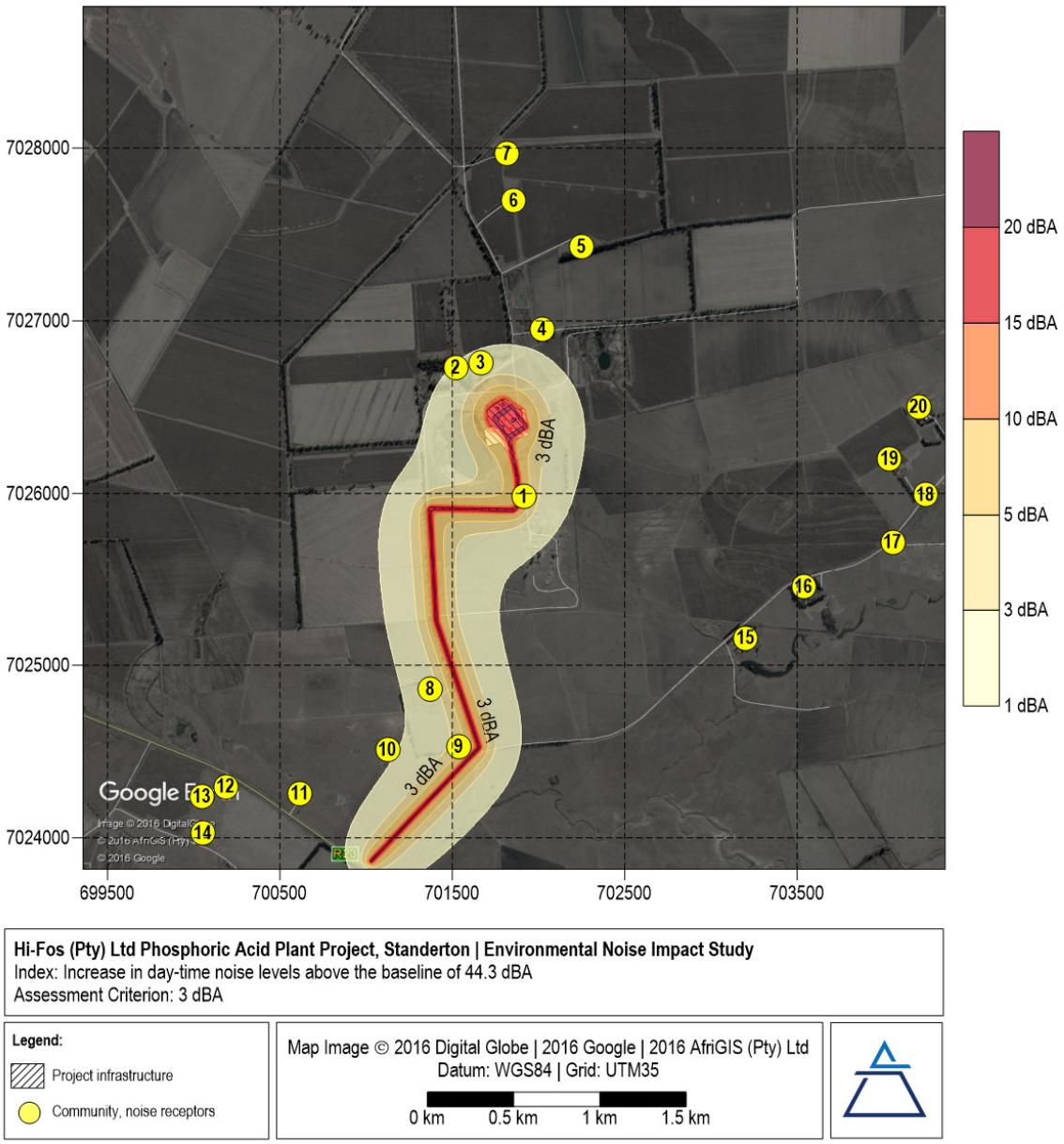


Figure 29: Simulated increase in day-time noise levels above the baseline of 44.3 dBA

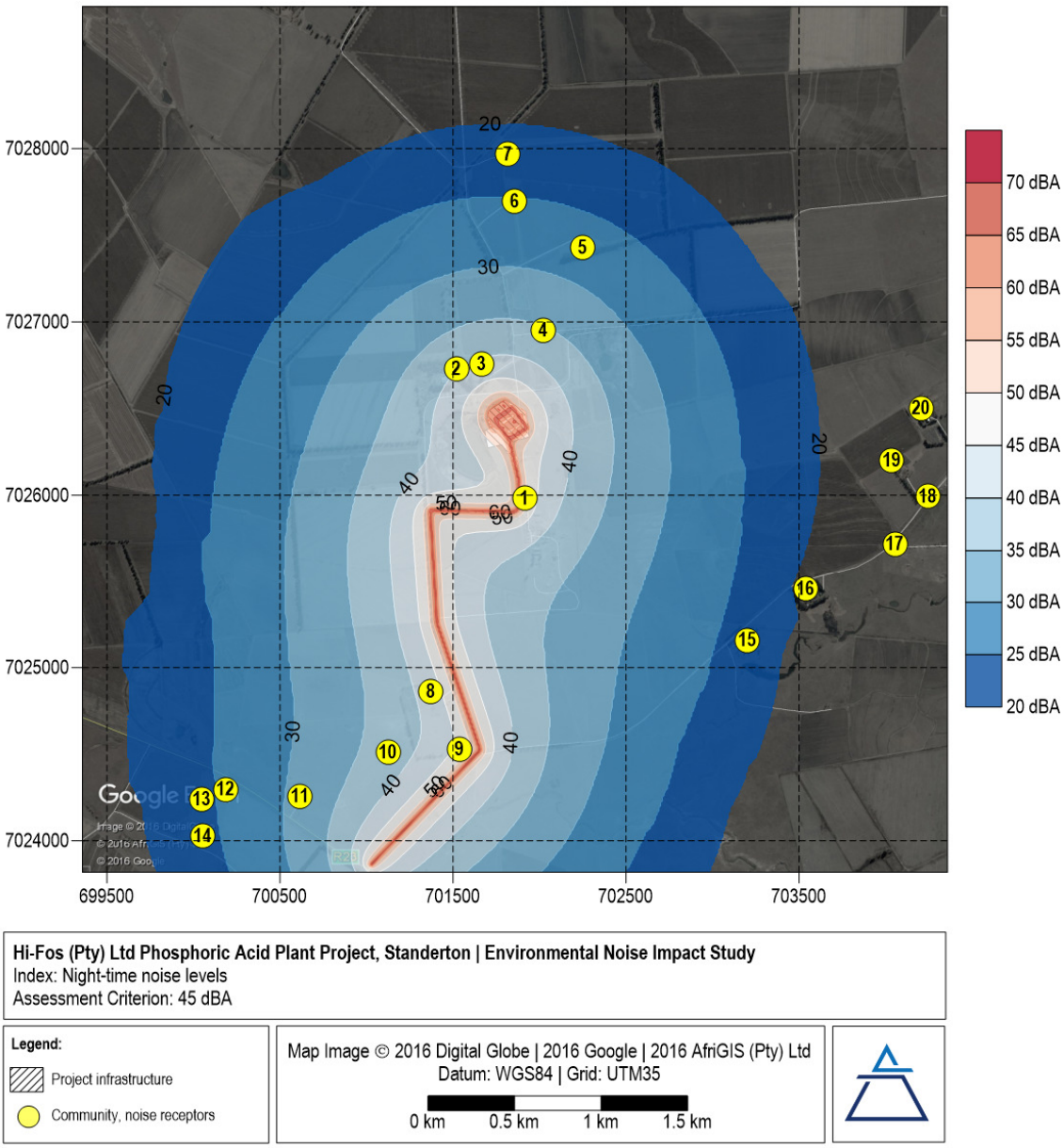


Figure 30: Simulated night-time noise levels

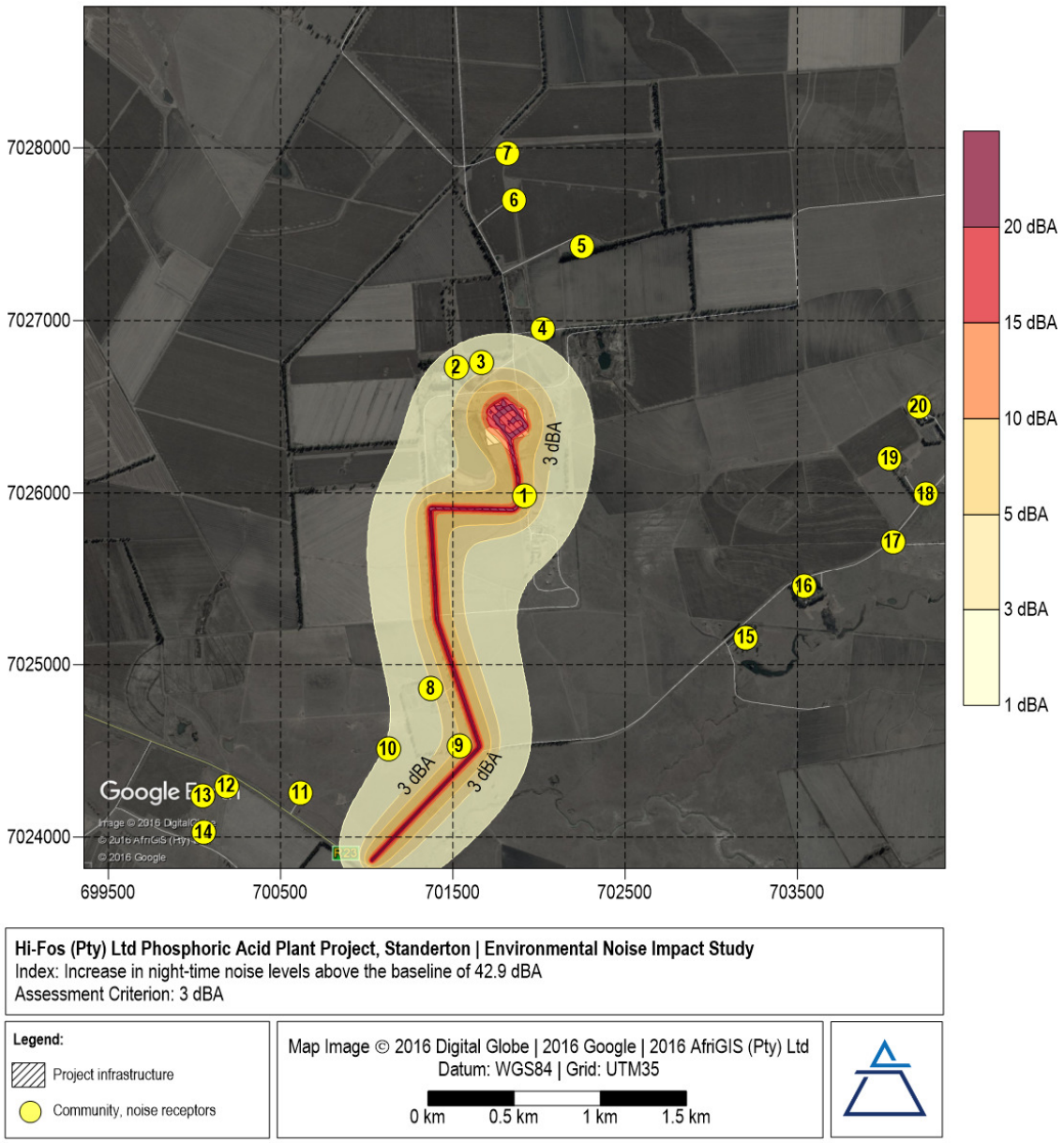


Figure 31: Simulated increase in night-time noise levels above the baseline of 42.9 dB

11.4.3 Conclusions and Recommendations

In the quantification of noise emissions and simulation of noise levels as a result of the proposed Phosphoric Acid Plant, it was calculated that ambient noise evaluation criteria for human receptors may be exceeded at the community south of the site and those in closest proximity to the access road. It was also found that night-time impacts will be most significant.

The proposed Phosphoric Acid Plant contribution to noise levels at most NRs, the exceptions being NR01 and NR09, will be less than 3dBA which would not likely result in annoyance. Impacts at NR01 and NR09 need however be monitored and managed. The general good practice measures for mitigating and managing noise as set out below, are recommended.

11.4.3.1 Good Engineering and Operational Practices

For general activities, the following good engineering practice should be applied to all project phases:

- All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.
- Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels.
- In managing noise specifically related to truck and vehicle traffic, efforts should be directed at:
    - Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
    - Maintain road surface regularly to avoid corrugations, potholes etc.
    - Avoid unnecessary idling times.
    - Minimising the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009).
    - Limiting traffic to hours between 06:00 and 18:00.
- Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
- A noise complaints register must be kept.

11.4.3.2 Monitoring

An environmental noise monitoring campaign should be conducted once during the pre-construction phase, once during construction and once during the operational phase, specifically at NR01 and NR09.

Also, In the event that noise related complaints are received short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions.

The following procedure should be adopted for all noise surveys:

- Any surveys should be designed and conducted by a trained specialist.
- Sampling should be carried out using a Type 1 Sound Level Meter (SLM) that meets all appropriate IEC standards and is subject to annual calibration by an accredited laboratory.

- The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session.
- Samples of at least 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic environment should be taken.
- The following acoustic indices should be recorded and reported: L_{Aeq} (T), L_{Aleq} (T), statistical noise level L_{A90}, L_{AFmin} and L_{AFmax}, octave band or 3rd octave band frequency spectra.
- The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.
- Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet.
- A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic environment of each site.

The investigation of complaints, should include an investigation into equipment or machinery that likely result or resulted in noise levels annoying to the community. This could be achieved with source noise measurements.

12. ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

During the EIA phase, impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- significance;
- spatial scale;
- temporal scale;
- probability; and
- degree of certainty.

A combined quantitative and qualitative methodology will be used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 15.

In order to make the report easier to read, the following notation format is used to highlight the various components of the assessment:

Significance - IN CAPITALS

Spatial Scale - *in italics*

Temporal Scale - in underline

Probability - *in italics and underlined*.

Degree of certainty - **in bold**

Table 15 : Quantitative Rating and Equivalent Descriptors for the Impact Assessment Criteria

Rating	Significance	Spatial scale	Temporal scale	Probability
1	VERY LOW	*Isolated sites/the site*	Incidental	*Practically impossible*
2	LOW	*Study area*	Short-term	*Unlikely*
3	MODERATE	*Local*	Medium-term	*Could happen*
4	HIGH	*Regional/provincial*	Long-term	*Very likely*
5	VERY HIGH	*Global/national*	Permanent	*Going to happen/has occurred*

A more detailed description of each of the assessment criteria is given in the following sections.

12.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be high or very high, but if it is diluted it would be very low or low. Similarly, if 60ha of a grassland type are destroyed the impact would be very high if only 100ha of that grassland type were known. The impact would be very low if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 16 below.

Table 16 : Description of the significance rating scale

Rating		Description
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.

Rating		Description
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

12.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional/provincial, global/national scale. The spatial assessment scale is described in more detail in Table 17.

Table 17 : Description of the spatial rating scale

Rating		Description
5	Global/national	The maximum extent of any impact.
4	Regional/provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (district municipality to provincial level).
3	Local	The impact will affect an area up to 5km from the site.
2	Study area	The impact will affect an area not exceeding the boundary of the site.
1	Isolated sites/the site	The impact will affect an area no bigger than the facility.

12.3 Temporal Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 18.

Table 18 : Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than five years, whichever is the greater.
3	Medium-term	The environmental impact identified will operate for the duration of life of project/operation.
4	Long-term	The environmental impact identified will operate beyond the life of project/operation.
5	Permanent	The environmental impact will be permanent.

12.4 Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in Table 19 below.

Table 19 : Description of the degree of probability of an impact occurring

Rating	Description
1	Practically impossible.
2	Unlikely.
3	Could happen.
4	Very likely.
5	Going to happen/has occurred.

12.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in Table 20. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 20 : Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The EAP believes an assessment is not possible even with additional research.
Don't Know	The EAP cannot, or is unwilling, to make an assessment given available information.

12.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\text{Impact rating} = \frac{(\text{Significance} + \text{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below in Table 21:

Table 21 : Example of impact rating scale

Impact	Significance	Spatial scale	Temporal scale	Probability	Rating
Impact to air	LOW	*Local*	Medium-term	*Could happen*	
	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0.6) to give the final rating of 1.6.

The impact risk is classified according to five classes as described in Table 22.

Table 22 : Impact risk classes

Rating	Impact class	Description
0.1 – 1.0	1	Very low.
1.1 – 2.0	2	Low.
2.1 – 3.0	3	Moderate.
3.1 – 4.0	4	High.
4.1 – 5.0	5	Very high.

Therefore, with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

12.7 Cumulative Impacts

In terms of EIA Regulations it is a requirement that the EIA phase take cognisance of cumulative impacts. In fulfilment of this requirement, the impact assessment will take cognisance of any existing impact sustained by the operations, any mitigation measures already in place, any additional impact to environment through continued and proposed activities, and the residual impact after mitigation measures.

It is important to note that cumulative impacts at national or provincial level will not be considered in this assessment, as the total quantification of external companies on resources is not possible at the project level due to the lack of information and research documenting the effects of existing activities. Such cumulative impacts that may occur across industry boundaries can also only be effectively addressed at a provincial and national government level.

12.8 Final Proposed Alternative which respond Impact Assessment

The two sites that were considered were Farm Vlakfontein 386, Portion 93 and Holfontein 399, Portion 4. The site selected for the proposed Phosphoric Acid Plant, Farm Holfontein 399, Portion 4, was dictated by provision of electricity, its proximity to Standerton followed by the site being Brownfields (previously developed land).

13. IMPACT ASSESSMENT

13.1 Construction Phase

13.1.1 Geology

Information was taken from the Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys 2013[9], Revised Environmental Scoping Report for the proposed CCGT Power Plant in the Amersfoort Area, Mpumalanga Province[10], The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006)[11].

13.1.1.1 Initial Assessment

The regional geology comprises Karoo Supergroup, which hosts sediments carbonaceous shales, sandstones and mudstone and the coals of the extensive Ecca Group. Existing impacts are dispersed across the site. The consultant does not know what the spatial extent is of existing impacts to geology. Anecdotal evidence does indicate that foundations of the historical brickworks are approximately 3m in depth and that compaction took place to limit expected settlement. The consultant is unsure, but it would seem that the initial impacts to Geology are permanent, of a LOW negative significance and limited in extent to the *study area*. The impacts have *already occurred*, resulting in a **MODERATE** negative impact.

13.1.1.2 Additional Assessment

The load of the proposed Phosphoric Acid Plant foundations is calculated for a building 25m wide, portal frames at 5m centres with 5m high sheeting covered sides. The maximum load of the proposed Phosphoric Acid Plant development was calculated to be approximately 50kN. The load on the soil will be 35kPa if a 1.2m x 1.2m x 0.3m deep concrete base is constructed.

If the sheeting covered sides are replaced with brickwork, the point load of portal frames will stay more of less the same, with the load of a 5m high brick wall being 24.2kN/m. The load on the soil from the brickwork will be 58kPa with a foundation width of 0.6, and 32kPa for a foundation with a width of 0.75m. The load will become approximately 70kPa if the maximum load of the loads noted above is doubled.

The proposed Phosphoric Acid Plant will be located on the historical brickworks footprint, with foundations shallower than the historical foundations thus no further impact to the geology is expected. The impact thus remains the same as for the initial impact assessment.

13.1.1.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Subsoil strata stripping and backfilling
    - Excavate material on site in accordance with the relevant SANS codes.
    - Ensure excavation of materials is avoided under high wind conditions or when a visible dust plume is present.
    - Ensure dust suppression is carried out to prevent excessive fugitive dust.
    - Perform checks on the quality and compaction of backfill to foundations.
    - Ensure uncontaminated material is used as fill material.

13.1.1.4 Residual Assessment

The residual impact to geology at the completion of the construction phase will be the same as for the initial impact assessment.

13.1.1.5 Cumulative Assessment

The additional impact is similar in nature to the existing impact within the site; the extent is however protracted, however will not result in an increase in the significance of current impact. The cumulative impact will thus be the same as for the initial impact described above.

13.1.2 Topography

Information was taken from the Mpumalanga State of the Environment Report 2003 (Mpumalanga DACE, 2003)[5], Mpumalanga Agricultural Education and Training Report[12], Lekwa Municipality IDP For Financial Year 2013/2014 (Final IDP 2013/2014)[13].

13.1.2.1 Initial Assessment

The site is relatively flat and gently undulating, ranging from 1500-1800mamsl. Several sources of existing impacts to topography were identified; these include the historical brickworks, disused clay quarry, historical ash dumps, farm dam, roads and farm/community housing. The existing impact to surface topography from current and historical activities is considered to **probably** be of a MODERATE negative significance. Impacts can be effectively rehabilitated and the surface topography and drainage can be re-established, thus impacts will only act in the long-term. The alterations to topography have disturbed the *local area*. This impact *has already occurred,* resulting in a **HIGH** negative impact.

13.1.2.2 Additional Assessment

The construction of proposed Phosphoric Acid Plant will result in alteration of surface topography and drainage. The stockpiling of *in-situ* soil and construction material, alteration of surface topographic flow patterns, and the concentration of surface water flow over hard surfaces will cause impacts to surface topography and drainage. The construction phase could impact on the surface water features. The impact to topography will **probably** be of a LOW negative significance acting in the long-term, and affecting the *local area*. This impact *is going to happen*, resulting in a **MODERATE** negative impact.

13.1.2.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Exposed surfaces
    - All embankments, unless otherwise directed by the Engineer, are protected by berms and channels to prevent rainwater from cascading down the face of the embankment and causing erosion.
    - Vegetation commences after the completion to reduce the risk of soil erosion.
- Stockpile management

- Stockpiles are not situated such that they obstruct water pathways i.e. they shouldn't extend outside the designated areas or impact on adjacent storm water systems.
- Stockpiles do not exceed 2m in height.
- Stockpiles exposed to windy conditions or heavy rain, are covered by sheeting or chemical coatings, depending on the duration of the project. Stockpiles may be further protected by the construction of berms or low brick walls around their bases.

- Storm water management
  - Material is properly stockpiled so as not to obstruct natural water pathways over the site.
  - During construction, unchannelled flow is controlled to avoid soil erosion.
  - The periodic checking of the site's drainage system to ensure that the water flow is unobstructed.
- Post construction activities
  - All structures comprising the site establishment are removed from the site and surrounding areas.
  - All residual stockpiles are removed.
  - All leftover building materials are removed from the site.
  - All rubble is removed from the site to an approved licensed landfill site.
  - The site is and surrounding areas are cleared of all waste.

13.1.2.4 Residual Assessment

With the successful implementation of mitigation measures, the additional impact to the topography will **probably** be of LOW significance acting in long-term and affecting the *site*. This impact *is going to happen,* resulting in a **MODERATE** negative impact.

13.1.2.5 Cumulative Assessment

There will be no substantive increase to the topographic impacts when compared to the existing level of impact on the site; therefore, the cumulative impact will be the same as the initial impact described above.

13.1.3 Soil and Land Capability

Information was taken from the Mpumalanga Agricultural Education and Training Report[12], The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006)[11], Goldi – A division of Astral Operations Limited, 2015[14] (Final Basic Assessment Report)[14], Soil Investigation by KBK Engineers (Pty) Ltd[15].

13.1.3.1 Initial Assessment

The soil located on the site is representative of the regional soil profile. Previous farming activities and the construction of the historical brickworks resulted in the alteration of the soil characteristics.

The removal of topsoil, compacting of soil, cementation of existing foundations, the establishment of the hard park associated with the historical brickworks and reducing water infiltration due to the existing brick paving has impact on the soil. These alterations to the soil have negatively impacted on the soil fertility, which consequently impacts negatively on indigenous plant growth and reduces land capability.

The extent of negative impacts to soil and land capability is **probably** of MODERATE significance, is permanent in nature affecting the *local area*. This impact *has already occurred,* resulting in a **HIGH** negative impact.

13.1.3.2 Additional Assessment

Activities such as the removal of embankment fill and subsoil, soil compaction and establishment of the hard park and site office during the construction phase, as well as the construction of the proposed Phosphoric Acid Plant will affect soil and consequently land capability. In addition, spillage of chemicals such as paint and hydrocarbons are likely to occur. Majority of the site has been impacted on; however, the further compaction of the soil will result in a permanent loss of soil structure and fertility.

Additional impacts to soil and land capability will **probably** be of LOW significance, long-term in nature, affecting the *local area.* The impact *is going to happen,* resulting in a **HIGH** negative impact.

13.1.3.3 Mitigation

The following mitigation measures are proposed to limit impacts associated with:

- Site establishment
  - Restrict all activities, materials, equipment and persons within the area/s specified.
  - Erect site notices at the construction site informing persons of restricted access, the nature and timeframes of the construction activities, and appropriate contact details.
  - Erect and maintain permanent and/or temporary barricading prior to starting construction.
  - Maintain all demarcation barriers for the duration of construction activities.
- Topsoil stripping and stockpiling
  - Once an area has been cleared of vegetation, the soil will be levelled and prepared for construction related activities.
  - Soil removed from site is used for a suitable purpose or disposed of at a landfill site.
  - Cleared vegetation is disposed of at a landfill site.
- Piling, subsoil strata stripping and backfilling
  - Excavate material on site in accordance with the relevant SANS codes.
  - Ensure excavation of materials is avoided under high wind conditions or when a visible dust plume is present.
  - Ensure dust suppression is carried out to prevent excessive fugitive dust.
  - Perform checks on the quality and compaction of backfill to foundations.

- Ensure uncontaminated imported material is used as fill material.

- Exposed surfaces
  - All embankments are protected by berms and channels to prevent rainwater from cascading down the face of the embankment and causing erosion.
  - Vegetation commences after the completion to reduce the risk of soil erosion.
- Stockpile management
  - Stockpiles are not situated such that they obstruct water pathways i.e. they shouldn't extend outside the designated areas or impact on adjacent storm water systems.
  - Stockpiles do not exceed 2m in height.
  - Stockpiles exposed to windy conditions or heavy rain, are covered by sheeting or chemical coatings, depending on the duration of the project. Stockpiles may be further protected by the construction of berms or low brick walls around their bases.
- Storm water management
  - Material is properly stockpiled so as not to obstruct natural water pathways over the site.
  - During construction, unchannelled flow is controlled to avoid soil erosion.
  - The periodic checking of the site's drainage system to ensure that the water flow is unobstructed.
- Access routes/haul roads
  - Access to the construction site is via existing roads.
  - Existing access roads impacted on by spillages from construction activities are cleared of such material at the earliest opportunity.
  - Damage to the existing access roads as a result of construction activities is repaired.
  - Vehicle speeds do not exceed the designated speed limits or a safe speed limit.
- Materials handling, use and storage: Hazardous substances and materials
  - Hazardous substances/materials are stored in designated and appropriately designed and constructed areas within a secured area on site.
  - Hazardous substances/materials are stored in tanks or drums located within impermeable facilities where required.
  - Storage areas containing hazardous substances/materials are demarcated with appropriate signage.
  - The integrity of the hazardous substances/materials storage vessels must be checked on a monthly basis.
  - Storage facilities are well-ventilated.
  - Material Safety Data Sheets (MSDS's) are readily available on site for all chemicals and hazardous substances/materials used on site.
  - Where possible and available, MSDS's additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
  - Persons are made aware of the health risks associated with any hazardous substances/materials used, and are provided with appropriate protective clothing/equipment.

- Paints
    - Paint containers and products are disposed of in the hazardous waste bins provided.
- Fuel (petrol and diesel) and hydrocarbons
    - Refuelling is confined to designated areas and the area is underlain by an impermeable surface.
    - Emergency repairs done on machinery using hydrocarbons have a drip tray placed strategically to avoid incidental spillage.
    - Drip trays are emptied daily into appropriate disposal containers and serviced when necessary. In particular, drip trays are closely monitored during rain events to ensure that they do not overflow.
- Waste management
    - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
    - Burning of waste does not occur.
    - Littering on the site is forbidden and the construction site is cleared of all litter at the end of each working day.
    - General waste drums are not overfilled and emptied regularly into mass waste containers.
    - Waste is placed in designated mass waste containers located within demarcated areas designed to prevent waste from being blown out by wind.
    - All builders refuse is deposited at an appropriate waste disposal facility.
    - Waste collected from site is undertaken by a licensed Contractor and removed to an appropriate waste disposal facility.
    - Reports of the quantity and proof of responsible disposal of waste are kept.
    - Waste disposal is done according to Hi-Fos Waste Management procedure.
- Emergency and response procedure : Accidental leaks and spillages
    - The accidental or negligent spillage of any fuels or potentially hazardous substances is cleaned up immediately using the appropriate methodologies, equipment and materials.
    - The necessary materials, equipment and chemicals are available on the site to deal with spills of any of the hazardous substances/materials present.
    - Relevant persons on site are trained to carry out a spill contingency plan should such an event occur.
    - Any contaminated soil or water is removed and stored in an appropriate container until it can be disposed of at a licensed landfill site, and proof thereof retained.
- Post construction activities
    - All structures comprising the site establishment are removed from the site and surrounding areas.
    - All residual stockpiles are removed.
    - All leftover building materials are removed from the site.
    - The areas are checked for spills of substances such as oil, paint, diesel, etc. and these are cleaned up.

- All rubble is removed from the site to an approved licensed landfill site.
- Fences, barriers and demarcations associated with the construction phase are removed from the site.
- The site is and surrounding areas are cleared of all waste.

13.1.3.4 Residual Assessment

With the successful implementation of mitigation measures, the additional impact to soil and land capability will **probably** be of a long-term nature, of a LOW negative significance and acting on *the site*. This impact *could happen*, resulting in a **MODERATE** negative impact.

13.1.3.5 Cumulative Assessment

There will be no substantive increase to soil and land capability impacts when compared to the existing level of impact on site therefore, the cumulative impact will be the same as the initial impact described above.

13.1.4 Land Use

This information was taken from the Kipower (Pty) Ltd Environmental Impact Assessment, 2016[16], The Mpumalanga State of the Environment Report 2003[3] (Mpumalanga DACE, 2003)[5], South African Land Cover 2013 (ArcGIS)[17].

13.1.4.1 Initial Assessment

Although the site is zoned agricultural, a historical brickworks is sited there. The historical brickworks has impacted the soil structure and fertility and in turn altered the land use. The area surrounding the site is characterised by historical brickworks activities, cultivated commercial fields, farm housing and community dwellings.

The land use of the site prior to development of the historical brickworks is unknown, however it is assumed that the site was either a natural untransformed area or cultivated land. Thus when the historical brickworks was development the land use was transformed by removal of flora, the levelling and compaction of soil, the construction of buildings and the excavation of the quarry.

The initial impact to land use is **probably** of a MODERATE significance, permanent in nature, and affecting the *local area*. This impact *has already occurred*, resulting in a **HIGH** negative impact.

13.1.4.2 Additional Assessment

The location of the proposed Phosphoric Acid Plant will have no impact on land use, as such will not result in an increase in the already impact footprint. The change of land use within the site will however result in secondary impacts to the environment. These secondary impacts have been assessed separately.

13.1.4.3 Mitigation

No mitigation measures can be identified for the impact to land use.

13.1.4.4 Residual Assessment

The residual impact to land use will be the same as the initial assessment.

13.1.4.5 Cumulative Assessment

The overall net cumulative impact to land use will be the same as the initial assessment.

13.1.5 Flora

Information was taken from The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006)[11], the Kipower (Pty) Ltd Environmental Impact Assessment, 2016[16].

13.1.5.1 Initial Assessment

The vegetation cover of the site prior to development of the historical brickworks is unknown, however it is assumed that the site was either a natural untransformed area or cultivated land. Thus, when the historical brickworks was development the vegetation was removed. The site is currently covered with concrete floors and brick paving. Scattered alien invasive plant species have established in areas.

The initial impact to vegetation is **probably** of a MODERATE significance, permanent in nature, and affecting the *local area*. This impact *has already occurred,* resulting in a **HIGH** negative impact.

13.1.5.2 Additional Assessment

The location of the proposed Phosphoric Acid Plant is within the existing impacted brickworks footprint, scattered with alien invasive plant species. Activities such as the removal of embankment fill and subsoil, soil compaction and establishment of the hard park and site office during the construction phase, as well as the construction of the proposed Phosphoric Acid Plant will affect flora.

The additional negative impact to vegetation will **probably** be of a LOW negative significance. The impact will be felt over *the local area* in the short-term. This impact is *going to happen*, resulting in a **MODERATE** negative impact.

13.1.5.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Site establishment
    - Restrict all activities, materials, equipment and persons within the area/s specified.
    - Erect site notices at the construction site informing persons of restricted access, the nature and timeframes of the construction activities, and appropriate contact details.
    - Erect and maintain permanent and/or temporary barricading prior to starting construction.
    - Maintain all demarcation barriers for the duration of construction activities.
- Topsoil stripping and stockpiling
    - Once an area has been cleared of vegetation, the soil will be levelled and prepared for construction related activities.
    - Soil removed from site is used for a suitable purpose or disposed of at a landfill site.
    - Cleared vegetation is disposed of at a landfill site.
- Access routes/haul roads
    - Access to the construction site is via existing roads.
- Protection of flora and fauna
    - No vegetation is cleared without the prior permission of the Engineer.
    - Gathering of firewood, fruit, muthi plants, crops, or any other natural material in areas adjacent to the site is prohibited.
    - No poaching of fauna is allowed and the disturbance of animals and their habitat is minimised wherever possible.
- Waste management
    - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
    - Burning of waste does not occur.
    - All builders refuse is deposited at an appropriate waste disposal facility.
    - Waste collected from site is undertaken by a licensed Contractor and removed to an appropriate waste disposal facility.
    - Reports of the quantity and proof of responsible disposal of waste are kept.
    - Waste disposal is done according to Hi-Fos Waste Management procedure.
- Emergency and response procedure: Fire
    - Precautions are taken (e.g. suitable fire extinguisher, welding curtains) when working with welding or grinding equipment near potential sources of ignition or combustible material.
    - All fire fighting equipment is routinely inspected by a qualified investigator for efficacy thereof.
    - Fire fighting equipment is present and accessible at all times.
- Post construction activities
    - All structures comprising the site establishment are removed from the site and surrounding areas.
    - All residual stockpiles are removed.
    - All leftover building materials are removed from the site.

- The areas are checked for spills of substances such as oil, paint, diesel, etc. and these are cleaned up.
- All rubble is removed from the site to an approved licensed landfill site.
- Fences, barriers and demarcations associated with the construction phase are removed from the site.
- The site is and surrounding areas are cleared of all waste.

13.1.5.4 Residual Assessment

With the successful implementation of mitigation measures, the additional impact to flora will **probably** be of a short-term nature, of a VERY LOW negative significance and acting on *the site*. This impact *could happen*, resulting in a **LOW** negative impact.

13.1.5.5 Cumulative Assessment

There will be no substantive increase to the flora when compared to the existing level of impact on the site therefore; the cumulative impact will be the same as the initial impact described above.

13.1.6 Fauna

Information was taken from the Mpumalanga Biodiversity Conservation Plan Handbook (Ferrar and Lotter, 2007)[18], Lekwa Municipality IDP for Financial Year 2013/2014 (Final IDP 2013/2014)[13].

13.1.6.1 Initial Assessment

As a consequence of historical brickworks activities, farming operations, farm housing and community dwellings limited fauna and avian species are found on site. In the area surrounding the site faunal and avian species that have been observed include rabbit, rodent, black-backed jackal, grey duiker, porcupine, hedgehog, mongoose, bush pigs, birds of prey and flamingo.

The initial impact on fauna is **probably** of a MODERATE negative significance, affecting the *local area* in extent, and acting in the long-term. The impact *has already occurred*, resulting in a **HIGH** negative impact.

13.1.6.2 Additional Assessment

The location of the proposed Phosphoric Acid Plant is within the existing historical brickworks footprint and the area does not offer suitable habitation for fauna and avian species. During the construction phase, fauna and avian species traversing the site will relocate.

The additional negative impact to fauna will thus **probably** be of a MODERATE negative significance. The impact will be felt over *the study area* acting in the short-term. This impact *is going to happen*, resulting in a **MODERATE** negative impact.

13.1.6.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Site establishment
  - Restrict all activities, materials, equipment and persons within the area/s specified.
  - Erect site notices at the construction site informing persons of restricted access, the nature and timeframes of the construction activities, and appropriate contact details.
  - Erect and maintain permanent and/or temporary barricading prior to starting construction.
  - Maintain all demarcation barriers for the duration of construction activities.
- Access routes/haul roads
  - Access to the construction site is via existing roads.
- Protection of flora and fauna
  - No vegetation is cleared without the prior permission of the Engineer.
  - Gathering of firewood, fruit, muthi plants, crops, or any other natural material in areas adjacent to the site is prohibited.
  - No poaching of fauna is allowed and the disturbance of animals and their habitat is minimised wherever possible.
- Waste management
  - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
  - Burning of waste does not occur.
  - All builders refuse is deposited at an appropriate waste disposal facility.
  - Waste collected from site is undertaken by a licensed Contractor and removed to an appropriate waste disposal facility.
- Post construction activities
  - All structures comprising the site establishment are removed from the site and surrounding areas.
  - All residual stockpiles are removed.
  - All leftover building materials are removed from the site.
  - The areas are checked for spills of substances such as oil, paint, diesel, etc. and these are cleaned up.
  - All rubble is removed from the site to an approved licensed landfill site.
  - Fences, barriers and demarcations associated with the construction phase are removed from the site.
  - The site is and surrounding areas are cleared of all waste.

13.1.6.4 Residual Assessment

With the successful implementation of mitigation measures, the additional impact to fauna and avian species will **probably** be of a short-term nature, of a LOW negative significance and acting on *the site*. This impact *could happen*, resulting in a **LOW** negative impact.

13.1.6.5 Cumulative Assessment

It is anticipated that the cumulative impact to fauna and avian species will be the same as the initial impact.

13.1.7 Surface Water

Information was taken from the dataset from the DWS, Lekwa Municipality IDP for Financial Year 2013/2014 (Final IDP 2013/2014)[13], Development of an integrated Water Quality Management Plan for the Vaal River System (2009)[19], Classification of significant water resources in three Vaal Water Management Areas (Newsletter No. 1 2011)[20], Revisiting Rietspruit: Land Cover Change and Water Quality in South Africa (2000)[21].

13.1.7.1 Initial Assessment

The site prior to development of the historical brickworks is unknown, however it is assumed that the site was either a natural untransformed area or cultivated land. There are several water features located in the vicinity of the site; a farm dam, a disused quarry containing water and natural drainage paths.

Located 2km south of the site is the Rietspruit, which is a sub-catchment of the Vaal River. The closest large water body to the site is the Grootdraai Dam, situated upstream of Standerton, 36km south-east of the site. The site lies within C12B quaternary drainage region within the Upper Vaal WMA.

The site has experienced extensive disturbance as a result of historical brickworks activities, farming operations, farm housing and community dwellings. These disturbances have resulted in a transformed landscape and have impacted on surface water.

The initial impact to surface water is **probably** of a MODERATE significance, permanent in nature, and affecting the *local area*. This impact *has already occurred,* resulting in a **HIGH** negative impact.

13.1.7.2 Additional Assessment

Activities such as topsoil stripping, removal of subsoil, soil compaction and establishment of the hard park and site office during site preparation and construction phases, as well as the construction of facilities associated with the proposed Phosphoric Acid Plant will impact negatively on surface water.

These activities expose the soil to the agents of erosion such as wind and water. Areas compacted will lose their soil structure and fertility permanently. The creation of hard surfaces increases the surface storm water flow and impacts negatively on downstream water bodies. In addition spillage of hydrocarbons and or chemicals used during the construction phase could impact on surface water.

The additional impact to surface water will **probably** be of a MODERATE negative significance, affecting the *local area*, and acting in the short-term. This impact *is going to happen,* resulting in a **MODERATE** negative impact.

13.1.7.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Site establishment
  - Restrict all activities, materials, equipment and persons within the area/s specified.
  - Erect site notices at the construction site informing persons of restricted access, the nature and timeframes of the construction activities, and appropriate contact details.
  - Erect and maintain permanent and/or temporary barricading prior to starting construction.
  - Maintain all demarcation barriers for the duration of construction activities.
- Topsoil stripping and stockpiling
  - Once an area has been cleared of vegetation, the soil will be levelled and prepared for construction related activities.
  - Soil removed from site is used for a suitable purpose or disposed of at a landfill site.
  - Cleared vegetation is disposed of at a landfill site.
- Subsoil strata stripping and backfilling
  - Excavate material on site in accordance with the relevant SANS codes.
  - Ensure excavation of materials is avoided under high wind conditions or when a visible dust plume is present.
  - Ensure dust suppression is carried out to prevent excessive fugitive dust.
  - Perform checks on the quality and compaction of backfill to foundations.
  - Ensure uncontaminated imported material is used as fill material.
- Exposed surfaces
  - All embankments are protected by berms and channels to prevent rainwater from cascading down the face of the embankment and causing erosion.
  - Vegetation commences after the completion to reduce the risk of soil erosion.
- Stockpile management
  - Stockpiles are not situated such that they obstruct water pathways i.e. they shouldn't extend outside the designated areas or impact on adjacent storm water systems.
  - Stockpiles do not exceed 2m in height.
  - Stockpiles exposed to windy conditions or heavy rain, are covered by sheeting or chemical coatings, depending on the duration of the project. Stockpiles may be further protected by the construction of berms or low brick walls around their bases.
- Storm water management
  - Material is properly stockpiled so as not to obstruct natural water pathways over the site.
  - During construction, unchannelled flow is controlled to avoid soil erosion.

- The periodic checking of the site's drainage system to ensure that the water flow is unobstructed.

- Access routes/haul roads
  - Access to the construction site is via existing roads.
  - Existing access roads impacted on by spillages from construction activities are cleared of such material at the earliest opportunity.
  - Damage to the existing access roads as a result of construction activities is repaired.
  - Vehicle speeds do not exceed the designated speed limits or a safe speed limit.
- Materials handling, use and storage: Hazardous substances and materials
  - Hazardous substances/materials are stored in designated and appropriately designed and constructed areas within a secured area on site.
  - Hazardous substances/materials are stored in tanks or drums located within impermeable facilities where required.
  - Storage areas containing hazardous substances/materials are demarcated with appropriate signage.
  - The integrity of the hazardous substances/materials storage vessels must be checked on a monthly basis.
  - Storage facilities are well-ventilated.
  - Material Safety Data Sheets (MSDS's) are readily available on site for all chemicals and hazardous substances/materials used on site.
  - Where possible and available, MSDS's additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
  - Persons are made aware of the health risks associated with any hazardous substances/materials used, and are provided with appropriate protective clothing/equipment.
- Paints
  - Paint containers and products are disposed of in the hazardous waste bins provided.
- Fuel (petrol and diesel) and hydrocarbons
  - Refuelling is confined to designated areas and the area is underlain by an impermeable surface.
  - Emergency repairs done on machinery using hydrocarbons have a drip tray placed strategically to avoid incidental spillage.
  - Drip trays are emptied daily into appropriate disposal containers and serviced when necessary. In particular, drip trays are closely monitored during rain events to ensure that they do not overflow.
- Waste management
  - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
  - Burning of waste does not occur.
  - Littering on the site is forbidden and the construction site is cleared of all litter at the end of each working day.

- General waste drums are not overfilled and emptied regularly into mass waste containers.
- Waste is placed in designated mass waste containers located within demarcated areas designed to prevent waste from being blown out by wind.
- All builders refuse is deposited at an appropriate waste disposal facility.
- Waste collected from site is undertaken by a licensed Contractor and removed to an appropriate waste disposal facility.
- Reports of the quantity and proof of responsible disposal of waste are kept.
- Waste disposal is done according to Hi-Fos Waste Management procedure.

- Emergency and response procedure : Accidental leaks and spillages
  - The accidental or negligent spillage of any fuels or potentially hazardous substances is cleaned up immediately using the appropriate methodologies, equipment and materials.
  - The necessary materials, equipment and chemicals are available on the site to deal with spills of any of the hazardous substances/materials present.
  - Relevant persons on site are trained to carry out a spill contingency plan should such an event occur.
  - Any contaminated soil or water is removed and stored in an appropriate container until it can be disposed of at a licensed landfill site, and proof thereof retained.
- Post construction activities
  - All structures comprising the site establishment are removed from the site and surrounding areas.
  - All residual stockpiles are removed.
  - All leftover building materials are removed from the site.
  - The areas are checked for spills of substances such as oil, paint, diesel, etc. and these are cleaned up.
  - All rubble is removed from the site to an approved licensed landfill site.
  - Fences, barriers and demarcations associated with the construction phase are removed from the site.
  - The site is and surrounding areas are cleared of all waste.

13.1.7.4 Residual Assessment

With the implementation of successful mitigation measures, residual impacts to surface water will **probably** be of a LOW negative significance, affecting the *study area*, and acting in the short-term. This impact *could happen,* resulting in a **LOW** negative impact.

13.1.7.5 Cumulative Assessment

The cumulative impact to surface water will remain the same as the initial assessment.

13.1.8 Groundwater

Information was taken from the Mpumalanga Groundwater Master Plan (DWAF, 2008)[22], the Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys 2013[9].

13.1.8.1 Initial Assessment

The site prior to development of the historical brickworks is unknown, however it is assumed that the site was either a natural untransformed area or cultivated land. Several sources of existing impacts to groundwater were identified; these include the historical brickworks, disused clay quarry, historical ash dumps, farm dam and farm/community housing. However, the characteristic shale layers in the Karoo lithology restrict the downward filtration of rainwater into the deeper formations.

Groundwater on site is abstracted from boreholes, which provides water to the farm housing and community dwellings. Anecdotal evidence indicates that the water quality is fair.

It is therefore **probable** that the extent of groundwater impacts are in the LOW significance range, affecting the *local area*, and acting in the long-term. This impact *has already occurred*, resulting in a **MODERATE** negative impact.

13.1.8.2 Additional Assessment

Activities such as topsoil stripping, removal of subsoil, soil compaction and establishment of the hard park and site office during site preparation and construction phases, as well as the construction of facilities associated with the proposed Phosphoric Acid Plant may impact negatively on groundwater. In addition, spillage of hydrocarbons and or chemicals used during the construction phase could impact on groundwater. However, the characteristic shale layers in the Karoo lithology restrict the downward filtration of rainwater into the deeper formations.

It is therefore **probable** that additional impact to groundwater will be in the LOW significance range, affecting the *local area*, and acting in the short-term. This impact *could happen*, resulting in a **LOW** negative impact.

13.1.8.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Site establishment
    - Restrict all activities, materials, equipment and persons within the area/s specified.
    - Erect site notices at the construction site informing persons of restricted access, the nature and timeframes of the construction activities, and appropriate contact details.
    - Erect and maintain permanent and/or temporary barricading prior to starting construction.
    - Maintain all demarcation barriers for the duration of construction activities.

- Topsoil stripping and stockpiling
    - Once an area has been cleared of vegetation, the soil will be levelled and prepared for construction related activities.
    - Soil removed from site is used for a suitable purpose or disposed of at a landfill site.
    - Cleared vegetation is disposed of at a landfill site.
- Subsoil strata stripping and backfilling
    - Excavate material on site in accordance with the relevant SANS codes.
    - Ensure excavation of materials is avoided under high wind conditions or when a visible dust plume is present.
    - Ensure dust suppression is carried out to prevent excessive fugitive dust.
    - Perform checks on the quality and compaction of backfill to foundations.
    - Ensure uncontaminated imported material is used as fill material.
- Exposed surfaces
    - All embankments are protected by berms and channels to prevent rainwater from cascading down the face of the embankment and causing erosion.
    - Vegetation commences after the completion to reduce the risk of soil erosion.
- Stockpile management
    - Stockpiles are not situated such that they obstruct water pathways i.e. they shouldn't extend outside the designated areas or impact on adjacent storm water systems.
    - Stockpiles do not exceed 2m in height.
    - Stockpiles exposed to windy conditions or heavy rain, are covered by sheeting or chemical coatings, depending on the duration of the project. Stockpiles may be further protected by the construction of berms or low brick walls around their bases.
- Storm water management
    - Material is properly stockpiled so as not to obstruct natural water pathways over the site.
    - During construction, unchannelled flow is controlled to avoid soil erosion.
    - The periodic checking of the site's drainage system to ensure that the water flow is unobstructed.
- Access routes/haul roads
    - Access to the construction site is via existing roads.
    - Existing access roads impacted on by spillages from construction activities are cleared of such material at the earliest opportunity.
    - Damage to the existing access roads as a result of construction activities is repaired.
    - Vehicle speeds do not exceed the designated speed limits or a safe speed limit.
- Materials handling, use and storage: Hazardous substances and materials
    - Hazardous substances/materials are stored in designated and appropriately designed and constructed areas within a secured area on site.
    - Hazardous substances/materials are stored in tanks or drums located within impermeable facilities where required.
    - Storage areas containing hazardous substances/materials are demarcated with appropriate signage.

- The integrity of the hazardous substances/materials storage vessels must be checked on a monthly basis.
- Storage facilities are well-ventilated.
- Material Safety Data Sheets (MSDS's) are readily available on site for all chemicals and hazardous substances/materials used on site.
- Where possible and available, MSDS's additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
- Persons are made aware of the health risks associated with any hazardous substances/materials used, and are provided with appropriate protective clothing/equipment.

- Paints
  - Paint containers and products are disposed of in the hazardous waste bins provided.
- Fuel (petrol and diesel) and hydrocarbons
  - Refuelling is confined to designated areas and the area is underlain by an impermeable surface.
  - Emergency repairs done on machinery using hydrocarbons have a drip tray placed strategically to avoid incidental spillage.
  - Drip trays are emptied daily into appropriate disposal containers and serviced when necessary. In particular, drip trays are closely monitored during rain events to ensure that they do not overflow.
- Waste management
  - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
  - Burning of waste does not occur.
  - Littering on the site is forbidden and the construction site is cleared of all litter at the end of each working day.
  - General waste drums are not overfilled and emptied regularly into mass waste containers.
  - Waste is placed in designated mass waste containers located within demarcated areas designed to prevent waste from being blown out by wind.
  - All builders refuse is deposited at an appropriate waste disposal facility.
  - Waste collected from site is undertaken by a licensed Contractor and removed to an appropriate waste disposal facility.
  - Reports of the quantity and proof of responsible disposal of waste are kept.
  - Waste disposal is done according to Hi-Fos Waste Management procedure.
- Emergency and response procedure : Accidental leaks and spillages
  - The accidental or negligent spillage of any fuels or potentially hazardous substances is cleaned up immediately using the appropriate methodologies, equipment and materials.
  - The necessary materials, equipment and chemicals are available on the site to deal with spills of any of the hazardous substances/materials present.

- Relevant persons on site are trained to carry out a spill contingency plan should such an event occur.
- Any contaminated soil or water is removed and stored in an appropriate container until it can be disposed of at a licensed landfill site, and proof thereof retained.

- Post construction activities
  - All structures comprising the site establishment are removed from the site and surrounding areas.
  - All residual stockpiles are removed.
  - All leftover building materials are removed from the site.
  - The areas are checked for spills of substances such as oil, paint, diesel, etc. and these are cleaned up.
  - All rubble is removed from the site to an approved licensed landfill site.
  - Fences, barriers and demarcations associated with the construction phase are removed from the site.
  - The site is and surrounding areas are cleared of all waste.

13.1.8.4 Residual Assessment

With successful mitigation, the impacts to groundwater from the construction phase will **probably** be of VERY LOW significance, affecting the *site*, and acting in the short-term. It is *unlikely* that this impact will occur, resulting in a **VERY LOW** negative impact.

13.1.8.5 Cumulative Assessment

The additional impacts to the groundwater are not considered to be substantive enough to affect the status quo.

13.1.9 Air Quality

Information was taken from The Air Quality Impact Report Setlabotsha Project (EIA, 2016)[8], Mpumalanga DALA Air Quality Monitoring Network, 2010[23], the Highveld Priority Area Air Quality Management Plan Executive Summary, 2010[24], the Final Scoping Report for the proposed construction and operation of two furnaces and associated infrastructure at Transalloys 2013[9].

13.1.9.1 Initial Assessment

The site is located within the HPA, which was declared as a priority airshed area on 23 November 2007. This area was demarcated as a priority area due to the poor air quality and elevated concentrations of criteria pollutants from industrial and non-industrial sources of air pollution.

The site has experienced extensive disturbance as a result of historical brickworks activities, farming operations, farm housing and community dwellings. The historical brickworks is inactive and thus no impact to air quality occurs from such. The current impact to air quality from farming

operations is associated with dust from ploughing of fields; planting and harvesting of crops, application of fertiliser and movement of vehicles. Farm housing and community dwellings typical impact to air quality is associated with the burning of fossil fuels.

The initial impact to the airshed is **probably** of a LOW negative significance, acting in the long-term, influencing the *local area.* This impact *has already occurred*, resulting in a **LOW** negative impact.

13.1.9.2 Additional Assessment

Fugitive dust emissions during construction can be expected from land-clearing, bulk earthworks, transport activities, material handling and areas exposed to wind. Wind will carry this dust and fine particles into adjacent areas.

It was assumed that at any given point in time during the construction phase, 25% of the approximately project footprint area would be under construction. It was further assumed that construction activities would last at least one full year but that work will be limited to day-time hours (8 hours per day) and weekdays. Fugitive dust emissions were assumed to be uncontrolled and the PM_{10} an $PM_{2.5}$ fractions at 12% and 2% of the TSP fraction respectively.

Uncontrolled fugitive TSP, PM_{10} and $PM_{2.5}$ emissions from the construction phase were estimated at 58.4, 7.10 and 0.99tparespectively.

The additional impact to air quality is **definitely** of MODERATE negative significance, acting in the short-term, influencing the *local area.* This impact *is going to happen,* resulting in a **MODERATE** negative impact.

13.1.9.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Site establishment
  - Restrict all activities, materials, equipment and persons within the area/s specified.
  - Erect site notices at the construction site informing persons of restricted access, the nature and timeframes of the construction activities, and appropriate contact details.
  - Erect and maintain permanent and/or temporary barricading prior to starting construction.
  - Maintain all demarcation barriers for the duration of construction activities.
- Piling, subsoil strata stripping and backfilling
  - Ensure excavation of materials is avoided under high wind conditions or when a visible dust plume is present.
  - Ensure dust suppression is carried out to prevent excessive fugitive dust.
- Exposed surfaces
  - Vegetation commences after the completion to reduce the risk of soil erosion.
- Stockpile management

- Stockpiles do not exceed 2m in height.
- Stockpiles exposed to windy conditions or heavy rain, are covered by sheeting or chemical coatings, depending on the duration of the project. Stockpiles may be further protected by the construction of berms or low brick walls around their bases.

- Access routes/haul roads
  - Access to the construction site is via existing roads.
  - Existing access roads impacted on by spillages from construction activities are cleared of such material at the earliest opportunity.
  - Vehicle speeds do not exceed the designated speed limits or a safe speed limit.
- Waste management
  - Burning of waste does not occur.
- Emergency and response procedure: Fire
  - Precautions are taken (e.g. suitable fire extinguisher, welding curtains) when working with welding or grinding equipment near potential sources of ignition or combustible material.
  - All fire fighting equipment is routinely inspected by a qualified investigator for efficacy thereof.
  - Fire fighting equipment is present and accessible at all times.
- Post construction activities
  - All structures comprising the site establishment are removed from the site and surrounding areas.
  - All residual stockpiles are removed.
  - All leftover building materials are removed from the site.
  - The areas are checked for spills of substances such as oil, paint, diesel, etc. and these are cleaned up.
  - All rubble is removed from the site to an approved licensed landfill site.
  - Fences, barriers and demarcations associated with the construction phase are removed from the site.
  - The site is and surrounding areas are cleared of all waste.
- Dust/Air pollution
  - Vehicles and machinery are kept in good working order and meet manufacturer's specifications for safety, fuel consumption etc.
  - Should excessive emissions be observed, the equipment is to be repaired as soon as possible.
  - Access roads and other cleared surfaces are dampened whenever possible and especially in dry and windy conditions to avoid excessive dust.
  - Construct and install the pollution abatement equipment as detailed in the Technical Review (Knights, 2017)[3] as attached in Appendix 3.

13.1.9.4 Residual Assessment

With the implementation of mitigation measures, the residual impact on air quality will **definitely** be of MODERATE negative significance, acting in the short-term, influencing the *study area.* This impact *could happen,* resulting in a **LOW** negative impact.

13.1.9.5 Cumulative Assessment

If mitigation measures are successfully implemented, the additional impacts to the air quality are not considered to be substantive enough to affect the status quo.

13.1.10 Noise

13.1.10.1 Initial Assessment

The site has experienced extensive disturbance as a result of historical brickworks activities, farming operations, farm housing and community dwellings. During the day, the acoustic environment at all noise survey points were influenced by farming activities incl. mobile equipment and animals, road traffic, railway noise, birds and insects. At night, noise from the nearby railway siding at a silo complex, insects and frogs, contributed most notably to recorded noise levels. The notably large difference between sampled L_{A90} and L_{Aeq} is indicative of frequent noise incidents such as passing cars.

An analysis of frequency spectrum data, done in accordance with the procedure set out in SANS 10103 (2008), indicated tonality in noise levels at all sampling sites and both during the day and the night. Except for insects/frogs and the more distant rail related noise, no other sources of tonal noise could be identified.

For the purpose of this assessment, given the description of the baseline acoustic environment and survey results, it was decided that sampled on-site L_{Aeq} values would be more representative of prevailing baseline conditions and provide the specialist with a slightly more conservative estimate of the project's noise impact since on-site noise levels were lower that levels recorded near farmsteads and roads. Baseline noise levels applied in the impact assessment are 44.3dBA during the day, and 42.9dBA at night.

The initial impact to the acoustic environment is **probably** of a LOW negative significance, acting in the long-term, influencing the *local area.* This impact *has already occurred,* resulting in a **MODERATE** negative impact.

13.1.10.2 Additional Assessment

During the construction phase noise will be generated by construction, heavy vehicles, excavation activities, hammering, welding, earth moving, as well as the transportation of machinery, equipment, and materials.

The additional impact to noise is **probably** of MODERATE negative significance, acting in the short-term, influencing the *local area.* This impact *will happen,* resulting in a **MODERATE** negative impact.

13.1.10.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Noise Management
  - All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.
  - Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels.
  - In managing noise specifically related to truck and vehicle traffic, efforts should be directed at:
    - Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
    - Maintain road surface regularly to avoid corrugations, potholes etc.
    - Avoid unnecessary idling times.
    - Minimising the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009).
    - Limiting traffic to hours between 06:00 and 18:00.
  - Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.

13.1.10.4 Residual Assessment

With the implementation of mitigation measures, the negative residual impact on environmental noise will **probably** be of a LOW negative significance, affecting the *study area* and acting in the short-term. This impact *could happen,* resulting in a **LOW** negative impact.

13.1.10.5 Cumulative Assessment

It is anticipated that the cumulative impact from noise will be the same as for the initial impact.

13.1.11 Visual

13.1.11.1 Initial Assessment

The historical brickworks has impacted visually on the character of the site. Structures associated with the brickwork can be visually seen some distance from the site.

The existing negative visual impact is **probably** of LOW significance, affecting the *local area* and acting in the long-term. This impact *has already occurred*, resulting in a **MODERATE** negative impact.

13.1.11.2 Additional Assessment

During the construction phase visual impacts will be sustained by vehicle traffic to-and-from the site, the generation of dust, and the erection of structures on site.

Construction activities will affect the visual quality of the area. The negative visual impact without mitigation measures will **probably** be LOW, acting in the short-term, and affecting the *local area*. The impact *is going to happen*, resulting in a **LOW** negative impact.

13.1.11.3 Mitigation

The following mitigation measures are to limit impacts associated with:

- Light pollution
    - Lighting on site is set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance.
    - Lighting installed on site does not interfere with road traffic or lead to unacceptable light pollution to the surrounding community.
- Visual intrusion
    - Storage facilities, elevated tanks and other temporary structures are located such that they have as little visual impact on the community as possible.
    - Special attention is given to the screening of highly reflective materials on site.

13.1.11.4 Residual Assessment

With mitigation measures successfully implemented, the construction of the proposed Phosphoric Acid Plant will **probably** have a LOW negative impact on the receiving environment, affecting the *study area,* acting in the short-term. The negative impact is *very likely,* resulting in a **LOW** negative impact.

13.1.11.5 Cumulative Assessment

If mitigation measures are successfully implemented, the additional impacts to the visual quality are not considered to be substantive enough to affect the status quo.

13.1.12 Cultural Heritage

13.1.12.1 Initial Assessment

The site has experienced extensive disturbance as a result of historical brickworks activities, farming operations, farm housing and community dwellings. The consultant does not know if any archaeological or cultural historical sites have been impacted to date.

13.1.12.2 Additional Assessment

The results of the AIA demonstrate that there are and no archaeological features or artefacts recorded within the study area, thus no mitigation prior to construction is recommended. In terms of the built environment of the area no standing structures older than 60 years occur within the study area. No burial sites were recorded in the study area. The study area is surrounded by commercial agricultural developments and no significant cultural landscapes or viewscapes were noted during the fieldwork.

13.1.12.3 Mitigation Measures

In the unlikely event that during construction any possible finds such as stone tool scatters, possible graves or fossil remains are made, the construction operations must stop and a qualified archaeologist contacted for an assessment of the find.

It is recommended that chance find procedure be put in place during the construction period as described below.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures. Personnel must be inducted to ensure they are fully aware of the procedures regarding a chance find as discussed below.

- If during the construction, operations or decommissioning phases of the proposed Phosphoric Acid Plant, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site manager will inform the Environmental Control Officer (ECO) of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the find and required reporting of such.

13.1.12.4 Cumulative Assessment

There is no cumulative impact to archaeological or cultural historical sites.

13.1.13 Socio-Economic

Information was taken from the Statistics South Africa: Local Municipality[26].

13.1.13.1 Initial Assessment

The unemployment levels in the regional area (Lekwa Municipality) are high, with the rate being 25.9% in 2011. Currently, employment opportunities, on site, are provided by farming operations.

The initial impact to the socio-economic environment is **probably** of a LOW positive significance acting in the long-term and affecting the *local area*. This impact *has already occurred*, resulting in a **MODERATE** positive impact.

13.1.13.2 Additional Assessment

Despite the already positive impact farming operations had on the community the levels of employment are still low. At the peak of the construction phase Hi-Fos will provide temporary employment opportunities. The majority of these positions will be for semi-skilled labourers. It is estimated that at least 50% of the employment that will be generated over the life of the project will come into effect during the construction phase. Although the majority of these positions will be sourced regionally from within Mpumalanga, allowing for easy offsite accommodation, many workers will be imported to the area to provide the necessary skills and expertise. Accommodation of workers from outside the area will not be permitted on site. Off site, accommodation and transportation of these workers will contribute to the local economy.

The concentration of workers at the site and accommodation areas will create a nucleus, around which conflict may occur. In addition workers sourced from outside the area are often times viewed with suspicion by local inhabitants as a crime and security threat.

It is the consultants assessment that negative impacts can be managed effectively and that the overall impact to the socio-economic environment will be positive. The construction of the proposed Phosphoric Acid Plant will therefore **probably** be a MODERATE positive impact, affecting the *regional* extent, and acting in the short-term. This impact *is going to happen*, resulting in a **MODERATE** positive impact.

13.1.13.3 Cumulative Assessment

During the construction phase, the cumulative positive impact will **probably** be of a MODERATE positive significance, acting in the short-term, and affecting the *regional* extent. The impact *is going to happen*, resulting in a **MODERATE** positive impact.

13.2 Operational Phase

13.2.1 Geology

13.2.1.1 Additional Assessment

There will be no additional impacts sustained to geology during the operational phase of the proposed Phosphoric Acid Plant.

13.2.1.2 Cumulative Assessment

The cumulative impact to geology is the same as the construction phase that being a **MODERATE** negative impact.

13.2.2 Topography

13.2.2.1 Additional Assessment

There will be no additional impacts sustained to topography during the operational phase of the proposed Phosphoric Acid Plant.

13.2.2.2 Cumulative Assessment

The cumulative impact to geology is the same as the construction phase that being a **HIGH** negative impact.

13.2.3 Soil and Land Capability

13.2.3.1 Additional Assessment

The proposed Phosphoric Acid Plant will be constructed mainly from polypropylene which is resistant to the process materials. Most of the vessels, equipment and pipework will constructed of polypropylene. It is a strong plastic and resistant to all the chemicals involved in the process. Exceptions to this are stainless steel 304, which will be used for the CNX section and the MAP 33 spray drier.

During the operational phase, spillage of chemicals and hydrocarbons associated with the proposed Phosphoric Acid Plant will be collected via bund walls and sumps.

The additional impact to soil and land capability will probably be of a MODERATE negative significance on the *local area* and permanent in nature. This impact is *unlikely* to happen, resulting in a **LOW** negative impact.

13.2.3.2 Mitigation

The following mitigation measures are to limit impacts associated with:

- Planned maintenance
  - Once final design is completed request the Contractor that supplied the proposed Phosphoric Acid Plant, to provide maintenance specifications and a schedule of recommended critical spares.
  - Implement and maintain a computerised maintenance management system.
  - Procure critical spares accordingly or enter into service contracts where required.
- Unplanned maintenance
  - Undertake a root cause analysis for major unplanned maintenance events and implement mitigation measures to prevent the reoccurrence of such events.
  - Analyse minor unplanned maintenance events and act accordingly.
  - Maintain a computerised maintenance management system.
- Hazardous substances and materials
  - Hazardous substances/materials are stored in designated and appropriately designed and constructed areas within a secured area on site.
  - Hazardous substances/materials are stored in tanks or drums located within impermeable facilities where required. The volume of the impermeable storage facility must be according to legal requirements.
  - Storage areas containing hazardous substances/materials are demarcated with appropriate signage.
  - The integrity of the hazardous substances/materials storage vessels must be checked.
  - Storage facilities are well-ventilated.
  - MSDS's are readily available on site for all chemicals and hazardous substances/materials used on site.
  - Where possible and available, MSDS's additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
  - Persons are made aware of the health risks associated with any hazardous substances/materials used, and are provided with appropriate PPE.
- Waste management : General waste
  - General waste disposal is done according to Hi-Fos Waste Management procedure.
  - General waste sorting is undertaken at source.
  - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
  - Burning of waste does not occur on site.
  - Littering is forbidden and the area is cleared of all litter at the end of each working day.
  - Domestic waste drums are not overfilled and emptied regularly into mass waste containers.

- General waste is placed in designated mass waste containers located within demarcated areas and designed to prevent waste from being blown out by wind.
- Handling, transportation and disposal of general waste complies with the legal requirements.
- The appropriate PPE is provided and utilised.
- Mass waste containers are covered at all times during transport.
- Waste collected is undertaken by a licensed contractor and removed to an appropriate waste disposal facility.
- The quantity and proof of responsible disposal of waste are kept.

- Waste management : Hazardous waste
  - Waste disposal is done according to Hi-Fos Waste Management procedure.
  - Hazardous waste sorting is undertaken at source, where practical.
  - No burying/dumping of hazardous waste occurs on site.
  - Burning of hazardous does not occur on site.
  - Hazardous waste is placed in designated mass waste containers located within demarcated areas and designed to prevent waste from being blown out by wind.
  - Handling, transportation and disposal of hazardous waste complies with the legal requirements.
  - The appropriate PPE is provided and utilised.
  - Mass waste containers are covered at all times during transport.
  - Hazardous waste collected is undertaken by a licensed contractor and removed to an appropriate waste disposal facility.
  - The quantity and proof of responsible disposal of waste are kept.
- Storm water management
  - Storm water falling on the proposed Phosphoric Acid Plant site is collected via bund walls and sumps. The collected water will be used in the Plant.

13.2.3.3 Residual Assessment

With successful mitigation the impacts to soil and land capability as a result of operational activities will **probably** be of LOW significance, affecting the *local area*, and *permanent* in nature. The impact is *unlikely* to happen, resulting in a **LOW** negative impact.

13.2.3.4 Cumulative Assessment

The cumulative impact to soil and land capability is the same as the construction phase that being a **HIGH** negative impact.

13.2.4 Land Use

13.2.4.1 Additional Assessment

There will be no additional impacts sustained to land use during the operational phase of the proposed Phosphoric Acid Plant.

13.2.4.2 Cumulative Assessment

The overall net cumulative impact to land use will be the same as the construction phase that being a **HIGH** negative impact.

13.2.5 Flora

13.2.5.1 Additional Assessment

There will be no additional impacts sustained to flora during the operational phase of the proposed Phosphoric Acid Plant.

13.2.5.2 Cumulative Assessment

The overall net cumulative impact to fauna will be the same as the construction phase that being **HIGH** negative impact.

13.2.6 Fauna

13.2.6.1 Additional Assessment

There will be no additional impacts sustained to fauna during the operational phase of the proposed Phosphoric Acid Plant..

13.2.6.2 Cumulative Assessment

The overall net cumulative impact to fauna will be the same as the construction phase that being **HIGH** negative impact.

13.2.7 Surface Water

13.2.7.1 Additional Assessment

The proposed Phosphoric Acid Plant will be constructed mainly from polypropylene which is resistant to the process materials. Most of the vessels, equipment and pipework will constructed

of polypropylene. It is a strong plastic and resistant to all the chemicals involved in the process. Exceptions to this are stainless steel 304, which will be used for the CNX section and the MAP 33 spray drier.

During the operational phase, spillage of chemicals and hydrocarbons associated with the proposed Phosphoric Acid Plant will be collected via bund walls and sumps. In addition, storm water falling on the proposed Phosphoric Acid Plant site is collected via bund walls and sumps. The collected water will be used in the Plant.

The additional impact to surface water will probably be of a MODERATE negative significance on the *local area* and permanent in nature. This impact is *unlikely* to happen, resulting in a **LOW** negative impact.

13.2.7.2 Mitigation

The following mitigation measures are to limit impacts associated with:

- Planned maintenance
  - Once final design is completed request the Contractor that supplied the proposed Phosphoric Acid Plant, to provide maintenance specifications and a schedule of recommended critical spares.
  - Implement and maintain a computerised maintenance management system.
  - Procure critical spares accordingly or enter into service contracts where required.
- Unplanned maintenance
  - Undertake a root cause analysis for major unplanned maintenance events and implement mitigation measures to prevent the reoccurrence of such events.
  - Analyse minor unplanned maintenance events and act accordingly.
  - Maintain a computerised maintenance management system.
- Hazardous substances and materials
  - Hazardous substances/materials are stored in designated and appropriately designed and constructed areas within a secured area on site.
  - Hazardous substances/materials are stored in tanks or drums located within impermeable facilities where required. The volume of the impermeable storage facility must be according to legal requirements.
  - Storage areas containing hazardous substances/materials are demarcated with appropriate signage.
  - The integrity of the hazardous substances/materials storage vessels must be checked.
  - Storage facilities are well-ventilated.
  - MSDS's are readily available on site for all chemicals and hazardous substances/materials used on site.
  - Where possible and available, MSDS's additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.

- Persons are made aware of the health risks associated with any hazardous substances/materials used, and are provided with appropriate PPE.

- Waste management : General waste
  - General waste disposal is done according to Hi-Fos Waste Management procedure.
  - General waste sorting is undertaken at source.
  - No burying/dumping of waste materials, vegetation, litter, builders' rubble or refuse occurs on site.
  - Burning of waste does not occur on site.
  - Littering is forbidden and the area is cleared of all litter at the end of each working day.
  - Domestic waste drums are not overfilled and emptied regularly into mass waste containers.
  - General waste is placed in designated mass waste containers located within demarcated areas and designed to prevent waste from being blown out by wind.
  - Handling, transportation and disposal of general waste complies with the legal requirements.
  - The appropriate PPE is provided and utilised.
  - Mass waste containers are covered at all times during transport.
  - Waste collected is undertaken by a licensed contractor and removed to an appropriate waste disposal facility.
  - The quantity and proof of responsible disposal of waste are kept.
- Waste management : Hazardous waste
  - Waste disposal is done according to Hi-Fos Waste Management procedure.
  - Hazardous waste sorting is undertaken at source, where practical.
  - No burying/dumping of hazardous waste occurs on site.
  - Burning of hazardous does not occur on site.
  - Hazardous waste is placed in designated mass waste containers located within demarcated areas and designed to prevent waste from being blown out by wind.
  - Handling, transportation and disposal of hazardous waste complies with the legal requirements.
  - The appropriate PPE is provided and utilised.
  - Mass waste containers are covered at all times during transport.
  - Hazardous waste collected is undertaken by a licensed contractor and removed to an appropriate waste disposal facility.
  - The quantity and proof of responsible disposal of waste are kept.
- Storm water management
  - Storm water falling on the proposed Phosphoric Acid Plant site is collected via bund walls and sumps. The collected water will be used in the Plant.

13.2.7.3 Residual Assessment

With successful mitigation the impacts to surface water as a result of operational activities will **probably** be of LOW significance, affecting the *local area*, and *permanent* in nature. The impact is *unlikely* to happen, resulting in a **LOW** negative impact.

13.2.7.4 Cumulative Assessment

The overall net cumulative impact to surface water will be the same as the construction phase that being **HIGH** negative impact.

13.2.8 Groundwater

13.2.8.1 Additional Assessment

There will be no additional impacts sustained to groundwater during the operational phase of the proposed Phosphoric Acid Plant..

13.2.8.2 Cumulative Assessment

The overall net cumulative impact to groundwater will be the same as the construction phase that being M**ODERATE** negative impact.

13.2.9 Air Quality

13.2.9.1 Additional Assessment

It was found that ambient CO, HF, NH_3, NO_2, $PM_{2.5}$, SO_2, as well as TVOC concentrations for the operational phase are within assessment criteria at the most affected air quality sensitive receptors. Gaseous emissions from the plant were found to impact more notably at receptors 1 and 2, the community to the south and farmstead to the north.

Simulated PM_{10} concentrations may however exceed the 24-hour NAAQS at nearby receivers with the highest impact as receptor 8, a farmstead close to the access road and up to approximately 850m from this road. To address such impacts, efforts should be made to minimise vehicle entrained dust from the access road.

Both odour and dustfall nuisance are expected to be within impact criteria. The maximum dustfall rate at the community south of the project is expected to be 326 mg/m^2-day.

The additional impact to air will probably be of a MODERATE negative significance on the *study area* and medium-term in nature. This impact is *very likely* to happen, resulting in a **MODERATE** negative impact.

13.2.9.2 Mitigation

The following mitigation measures are to limit impacts associated with:

- Air Emissions Management
  - Implement the recommendations contained Technical Evaluation (Knights, T. 2017. Hi-Fos (Pty) Ltd, Phosphoric Acid Plant Standerton. Technical Review Final Draft. Johannesburg. Knights Environmental) and the Atmospheric Impact Report (Airshed Planning Professionals (Pty) Ltd, 2016. Atmospheric Impact Report for the Hi-Fos (Pty) Ltd Phosphoric Acid Plant Project, Standerton).
  - Adhere to the conditions in the AEL.
  - Undertake relevant monitoring of air quality as detailed in the Atmospheric Impact Report (Airshed Planning Professionals (Pty) Ltd, 2016. Atmospheric Impact Report for the Hi-Fos (Pty) Ltd Phosphoric Acid Plant Project, Standerton).
  - Ensure that environmental air quality monitoring equipment installed at the proposed Phosphoric Acid Plant is maintained, operational and records are taken.
  - As far as practicably possible prevent, inhibit or retard the pollution of air by:
    - implementing good environmental practice;
    - sufficient forward planning; and
    - taking into consideration best available technology not entailing excessive cost (BATNEEC) management principles.

13.2.9.3 Residual Assessment

With successful mitigation the impacts to air as a result of operational activities will **probably** be of MODERATE significance, affecting the *study area*, and medium-term in nature. The impact is very *likely* to happen, resulting in a **MODERATE** negative impact.

13.2.9.4 Cumulative Assessment

The overall net cumulative impact to air will be the same as the operational phase residual impact that being M**ODERATE** negative impact.

13.2.10 Noise

13.2.10.1 Additional Assessment

During the operational phase, the proposed Phosphoric Acid Plant will produce environmental noise during the day and night. Default L_W's of 60dBA/m^2 during the day and 45 dBA/m^2 during the night were applied to the ablutions. The default L_W of 60dBA/m^2 for light industrial areas during both the day- and night was applied to all storage and bunker areas. The default LW of 65dBA/m^2 for heavy industries was applied to the CNX Plant, MAP 33 and MAP 39 Plant, Phosphoric Acid Plant, compressor and cooling area, boiler, MAP, LAN, and the Granulation Blending Plant. These

factors were applied to take into account all materials handling, feeders, feed hoppers and conveyors, electrical motors, motor driven pumps and fans, pumping and compressed air noise and loading.

The additional impact to the environmental noise will *possibly* be of a MODERATE negative significance, affecting the *study area* over the medium term. This impact is *very likely,* resulting in a **MODERATE** negative impact.

13.2.10.2 Mitigation

For general activities, the following good engineering practice should be applied to all project phases:

- All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.
- Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels.
- In managing noise specifically related to truck and vehicle traffic, efforts should be directed at:
    - Minimizing individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
    - Maintain road surface regularly to avoid corrugations, potholes etc.
    - Avoid unnecessary idling times.
    - Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level near the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009).
    - Limiting traffic to hours between 06:00 and 18:00.
- Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
- A noise complaints register must be kept.

13.2.10.3 Residual Assessment

With successful mitigation measures, the impacts to environmental noise, as a result of operational activities, will **probably** be of LOW significance, affecting the *study area,* and acting in the medium-term. The impact is *very likely* to happen*,* resulting in a **MODERATE** negative impact.

13.2.10.4 Cumulative Assessment

The overall net cumulative impact will be the same as the operational phase residual impact that being M**ODERATE** negative impact.

13.2.11 Visual

13.2.11.1 Additional Assessment

There will be no additional impacts sustained during the operational phase of the proposed Phosphoric Acid Plant.

13.2.11.2 Cumulative Assessment

The overall net cumulative impact will be the same as the construction phase that being M**ODERATE** negative impact.

13.2.12 Socio-Economic

13.2.12.1 Additional Assessment

During the operational phase the creation of employment opportunities, the generation of additional GDP, the generation noise and nuisance dust and the decrease in air quality, will sustain socio-economic impacts.

The proposed Phosphoric Acid Plant will create employment opportunities. A conservative estimate is that 50% of employment at the proposed project will be obtained locally for the duration of the operational phase. Those living locally will also contribute substantially to the local economy as they will spend their wages in the areas where they live.

The additional impact of the proposed furnaces will **probably** be of a HIGH positive significance during the operational phase. The impacts will be felt *regionally*, and will act in the long-term. This impact is *going to happen*, resulting in a **HIGH** positive impact.

13.2.12.2 Cumulative Assessment

The cumulative impact to the socio-economic environment from the on-going operation of proposed Phosphoric Acid Plant will **probably** be of a HIGH positive significance affecting the *reginal* extent, and acting in the long-term. The impact *is going to happen*, resulting in a **HIGH** positive impact

13.3 DECOMMISSIONING PHASE

It is not possible to provide an accurate impact assessment for the closure and rehabilitation of the proposed Phosphoric Acid Plant and a risk based closure assessment will be undertaken approximately five (5) years prior to closure of the operation to identify the ideal scenario for closure planning. The following steps will be undertaken closer to the compilation of the final closure plan:

- Establishment of a multi-disciplinary closure team, which will manage all facets of this phase. This team will consist of a project manager as well as various technical and production expertise (including engineers and environmental specialists). Objectives for the team will be clearly defined in collaboration with the relevant authorities.
- Identification of equipment, structures, buildings and land that must be disposed of. Disposal by sale of moveable equipment will be arranged and at the same time tenders will be invited for the removal and disposal of fixed equipment and structures. Other assets e.g. buildings, land and structures will either be sold or held in trust until change of ownership has been negotiated and finalised. It will also be required of management to introduce action plans prior to closure to prepare employees and the community for this event.
- Once all equipment and structures have been removed, demolition and disposal of foundations, concrete works and roads will commence. Disposal sites for the rubble will have to be identified prior to this phase.
- After the demolition and cleaning phase, rehabilitation of the disturbed areas above will commence.

It is not possible to provide an accurate estimate of the duration for each phase, since overlap will occur. It is expected however, that the first year after cessation of operations will be spent on disposal of equipment (mobile and fixed) and structures. It is furthermore estimated that the demolition and rehabilitation phases will take another twenty four (24) months to completion before commencement of the decommissioning monitoring and audit phases.

The total period from cessation of operations to the commencement of monitoring and auditing is expected to be thirty six (36) months. The post decommissioning phase (aftercare) of monitoring (and remedial action) is expected to take another ten years before the situation can be declared stable.

13.4 IMPACT ASSESSMENT SUMMARY

The environmental impacts for each phase of the proposed Phosphoric Acid Plant have been summarised in Table 23.

Table 23 : Summary of the Impact Assessment

		Construction Phase				Operational Phase		
		Initial	Additional	Residual	Cumulative	Additional	Residual	Cumulative
GEOLOGY	Significance	Low						
	Spatial	Study Area						
	Temporal	Permanent						
	Probability	Has occurred						
	CLASS	**Moderate**	**No additional impact**	**No additional impact**	**Moderate**	**No additional impact**	**No additional impact**	**Moderate**
TOPOGRAPHY	Significance	Moderate	Low	Low				
	Spatial	Local Area	Local Area	The Site				
	Temporal	Long-term	Long-term	Long-term				
	Probability	Has occurred	Is going to happen	Is going to happen				
	CLASS	**High**	**Moderate**	**Moderate**	**High**	**No additional impact**	**No additional impact**	**High**
SOIL & LAND CAPABILITY	Significance	Moderate	Low	Low		Moderate	Low	
	Spatial	Local Area	Local Area	The Site		Local Area	Local Area	
	Temporal	Permanent	Long-term	Long-term		Permanent	Permanent	
	Probability	Has occurred	Is going to happen	Could happen		Unlikely	Unlikely	
	CLASS	**High**	**Moderate**	**Low**	**High**	**Low**	**Low**	**High**
LAND USE	Significance	Moderate						
	Spatial	Local Area						
	Temporal	Permanent						
	Probability	Has occurred						
	CLASS	**High**	**No additional impact**	**No additional impact**	**High**	**No additional impact**	**No additional impact**	**High**
VEGETATION	Significance	Moderate	Low	Very Low				
	Spatial	Local Area	Local Area	The Site				
	Temporal	Permanent	Short-term	Short-term				
	Probability	Has occurred	Is going to happen	Could happen				
	CLASS	**High**	**Moderate**	**Low**	**High**	**No additional impact**	**No additional impact**	**High**

		Construction Phase				Operational Phase		
		Initial	**Additional**	**Residual**	**Cumulative**	**Additional**	**Residual**	**Cumulative**
FAUNA	**Significance**	Moderate	Moderate	Low				
	Spatial	Local Area	Study Area	The Site				
	Temporal	Long-term	Short-term	Short-term				
	Probability	Has occurred	Is going to happen	Could happen				
	CLASS	**High**	**Moderate**	**Low**	**High**	**No additional impact**	**No additional impact**	**High**
SURFACE WATER	**Significance**	Moderate	Moderate	Low		Moderate	Low	
	Spatial	Local Area	Local Area	Study Area		Local Area	Local Area	
	Temporal	Permanent	Short-term	Short-term		Permanent	Permanent	
	Probability	Has occurred	Could happen	Could happen		Unlikely	Unlikely	
	CLASS	**High**	**Moderate**	**Low**	**High**	**Low**	**Low**	**High**
GROUNDWATER	**Significance**	Low	Low	Very Low				
	Spatial	Local Area	Local Area	The Site				
	Temporal	Long-term	Short-term	Short-term				
	Probability	Has occurred	Could happen	Unlikely				
	CLASS	**Moderate**	**Low**	**Very Low**	**Moderate**	**No additional impact**	**No additional impact**	**Moderate**
AIR QUALITY	**Significance**	Moderate	Moderate	Moderate		Moderate	Moderate	
	Spatial	Local Area	Local Area	Study Area		Study Area	Study Area	
	Temporal	Long-term	Short-term	Short-term		Medium-term	Medium-term	
	Probability	Has occurred	Is going to happen	Could happen		Very likely	Very likely	
	CLASS	**Low**	**Moderate**	**Low**	**Low**	**Moderate**	**Moderate**	**Moderate**
NOISE	**Significance**	Low	Moderate	Low		Moderate	Low	
	Spatial	Local Area	Local Area	Study Area		Study Area	Study Area	
	Temporal	Long-term	Short-term	Short-term		Medium-term	Medium-term	
	Probability	Has occurred	Is going to happen	Could happen		Very Likely	Very Likely	
	CLASS	**Moderate**	**Moderate**	**Low**	**Moderate**	**Moderate**	**Moderate**	**Moderate**

		Construction Phase				Operational Phase		
		Initial	**Additional**	**Residual**	**Cumulative**	**Additional**	**Residual**	**Cumulative**
VISUAL	**Significance**	Low	Low	Low				
	Spatial	Local Area	Local Area	Local				
	Temporal	Long-term	Short-term	Short-term				
	Probability	Has occurred	Is going to happen	Very Likely				
	CLASS	**Moderate**	**Low**	**Low**	**Moderate**	**No additional impact**	**No additional impact**	**Moderate**
CULTURAL HISTORICAL	**Significance**							
	Spatial							
	Temporal							
	Probability							
	CLASS	**Unknown**	**No Impact**	**No Impact**	**No Impact**	**No Impact**	**No Impact**	**No Impact**
SOCIO-ECONOMIC	**Significance**	Low	Moderate		Moderate	High		High
	Spatial	Local area	Regional		Regional	Regional		Regional
	Temporal	Long-term	Short-term		Short-term	Long-term		Long-term
	Probability	Has Occurred	Going to happen		Going to happen	Going to happen		Going to happen
	CLASS	**Moderate Positive**	**Moderate Positive**		**Moderate Positive**	**High Positive**		**High Positive**

14. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The Final EIAR was limited to the scope of the assessment described in detail in Section 5 of this report. The content of this Final EIAR was largely sourced from Technical Review (Knights, 2017)[3] and various specialist studies referenced in the text.

15. ENVIRONMENTAL MANAGEMENT PROGRAMME

In terms of the EIA Regulations, Hi-Fos will apply to the DARDLEA for an EA. Should authorisation be granted, the EA will form an Appendix to the EMPr contained in Appendix 18, as the EA may contain a number of conditions of authorisation, for the phases of the proposed Phosphoric Acid Plant.

According to South African legislation, the EMPr will need to be updated or amended with new information whenever significant changes are made during the life of the proposed Phosphoric Acid Plant.

16. CONCLUSION

The essence of any EIA process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that *"development must be socially, environmentally and economically sustainable…and requires the consideration of all relevant factors…."*. In addition, the preventative principle is required to be applied, i.e. that the disturbance of ecosystems and loss of biological diversity are to be *"… avoided, or … minimised and remedied"* and *"disturbance of the landscape and the nation's cultural heritage is avoided and where it cannot be altogether avoided is minimised and remedied"*.

Therefore, negative impacts on the environment and on people's environmental rights (in terms of the Constitution) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures". "Reasonable measures" implies that *"every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment"*.

In assessing the environmental feasibility of the proposed Phosphoric Acid Plant, as well as determining reasonable mitigation measures which are required to be implemented in order to minimise potential impacts associated with the project, the requirements of all relevant environmental legislation has been considered, including, *inter alia*, those of:

- National Environmental Management Act 107 of 1998.
- National Environmental Management: Air Quality Act 39 of 2004.
- National Environmental Management: Biodiversity Act 10 of 2004.

- National Environmental Management: Waste Act 59 of 2008.
- National Water Act 36 of 1998.
- National Heritage Resources Act 25 of 1999.
- National Road Traffic Act 93 of 1996.
- Water Services Act 108 of 1997.
- Hazardous Substances Act 15 of 1973.
- Explosives Act 26 of 1956.
- Occupational Health and Safety Act 85 of 1993.

The conclusions of this Final EIAR are the result of intensive and comprehensive studies and specialist assessments, which began in 2016. These studies were based on issues identified within the Scoping Phase, as well as the parallel process of public participation. The public participation process has made every effort to include representatives of all stakeholders in the study area.

Based on the specialist studies undertaken within this Final EIAR, both benefits and negative impacts are anticipated as a result of the proposed Phosphoric Acid Plant. The benefits (contacted in Section 5.4.3, Section 6 and Section 13) associated with the proposed Phosphoric Acid Plant predominantly pertain to the social environment and economic benefits. However, the direct negative impacts (contacted in Section 11 and Section 13) of the proposed Phosphoric Acid Plant are presented in this Final EIAR, although significant in identified sensitive areas, are considered to be acceptable from a holistic environmental perspective. Thus, if the DARDLEA consider the impacts to be of such an unacceptable level that the proposed Phosphoric Acid Plant should not be built, then the social and economic benefits anticipated to be derived from the project will be lost.

The recommendations arising from this Final EIAR focus predominantly on the role and implementation of the EMPr (contained in Appendix 18). The specialist studies identified areas and issues which are addressed by the EMPr for all phases of the project, and the application of the EMPr is considered to be key in achieving appropriate environmental management standards.

Should the proposed Phosphoric Acid Plant be approved by the DARDLEA, the finalisation of the design must take the requirements of the EMPr into consideration.

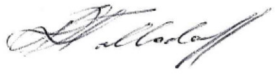
17. OPINION ON WHETHER THE ACTIVITY SHOULD BE AUTHORISED

Provided that all the environmental management measures described in the Final EIAR and EMPr are applied diligently, the proposed Phosphoric Acid Plant will have no environmental impacts that cannot be adequately mitigated to protect the environment, and authorisation of Hi-Fos application would be justified on the basis that the positive effects of the project are likely to outweigh the negative impacts.

18. UNDERTAKING OR AFFIRMATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

I, Paula Jane Tolksdorff, declare that:

- the information in provided in this report, to the best of my knowledge, in all respects are factually true and correct;
- all comments and inputs from stakeholders and I&APs have been included in the Final EIAR,
- all inputs and recommendations from the specialist reports have been included in the Final EIAR, and
- any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties have been included in the Final EIAR.



Signature

Date: 30 May 2017

Appendix 1 : List of Abbreviations

Abbreviation	Description
AD	anno Domini
AEL	Atmospheric Emissions Licence
AIA	Archaeological Impact Assessment
AIR	Air Impact Report
Airshed	Airshed Planning Professionals (Pty) Ltd
AQMP	Air Quality Management Plan
AQSR	Air quality sensitive receptors
ASAPA	Association for Southern African Professional Archaeologist
ASTM	American Society for Testing and Materials
BA	Basic Assessment
B-BBEE	Broad Based Black Economic Empowerment
BID	Background Information Document
BP	Before Present
The Constitution	The Constitution of the Republic of South Africa (No. 108 of 1996)
CCGT	Combined Cycle Gas Turbine
CSTR	Continuous Stirred Tank Reactors
CRM	Cultural Resource Management
DACE	Department of Agriculture, Conservation and Environment
DARDLEA	The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
DEA	Department of Environmental Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (No. 73 of 1989)
EIA	Environmental Impact Assessment
EIA	Early Iron Age
EIA Regulations	Government Notice Regulation 982 (4 December 2014) in terms of the NEMA
EIAR	Environmental Impact Assessment Report
ECO	Environmental Control Officer
EMPr	Environmental Management Programme
ESA	Early Stone Age
GA	General Authorisation
GDP	Gross Domestic product
GNR 324	Government Notice Regulation 324 (7 April 2017) in terms of NEMA
GNR 325	Government Notice Regulation 325 (7 April 2017) in terms of NEMA
GNR 982	Government Notice Regulation 326 (7 April 2017) in terms of NEMA
GNR 327	Government Notice Regulation 327 (7 April 2017) in terms of NEMA
GNR 533	Government Notice Regulation 533 (11 July 2014) in terms of NEM:AQA

GNR 805	Government Notice Regulation 802 (10 October 2012) in terms NEMA
GNR 807	Government Notice Regulation 807 (10 October 2012) in terms of NEMA
GNR 827	Government Notice Regulation 827 (1 November 2013) in terms of NEM:AQA
GNR 831	Government Notice Regulation 831 (1 November 2013) in terms of NEM:AQA
GNR 893	Government Notice Regulation 893 (22 November 2013) in terms of NEM:AQA
GNR 891	Government Notice Regulation 891 (20 October 2014) in terms of NEMA
GNR 921	Government Notice Regulation 921 (29 November 2013) in terms of NEM:WA
GNR 926	Government Notice Regulation 926 (29 November 2013) in terms of NEM:WA
GNR 993	Government Notice Regulation 993 (8 December 2014) in terms of NEMA
GPS	Global Positioning System
HCAC	Heritage Contracts and Archaeological Consulting
HIA	Heritage Impact Assessment
Hi-Fos	Hi-Fos (Pty) Ltd
HPA	Highveld Priority Area
IAIAsa	International Association for Impact Assessment (South Africa)
I&APs	Interested and Affected Parties
IAP2	International Association for Public Participation
IDP	Integrated Development Plan
IEC	International Electro Technical Commission
IEMA	The Institute of Waste Management of Southern Africa
IFC	International Finance Corporation
IWMSA	The Institute of Environmental Management and Assessment (In progress)
KBK Engineers	KBK Engineers (Pty) Ltd
LIA	Later Iron Age
LSA	Late Stone Age
Ltd	Limited
MES	Minimum Emission Standards
MIA	Middle Iron Age
MSA	Middle Stone Age
MSDS	Material Safety Data Sheets
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NGOs	Non-Governmental Organisations
NHRA	National Heritage Resources Act (No. 25 of 1999)

NLGs	Noise level guidelines
NRs	Noise sensitive receptors
NWA	National Water Act (No. 36 of 1998)
OHSA	Occupational Health and Safety Act (No. 85 of 1993)
PAs	Protected Areas
PM	Particulate Matter
$PM_{2.5}$	Inhalable particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Thoracic particulate matter with an aerodynamic diameter of less than 10µm
PPE	Personal protective equipment
Pty	Propriety
SAHRA	South African Heritage Resources Agency
S&EIR	Scoping and Environmental Impact Reporting
SANS	South African National Standards
SLM	Sound Level Meter
SS	Stainless Steel
Sonskyn	Sonskyn Kunsmis (Pty) Ltd
TBT	Trailblazer Technologies (Pty) Ltd
Terra Pacis	Terra Pacis Environmental (Pty) Ltd
TDS	Total Dissolved Solids
TSP	Total Suspended Particulates
TVOC	Total volatile organic compounds
US EPA	United States Environmental Protection Agency
WA	Water Act (No. 54 of 1956)
WG-AEN	Working Group for the Assessment of Environmental to Noise
WMA	Water Management Area
WUL	Water Use Licence
WULA	Water Use Licence Application
AN	Ammonium Nitrate
CaF_2	Solid Calcium Fluoride
CN4	Crystallisation
CNL	Calcium Nitrate Liquid
CNX	Calcium Ammonium Nitrate Plant
CO	Carbon Monoxide
HF	Hydrofluoric Acid
K	Potassium
LAN	Limestone Ammonium Nitrate
MagAmP	Magnesium Ammonium Phosphate
MAP 33	Pure Ammonium Phosphate
MAP 39	Pure Ammonium Phosphate Plant
N	Nitrogen

NDCR	National Dust Control Regulations
NH_3	Ammonia
NO_x	Substance consisting of one nitrogen atom and any amount of oxygen atoms (represented by the $_x$)
O	Oxygen
P	Phosphorus
S	Sulphur
SO_2	Sulphur dioxide
℃	Degrees Centigrade
kW	Kilowatt
ha	hectare
mm	Millimetres
m	Metre
kN	Kilonewtons
kN/m	Kilonewtons per metre
km	Kilometres
km^2	kilometres squared
km/h	Kilometres per hour
l/m^2-day	Litre per meter squared per day
m^2	Metre squared
m^3	Metres cubed
m^3/s	Metres cubed per second
m^3/y	Metres cubed per year
mamsl	Metres above mean sea level
mg/m^2-day	Milligrams per metre squared per day
mg/Nm^3	Milligrams per Normal metre cubed
N/m	Newton metre
$_ouE/m^3$	Odour concentration of one European odour per m^3
t	Tons
tpa	Tons per annum
µm	Micrometer
$µg/m^3$	Microgram per metre cubed
dB(A)	Decibel A-Weighting
dB	Decibels
dBA/m^2	Decibels per metre squared
L_{Aeq} (T)	The A-weighted equivalent sound pressure level, where T indicates the time over which the noise is averaged (calculated or measured) (in dBA).
L_{Aleq} (T)	The impulse corrected A-weighted equivalent sound pressure level, where T indicates the time over which the noise is averaged (calculated or measured) (in dBA)
LA_{90}	The A-weighted 90% statistical noise level, i.e. the noise level that is exceeded during 90% of the measurement period. It is a very useful descriptor, which provides an indication of what the LAeq could have been in the absence of noisy single events and is considered representative of background noise levels (LA90) (in dBA).

L_{AFmin}	The A-weighted minimum sound pressure level recorded during the measurement period.
L_{AFmax}	The A-weighted maximum sound pressure level recorded during the measurement period.
L_w's	Sound power levels
SLM	Sound Level Metre
ppm	Parts per million
v/v	Volume/volume
T_{max}	Maximum Temperature
T_{min}	Minimum Temperature
T_{avg}	Average Temperature
/	per
%	Percent
<	Less than
>	Greater than
R	Rand
pH	Potential of hydrogen (is a numeric scale used to specify the acidity or basicity of an aqueous solution)
i.e.	That is
e.g.	Example
kPa	Kilopascal

Appendix 2 : Curriculum Vitae of the Project Team

Appendix 3 : Phosphoric Acid Plant Technical Review

Appendix 4 : Soil Investigation

Appendix 5 : Archaeological Impact Assessment

Appendix 6 : Stakeholder Database

Appendix 7 : Newspaper Advertisements announcing the Project and Availability of the Draft Scoping Report

Appendix 8 : Site Notices Announcing the Project and Availability of the Draft Scoping Report

Appendix 9 : Background Information Document

Appendix 10 : Proof of Delivery of the Draft Scoping Report

Appendix 11 : Proof of Delivery of the Final Scoping Report

Appendix 12 : Acceptance of Scoping Report

Appendix 13 : Comment Response Report

Appendix 14 : Newspaper Advertisements Availability of the Draft Environmental Impact Assessment Report

Appendix 15 : Focus Group Meeting

Focus Group Meeting Notification Letters

Focus Group Meeting Minutes and Presentations

Individual Response Letters to Comments and Concerns Raised

Appendix 16 : Atmospheric Impact Report

Appendix 17 : Environmental Noise Specialist Study

Appendix 18 : Environmental Management Programme