EON Consulting

Waterval Solar Park:

Draft Scoping Report

6 July 2015

ENABLING BUSINESS TO SUCCEED

1. Executive Summary

This Environmental Impact Assessment (EIA) Draft Scoping Report has been compiled by EON Consulting on behalf of TFS Solar (Pty) Ltd, in response to the undertaking of the proposed construction of facilities for a renewable energy plant consisting of 200 Ha of photovoltaic panels as well as a manufacturing plant for solar panels. The proposed development site is located on Farm Waterval 150-IR, Portion 6 near Meyerton, is situated within the Midvaal Local Municipality in the Sedibeng District, south of the Gauteng Province ***(Refer to Figure 1).*** The area of development falls within an industrial complex, and is currently characterised as vacant\derelict land previously used for agricultural purposes.

The project entails the following production units:

a) The construction of a production plant for the manufacturing of solar panels through the use of a Fluidized Bed Reactor (FBR) to manufacture poly-silicon through the application of hydrochloric acid to silica. The plant will produce 6 000 tons of solar grade poly-silicon per annum.

b) The construction of a solar energy plant for the generation of 100MW of electric power

c) The construction of a float glass manufacturing plant (65 000 tons per annum)

d) Production units referred to above (a-c) will be constructed on Portion 6 of the Farm Waterval 150-IR, Meyerton, Gauteng. The total size of the farm is 438Ha. The buildings, in which the manufacturing units will be housed, will consist of 40 Ha and the solar energy plant will consist of 200 Ha of land.

The legislative regulations followed for this document represents the EIA Scoping Report as required by the National Environmental Management Act, 1998 (Act No. 107 of 1998): Environmental Impact Assessment Regulation 2014 R982, dated the 4 December 2014. These regulations define the aspects of the legislation required for certain listed activities, which may be detrimental to the environment as a whole.

The objectives of the EIA process are as follows:

- To identify issues/ concerns that should be included into the scope of the Environmental Impact Assessment process;
- To inform stakeholders about the proposed project and provide them with an opportunity to raise their concerns that will contribute towards the EIA process; to establish/confirm the scope and

contents of the Scoping and EIA Report and to identify possible specialist studies to be conducted to address significant issues;

- To understand and thoroughly document the issues/concerns and comments submitted raised by stakeholders in such a way that delay due to misunderstanding will be prevented at all costs;
- To assess the relevant biophysical environmental components of the site to an appropriate level of detail. This includes the physical, biological, and socio-economic components;
- To identify/ describe possible environmental issues associated with the construction and operational phases of the training facilities and its associated infrastructure; and
- To reflect all the required information/ findings in a logical and systematic way in order to assist the DEA with the evaluation of the proposed activity in terms of the requirements of the National Environmental Act, 1998 (Act No. 107 of 1998) as amended.

The following listed activities are triggered by the proposed development:

R984 Listing Notice 2: Activity 15: The clearing of indigenous vegetation more than 20Ha	An area in excess of 300Ha will be cleared for the building of the manufacturing plant and solar PV farm
R 984 Listing Notice 2: Activity 28: The commencement of an activity for which an air emission license is required	The manufacturing of poly-silicon from silica by the application of heat and the Manufacturing of Glass in terms of the NEMAQA: R893: Activity Subcategory 4.15 and 5.8 : (Listed Activities and associated emission standards identified in terms of Section 21 of the national Environmental management: Air Quality Act, 2004 (Act No 39 of 2004)
R 984 Listing Notice 2: Activity 6: The development of infrastructure for a process which will require a permit of the release of emissions	The manufacturing of poly-silicon from silica through the application of heat will result in air emissions as well as the manufacturing of glass
R 983 Listing Notice 1: Activity 25: The treatment of effluent of more than 2 000m^3 but less than 15 000m^3 daily throughputs.	The effluent stream from the Fluidized Bed Reactor (FBR) will be cleaned to remove Silicon fines and impurities like metal chlorides.
R 984 Listing Notice 2: Activity 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	A photo-voltaic solar plant will be erected comprising 200Ha on the project site to generate 100MW of electricity
R 985 Listing Notice 3: Activity 10: The storage of dangerous goods (hydrochloric acid) with a combined capacity of more than 30m^3 but less than 80m^3 on a site identified as high agricultural potential as well as located within an ecological support area as per the Gauteng Conservation Plan 3.	The site of the proposed project is classified as agricultural potential as well as an ecological support area. More than 30m^3 of hydrochloric acid and other dangerous substances will be stored on site

An application was submitted to DEA with respect to the above. The application was accepted and the following Reference Number provided: 14/12/16/3/3/2/812.

This document represents the scoping report as required by the NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998): ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 R 982 of 4 December 2014

Thus, all environmental impacts that will be investigated during the EIA phase and appropriate mitigation will be adhered to as governed by the above regulation. However, the primary findings of this Draft Scoping Report are the risks associated with air quality and it overall impact within the proposed development ambient.

Subsequent to these findings this Draft Scoping Report will be submitted to the DEA. Following which all stakeholders and registered I&APs will be informed of the proposed development and consulted on an on-going basis during the EIA process. This will give them an opportunity to provide comments and/or raise issues. The Draft Scoping Report will be available for public review and comment from ***Tuesday, 23 June 2015 to Friday, 24 July 2015***. After the public comment period, the report will be updated and made available to the registered Interested and Affected Parties during the compilation of the Environmental Impact Assessment report again.

Public View of the Draft Scoping Report:

EON Consulting Website: *www.eonconsulting.co.za*

Registered Interested and Affected Parties will be informed where hard copies of the draft scoping report can be obtained.

The public can submit their comments in writing to the following on\before 24 July 2015:

Adri Venter
EON Consulting
PO Box 12389
Vorna Valley Midrand
1686
Fax: 011 564 2371
Email: adri.venter@eon.co.za

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DEFINITIONS

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

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

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

Environmental Degradation: Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage which may be the result of accidental or intentional human activities.

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

ABBREVIATIONS

BID	Background Information Document
CRR	Comments and Response Report
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
GN	Government Notice
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
NEMA	National Environmental Management Act, Act 107 of 1998 as amended
NEMWA	National Environmental Management Act: Waste Management Act
PM	Particulate Mater
PPP	Public Participation Process
R	Regulation
SANBI	South African National Biodiversity Institute

2. Project Details

Reference No.: 14/12/16/3/3/2/812. National Department of Environmental Affairs (DEA)

Project Title: Waterval Solar Park situated in Meyerton, Gauteng

Applicant: TFS Solar (Pty) Ltd.

Compiled by: EON Consulting, Adri Venter

Date: 9 June 2015

3. Introduction

3.1. Applicant

Applicant name:	Waterval Solar Park
Registration number (if applicant is a company)	2012/054808/07
Trading name (if any)	TFS Solar PTY Ltd
Responsible person name (If the applicant is a company):	Tom Lombard
Responsible position, e.g. Director, CEO, etc.:	Managing Director
Physical address:	466 Ketton Road, Wadeville
Postal address:	PO Box 5107, Meyersdal

Postal code:	1447	Cell:	082 410 7598
Telephone:	011 902 9070	Fax:	086 425 3078
E-mail:	tlombard@tfssolar.co.za	BBBEE status	B-BBEE Level 4

3.2. Appointed Environmental Assessment Practitioner

Environmental Assessment Practitioner (EAP):	EON Consulting		
Contact person:	Adri Venter		
Postal address:	PO Box 12389, Vorna Valley, Midrand		
Postal code:	1686	**Cell:**	0823728186
Telephone:	011 564 2300	**Fax:**	011 564 2371

E-mail:	*adri.venter@eon.co.za*
Qualifications & relevant experience	MSc (Geography and Environmental Studies), 10 years
Professional affiliation	SACNASP (Pr. Sc. Nat.:400062/14)

3.3. Proposed Locality

The locality of the proposed project on Farm Waterval 150-IR , portion 6, near Meyerton, Gauteng is provided in the map below.

The Surveyor General (SG) code is indicated below:

T	O	I	R	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	6

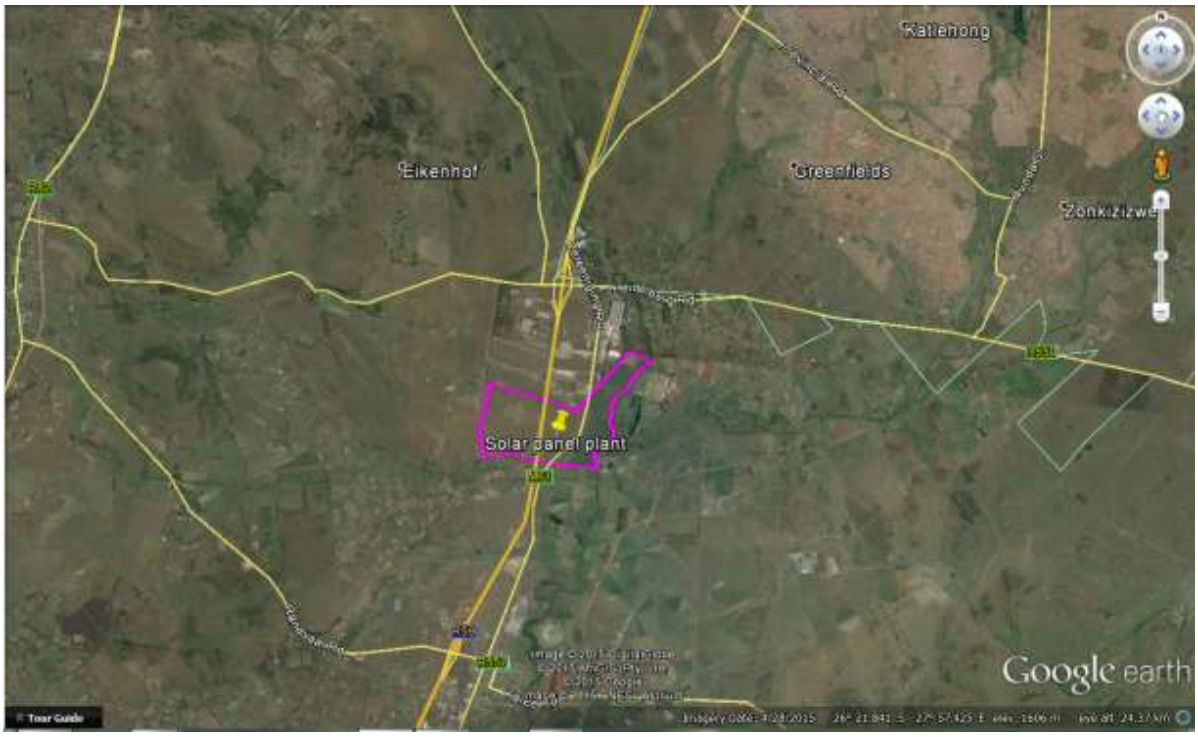

Figure 1: The location of the Waterval Solar Plant Plant

3.4. Activities Applied for the Purposes of an Environmental Authorisation

The following listed activities are triggered by the proposed development:

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4. Description of the Proposed Activity

The proposed activity will consist of 3 aspects, namely:

1) Glass manufacturing
2) Silicon manufacturing
3) Photovoltaic installation to generate electricity

The aluminium frames and silver grid which forms part of the PV cells is pre-manufactured on another site

4.1. Glass manufacturing

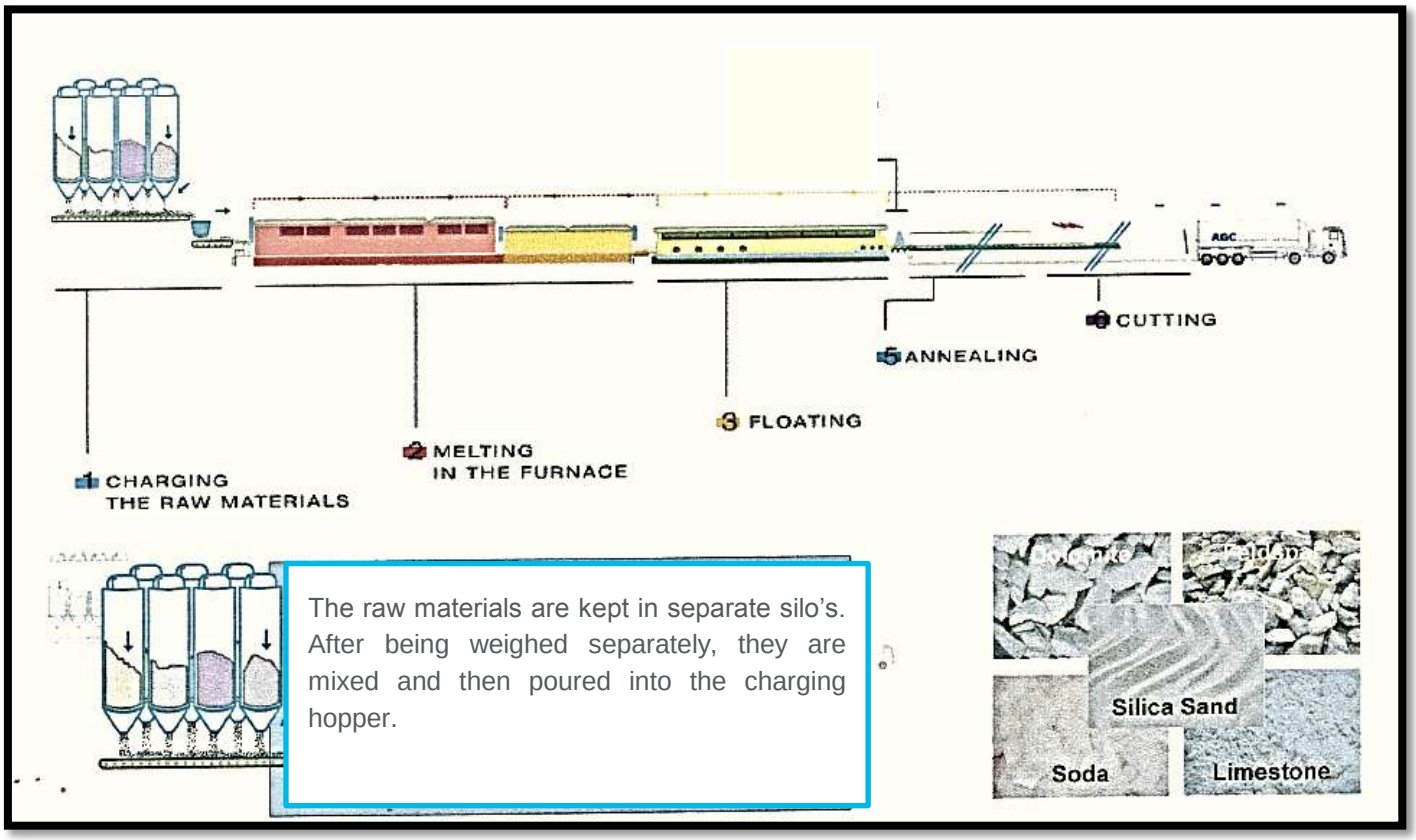
Glass will be manufactured onsite as part of the parts of the photovoltaic panels that will be manufactured onsite.

4.1.1. Raw materials:

The following raw materials are used to produce glass:

- Silica
- Soda (Na_2CO_3)
- Lime Stone
- Dolomite
- Feldspar
- Filter cake – originating from the treatment of gaseous emissions and returned to the raw materials used in the melting process
- Waste Glass – from the production process is returned as raw materials to the melting process

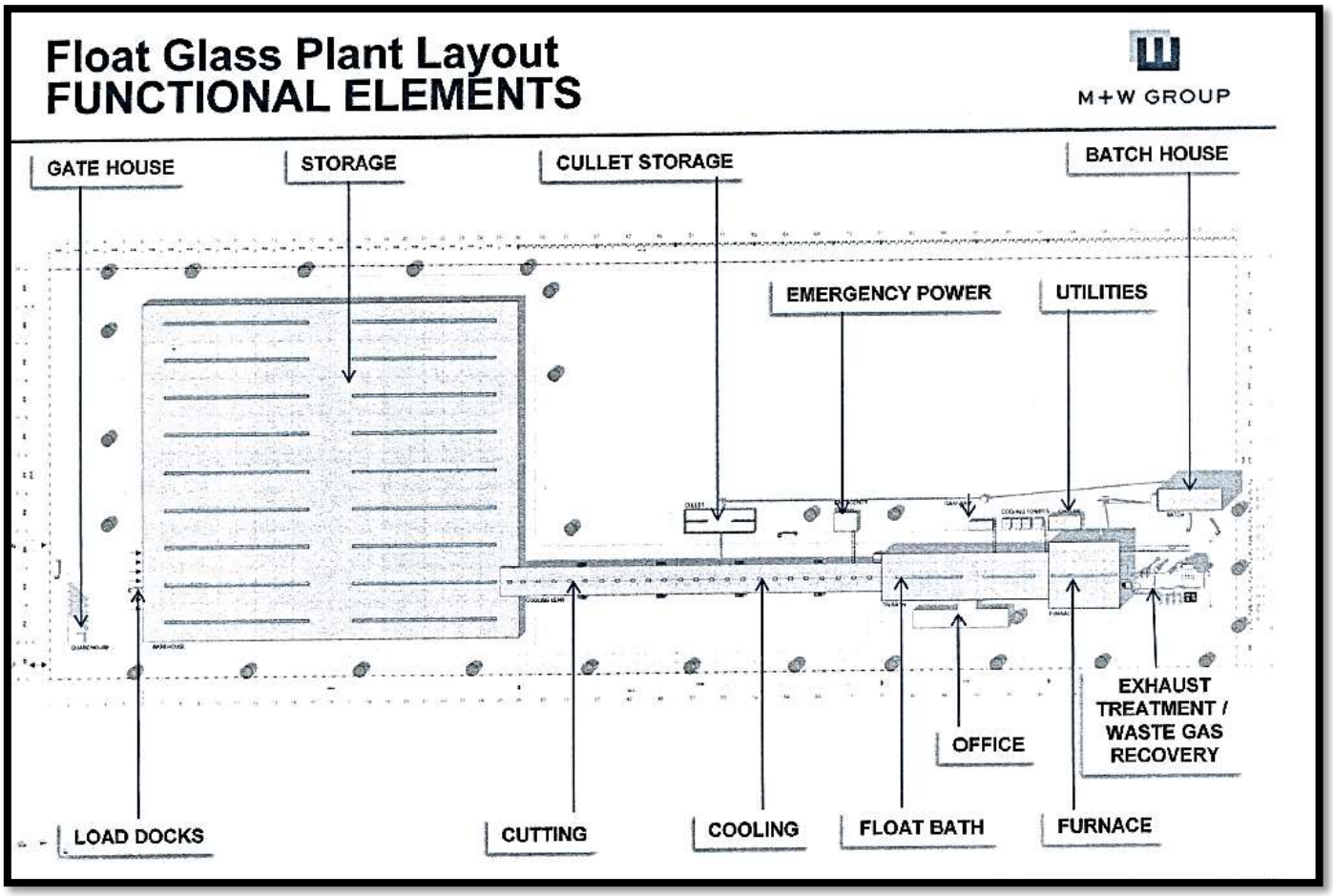
4.1.2. Process steps for floating glass



Melting in the furnace: Temperatures are 1550°C. The molten glass is kept at high temperature for several hours, allowing bubbles of trapped air to escape

Floating: As the product comes out of the furnace, the molten glass is poured onto a bath of liquid, where a sheet of glass is formed by flotation. Rollers on either side of the bath draw out the glass to roll it into the required thickness and width

Annealing: Once the glass emerges from the floating bath it is led by a roller conveyer to an annealing tunnel where the glass is gradually cooled to ensure the glass remain perfectly flat and ready for cutting at ambient temperature.
Cutting: After annealing, the glass strip is inspected by an optical laser and then automatically cut into the required sizes



Gas will be used to heat the melting furnace. Gas will be obtained directly from a Sasol gas pipeline on the edge of the property. The gas pipeline will be inside the industrial complex, and will not exceed 1000 metres in length.

Environmental impacts associated with glass manufacturing process:

- Air quality impacts from loading and mixing of raw materials as well as from the furnace, and float bath.
- Noise impacts from the mixers, roller conveyers and cutting
- Air quality impacts in the case of emergency venting from the pipeline
- Clearing of vegetation for the construction of the plant

4.2. Silicon manufacturing

The process is structured in a straight-forward way, consisting of three main production units:

- Hydrochlorination unit
- Monosilane Disproportionation Unit
- CVD Polysilicon Deposition

The SST process is characterized by a process structure which leads to reduced energy consumption in comparison to conventional Polysilicon production technologies like, for example, the Siemens process. This provides manufacturers with remarkable operating cost saving.

Monosilane gas (SiH_4) is a basic feedstock for the photovoltaic industry. It is used as an anti-reflective for solar cell coatings, as basis material for thin film solar cells, flat-screen displays (TFT) and semiconductors for the electronics industry. The monosilane-based process facilitates purification to the degree of electronic-grade high purity polysilicon. In the hydrochlorination in two parallel reactions, both STC (Tetrachlorsilane) and metallurgical silicon respectively are converted into TCS (Trichlorosilane). Then the TCS is fed to a disproportionation reactor, where purified TCS is processed to monosilane gas. The monosilane gas is then directly fed to the CVD reactor, where polysilicon deposition finally occurs on heated slim rods. The monosilane process makes possible an unprecedented silicon conversion rate of 98%.

For example, the oxidation of monosilane is strongly influenced by moisture, since SiH4 is relatively easily hydrolyzedii: $SiH_4 + 2H_2O > SiO_2 + 4H_2$; high humidity will reduce the risk of ignition. On the other hand, there is a positive aspect about silane leaks for any plant operating with monosilane: there are no “hidden leaks”. Almost every silane leak is found quickly, because even most tiny silane leaks make a “popping” sound, or are disclosed by a small flame and a dust cloud instantly. That means, silane leaks are unlikely to accumulate, which prevents vapor clouds that would explode with large impact (as would happen with CH_4 or H_2). The risk of delayed ignition is higher, the larger the difference between line pressure and ambient pressure is, or when abrupt changes in pressure occur. Then, there is the point of air flow: the most dangerous places for monosilane are small, confined spaces like gas cabinets in buildings. The best location for monosilane operating is outdoors, or in large buildings like polysilicon CVD rooms if they have appropriate air flow. Sources of monosilane incidents were in most cases corroded cylinder caps or physically stressed/ incorrectly used material. Most significant silane industrial accidents have occurred in this context, and not in monosilane production plants. These risks can be managed by good design of equipment and proper handling by trained operators. Toxicity: Silane is not as highly a toxic gas as TCS, STC, DCS, HCl, or Cl_2. The byproducts of a silane leak and fire would be SiO_2 (dust) and H_20 – all not toxic or harmful

gases. In contrast, the byproducts of a TCS, STC, DCS, HCl, or Cl^2 release to the atmosphere include highly toxic hydrochloric acid. While such a release of chlorine containing gas can create a toxic cloud that might travel far with the wind and have negative impacts outside plant boundaries, the hazards of monosilane are typically confined to the production facility itself, and provide no risk to the environment. *(Schmid Silicon Technology GmbH Robert-Bosch-Str. 32-36 Phone: 0049 7441 538-454 Fax: 0049 7441 538-260 72250 Freudenstadt Germany info@schmid-silicon.com www.schmid-silicon.com, undated)*

Monosilane is produced from metallurgical grade silicon in a two-step process. In the first step, powdered silicon is reacted with *hydrogen chloride* at about 300 °C to produce *trichlorosilane*, $HSiCl_3$, along with *hydrogen* gas, according to the *chemical equation*:

$$Si + 3\ HCl \rightarrow HSiCl_3 + H_2$$

At room temperature, silane is a gas, and is pyrophoric — it undergoes spontaneous combustion in air, without the need for external ignition.
Above 420 °C, silane decomposes into silicon and hydrogen; it can therefore be used in the chemical vapor deposition of silicon.

Silane is fairly toxic: the lethal concentration in air for rats (LC_{50}) is 0.96% (9,600 ppm) over a 4-hour exposure. In addition, contact with eyes may form *silicic acid* with resultant irritation. In Japan, in order to reduce the danger of silane for amorphous silicon solar cell manufacturing, several companies began to dilute silane with *hydrogen* gas. This resulted in a symbiotic benefit of making more stable *solar photovoltaic* cells as it reduced the *Staebler-Wronski Effect*.

In regards to occupational exposure of silane to workers, the US *National Institute for Occupational Safety and Health* has set a *recommended exposure limit* of 5 ppm (7 mg/m^3) over an eight-hour time-weighted average.

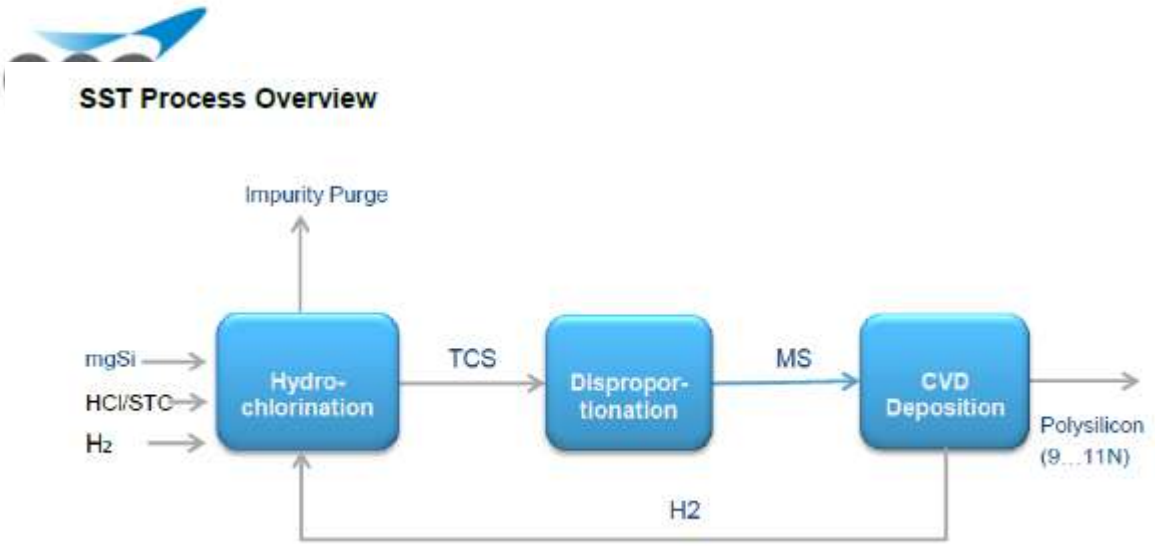
Properties	
Chemical formula	H_4Si
Molar mass	32.12 g·mol^{-1}
Appearance	Colourless gas
Odor	repulsive[1]
Density	1.342 g dm^{-3}
Melting point	−185 °C (−301.0 °F; 88.1 K)
Boiling point	−112 °C (−170 °F; 161 K)
Solubility in water	Reacts slowly
Vapor pressure	>1 atm (20°C)[1]
Structure	
Molecular shape	tetrahedral r(Si-H) = 1.4798 angstroms
Dipole moment	0 D
Thermochemistry	
Std molar entropy ($S^{\ominus}_{298}$)	204.6 J mol^{-1} K^{-1}
Std enthalpy of formation ($\Delta_f H^{\ominus}_{298}$)	34.31kJ/mol
Hazards	
Main hazards	Extremely flammable, pyrophoric in air
Safety data sheet	ICSC 0564
EU Index	Not listed
NFPA 704	
Flash point	Not applicable, pyrophoric gas.
Explosive limits	1.37–100%
US health exposure limits (NIOSH):	
PEL (Permissible)	none[1]
REL (Recommended)	TWA 5 ppm (7 mg/m^3)[1]

Hydrochloric acid is used in the rector to generate silicon from metallurgical silica. Hydrochloric acid is a clear, colorless, highly pungent solution of hydrogen chloride (HCl) in water. It is a highly corrosive, strong mineral acid. The main risk associated with HCL is its high corrosively and causing chemical burns during contact. Exhaust ventilation or other engineering

controls are required to keep the airborne concentrations of vapors below their respective threshold limit value

(Source: Wikipedia, 2016)

Silica raw material will be delivered by a rotary truck (similar to a ready mix cement truck) and pumped with air pressure directly into the silo. From the silo, raw material will be pumped directly to the reactor by means of air pressured pipes. As such, during normal operations no silica will be released into the environment as part of this process.



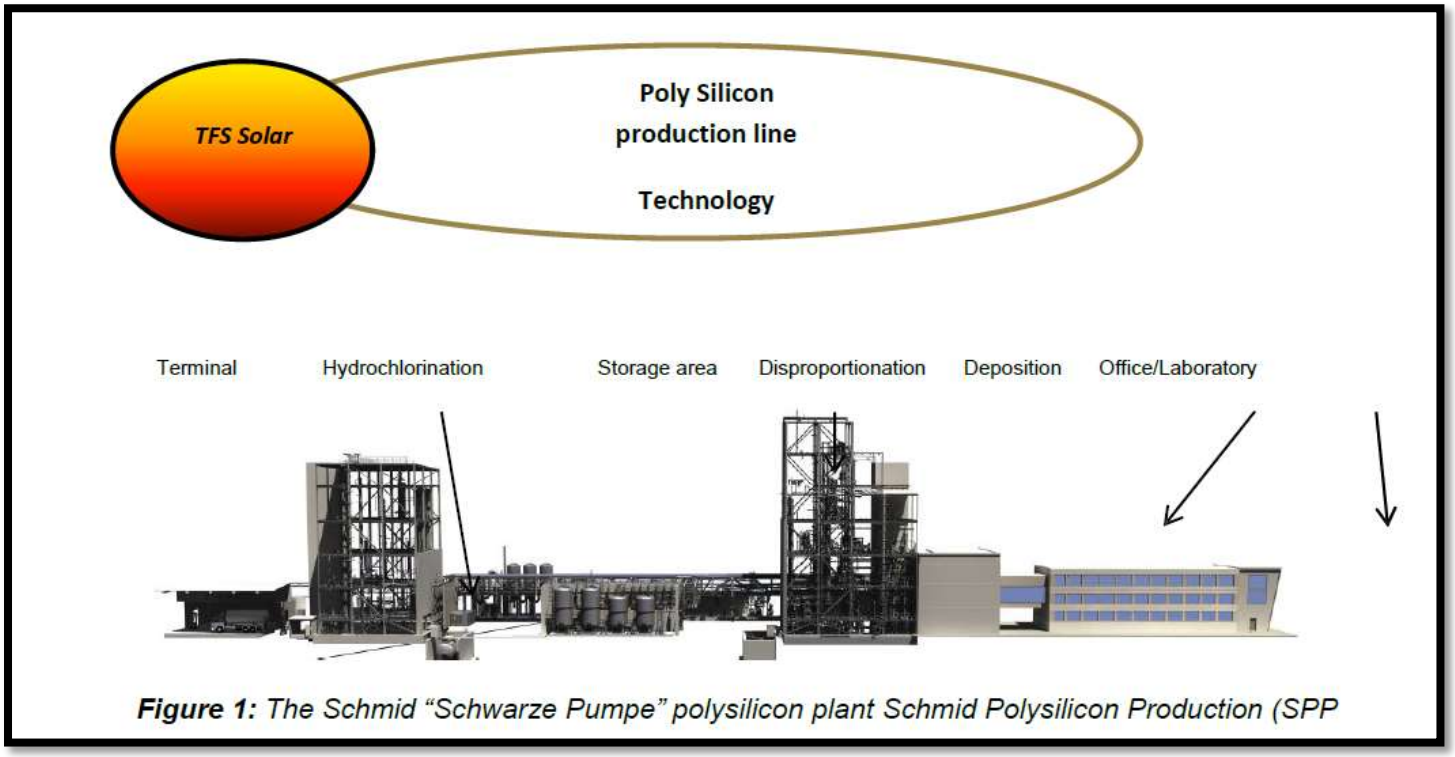


Figure 1: *The Schmid "Schwarze Pumpe" polysilicon plant Schmid Polysilicon Production (SPP*

Figure 2: An example of a CVD Reactor Installation

4.2.1. Process description - Hydrochlorination Unit

The SST Hydrochlorination Unit combines four individual process steps in one unit.

Step 1:
A highly sophisticated fluidized bed reactor is employed for Hydrochlorination of metallurgical Silicon with hydrogen and STC. The product of Hydrochlorination which is also called conversion, is TCS.

Chemical reaction inside the FBR:

(1) Hydrogenation of STC (SiCl4): SiCl4 + H2 SiHCl3 + HCl
(2) Chlorination of mg-Si: mg-Si + 3 HCl SiHCl3 + H2

Typically no external HCl is required for the SST Hydrochlorination. HCl forms only as an intermediate product inside the FBR, wherein HCl is fully converted into TCS. High processing temperature ensures the maximum conversion rate of >=25% (this number represents the concentration of TCS in mol-% in the liquid phase stream emerging from the FBR).

Step 2:
The SST Quench System downstream of the FBR is cooling down the product stream emerging from the FBR and removing traces of Si-fines and impurities like metal chlorides. Thus, fouling in the downstream equipment can be eliminated.

Step 3:
In the following SST Condensation System the gaseous STC/TCS mixture coming from the Quench system is condensed and fed to the STC/TCS –split column.

Step 4:
The STC/TCS –split column removes the non-converted STC from the TCS-product stream. The separated STC is recycled back to the FBR.

The reactor is fitted with a silicon dust filter.

4.2.2. SST Disproportionation Technology

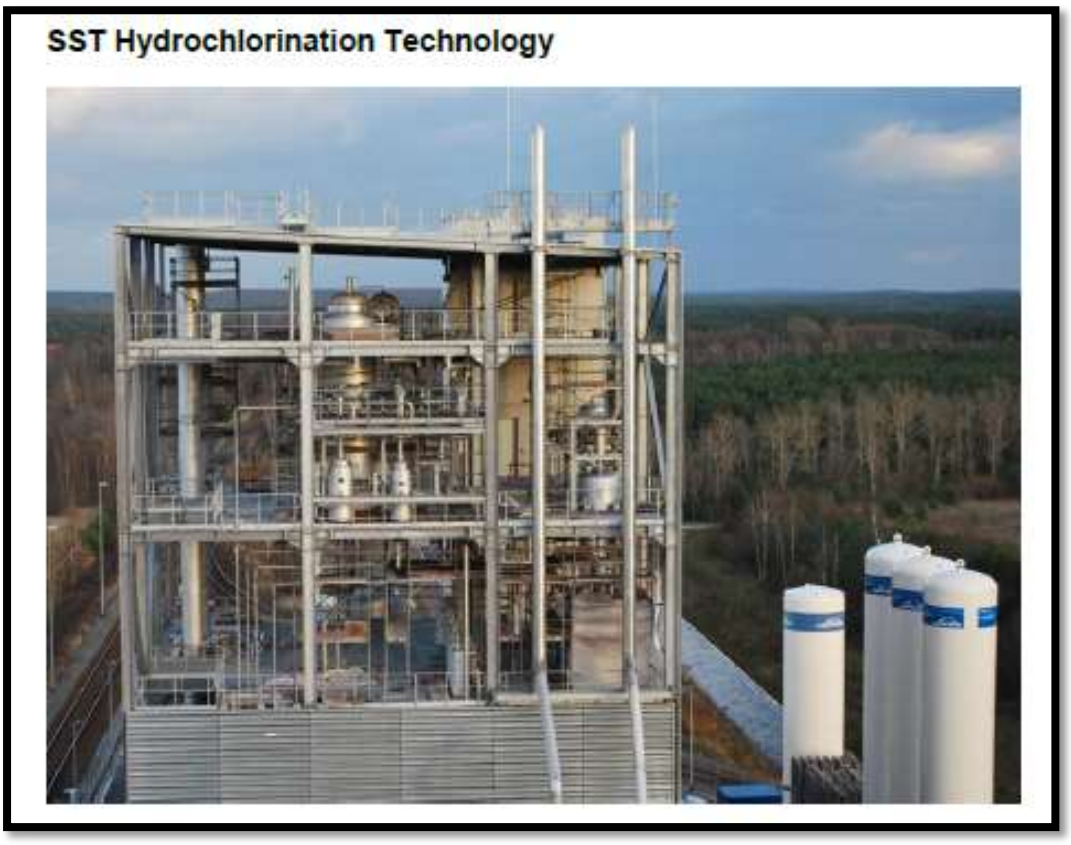
The SST Disproportionation Units shows the state of the art for converting Trichlorosilane to Monosilane of highest purity based on so called reactive distillation. Within a wide operation window this technology utilizes only about 10% of the energy compared to the conventional two step disproportionation process.
The SST Disproportionation Technology provides Monosilane Gas which can be fed via the Monosilane buffer storage either to the MS Deposition Unit or to a Monosilane filling and loading station.
In comparison to the common TCS-Purification Process using a multiple stage Distillation Unit, the SST Disproportionation is easy to operate and guarantees a consistently high product

quality of Monosilane Gas as well as Polysilicon. Because Dichlorosilane gets converted in the disproportionation to Monosilane there is no need for an extra Dichlorosilane recovery and conversion unit. Adding an additional Monosilane Purification Unit to the Disproportionation Unit UHP (UHP = Ultra High Purity) - Monosilane Gas can be produced.

The SST Hydrochlorination unit features the state-of-the-art technology of the Hydrochlorination process utilized at advanced Polysilicon production plants. Operated at a low pressure and high temperature level it achieves an outstanding conversion rate of >=25mol %. (STC=>TCS).

4.2.3. Process description – Disproportionation Unit

SST´s combination of TCS via hydrochlorination and Monosilane via disproportionation creates the lowest number of impurities and makes them easier to remove. Pure Monosilane can be obtained most easily through the disproportionation reaction of Trichlorosilane in the presence of a catalyst.



Environmental impacts associated with the silicon manufacturing process:

- Air quality impacts from loading and mixing of raw materials as well as from the reactor, storage area and disproportion unit
- Noise impacts from the roller conveyers
- Clearing of vegetation for the construction of the plant
- Accidental spillages from the chemical tank farm leading to ground and water pollution
- Waste water generation from the SST Quench system containing impurities such as metal chlorides
- Accidental releases from HCL vapour clouds and Monosilane causing air pollution and human health hazards.

4.3. Photovoltaic installation to generate electricity

The ground slope is usually kept below 5%, by grading, if necessary. Given the relative flatness of the site grading will not be required. After installation of the solar panels, the vegetation will be periodically mowed to prevent shading of the panels, which limits vegetation height to below 1 m height. Inverters, transformers, and collector boxes are built for every 1 MW of panels, and is placed on concrete pads sized at roughly 5 × 5 m.

Trenching for electrical and communications cables is required.

The panels require washing, which uses water at a rate of roughly 500–1000 gallons per MW of panels per year. Rainfall events will reduce the need for washing. No soap will be used, only pure water. Wash water will therefore not create any environmental impacts but will infiltrate into the soil and evaporate from the panels. Maintenance vehicles travel the access roads between the panels for washing and mowing.

Redox Flow Batteries will be used and will be stored in a normal store building. Redox flow batteries, and to a lesser extent hybrid flow batteries, have the advantages of flexible layout (due to separation of the power and energy components), long cycle life (because there are no solid-to-solid phase transitions), quick response times, no need for "equalisation" charging (the overcharging of a battery to ensure all cells have an equal charge) and no harmful emissions. They offer easy state-of-charge determination (through voltage dependence on charge), low maintenance and tolerance to overcharge/over discharge.

Flow batteries are rather complicated in comparison with standard batteries as they may require pumps, sensors, control units and secondary containment vessels.

Environmental impacts associated with the PV plant:

- Land-use
- Water use for washing
- significant alteration to the vegetation onsite due to construction and the creation of shadows by the panels
- erosion of topsoil, increase of sediment load or turbidity in local streams,
- the reduction of groundwater recharge due to the creation of impermeable surfaces
- fencing around the site will limit the movement of animals
- Flow batteries require secondary containment to prevent spillages

5. Legislation and guidelines that have been considered in the preparation of the scoping report

5.1. Overarching/Framework legislation

5.1.1. Constitution of the Republic of South Africa (Act No 108 of 1996)

According to Section 24 of the Constitution: *"Everyone has the right 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 prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".*

The proposed development can be considered as sustainable use of renewable natural resources whilst providing employment opportunities and promoting economic development.

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

The National Environmental Management Act 107 of 1998 (NEMA) establishes a set of principles, which all authorities have to consider when exercising their powers during the granting of permits. The principles underpinning environmental management contained in the NEMA, as stated in Section 2 are that sustainable development requires the consideration of all relevant factors including the following:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That the development, use and exploitation of renewable resources and the ecosystems of which they are a part do not exceed the level beyond which their integrity is jeopardised;
- That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.
- Development must be socially, environmentally and economically sustainable.
- Environmental management must be integrated and acknowledge that all elements of the environment are linked and interrelated, and it must pursue the best practicable environmental option.
- People and their needs must be placed at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.

Section 28(1) states 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”. If such degradation/pollution cannot be prevented, then appropriate measures must be taken to rectify or minimise such pollution. These measures may include, but are not limited to:

- Assessing the impact of the project or development on the environment;
- Informing and educating employees about the environmental risks of their work and possible ways of minimising such risks;
- Ceasing, adapting or controlling actions which cause pollution/degradation;
- Preventing movement of pollutants;
- Eliminating the pollution source; and
- Remedying the effects of the pollution.

For this reason Regulations have been published which lists activities for which environmental impact assessments are required. The Environmental Impact Assessment Regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA) (Act no. 107 of 1998) were promulgated on 4 December 2014 and include Regulations R983, R984 and 985.

- **Regulation GN R982**: Environmental Impact Assessment Regulations: provides for activities that may impact detrimentally on the environment to require prior environmental authorisation. The Regulations describes the procedures that are to be followed in order to obtain an environmental authorisation.

- **Regulation GN R983 and R984**: sets out lists of identified activities which may not commence without environmental authorisation from the competent authority and which must follow the basic assessment or full scoping EIA procedure as provided for in the NEMA EIA Regulations.

- **Regulations GN 985:** sets out activities in specified regions of the country, for which an environmental authorization will be required.

The proposed project requires a full scoping EIA in terms of R984.

5.2. Biodiversity

5.2.1. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

This Act gives effect to ratified international agreements affecting biodiversity to which South Africa is a party, and which bind the Republic. Furthermore, the Minister may list ecosystems and species that are threatened or in need of protection. The Minister may also

list threatening processes and activities in listed ecosystems and related to protected species. The Act also makes provision for the rehabilitation of ecosystems. The Minister may also promulgate a list of invasive species and the required measures associated with these.

Given the location of the proposed project on the existing footprint of a brownfield site, zoned for industrial use, it is not foreseen that any protected species will be affected.

In terms of **Regulation 507 of 19 July 2014** (Publication of National List of Invasive Species) invader species are categorised as follows:

Category 1a Listed Invasive Species

- Take immediate steps to combat, or eradicate where possible.

Category 1b Listed Invasive Species

- Control the listed invasive species.

Category 2 Listed Invasive Species

- Utilization allowed under Permit conditions.
- Control outside of the Permit conditions.

Category 3 Listed Invasive Species

- Subject to certain prohibitions (e.g. sell)
- Category 3 plant specimens in riparian areas are treated as Category 1b.

The Environmental management programme (EMPr) will make provision for the control of all listed invasive species.

5.2.2. National Environmental Management: Protected Areas Act (Act 57 of 2003)

The intention of the Act is to protect and conserve ecologically viable areas as well as their natural landscapes.

The proposed site is not within or close to a formally protected area.

5.2.3. National Veld and Forest Fires Act (Act No 101 of 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic and provides for a variety of institutions, methods and practices for achieving the purpose. Chapter 4 places a duty on owners to prepare and maintain firebreaks. The procedure in this regard and the role of adjoining owners and the fire protection association are dealt with. Chapter 5 places a duty on all owners to acquire equipment and have available personnel to fight fires.

The location of the proposed plant amidst extensive grasslands will require specific measures that will be included in the environmental management Programme (EMP) to prevent fires.

5.2.4. Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983)

The Act sets out measures to prevent the spread of alien vegetation. The legislation includes a list of alien and invasive species and the required measures to be taken in relation to these. The Act also provides for the regulation of control over the utilisation of agricultural resources in SA in order to promote the conservation of soil, water and vegetation (including wetlands). In accordance with the Act, authorisation is required to:

i. drain or cultivate any vlei, marsh or water sponge
ii. cultivate any land within the flood area of a water course or within 10 m outside the flood-area of a water course
iii. divert run-off from a water course, or
iv. burn veld, including wetland vegetation.

Regulation GNR 1048 of 24 May 1984 (as amended): makes provision of land through various measures, such as the prevention of soil erosion, the prevention of the disturbance of natural flow patterns and run-off, prevention of bush encroachment and makes provision for the restoration of land resources.

Measures will be included in the EMP to curb the spread of declared weeds and to prevent soil erosion.

5.3. Water

5.3.1. National Water Act (Act No 36 of 1998)

Water use is controlled by the National Water Act (Act no 36 of 1998)(NWA) and the enforcing authority is Department of Water Affairs (DWA). The NWA recognises that water is a scarce resource in South Africa and its provisions are aimed at achieving sustainable use of water to the benefit of all users. The provisions of the Act are thus aimed at discouraging pollution and waste of water resources.

Water use is defined broadly, and includes:

a. Taking water from a water resource;
b. Storing water;
c. Impeding or diverting the flow of water in a water course;
d. Engaging in a stream flow reduction activity reduce stream flow;
e. Engaging in a controlled activity identified as such in section 37 (1) or declared under section 38 (1);
f. Discharging waste or water containing waste into a water resource through pipe, canal, sewer, sea outfall or other conduit;
g. Disposing of waste in a manner which may detrimentally impact on a water resource;
h. Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i. Altering the beds, banks, course or characteristics of a watercourse;
j. Removing, discharge or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

A water use must be licensed unless it is listed in Schedule I as an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a license.

The Act also makes amongst others, provision for the prevention and remediation of pollution, the handling and emergency incidences and the registration of dams with a safety risk.

The proposed project does not require a water use licence. Water will be supplied by Rand Water and waste water will be disposed of into the sewer system – no water will be disposed of into the environment and no wetlands or water courses will be affected during construction or operation. Measures will however be included in the EMP related to the prevention of the pollution of storm water run-off, the prevention of water resource pollution and the handling of emergency incidences.

5.4. Waste

5.4.1. National Environmental Management Waste Act (Act 59 of 2008) and amendment R449 dated 2 June 2014.

In July 2009, the National Environmental Management Waste Act (Act 59 of 2008) came into effect. This Act requires that any holder of waste must take all reasonable measures to –

- avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;
- re-use, recycle or recover waste;

- where waste must be disposed of, to ensure that the waste is treated and disposed of in an environmentally sound manner;
- manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
- within that person's power, prevent any other person from contravening a provision of this Act in respect of the waste; and
- take reasonable measures to prevent the waste from being used for an unauthorised purpose.

The Minister published a list of waste management activities which require authorization under the Act. Government Notice R921 of 29 November 2013 lists Category A and Category B waste activities which requires any person undertaking such activities to perform a Basic Assessment Process or Scoping / EIA Process respectively. No person may commence, undertake or conduct a waste management activity listed in the GN R718 unless a license is issued in respect of that activity.

There are no activities associated with the proposed project that requires a Waste Management License Application. Any waste that will be generated during construction and operation, will be disposed of in a manner compliant with the Act.

5.5. Atmospheric emissions

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

The Act provides for the protection of air quality in South Africa. Amongst others, no person may without a provisional atmospheric emission license or an atmospheric license conduct an activity that is listed in the Act. The Act also makes provision for ambient air quality standards related to criteria air pollutants in SA.

The proposed project requires an air emission license given that activities as listed under the Act will be conducted. The manufacturing of poly-silicon from silica through the application of heat will result in air emissions as well as the manufacturing of glass. An air quality assessment will be done as part of the impact study associated with the application for environmental authorization.

5.5.2. National Dust Control Regulations, 2013: No R 827

The Regulations makes provision for the control of dust as well as to prescribe acceptable dust fall levels (as indicated in the table below).

Restriction Areas	Dustfall rate (D) (mg/m²/day, 30-days average)	Permitted frequency of exceeding dust fall rate
Residential area	D < 600	Two within a year, not sequential months.
Non-residential area	600 < D < 1200	Two within a year, not sequential months.

Dust will be generated by the proposed activities during construction. Adequate dust control measures will have to be instituted to ensure that the fall-out rates do not exceed the standards. Dust control measures will be included in the EMPr.

5.6. Declaration of the Vaal Triangle Air Shed Priority Area

The Vaal Triangle and surrounding areas has been declared in Regulation 365 of 21 April 2006 as a priority area) in terms of Section 18 (1) of the National Environmental Management: Air Quality Act 2004 (Act No. 39 of 2004) (AQA). The Midvaal Municipal area falls within this priority air shed.

Special interventions are now being made by the National Department of Environmental Affairs and Tourism (DEAT) to improve the air quality in the Vaal Triangle Airshed Priority Area. These interventions include a Priority Area Air Quality Management Plan (AQMP).

The EMPr will include measures to ensure that air quality in the region is not further deteriorated and to ensure compliance with the National Ambient Air Quality Standards

5.7. National Ambient Air Quality Standards

In terms of R 1210 of 24 December 2009, National Ambient Air Quality Standards were promulgated. The standards include those for Nitrogen dioxides (NO_2), Sulphur Dioxide (SO_2), Ozone (O_3), lead, benzene and Particulate matter (PM 10) and Carbon Monoxide (CO).

In terms of R 486 of 29 June 2012, National; Ambient Air Quality standards for particulate matter with an aerodynamic diameter less than 2.5 micron (PM 2.5) were promulgated.

The EMPr will include measures to ensure that air quality in the region is not further deteriorated and to ensure compliance with the National Ambient Air Quality Standards

5.8. Government Notice, R. 533 National Environmental Management: Air Quality Act (39/2004): Regulations regarding Air Dispersion Modelling, page 3 in Government Gazette 37804, 11 July 2014

The Regulations dictates the methodology for air dispersion modelling.

The air quality impact assessment modelling study will have to comply with the Regulations

5.9. National Environmental Management Air Quality Act, Act No. 39 of 39 of 2004, Declaration of Greenhouse Gases as Priority Air Pollutants, 14 March 2014

A person conducting an activity set out in Annexure I to this Notice which involves the emission of greenhouses declared as priority air pollutant in paragraph 2 in excess of 0.1 Megatonnes (109 kg) (Mt) or more annually or measured as $C0_2$-eq is required to submit a pollution prevention plan.

The following greenhouse gases or any other gases are declared priority air pollutants in terms of section 29(1){a) of this Act: (a) Carbon dioxide (CO_2); (b) Methane (CH_4); (c) Nitrous oxide (N_2O); (d) Hydrofluorocarbons (HFCs); (e) Perfluorocarbons (PFCs); and (f) Sulphur hexafluoride (SF_6).

During the air quality assessment, the amount of CO_2 released during the operations (glass manufacturing, will have to be calculated in order to determine if a pollution prevention plan under this Regulations have to be submitted.

5.10. National Environmental Management Act: Air Quality Act, 2004 (Act No 39 of 2004): Declaration of small boilers as a controlled emitter and establishment of emission standards, 1 November 2013

In terms of these regulations, small boilers have to comply with specified emission standards Small boilers are those with a design capacity equal to 10MW but less than 50MW net heat input from any fuel type. Operators have to submit emission reports to the relevant authorities.

A small boiler will be installed onsite. The air quality study will include the modelling of boiler emissions. The EMPr will also include measures to control emissions, measure and report emissions.

5.10.1. Environment Conservation Act, 1989 (Act No 73 of 1989) – Noise Control Regulations in terms of Section 25 of the Environment Conservation Act, 1989: GN 154 of January 1992

The Regulations makes provision for the control of disturbing and nuisance noise.

A noise *disturbance or nuisance* as defined in the national and provincial legislation means any sound which disturbs or impairs the convenience of any person. The Regulations describe a *disturbing noise* as noise that exceeds the ambient noise by more than 7 dB. This difference is usually measured at the location of the person experiencing the noise as disturbing. Therefore, if a new noise source is introduced into the environment, irrespective of the current noise levels, and the new source is louder than the existing ambient environmental noise by more than 7 dB, the noise can be construed as a disturbance.

The most applicable standard for use relevant to the proposed project is SANS 10103:2008 which provides typical rating levels for noise in various types of districts, as described in Table 1 below. SANS 10103:2008 defines daytime as between 06:00 to 22:00 hours and night time as between 22:00 to 06:00 hours. The rating levels in the table above indicate that in industrial districts the ambient noise.

Table: 1. Typical rating levels for noise in various types of districts (SANS 10103:2008)

Type of District	Equivalent Continuous Rating Level, LReq.T for Noise					
	Outdoors (dB(A))			Indoors, with open windows (dB(A))		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
Rural Districts	45	45	35	35	35	25
Suburban districts with little road traffic	50	50	40	40	40	30
Urban districts	55	55	45	45	45	35
Urban districts with one or more of the following: Workshops; business premises and main roads	60	60	50	50	50	40
Central business districts	65	65	55	55	55	45
Industrial districts	70	70	60	60	60	50

Noise levels in industrial areas should not exceed 60 dB(A) at night and 70 dB(A) outdoors during the day. The day / night (24hour) rating limit is 70 dB(A). These levels can thus be seen as the maximum target levels for any noise pollution sources.

The site of the proposed project has been zoned as “industrial” and is adjacent to many other sources of industrial and transport noise. It is not foreseen that the proposed project will contribute to the ambient noise levels in the area but noise control measures will be included in the EMPr.

5.11. Heritage resources

5.11.1. National Heritage Resources Act No 25 of 1999 (Act No 25 of 1999 as amended)

No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50 m in length;

(c) any development or other activity which will change the character of a site—

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

A heritage impact assessment study was executed during 2007 and no heritage objects of significance were found.

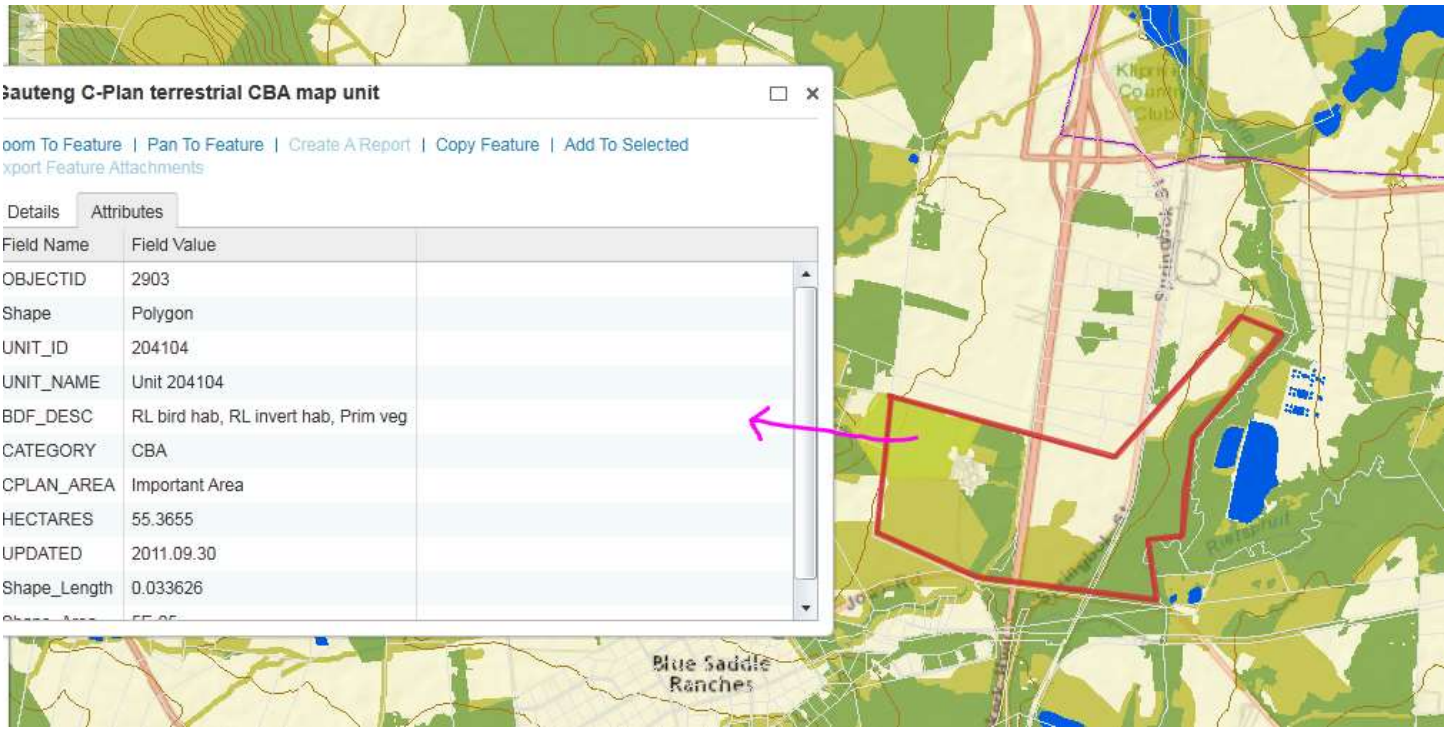
5.12. Policies, Plans, Guidelines, spatial tools and municipal development frameworks and instruments

5.12.1. Gauteng Conservation Plan

C-Plan version 3.3 became available in October 2011. The main purposes of C-Plan 3.3 are:

- to serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process;

- to inform protected area expansion and biodiversity stewardship programs in the province;
- to serve as a basis for development of Bioregional Plans in municipalities within the province.



Critical Biodiversity Areas (CBAs): CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an areas biodiversity characteristics, spatial configuration and requirement for meeting both biodiversity pattern and ecological process targets. CBAs include irreplaceable sites where no other options exist for meeting targets for biodiversity features, as well as best-design sites which represent an efficient configuration of sites to meet targets in an ecologically sustainable way that is least conflicting with other land uses and activities. These areas need be maintained in the appropriate condition for their category. Some CBAs are degraded or irreversibly modified but are still required for achieving specific targets, such as cultivated lands for threatened species. Refer to Section 2 for the biodiversity features that represent the Critical Biodiversity Areas and Section 5.2.1 for a summary of the CBA criteria

The proposed site contains Important areas and Ecological support areas as per Gauteng C Plan 3. There are no wetlands present on site. The site is adjacent to a water course, but the development will not encroach on the flood line/32m buffer sone. Listing Notice 3 is therefore relevant in terms of this application.

5.13. Municipal Biodiversity Summaries

(As per Sanbi: BGIS, 2015) Municipalities have a significant role to play in biodiversity conservation as part of their mandate to provide a safe and healthy environment for residents. In support of this role, the Department of Environmental Affairs (DEA) and the South African National Biodiversity Institute (SANBI) identified the need to provide municipalities with good quality biodiversity information that is easily accessible. The Municipal Biodiversity Summary project aims to make biodiversity information, including spatial data, available to municipalities to support them in their reporting responsibilities such as the drafting of State of Environment Reports. In addition, the project also provides municipalities with generic land-use planning and decision-making implications in terms of listed threatened ecosystems and other biodiversity features.

A municipal biodiversity summary has been developed for each municipality in South Africa. The summary provides a standard, national set of biodiversity information for each municipality which includes the following:

- Statistics for a selection of biodiversity features
- A terrestrial biodiversity summary map
- Shapefiles of biodiversity features for downloading
- Access to an interactive map to produce your own map of biodiversity features within a municipality
- A series of fact sheets related to the project

The main focus of the Municipal Biodiversity Summary Project is not as a land-use planning and decision-making tool as there are other tools, namely biodiversity sector plans and bioregional plans, which provide this role. Municipal biodiversity summaries are primarily a reporting tool providing biodiversity statistics, based on the best available national data, for municipalities.

However, in those municipalities where there is no biodiversity sector plan or bioregional plan the municipal biodiversity summary for the municipality can provide some guidance in terms of land-use planning and decision-making as it provides information on the location of threatened ecosystems and other biodiversity features within the municipality.

The Municipal Biodiversity Summary Project used national data generated as of December 2009, unless otherwise indicated. Additional finer-scale biodiversity information is available on BGIS for some municipalities in the country. It is important to note that when this is the case, the finer-scale information should be used for land-use planning and decision-making purposes.

Gauteng Conservation Plan 3.3 2011 is the most relevant biodiversity conservation plan for Midvaal Municipality and its information should be used for land use decision support. Luds Map: Gauteng C-Plan 3.3 (Terrestrial CBA map) is the appropriate map in which to assess the LUDS for the Midvaal Municipality

The proposed site contains Important areas and Ecological support areas as per the Land Use Development Support (LUDS). There are no wetlands present on site. The site is adjacent to a water course, but the development will not encroach on the flood line/32m buffer sone. Listing Notice 3 is therefore relevant in terms of this application.

5.14. Gauteng Environmental Management Framework

The Gauteng Provincial Environmental Management Framework is a legal instrument in terms of the Environmental Management Framework Regulations, 2010

The objectives of the EMF are to:

- To protect Critical Biodiversity Areas (CBAs as defined in C-Plan 3.3) within urban and rural environments
- To facilitate the optimal use of current industrial, mining land and other suitable derelict land for the development of non-polluting industrial and large commercial developments
- To ensure the proper integration Ecological Support Areas (ESAs as defined in C-Plan 3.3) into rural land use change and development
- To use ESAs as defined in municipal bio-regional plans in spatial planning of urban open space corridors and links within urban areas
- To focus on the sustainability of development through the implementation of initiatives such as:
  - Energy efficiency programmes, plans and designs;
  - Waste minimisation, reuse and recycling;
  - Green infrastructure in urban areas; and
  - Sustainable Drainage Systems (SuDS).

6. A Description of the Environment that may be affected by the Proposed Activity

6.1. Geographical

The spatial structure of the Midvaal municipal area is predominantly rural with extensive farming constituting approximately 50% of the total area of jurisdiction. Several natural features, which present significant tourism opportunities, occur in the area, of which the Suikerbosrand Nature Reserve, the Klip River and the Vaal River are the most prominent. The Suikerbosrand Nature Reserve is a formal nature reserve protected by law.

The region also falls within the Grassland Biome, which includes approximately one-third of the mammal species of South Africa. The Klip River is an important habitat for birds and small animals.

The map below provides an overview of the immediate location of the proposed project. As can be seen, the different land-uses in the area are mainly associated with industrial use, road and railway networks as well as residential areas. Informal houses occur on the site.

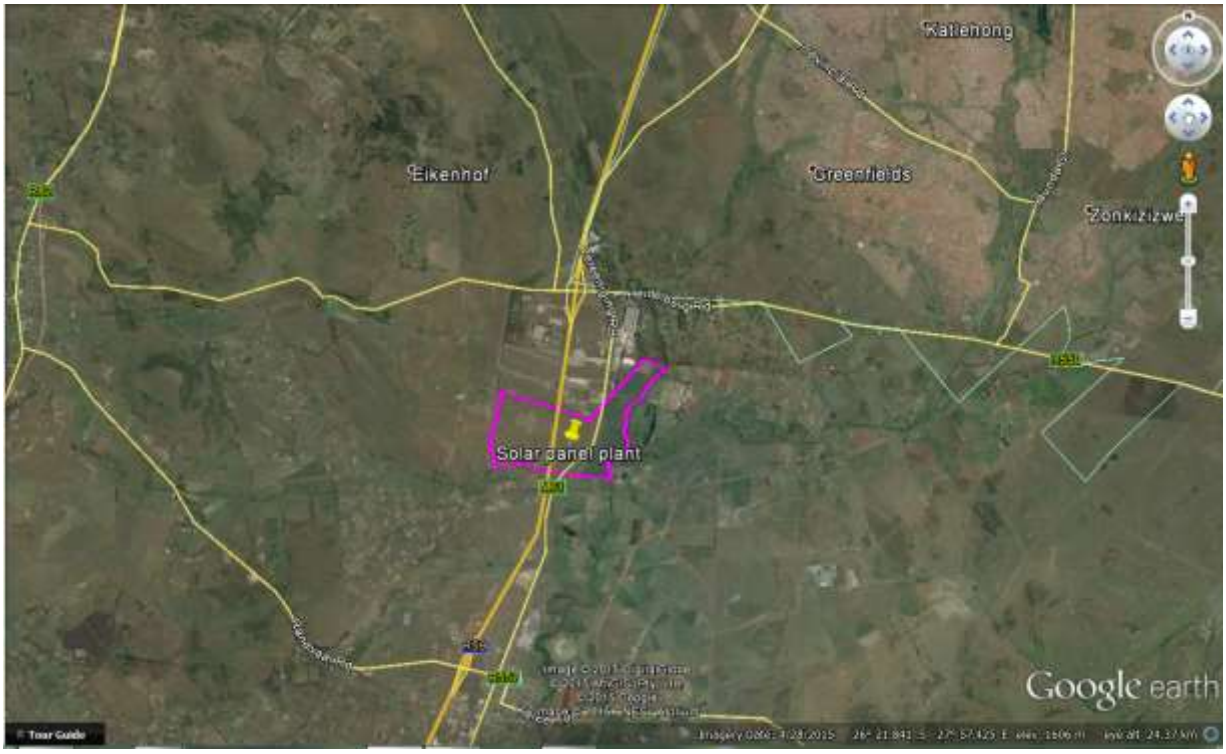


Figure 3: The location of the proposed activity

The Land Cover map below (obtained from BGIS, SANBI, 2015) indicates the land uses associated with the whole of the farm Waterval (of which the relevant Portion has been indicated by the red polygon. The land classes associated with the project area is “Cultivation, urban built –up and waterbodies”.

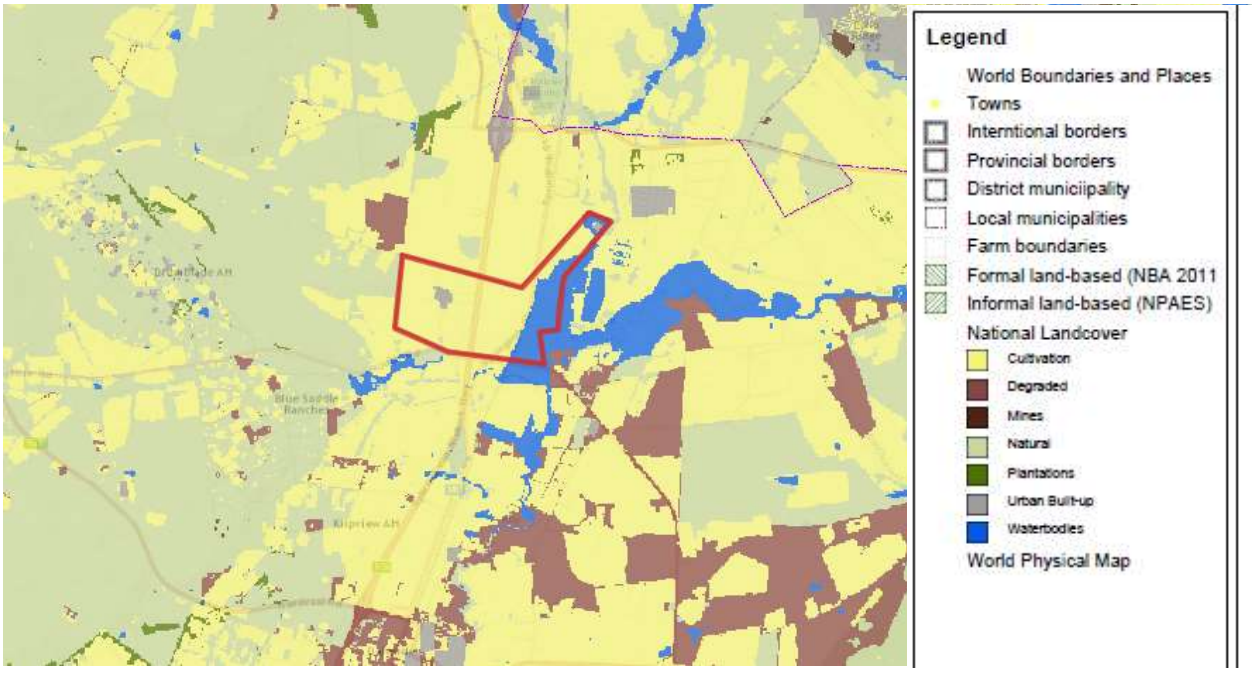


Figure 4: Land cover classes associated with the region (Data from SANBI, 2012)

6.2. Physical

Relief on the site varies around 1500 mamsl. The site is fairly flat with the highest point towards the western side of the site.

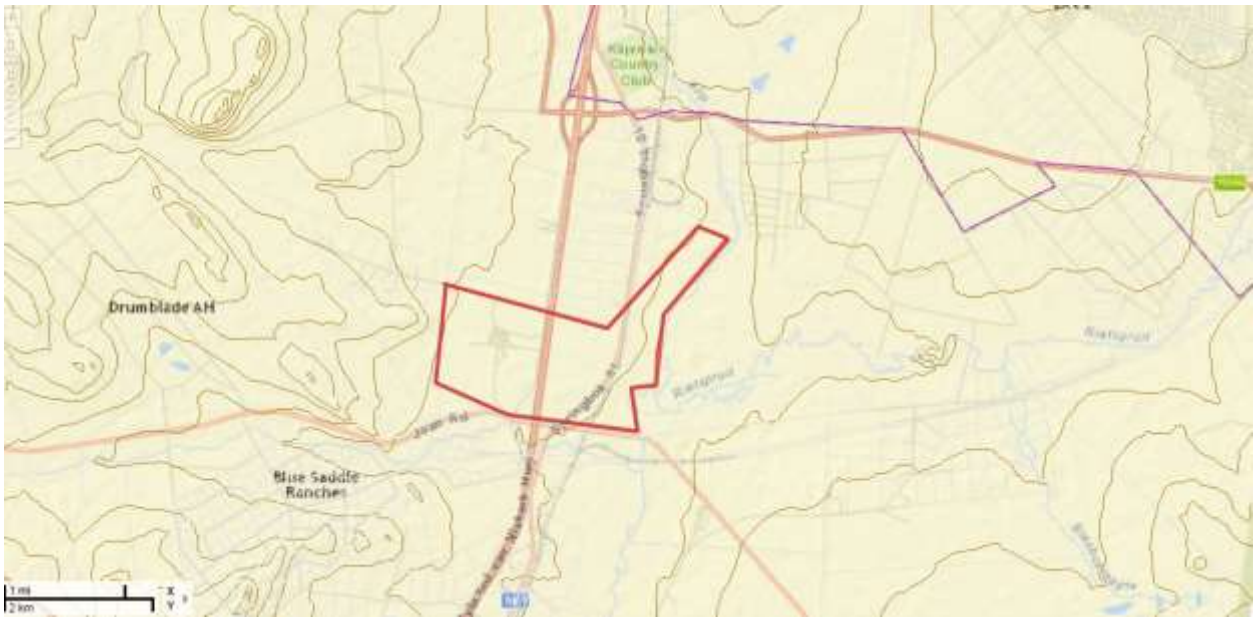
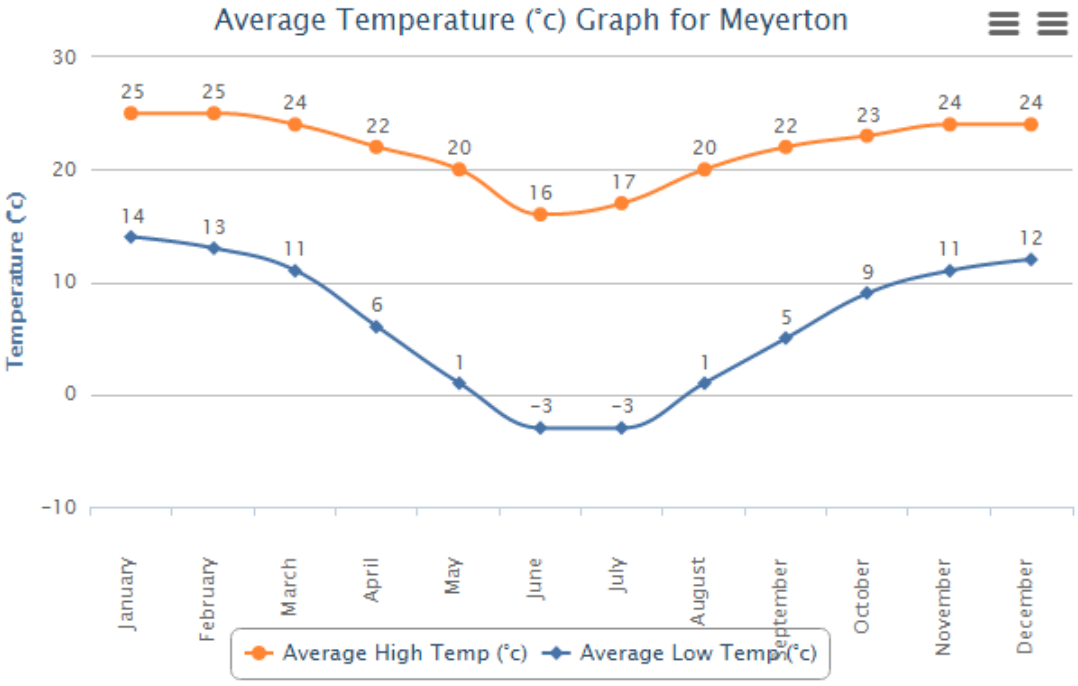
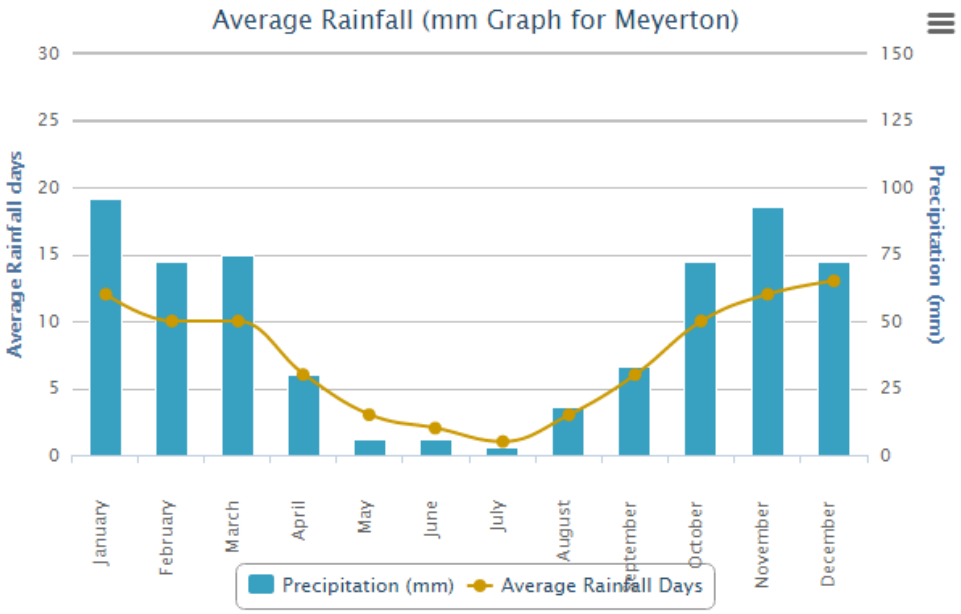


Figure 5: 20 meter contours associated with the project site, indicating the relative flatness of the site (SANBI, 2015).

6.2.1. Climate

The site falls within the summer rainfall area of South Africa. Daily summer temperatures range between 14°C and 25°C. Winter temperatures range between 1°C and 20°C. Spring temperatures range between 5°C and 22°C, while autumn temperatures range between 6°C and 22°C.





Note: The data for charts above are taken from year 2000 to 2012.

Figure 6: Average Temperature and rainfall for the Meyerton Area (from 2000 to current) (http://www.worldweatheronline.com)

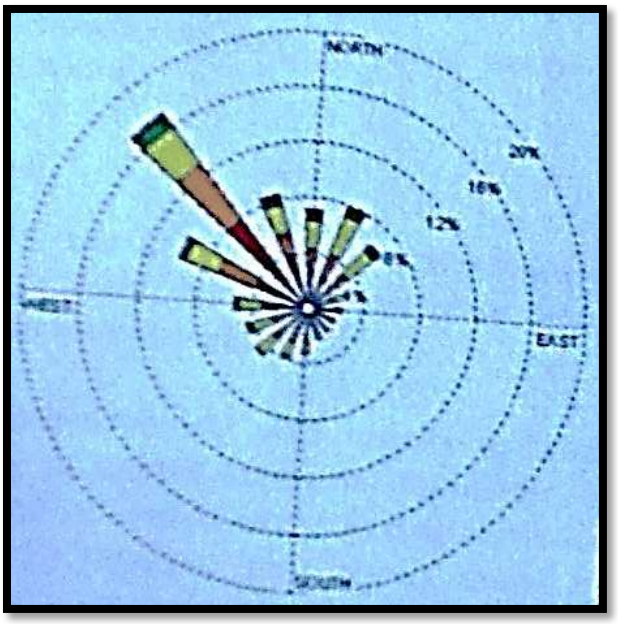


Figure 7: Annual average wind speed and direction – (Bohlweki Environmental, 2007)

Winds are predominantly north westerly. Strongest wind speeds are recorded in late winter, during the period July / August. More than half the data shows periods of calm (wind <0.5 m.s^{-1}).

6.2.2. Geology

The site is underlain by Dolomite as per the figure below.

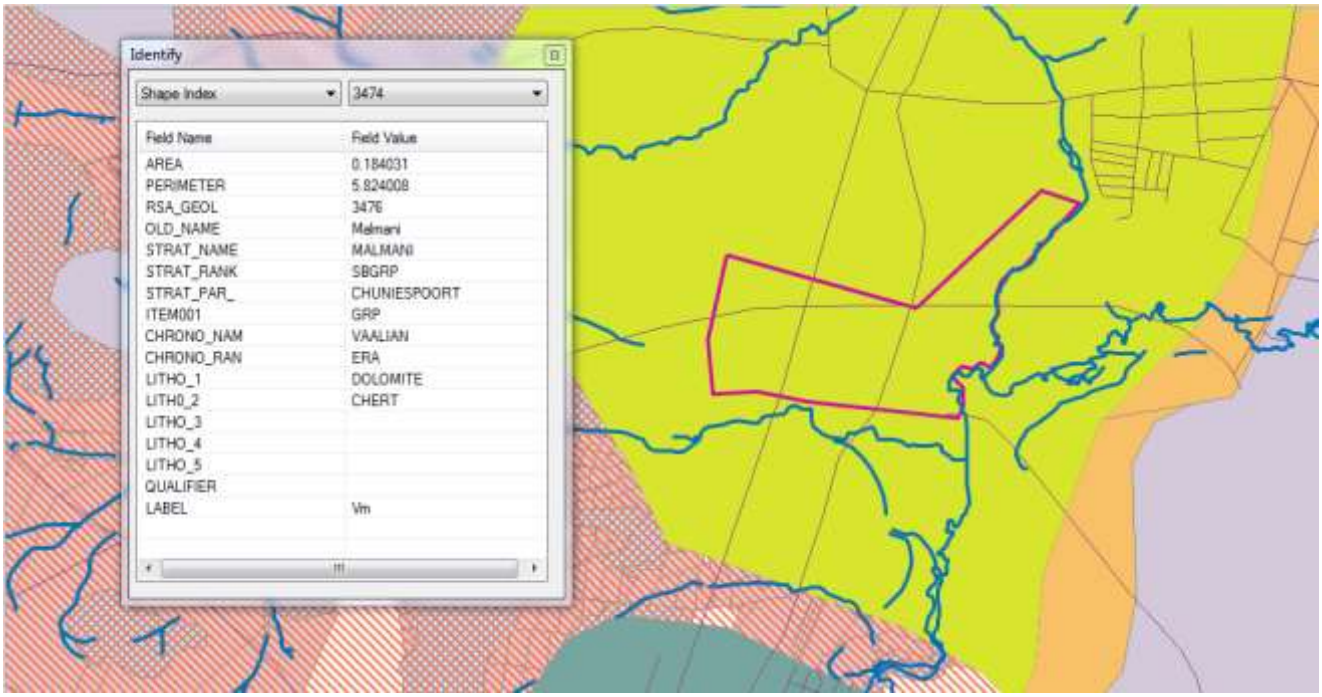


Figure 8: The geology associated with the Project Site

The presence of weathered or fractured dolomite onsite is not known at present. However, the presence of dolomite onsite will have implications for risk management related to the storage of hydrochloric acid onsite due to the ability of acids to dissolve the dolomitic elements of calcium magnesium carbonate.

Storm water control measures have to be implemented to avoid standing water onsite.

6.3. Soils

The soil on site is classified as Hutton soils with a fairly high percentage of sand content.

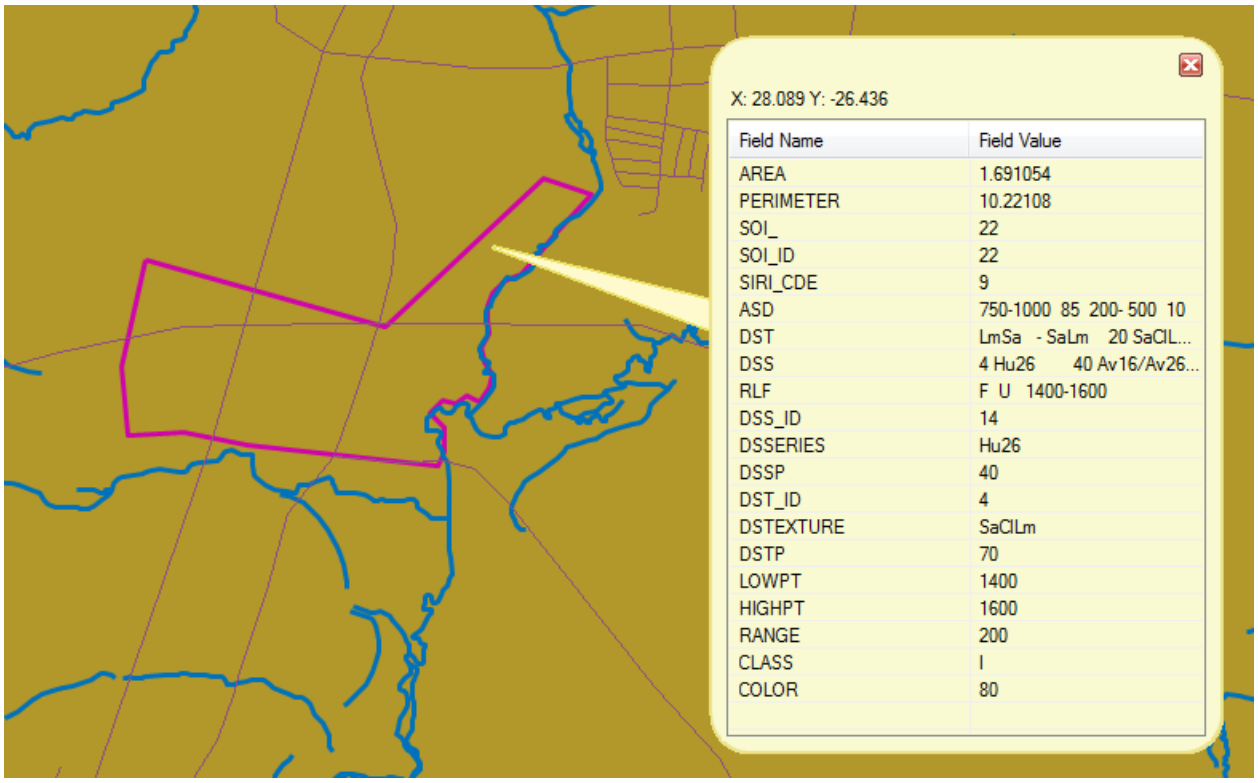


Figure 9: The soil onsite consist of Hutton Soils

The site also has the following soil characteristics:

Freely drained, structureless soils	Favourable physical properties	May have restricted soil depth, excessive drainage, high erodibility, low natural fertility

Storm water control measures therefore have to be implemented to prevent erosion.

6.4. Water

6.4.1. Water Courses

The site falls within quaternary catchment C22E. No wetlands are present on site. The Klipspruit (a perennial river) forms the eastern boundary of the site. No surface water will be abstracted and no effluent will be returned to the environment.

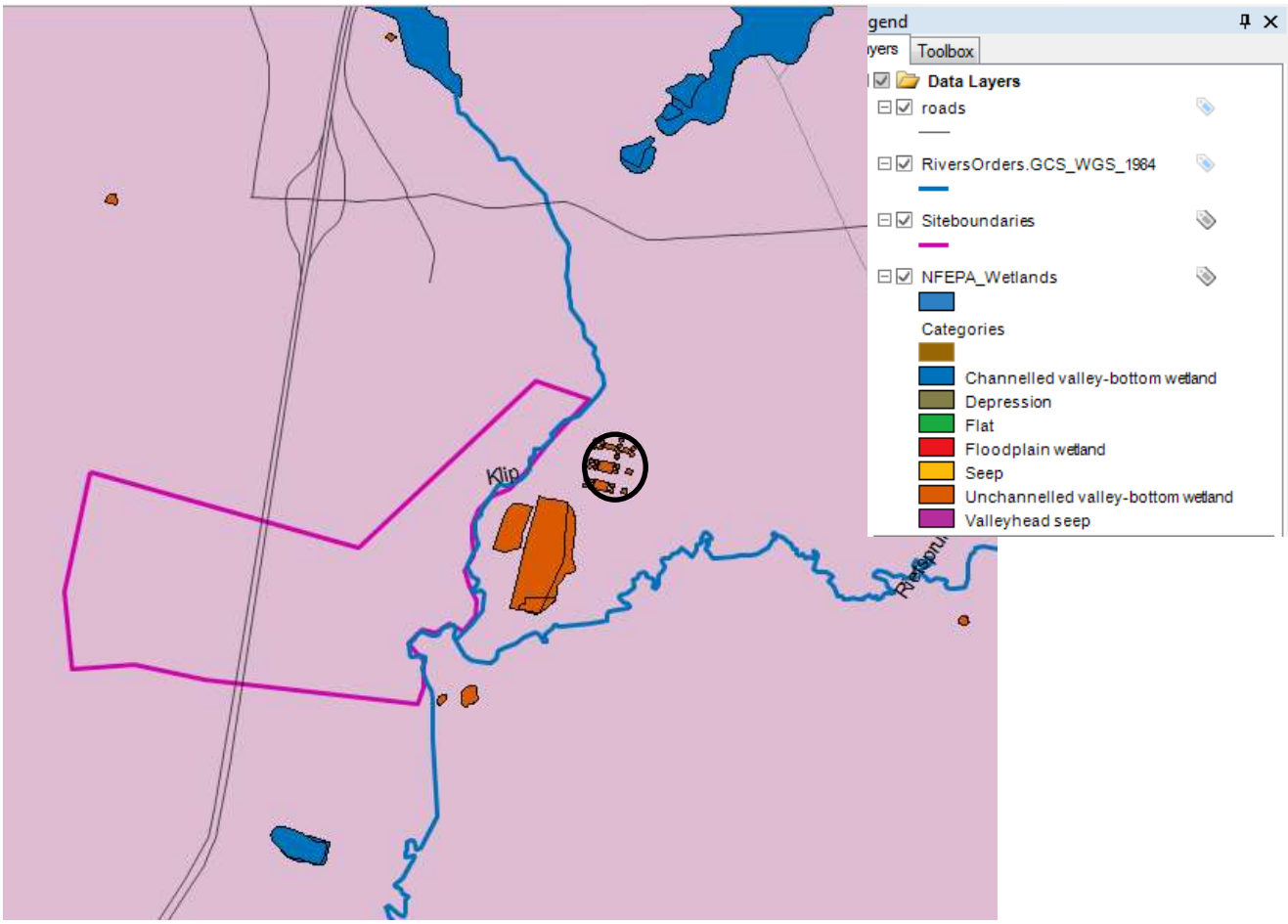


Figure 10: Water Courses in the region of the Project Site (data from DWA, 2013 and NFEPA, Sanbi)

Due to the proximity of the Klip River, stormwater run-off has to be managed to prevent siltation as well as contaminated run-off (from site operations) to negatively affect water quality of the surrounding water resources.

Development will be restricted to a 32meter buffer sone from the riparian edge of the water course.

6.4.2. Wetlands

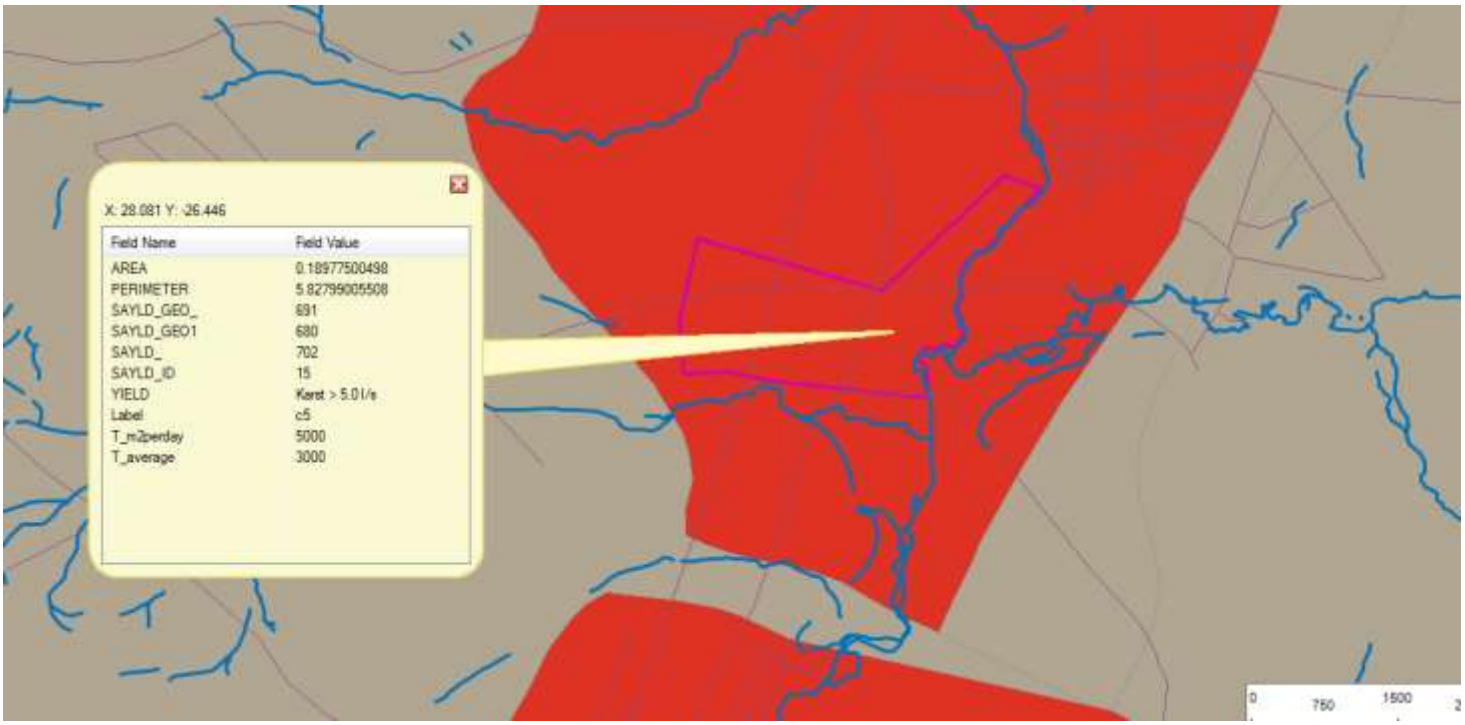
No evidence of existing wetland vegetation could be found on site, especially since the site has been completely reformed due to agricultural activities on-site. Channelled valley bottom wetlands are found upstream of the site as well as unchanneled valley bottom wetlands.

Figure 10 above also refers to wetlands which are in fact maturation ponds of a nearby waste water treatment works (black circle around unchanneled valley bottom wetlands)

No activities will take place within 500meters of any wetland and as such no wetland delineation or assessment will be required for the purposes of the impact assessment.

6.4.3. Ground Water

The site is underlain by geology with a high rate of transmissivity (average of 3000m^2 per day). As such, the potential for groundwater pollution is high in the event of spillages should the geology on site be weathered or fractured. The ground water levels are currently not determined.



6.5. Ecological

The site contains important areas (yellow) and Ecological support area (blue) as per Gauteng C Plan 3. There are no wetlands present on site. The site is adjacent to a water course, but the development will not encroach on the flood line/32m buffer sone.

The map below indicates the extent of the areas referred to above. The cross on the map indicates the maturation ponds of the Waste water treatment Works of the Midvaal Municipality.

Figure 11: The results of the C-Plan and National Freshwater Priority Areas (NFEPA) wetlands with reference to the site

During March 2007, a specialist faunal consultant assessed the site (a portion of the total Farm Waterval) as per the red diagram in the figure below.

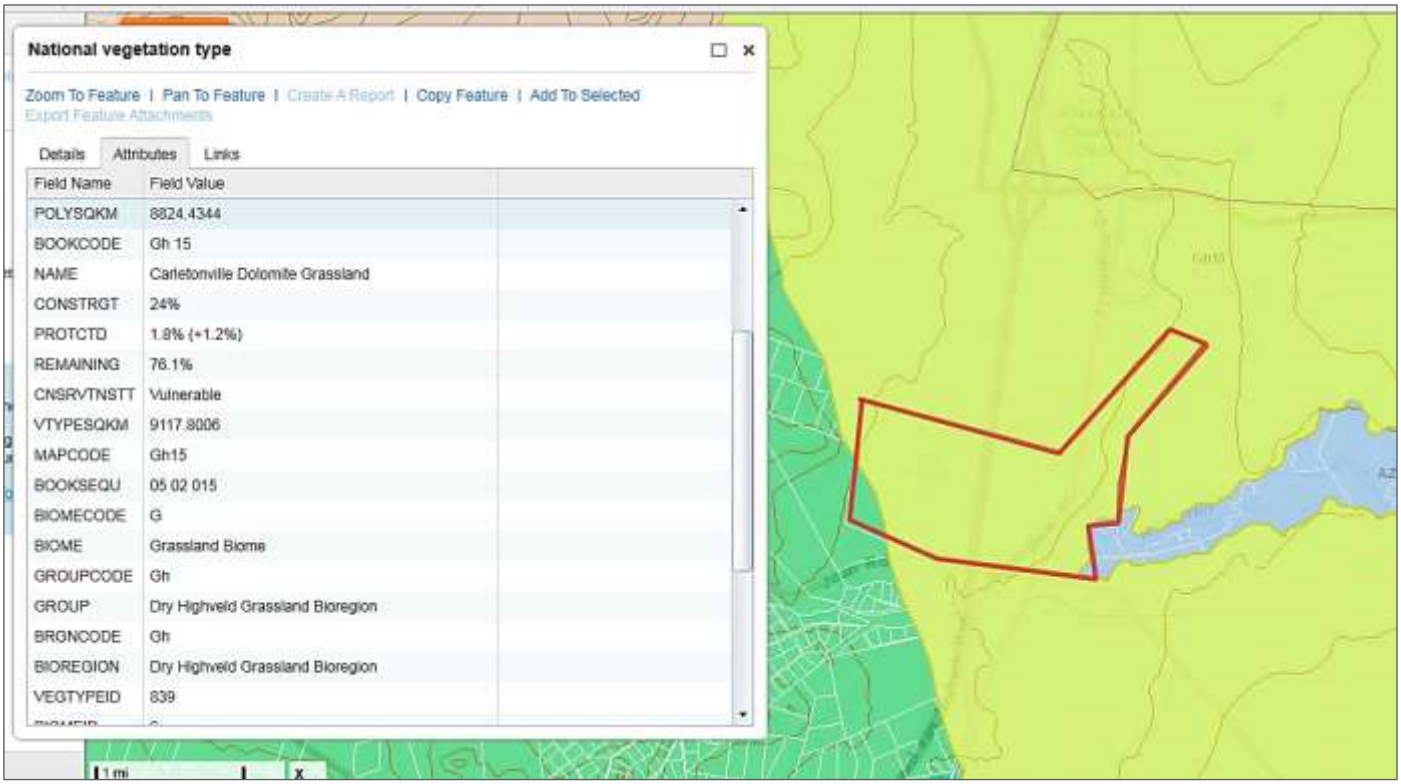
Figure 12: The study area of the 2007 assessments

The study found that the site is dominated by Eragrostis curvula (Teff pastures) and fallow weeds (Tagetes minuata, Acasia mearsnii etc.) invaded agricultural lands. Remaining grassland is relic patches and in various stages due to poor land management and overgrazing. Evidence of illegal hunting and snaring were found onsite, as well as extensive littering.

The study found that no sensitive habitats were observed onsite and that the current condition of the site offers limited suitable habitat and low conservation potential for animals and threatened animal species. The specialist recommended that drainage lines be fenced as no-go areas during construction. The study concluded that the loss of this site would have a medium-

low impact as a local scale and a low significance impact on a provincial scale. The old agricultural lands and surrounding grasslands have little or no conservation or biodiversity value. A rescue and recovery operation should however be implemented prior to construction with reference to remnant grass patches, termite mounds (harlequin snake) and rock outcrops.

Figure 13: The vegetation on-site is Carletonville Dolomite Grassland in the



Dry Highveld Grassland Bioregion (SANBI, 2015). The green corner of the site consists of Soweto Highveld Grassland.

A vegetation study by Dr GJ Bredenkamp and Dr. LR Brown undertaken during June 2007 also found that the area is degraded due to agricultural practices onsite and that very little natural vegetation remains intact. The area is regarded as having a low/low-medium conservation value. *Boophane distichia*, a medicinal plant was found onsite and it was recommended that these be relocated before construction commences.

Figure 14: Boophane distichia

In terms of invertebrate, a study was undertaken by CA di Toit and VC van der Merwe during April 2007. The assessment found that no invertebrates of conservation value were found in the transformed areas and that the area has a low conservation value. Vegetation Unit 3 however, should be kept as open space and rehabilitated. Refer to Figure 13 below.

Figure 15: Vegetation units of the study area, with specific reference to the location of Unit 3

In terms of the specialist assessments above, it must be noted that the whole of the proposed site was not assessed (refer to figure 11).

However, during a site visit by the EAP in February 2015, the remaining portion of the site which was not investigated was found to be in a similar degraded condition, with patches of remnant natural vegetation. Due to the time lapse between 2007 and 2015, it is recommended that a vegetation specialist review the site again to determine the status of natural habitat. Should similar conditions be found as in the 2007 study, no further specialist studies will be required.

6.6. Noise

A noise *disturbance or nuisance* as defined in the national and provincial legislation means any sound which disturbs or impairs the convenience of any person. The Regulations describe a *disturbing noise* as noise that exceeds the ambient noise by more than 7 dB. This difference is usually measured at the location of the person experiencing the noise as disturbing. Therefore, if a new noise source is introduced into the environment, irrespective of the current noise levels, and the new source is louder than the existing ambient environmental noise by more than 7 dB, the noise can be construed as a disturbance.

The most applicable standard for use relevant to the proposed project is SANS 10103:2008 which provides typical rating levels for noise in various types of districts, as described in Table 7 below. SANS 10103:2008 defines daytime as between 06:00 to 22:00 hours and night time as between 22:00 to 06:00 hours. The rating levels in the table above indicate that in industrial districts the ambient noise.

Table: 2. Typical rating levels for noise in various types of districts (SANS 10103:2008)

Type of District	Equivalent Continuous Rating Level, LReq.T for Noise					
	Outdoors (dB(A))			Indoors, with open windows (dB(A))		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
Rural Districts	45	45	35	35	35	25
Suburban districts with little road traffic	50	50	40	40	40	30
Urban districts	55	55	45	45	45	35
Urban districts with one or more of the following: Workshops; business premises and main roads	60	60	50	50	50	40
Central business districts	65	65	55	55	55	45
Industrial districts	70	70	60	60	60	50

Noise levels in industrial areas should not exceed 60 dB(A) at night and 70 dB(A) outdoors during the day. The day / night (24hour) rating limit is 70 dB(A). These levels can thus be seen as the maximum target levels for any noise pollution sources.

Based on feedback from the equipment manufacturers, noise in the immediate vicinity of the plant will not exceed 85 dB(A). It will however be required to execute a noise assessment study once the plant is operational, to determine whether noise impact thresholds will be breached. A noise baseline survey will have to be carried out (by switching of noise sources associated with the new plant). In the case of a breach, noise generating equipment will have to be screened off to prevent a noise nuisance.

6.7. Air Quality

The Midvaal Municipality is located within the Vaal Triangle Priority Area. The Air Quality Management Plan (AQMP) promulgated on 18 May 2009. The information below has been taken from the AQMP, 2009.

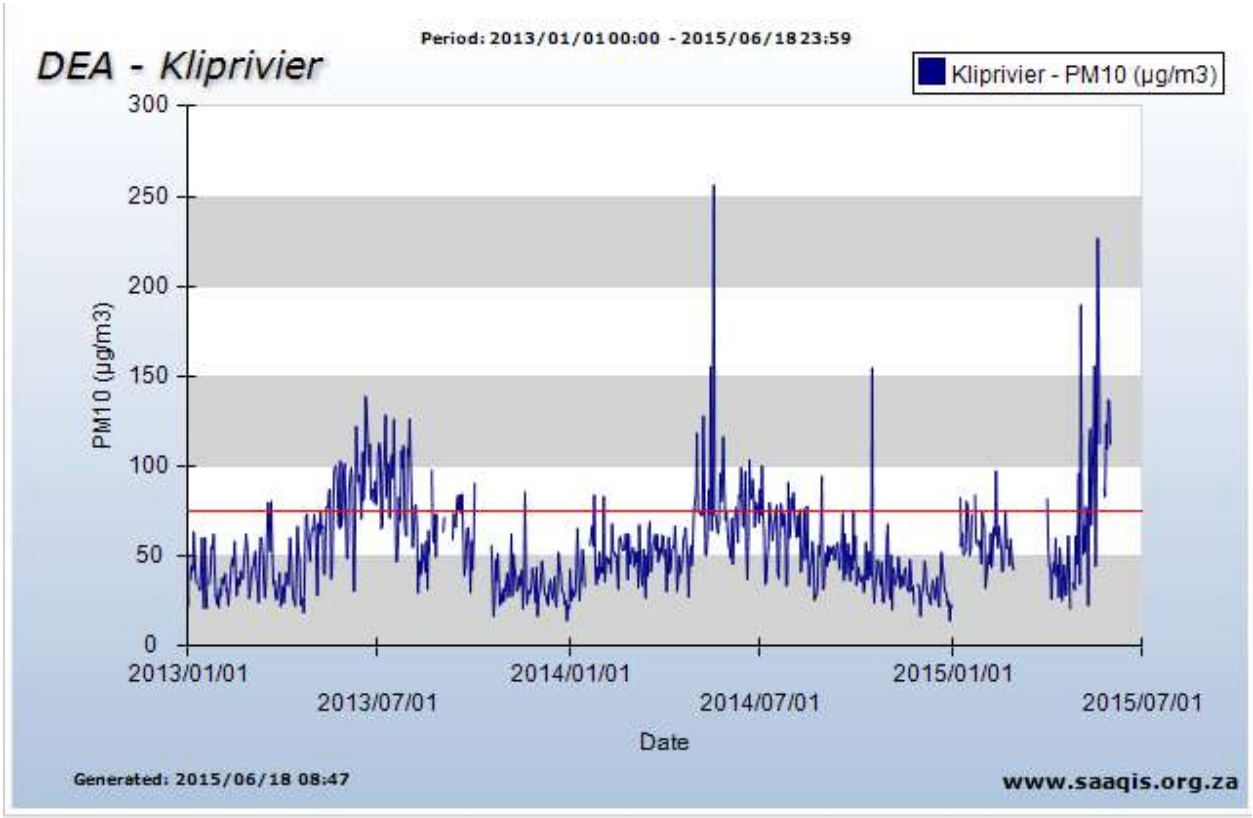
The Vaal Triangle is a highly industrialised area housing numerous industries, a coal fired power station, and various smaller industrial and commercial activities in addition to a few collieries and quarries giving rise to noxious and offensive gasses. The Vaal Triangle is also home to a number of large informal settlements mainly using coal and wood as fuel source. This in return impacts directly on the health and wellbeing of the people residing there. Other sources of concern contributing to the pollution mixture within the area include vehicle tailpipe

emissions, · biomass burning, water treatment works and landfill areas, agricultural activities and various other fugitive sources.

Priority Pollutants within the VTAPA: based on the available monitoring data, the major findings of the air quality assessment indicated that:

- Particulate (PM_{10}) concentrations are elevated over most areas of the VTAPA, particularly in residential areas where domestic coal burning is occurring and areas neighbouring major industrial operations.
- Sulphur dioxide ($S0_2$) concentrations are generally below the VTAPA air quality objectives in both the residential and industrial stations, although exceedances were recorded on several occasions at Jabavu and Orange Farm and in Sasolburg.
- Nitrogen dioxide (NO_2) concentrations are low in the VTAPA, although a seasonal signature is observed in $N0_2$ concentrations. Nitrogen dioxide concentrations have a regional impact within the Vaal Triangle.
- Carbon monoxide (CO) concentrations are not considered to be significant in the VTAPA.
- Ozone (0_3) concentrations are elevated in areas surrounding major industrial operations with exceedances of the one-hour average target recorded on numerous occasions. Ozone concentrations measured at Makalu are representative of known background concentrations in South Africa.

Simulated ground level concentrations, verified with ambient monitored data, indicated that the main pollutant of concern within the VTAPA is inhalable particulates (PM10). Six priority areas were identified within the VTAPA based on highest PM10 concentration zones or "hotspots". The areas were also selected to correspond with impact zones due to acute exposures to $S0_2$ and $N0_2$. Meyersdal forms part of the identified hotspot zone. The graphs below were obtained from the SAQIS website, measured at the Kliprivier monitoring station. The results indicate that PM_{10} and $PM_{2.5}$ are problematic (the data referred to are daily averages).


Period: 2013/01/01 00:00 - 2015/06/18 23:59
DEA - Kliprivier
Kliprivier - PM10 (µg/m3)
PM10 (µg/m3)
300
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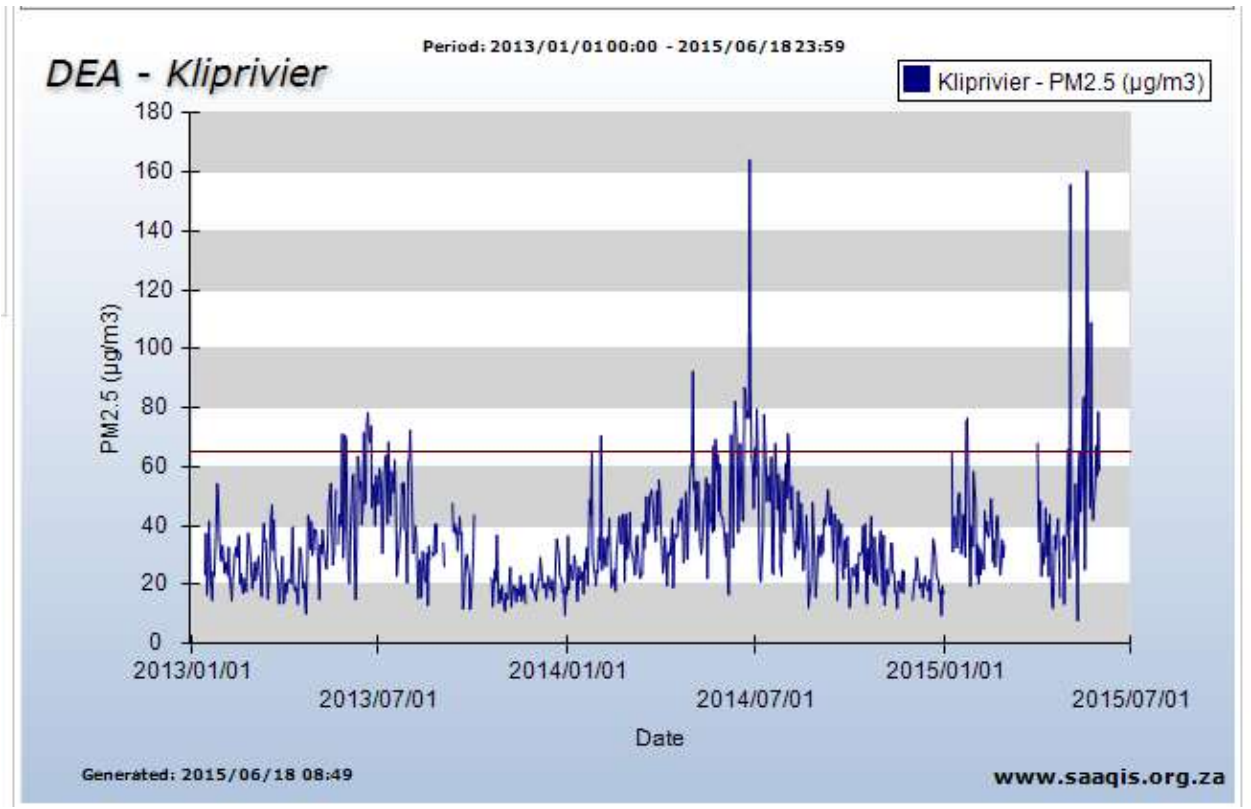
Period: 2013/01/01 00:00 - 2015/06/18 23:59
DEA - Kliprivier
Kliprivier - PM2.5 (µg/m3)
PM2.5 (µg/m3)
180
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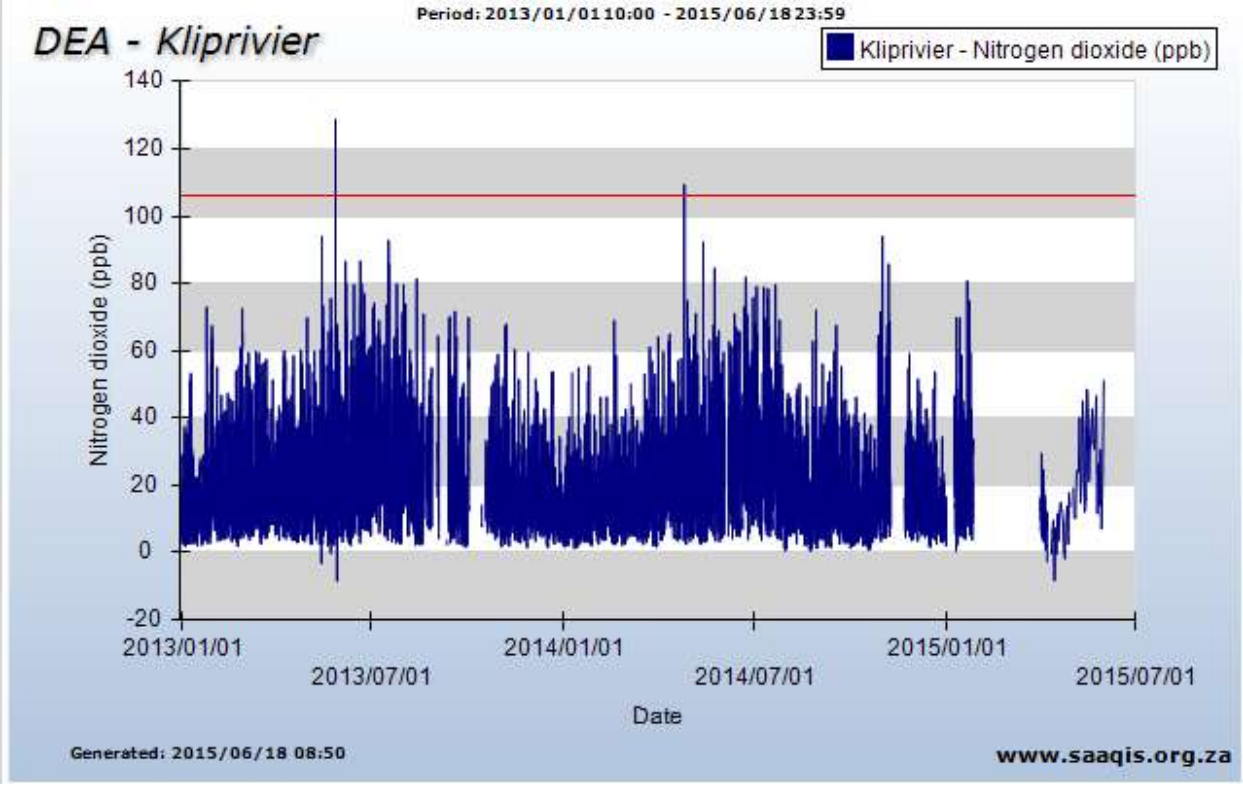


Particulate matter (PM_{10}) is a major problem in the surrounding area of the proposed project site. As such, measures will have to be included in the EMPr to ensure that the proposed project does not contribute to the levels of particulate matter in the area.

7. Cultural and Heritage

Professor TN Huffman from the Archaeological Resources Management from the University of the Witwatersrand visited the Farm Waterval 150 IR during February 2007 for the purposes of an EIA for the establishment of an Industrial Park. The findings of the site visits as per the March 2007 report were as follows:

As part of agricultural activities, farmers have cleared surface stones from the fields and placed them in piles. Some of the piles contained Earlier Stone Age, Middle Stone Age Artefacts. Due to fact that the artefacts were not in their original in situ position, the archaeologist concluded that they have a low significance. The recommendations of the report are as follows: “The sites have no research value beyond their present recording because they are not in primary context, and artefact numbers are low. Further investigation is therefore not required. If in-situ deposits are uncovered in the course of development, the South African heritage Resource Agency must be notified so that the material can be examined.” The study concluded that the development can proceed given that there are no archaeological reasons why it should not be allowed to proceed.

It is therefore recommended that the Waterval Solar Park project need not undergo another heritage assessment, given that the location is on the same site referred to above.

8. Socio-economic Overview of the Midvaal Region

The following information has been obtained from the Midvaal Integrated development Plan (IDP) of 2015/2016.

8.1. Social features

The Midvaal Municipality has an estimated population of 83 443 people, which constitutes approximately 8% of the Sedibeng District population and 0.7% of the Gauteng population. The 83 443 people represent an estimated 31 102 households of which, approximately 4 172 families reside in informal structures. The average annual population growth since 1996 has been around 4.27%. The table below (Midvaal IDP 2015/2016) provides an overview of the qualification levels of the Midvaal residents.

Qualification levels	GENDER	2011 ( )
1. No schooling	Male	4,95
	Female	5,02
2. Grade 0 - 7	Male	24,69
	Female	24,07
3. Grade 8 - 11	Male	32,16
	Female	32,20
4. Grade 12	Male	25,01
	Female	26,87
5. NTC1 – 6	Male	3,93
	Female	1,11
6. Certificate/Diploma	Male	5,59
	Female	7,15
7. Bachelor's or Higher Degree	Male	3,67
	Female	3,60

8.2. Socio-economic features

The Midvaal community is a relatively young (and growing) population, which will result in a larger labour force during the next five to ten years.

The majority of households earn between R6 000 – R30 000 per annum.

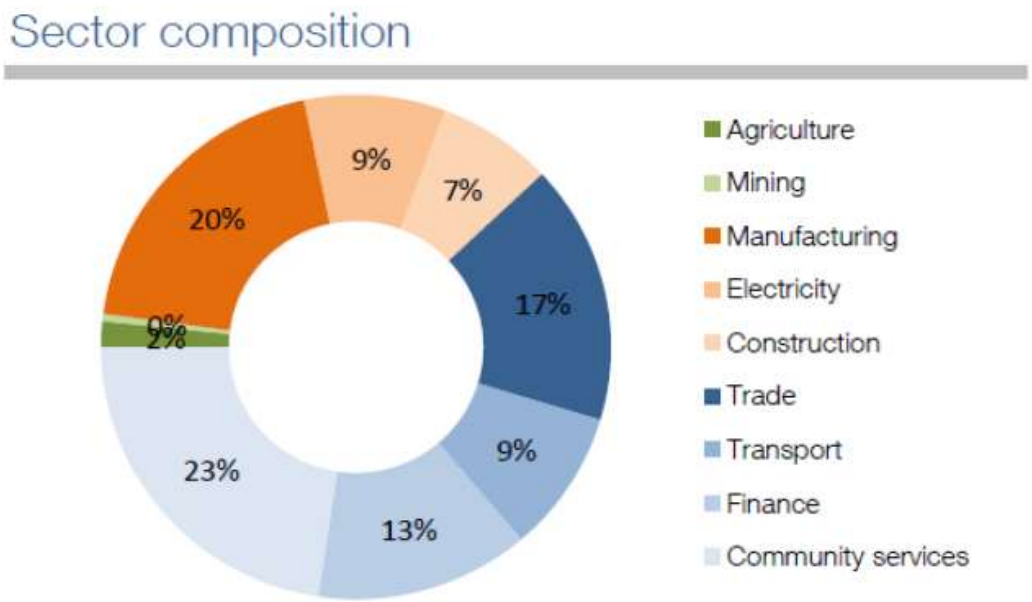
In comparison with the other local municipalities within the Sedibeng District Municipality, Midvaal has the highest Human Development Index and thus a better balanced society.

Several new businesses have invested in the Midvaal region during the last few years, creating employment opportunities for the local community. The unemployment level in the Midvaal region is approximately 18.8% and there has been a consistent decline recorded in the unemployment rate since 2002.

The major employment sector is services, followed by manufacturing, whilst the following sectors contribute to the GDP of the municipality:

- Mining (0.4%)
- Agriculture (2.6%)
- Electricity (5.7%)
- Construction (5.7%)
- Manufacturing (25.1%)
- Services sector (60.4%).

According to IHS Global Insight, Social Services, followed by Manufacturing and Trade, is the largest contributors to the Midvaal economy, see figure below.



It is evident from the information above, that the area is in great need for the creation of additional job opportunities for unskilled and low level skilled workers to address the levels of unemployment. The proposed project will contribute to the creation of job opportunities.

9. Need and Desirability of the Proposed Activity

The proposed project has several benefits that are aligned with local, regional, national and international initiatives. It will also impact positively on several key issues of concerns. The benefits and positive impacts are described below.

9.1. Electricity Generation

The project will supply its own electricity for the manufacturing plant and would therefore not place a further burden on the National Grid.

The project will also supply locally manufactured solar panels which will support the drive for renewable energy in South Africa, supporting the national targets for the generation of renewable energy.

The solar panels that will be manufactured are more efficient than the currently available solar panels.

9.2. Creating job opportunities

The proposed project will create 1200 jobs. Furthermore it will create nearly one million jobs through the provision of solar panels which will be provided amongst others to low cost housing initiatives and housing supplied by Government.

9.3. Economic benefits:

The project will furthermore support the following municipal initiatives:

Midvaal Spatial Development principles: Development Principle 7. To promote the development of a diverse range of industrial and commercial activities in the Midvaal area with specific focus along the R59-Corridor and at the designated nodal points.

KPA 8 (Economic growth and development): To facilitate and promote local economic growth and develop the skills capacity of the local community

The World Bank provided a loan of 26 Billion Rand for the proposed project. This will have a significant positive impact on the South African Economy.

10. Identified Alternatives to the Proposed Activity

10.1. Site Alternatives

No site alternatives have been provided for the proposed project. The reason for the selection of the specific site is guided by the following:

- The site is owned by the developer and is the only portion of land owned by the developer that is big enough to accommodate the development
- The site has specific infrastructure in the vicinity that would support the development, namely a gas pipeline from which gas can be obtained, a water pipeline from which water can be obtained, a sewer line to which a connection can be made, an electrical substation to which a connection can be made (to supply additional electricity to the site and to allow for an opportunity to put additional energy generated from the PV plant into the national grid).
- The site is zoned as industrial
- The site is fairly level which is an important criteria for the installation of solar panels for the generation of energy. Sloping sites will reduce the amount of sunshine available per day.

10.2. Technology Alternatives

Fluidized bed reactors have excellent heat and mass transfer characteristics and can be utilized for Silane decomposition to overcome the energy waste problem in Siemens process. The energy consumption is reduced because the decomposition operates at a lower temperature and cooling devices are not required. In addition fluidized beds have high throughput rate and operate continuously reducing further capital and operating costs. The final product consist of small granules of high purity silicon that are easy to handle compared to powder produced by free space reactor (Odden et al., 2005).

The MG-Si, which costs about US$1/kg, is produced by the reduction of natural quartzite (silica) with coke (carbon) in an electric arc furnace. This method of polysilicon production is very energy intensive [13], and it produces large amounts of wastes, including a mix of environmentally damaging chlorinated compounds. About 80% of the initial metallurgical-grade silicon material is wasted during the process

Energy consumption is the main cost driver for poly-silicon production process which is highly energy intensive.

Technological solutions exist to the discharges that occur in PV production. For instance, in polysilicon production, discharge of $SiCl_4$, a hazardous chemical, has been a huge cause of concern. The use of cold hydrogenation technology increases conversion rates of $SiCl_4$.

The developers of the proposed project have already chosen the following technologies to minimize environmental impacts associated with the project:

- Closed circuit use of water leading to zero liquid effluent
- Reduction in the use of electricity from the national grid
- Low cost due to custom designed plant with effective melting technology for the manufacturing of glass
- Flexibility due to the modular nature of the technology
- Environmentally friendly due to less energy consumption due to combined gas and electricity melt (electricity will be supplied by the PV plant)
- Waste glass from the production process will be collected and returned to the production plant, thus zero waste from this process
- The silicon technology which will be used is the leading edge technology providing a higher silicon yield at comparable product quality
- Hydrochlorination is much less energy intensive than direct chlorination and thermal converters
- Any waste comes in the form of non-hazardous neutral salts
- No vent gasses
- Simple and clear process allows for faster ramp-up to target and operational stability

As such, no technology alternatives are available in terms of performance and environmentally friendly.

10.3. Alternative Design

The proposed project has been designed to fit on the available site. Sensitive areas will be avoided and construction will take place on the degraded areas. As such, no alternative designs have to be considered.

10.4. Scheduling Alternatives

No detailed information regarding the proposed time frame for the project is available yet, however it is anticipated that construction will start as soon as possible after all the necessary approvals have been obtained. Given that the project footprint will be placed on an existing brownfields site and that all associated infrastructure is required for the operation of the proposed plant, few viable scheduling alternatives is available.

10.5. Input Alternatives

No input alternatives are available, as photovoltaic cells can only be manufactured from silica and glass to ensure optimum efficiency.

Water will be obtained from Rand Water and all input materials, such as silica sand, will be obtained locally, therefore supporting the local economy.

The glass furnace will be heated by gas, which is a more environmentally friendly option than diesel or solid fuels – leading to reduced air emissions.

10.6. No-go option

The no-go option will lead to severe opportunity losses for:

- Employment creation
- CDM credits
- Renewable energy generation
- Contribute to relieving pressure on the national electricity grid
- Improvement of air quality in South Africa due to the availability of locally manufactured PV units
- Economic development in the region as well as economic investment.

No benefits will be obtained from a no-go option.

11. Methodology to Rate and Assess Significance

Significance is the product of probability and severity rating divided by the mitigation potential:

$$Significance = \frac{Probability \times Severity}{Mitigation}$$

Probability and Severity will be determined based on the following:

11.1.1. Determining the Severity of an Impact

Determination of the severity of an impact is a function of intensity, duration and extent, divided by the extent to which mitigation can successfully be applied:

$$Severity = intensity + duration + extent$$

Each of the 4 factors used to determine the severity of an impact, are described below:

11.1.1.1. Intensity factor

The level of intensity is the sum of volume, toxicity, social impact and ecological impacts.

Note that either Volume A or Volume B is used (refer to the description) but never both at the same time.

Table: 3. Intensity factor rating and description

	Low (1)	**Medium (3)**	**High (5)**	Sub Total (Sum)
Volume (A) (refers to process input and output substances/ material or products)	Less than 80 m^3 at any one time (or low volumes relative to industry/commercial standards)	Between 80 and 300 m^3 at any one time (or medium volumes relative to industry/ commercial standards)	In excess of 300 m^3 at any one time (or high volumes relative to industry/ commercial standards)	
Volume (B) (refers to natural resources)	Relatively small	Medium	Large	
Toxicity	Toxicity is on par with everyday goods in wide-spread use and is biodegradable.	Toxicity can be compared to those that have to be handled with some caution and are non-biodegradable.	Toxicity is on par with toxic/dangerous/ flammable substances that are non-biodegradable.	
Social	No or very limited impact	Some impact on immediate communities, but cannot be considered as disruptive	Major disruptive impact on surrounding communities	
Ecological	Natural functions not affected or negligible.	Environment affected but natural functions and processes continue (Some damage or wildlife injury may occur). Impact is reversible or irreplaceable loss will not occur	Environment affected to the extent that natural functions are altered to the extent that it will permanently or over the long term cease (Major damage or wildlife injury could occur). Irreplaceable loss will occur.	
			Total	

11.1.1.2. Duration

Duration is assessed and a factor awarded in accordance with the following:

Table: 4. Duration factor rating and description

	Duration of Impact	Duration factor
Short term	The duration of the is impact is 1 Year or less	Factor 1
Medium term	The duration of the is impact is 1-5 Years	Factor 3
Long term	The duration of the is impact is 5 to 25 years	Factor 4
Permanent	The duration of the is impact is longer than 25 years and can be considered as permanent	Factor 5

11.1.1.3. Extent

Describes the physical extent the impact and factors are awarded according to the following:

Table: 5. Extent factor rating and description

	Extent of the impact	Extent factor
Site	The impact only exists within the activity's footprint	Factor 1
Local	The impact could impact on the whole or a considerable portion of the properties on which the activity is undertaken as well as neighbouring properties	Factor 3
Regional	The impact could affect the area, neighbouring as well as other areas further away than the immediate neighbours	Factor 5

11.1.2. Probability

Probability describes the likelihood of the impact actually occurring, and is rated as follows:

Table: 6. Probability factor rating and description

	Possibility that impact will occur	Rating
Improbable	Low possibility of impact occurring due to design or history	1
Probable	Distinct possibility that impact will occur	2
Highly probable	Most likely that impact will occur	3
Definite	Impact will definitely occur	5

11.1.3. Significance Rating

Following from the above, the Significance rating can now be determined as follows:

Significance = severity x probability

The significance rating thus determined should influence the proposed project as described below:

Negligible (calculated Significance Rating < 25)

- *Positive and negative impacts of negligible significance are unsubstantial and should have little or no influence on the proposed development project.*

Low (calculated Significance Rating 25 < 50)

- *The impact is limited and should not have a material effect on the decision to continue. Management intervention is required.*

Moderate (calculated Significance Rating 50 < 90)

- *Positive impact: Should weigh towards a decision to continue, should be enhanced in final design.*
- *Negative impact: Should weigh towards a decision to terminate proposal, or mitigation should be performed to reduce significance to a low significance rating.*

High (calculated Significance Rating > 90)

- *Positive impact: Continue*
- *Negative impact: If mitigation cannot be implemented effectively (into the moderate category), proposal should be terminated.*

The table below provides an example of how the unmitigated significance ratings are calculated:

Table: 7. Calculating of Significance Ratings (Unmitigated)

Probability		***Severity***						**Severity Rating**	**Significance Rating** (Probability x Severity rating)	
		Intensity		*Duration*		*Extent*				
Probable	**2**	*Low*	*4*	*Short Term*	*1*	*Local*	*2*	**7**	**14**	**Negligible**
Probable	**2**	*Low*	*4*	*Medium Term*	*3*	*Regional*	*3*	**10**	**20**	**Low**
Definite	**5**	*Medium*	*12*	*Medium Term*	*3*	*Local*	*2*	**19**	**85**	**Moderate**
Definite	**5**	*High*	*20*	*Permanent*	*5*	*Site*	*1*	**26**	**180**	**High**

11.1.4. Mitigation

Mitigation will be calculated as follows:

Table: 8. Mitigation factor rating and description

Description	Factor Allocated
Mitigation is not possible or positive impact of mitigation is negligible. Impact remains irreversible.	1
Mitigation is possible to some extent with moderate levels of positive impact. Impact is largely reversible with only a small portion that remains as irreversible.	2
Mitigation is possible with moderate to high levels of positive impact. Impact is reversible.	3
Mitigation is possible to such an extent that all negative impacts are reduced significantly or eliminated. Impact is completely reversible.	4

$$Significance = \frac{intensity + duration + extent}{Mitigation\ potential}$$

11.2. Description and Assessment of Impacts Associated with the Proposed Project

The following aspects associated with the proposed project have been identified and will be assessed for their respective impacts:

Table: 9. Aspects and Impacts associated with the proposed project

ASPECT	IMPACTS TO BE CONSIDERED	Pre-mitigation significance rating	Mitigation measures	After mitigation significance rating
		PHYSICAL		
Hydrology	• The increase in concrete and impermeable surfaces will increase runoff from the site and increase erosion	39	Storm water management plan	10
	• Excavation and construction may lead to soil washing away and increasing sediment loads in surface runoff	20	Storm water management plan	7
	• Increased sediment loads in surface run-off from raw material stock piles	57	Storm water management plan	14
Noise	• Increase in ambient noise levels in the area due to construction activities, increase in traffic and operations	39	Construction times and delivery of materials to site is to be limited to day light hours Screening of high noise generation areas or equipment	13
Air Quality	• Increase in dust emissions during construction	36	Dust suppression measures to be implemented	18
	• Increase in localized emissions of particulate matter	115	Air quality control equipment will be installed with a 90% efficiency rating. Monitoring and maintenance plan to	29

ASPECT	IMPACTS TO BE CONSIDERED	Pre-mitigation significance rating	Mitigation measures	After mitigation significance rating
			be developed and implemented. Small Boiler operation manual to be compiled to ensure optimum combustion temperatures and air flow is maintained, to minimize emissions related to incomplete combustion. Boiler operators are to be trained in the procedure. Reciprocating engines must be maintained to ensure compliance with emission standards. Air emission monitoring should be done annually to determine compliance and provide data for reporting to the relevant authority.	
	• Increase in dust and diesel exhaust fumes from increased truck movement to and from the site, delivering raw materials	75	Dust suppression measures to be implemented Maintenance of trucks to prevent inefficient combustion and high emission rates of exhaust gasses	38
	• Accidental releases of HCL vapours and Monosilane	75	Engineering controls, monitoring and maintenance	38
	• Emissions from the manufacturing process of glass (furnace, floating bath, metal oxide coatings) and silicon (reactor, disproportionation and deposition units).	75	Engineering controls, monitoring and maintenance. Air emission monitoring and reporting.	38
	• Reduced carbon emissions associated with energy from a renewable source	110	Positive impact	110

ASPECT	IMPACTS TO BE CONSIDERED	Pre-mitigation significance rating	Mitigation measures	After mitigation significance rating
	• Storage of raw materials	75	Dust suppression measures to be implemented. Conveyer belts and hoppers to be enclosed to prevent dust emissions	38
Solid and liquid Waste	• Waste produced during construction may impact on the surrounding land	30	Re-use of waste material to take place where viable. Waste management plan to be compiled and implemented.	8
	• Increase in the volumes of general office waste generated on site due to the increased number of people present on site	39	Office waste will be managed with current waste generated on site	13
	• Increase in the volumes of sewage generated on site due to the increased number of people present on site	51	Adequate sanitation facilities on-site to be ensured	17
BIOLOGICAL				
Flora	• Alien species may establish due to disturbance during construction and operation of the solar farm	33	Quarterly inspection of the site Rehabilitation and re-vegetation of disturbed areas with a suitable specie	8
	• Presence of medicinal plants on site which may be disturbed during construction	32	Search and rescue before construction commences	11
Fauna	• Presence of fauna on site may be disturbed or killed during construction	20	Search and rescue before construction commences	10
	• Restricted movement of animal species due to fencing of the site	20	Search and rescue before construction commences	10
SOCIO-ECONOMIC				

ASPECT	IMPACTS TO BE CONSIDERED	Pre-mitigation significance rating	Mitigation measures	After mitigation significance rating
Employment	• Increase in local employment opportunities.	80	Positive impact	80
Economic	• Positive impacts on local economic development through the increase in regional domestic product	64	Positive impact	64
Electricity supply	• Positive impact on the amount of electricity available in SA	65	Positive impact	65
Renewable energy	• Positive impact on the availability of renewable energy	85	Positive impact	85
RESOURCE USE				
Use of non-renewable resources	• The use of non-renewable resources during construction	40	Use of recyclable material and locally obtained materials where feasible	38
SPILLAGES				
Spills	• Pollutants such diesel fuel and hydrochloric acid may lead to soil pollution and infiltrate groundwater.	26	Spill management plan Bunding around all liquid substances stored on site	9
FIRES AND EXPLOSIONS				
Emergencies	• Leakages of monosilane, HCL vapours and exposure of monosilane to ambient temperatures	85	Engineering controls, monitoring and maintenance Compilation of an emergency	38

ASPECT	IMPACTS TO BE CONSIDERED	Pre-mitigation significance rating	Mitigation measures	After mitigation significance rating
	may lead to explosions		management plan	

After mitigation measures have been applied, it is evident that none of the identified negative impacts are of a high or even moderate significant rating. Six positive impacts have been identified.

11.3. Cumulative Impacts

Two of the impacts identified could have cumulative impacts when considering impacts emanating from activities in the vicinity of the site and in the broader region. These are related particulate matter emissions.

The area falls within the Vaal Triangle Priority Area and several other large scale sources are located within the region. The Vaal Triangle is a highly industrialised area housing numerous industries, a coal fired power station, and various smaller industrial and commercial activities in addition to a few collieries and quarries giving rise to noxious and offensive gasses. The Vaal Triangle is also home to a number of large informal settlements mainly using coal and wood as fuel source. Other sources of concern contributing to the pollution mixture within the area include vehicle tailpipe emissions,' biomass burning, water treatment works and landfill areas, agricultural development activities and various other fugitive sources.

The contribution of the proposed project to the particulate matter load in the air shed is negligible.

12. Assumptions, Uncertainties and Gaps in Knowledge

This report has been compiled based on the following assumptions, uncertainties and gaps in knowledge:

a) Due to noise generating equipment not being available on site to measure future noise levels, it is recommended that a study in this regard be executed during full operation and that the required engineering controls are instituted is required. Full mitigation of any noise impacts will be possible and as such it is recommended that environmental authorization not be declined based on the absence of this data
b) No current assessment of fauna and flora on site has been done, based on the disturbed nature of the sight.

13. Environmental Impact Statement and Recommendations by the EAP

With adequate mitigation and management measures in place, the project can be expected to have a low negative impact during the construction phase on the surrounding social and natural environment.

The project will furthermore have a positive impact on the region in terms of job creation and economic stimulation during the construction phase. These positive impacts benefits can be maximised through preference in procurement processes for local firms and employment of local labourers where viable.

Once in operation, the proposed project will continue to impact in a positive way on the local job creation and therefore indirectly, on the local economy. The local manufacturing of photovoltaic panels will make solar energy more available locally as well as cost effective.

Based on the outcomes of the environmental impact assessments as contained in the relevant sections of this document, the overall negative impact of the project is of Medium Significance, which can be reduced to a Low Significance though the implementation of cost-effective mitigation measures that are fairly easy to implement, maintain and monitor.

Based on the aforementioned, the EAP makes the following recommendations:

a) The project should be approved and allowed to proceed.

b) The mitigation measures proposed in the impact assessment section have been incorporated into the EMPr in more detail and must be implemented during the final planning of and construction as well as operational phases of the project

c) A communications pathway must be established that would allow a designated person to deal with any concerns and complaints that may arise during construction and operation.

d) Strict monitoring and enforcement of the conditions and requirements of the EMP must be undertaken by the developer to ensure that all contractors and operators adhere to the requirements and that the monitoring regime is followed without fail.

Adri Venter, as the EAP, hereby confirms in terms of the final scoping report:

i. The correctness of the information provided in this report
ii. That all comments and inputs from stakeholders and I&AP's are included in this report
iii. That all information provided by the EAP to I&AP's and responses by the EAP to comments or inputs are included in this report

Signature…….Date……

14. Details of the Public Participation Process Conducted

The Public Participation Process (PPP) for this project is conducted by Eon Consulting according to the guidelines as published in the Department of Environmental Affairs (2010), Public Participation 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs, Pretoria, South Africa and the relevant regulations. This section of the document provides detail of the public participation process (PPP) undertaken up to this point in time. Note that the PPP is still in process.

14.1. Steps that were taken to notify potentially interested and affected parties of the proposed application

The following PPP was performed for the proposed project:

- Potential I&APs were identified by review of the site and consultation with the client
- These potential I&APs were informed of the process and invited by letter to be registered I&APs. The letter was accompanied by additional basic information and a registration form
- A notice in the local newspaper, The Vaal Ster, was printed in the 23 June 2015 edition, and informs the public of the public participation process
- Two site notices were displayed near the site
- The local Councillor was contacted telephonically
- The neighbouring land owners were served with hand delivered notices.

14.2. Proof of notice boards, advertisements and notices

14.2.1. Notification to I&AP

The municipal parties were contacted telephonically and it was agreed that they prefer to be e-mailed. Emails were sent which included a personal letter, Basic Information Document and registration form as attachments. If no reply is received as requested, the documents will be delivered by hand. Copies of the confirmation emails (or then signed hand delivery notices) will be included in the final scoping report.

14.2.2. Notice in the newspaper

A notice of the PPP was printed in the local newspaper, The Vaalster during June 2015.

A copy of the notice and photo of the publication is shown below:

MTN SA Foundation hands over 170 school shoes to Vaal learners

MTN SA Foundation hands over 170 school shoes to Vaal learners.

This year's first project in the MTN 21 Days of Y'ello Care Campaign focused on empowering learners.

MTN SA Foundation through the 21 Days of Y'ello Care Campaign partnered with the Lawrence Klokhe Foundation, a local community NPO (Non-Profit Organisation), Mittal Foundation, The MMC of Health and Social Development from Emfuleni Local Municipality, as well as the Department of Education in Sedibeng West District 8, to hand over 170 pairs of school shoes to learners in need, just in time to keep the winter chill at bay. The handover took place at the Letshego Primary School based in Evaton where 170 learners from 8 neighbouring schools were gifted with a brand new pair of South African-made, leather school shoes.

From Letshego Primary, the MTN Foundation team, the MMC and representatives from the Sedibeng West, drove to Ramolikle High, (a farm school situated just off the N1 South, close to Vanderbijlpark) where 50 learners from schools in and around the area, got the surprise of their lives when they each received a bright yellow bicycle, a safety helmet, a bicycle lock and chain as well as a puncture set and tyre pump.

These pre-identified learners have to walk distances of well over 10km from their homes to attend the nearest school in their region on a daily basis. The investment of these bicycles will definitely encourage them to not only attend school but to also arrive on time. Without the added stress of making it to school on time they will now have more time to focus on their studies, friends and families. And without the constant physical exhaustion, these 50 learners can now put their energy and focus into their schoolwork!

The MTN 21 Days of Y'ello Care campaign - an employee volunteerism initiative that was launched by the MTN Group in 2007, aims to invest R8 million in 21 days in various communities in and around South Africa. The campaign has proven to be a phenomenal success with employees and the communities that benefit as it allows both groups to be more involved in their communities and to make a difference.

For 21 days in June, from the 1st of June to the 21st) MTN employees - with strong involvement from senior managers - are focused on serving the needs of the community. The chosen projects are often the choice of the employees, ensuring that the initiatives beyond the campaign. Although the campaign is run and strongly supported by the MTN SA Foundation the projects are not an extension of the foundation's established projects - these projects are often projects that staff has become involved with in their personal capacity and time. The campaign simply provides a structured platform and resources for the employees to focus on said projects and inject some much needed resources during a dedicated time frame. To ensure the interest and sustainability of resources that will be invested into the projects, the campaign (and therefore the projects) is aligned to the organisation's core products and services offerings.

This can be gathered from the theme 'Investing in education for all' which requires engagement in projects within the educational sectors through the provision of infrastructure, ICT facilities and or educational equipment and materials. Involvement in the education sector is largely focused in three broad areas, empowering or equipping teachers, digital content for education and empowering learners.

Regskennisgewings STER Legal Notices

In terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and associated EIA regulations and listed activities: Public Participation Notice to register as an Interested and Affected Party

DEA: Ref No: 14/12/16/3/3/2/812

PROPOSED CONSTRUCTION OF: a production plant for the manufacturing of solar panels through the use of a Fluidized Bed Reactor (FBR) to manufacture polysilicon through the application of hydrochloric acid to silica. The plant will produce 6 000 tons of solar grade polysilicon per annum .b) The construction of a solar energy plant for the generation of 100MW of electric power c) The construction of a float glass manufacturing plant (85 000 tons per annum)

PROJECT NAME: Waterval Solar Park
APPLICANT: TPS Solar PTY Ltd
LOCATION AND SIZE: Portion 8 of the Farm Waterval 150IR, Meyerton, Gauteng. The total size of the farm is 438Ha. The buildings, in which the manufacturing units will be housed, will consist of 40 Ha and the solar energy plant will consist of 200 Ha of land.
APPLICATION FOR ENVIRONMENTAL AUTHORISATION TO UNDERTAKE THE FOLLOWING EIA ACTIVITIES:
A full Scoping EIA is required to be undertaken for the proposed project. In terms of sections 24(5) and 24(M) of the National Environmental Management Act, Act 107 of 1998 (NEMA), as read with the EIA Regulations of GN R982 of 4 December 2014:

R984 Listing Notice 2: Activity 15: The clearing of indigenous vegetation more than 20Ha	An area in excess of 300Ha will be cleared for the building of the manufacturing plant and solar PV farm
R 904 Listing Notice 2: Activity 39: The commencement of an activity for which an air emission license is required	The manufacturing of poly-silicon from silica by the application of heat and the Manufacturing of Glass in terms of the NEMAQA: R893: Activity Subcategory 4.15 and 5.8 : (Listed Activities and associated emission standards identified in terms of Section 21 of the national Environmental management: Air Quality Act, 2004 (Act No 39 of 2004)
R 904 Listing Notice 2: Activity 6: The development of infrastructure for a process which will require a permit of the release of emissions	The manufacturing of poly-silicon from silica through the application of heat will result in air emissions as well as the manufacturing of glass
R 903 Listing Notice 1: Activity 28: The treatment of effluent of more than 2 000m3 but less than 15 000m3 daily throughputs.	The effluent stream from the Fluidized Bed Reactor (FBR) will be cleaned to remove Silicon fines and impurities like metal chlorides.
R 904 Listing Notice 2: Activity 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	A photo-voltaic solar plant will be erected comprising 200Ha on the project site to generate 100MW of electricity
R 905 Listing Notice 3: Activity 10: The storage of dangerous goods (hydrochloric acid) with a combined capacity of more than 30m3 but less than 80m3 on a site identified as high agricultural potential as well as located within an ecological support area as per the Gauteng Conservation Plan 3.	The site of the proposed project is classified as agricultural potential as well as an ecological support area. More than 30m3 of hydrochloric acid and other dangerous substances will be stored on site

INDEPENDENT ENVIRONMENTAL CONSULTANT: EON Consulting
Persons who wish to participate by contributing comments to the scoping report and environmental impact assessment report , or who would like to obtain more information, should please contact EON Consulting: **Adri Venter,** (no later than 23 June 2015) in order to register as Interested and/or Affected parties. Please provide name, contact details, address to one of the following EON contact details:
Postal Address: P.O. Box 12359, Vorna Valley
Fax +27 (0)86 674 3516
Tel: +27 (0)11 564 2300
E-Mail: adri.venter@eon.co.za or info@eon.co.za

Registered Interested and Affected Parties will be contacted and informed of the manner in which the draft Scoping Report can be accessed in order to provide comments.

Successful Two Ball Trips Tournament

SASOLBURG. - For the last 22 years Sasol Bowling club have given the Sedibeng District bowlers the opportunity to participate in a different bowls game by playing in the "Two Bowl Trips" held over four weeks. This tournament is sponsored by Warwick and numerous other companies and has become a household item in the Sedibeng yearly calendar. Their sponsors make it possible to offer a tournament of such an overwhelming high standard. The prizes up for grabs were the biggest ever, making the competition even more intense. As usual the ladies of the Sasolburg bowling club again tickled the taste buds with lovely food and a variety that suited everybody.

The greens played well and nobody had anything to complain about. Every year the teams that participate lift the standard of this tournament, leaving the organizers with the feeling that it just can't get better. This year proved to be no different and there was so much enjoyment that every person who did not participate must feel that they are really missing out. The power against power format really forced every team to be on high alert throughout the four weeks. The greatest surprise however was the total of new teams entering this year and the fact that they played extremely well. Just shows you that you don't have to be an old age to learn new tricks. This year the honors went to the following teams; in first place was Johny Pearse, Kevin Joynson and Nickie Miller. In second place was Raymond Hockstell, Terrance Balfour and Natasha Cook, and in third place was Lemkie Hardy, Jana Meyer and Vickie Slater. The club would like to sincerely thank the Sasolburg Bowls Club Committee for all their hard work with the organizing of the Tournament. Special thanks to Bobby Duguid whose hard work in getting sponsored prizes ensured that after 4 days of play each and every team received a prize and felt satisfied with their participation. Thanks to Jimmy Stewart who organized each days play and collated the scores so each team knew their ranking at the end of each day. Because the water was contaminated on the last day of play Pine Pienaar had a very busy day behind the bar.

Figure 16: Copy of Print Notice

14.2.3. Notice Boards:

14.3. Registration of I&APs and Comments

This section will be updated once registration from I&APs and comments have been received and consolidated. The Public Participation Process is in progress.

14.4. Issues raised by the I&AP's

This section will be updated once registration from I&APs and comments have been received and consolidated. The Public Participation Process is in progress

15. Plan of Study for the Impact Assessment

15.1. Alternatives to be considered

Based on Section 9 of this report, no alternatives will be assessed. The chosen technology will render high quality products and is the most environmentally friendly methodology in comparison with other methods. The project applicant is the owner of the site and no other site is available (which belongs to the project proponent). The silicon manufacturing technology chosen, renders the highest silicon returns in comparison with other older technology.

15.2. Description of aspects to be assessed

The following aspects will be assessed:

15.2.1. Gas furnace

The furnace for melting raw materials for the manufacturing of glass is a potential source of air emissions (PM_{10}, $PM_{2.5}$ and NO_2). The energy source is gas, and as such no significant SO_2 emissions is expected.

Emissions from the furnace will be routed through air quality control equipment. The effectiveness of the control equipment and the emissions from the stack will be modelled to determine the impact on ambient air quality.

15.2.2. Floating bath

Emissions from the floating bath cooling down molten glass will be assessed in terms of impact on ambient air quality.

15.2.3. Annealing

The coating of float glass with metal oxides will be assessed in terms of impact on ambient air quality.

15.2.4. Storage of raw materials for the manufacturing of silicon and glass

Dust and particulate matter from the storage of silica sand, soda, limestone, dolomite and feldspar will be investigated to determine the impact on dust levels on the environment.

15.2.5. Storage of Hydrochloric Acid

Venting of HCL will be modelled to determine the impact on ambient air quality.

15.2.6. Hydrochlorination Reactor, Dispropotion Unit and Deposition Unit

The units are a potential source of chlorine/chloride gas as well as silica particulate matter and Monosilane and Trichlorosilane. Emissions from the units will be routed through air quality control equipment. The effectiveness of the control equipment and the emissions from the equipment will be modelled to determine the impact on ambient air quality

Accidental releases of monosilane and trichlorosilane will be modelled to determine the levels of risks to surrounding communities in terms of ambient air quality levels.

15.2.7. Clearing of vegetation for construction

Although previous studies found that very little natural vegetation remained on the site, the current levels of significant fauna and flora species will be determined.

15.2.8. Storm water run-off

Storm water run-off from paved areas has the potential to course soil erosion and pick up pollutants from non-point sources on the site. This may lead to polluted run-off entering the nearby water courses.

The extent of storm water run-off and potential NPS pollution sources will be assessed based on a storm water management plan that will be compiled by the design engineers.

15.2.9. All manufacturing units

The noise levels from all manufacturing units will be assessed based on the levels as certified by the manufacturers.

15.2.10. Waste water

Control and management of waste water emanating from the floating bath, cooling equipment for glass emerging from the furnace as well as from the disproportionate unit will be assessed in terms of pollutants, management of waste water and removal of sludge from waste water control equipment.

15.2.11. Storage of Hydrochloric Acid

Storage of HCL will be assessed in terms of the probability for soil and ground water pollution by reviewing the proposed storage vehicles, loading and transport methodology. Venting of gas clouds containing HCL will also be investigated by assessing the aforementioned aspects.

15.2.12. Flow batteries

The storage and maintenance of flow batteries will be investigated with a view toward soil, surface and ground water pollution.

15.2.13. Photovoltaic installations

The installation of PV panels for the generation of electricity will be assessed in terms of the probability to allow for the proliferation of alien vegetation in the area, stormwater run-off resulting in sedimentation of nearby water courses.

15.2.14. Buildings and manufacturing units and PV installations

The final site lay-out plan will be assessed in terms of encroachment on sensitive areas: buffer sones around water courses and wetlands as well as important patches of remnant natural vegetation.

15.2.15. Access roads and vehicular movement

The above will be assessed in terms of dust generation during construction and operation.

15.2.16. Construction

The timing of construction, construction activities and control over no-go areas will be assessed to prevent accidental damage to no-go areas, dust nuisances, noise nuisances, oil spillages, storm water contamination, waste management, fire risks and sanitation services for workers. A complete EMPr will be compiled to control all construction related aspects.

15.3. Aspects to be assessed by specialists

The following aspects will be assessed by specialists:

a) Air quality impacts from:
   - Glass manufacturing
   - The manufacturing of polysilicon
   - The storage of raw materials, gas and HCL on site
   - Dust emissions during construction

b) Ecological impacts as a result of the clearing of vegetation
   - Vegetation on site to determine if detailed fauna studies are required based on the presence of natural vegetation of high conservation value

15.4. Proposed methodology to assess impacts

15.4.1. Air quality impacts

The Scope of Work will include the following:

- Identify all legislation and guidelines that should be considered;
- Describe the approach and methodology used for the assessment;
- Obtain all relevant data, including meteorological data and current air quality data
- An emissions inventory for dust, total suspended particulates, PM_{10} and emissions from all project-related activities are quantified (during construction and operational phase)

- A dispersion potential model of the area must be produced based on Government Notice, R. 533 National Environmental Management: Air Quality Act (39/2004): Regulations regarding Air Dispersion Modelling, page 3 in Government Gazette 37804, 11 July 2014
- Scenario modelling must be produced: The prediction of ambient air pollutant concentrations and dust fallout in terms of dispersion modelling
- The assessment of the impacts based on comparisons of the resulting concentration against the approximated pre-construction/construction/operational and rehabilitated ambient conditions, as well as against relevant standards and guidelines
- The identification of emission reduction opportunities and cost-effective emission abatement strategies
- Mitigation measures for worst case, most probable and best case scenarios must be identified
- Provision of recommendations regarding the optimum air quality monitoring positions and the establishment of an air quality monitoring programme
- The cumulative effect of existing air pollution levels must be clearly identified and measured against the approximated cumulative effect of the proposed operation.
- Highlight potential impacts that should be investigated and assess their importance within local, provincial and national context;
- Suggest feasible alternatives based on the above;

15.4.2. Ecological impacts

An ecologist will be appointed to do a site visit

The aim of the Assessment is to provide an overview of the Ecological Sensitivity on site. During Scoping, the study will focus on fieldwork and culminate in the generation of a Baseline Site Sensitivity Map, aimed at identifying potential environmentally sensitive areas / red flags, in particular, to be avoided during site development. The Sensitivity Map will be accompanied by a Summary Report, containing the results of field investigations, providing recommendations in terms of site establishment and identifying additional studies that should be undertaken during Phase 2 of the project. This study may, for example, confirm the extent of wetland and aquatic ecological assessment required. Preliminary impacts will be identified however, detailed impact identification and identification of mitigation measures will occur during the EIA Phase of the project.

15.5. Methodology to assess significance and duration

Significance is the product of probability and severity rating divided by the mitigation potential:

$$Significance = \frac{Probability \times Severity}{Mitigation}$$

Probability and Severity will be determined based on the following:

15.5.1. Determining the Severity of an Impact

Determination of the severity of an impact is a function of intensity, duration and extent, divided by the extent to which mitigation can successfully be applied:

$$Severity = intensity + duration + extent$$

Each of the 4 factors used to determine the severity of an impact, are described below:

15.5.1.1. Intensity factor

The level of intensity is the sum of volume, toxicity, social impact and ecological impacts.

Note that either Volume A or Volume B is used (refer to the description) but never both at the same time.

Table: 10. Intensity factor rating and description

	Low (1)	**Medium (3)**	**High (5)**	Sub Total (Sum)
Volume (A) (refers to process input and output substances/ material or products)	Less than 80 m^3 at any one time (or low volumes relative to industry/commercial standards)	Between 80 and 300 m^3 at any one time (or medium volumes relative to industry/ commercial standards)	In excess of 300 m^3 at any one time (or high volumes relative to industry/ commercial standards)	
Volume (B) (refers to natural resources)	Relatively small	Medium	Large	
Toxicity	Toxicity is on par with everyday goods	Toxicity can be compared to those that	Toxicity is on par with	

	Low (1)	Medium (3)	High (5)	Sub Total (Sum)
	in wide-spread use and is biodegradable.	have to be handled with some caution and are non-biodegradable.	toxic/dangerous/ flammable substances that are non-biodegradable.	
Social	No or very limited impact	Some impact on immediate communities, but cannot be considered as disruptive	Major disruptive impact on surrounding communities	
Ecological	Natural functions not affected or negligible.	Environment affected but natural functions and processes continue (Some damage or wildlife injury may occur). Impact is reversible or irreplaceable loss will not occur	Environment affected to the extent that natural functions are altered to the extent that it will permanently or over the long term cease (Major damage or wildlife injury could occur). Irreplaceable loss will occur.	
			Total	

15.5.1.2. Duration

Duration is assessed and a factor awarded in accordance with the following:

Table: 11. Duration factor rating and description

	Duration of Impact	Duration factor
Short term	The duration of the is impact is 1 Year or less	Factor 1
Medium term	The duration of the is impact is 1-5 Years	Factor 3
Long term	The duration of the is impact is 5 to 25 years	Factor 4
Permanent	The duration of the is impact is longer than 25 years and can be considered as permanent	Factor 5

15.5.1.3. Extent

Describes the physical extent the impact and factors are awarded according to the following:

Table: 12. Extent factor rating and description

	Extent of the impact	Extent factor

Site	The impact only exists within the activity's footprint	Factor 1
Local	The impact could impact on the whole or a considerable portion of the properties on which the activity is undertaken as well as neighbouring properties	Factor 3
Regional	The impact could affect the area, neighbouring as well as other areas further away than the immediate neighbours	Factor 5

15.5.2. Probability

Probability describes the likelihood of the impact actually occurring, and is rated as follows:

Table: 13. Probability factor rating and description

	Possibility that impact will occur	**Rating**
Improbable	Low possibility of impact occurring due to design or history	1
Probable	Distinct possibility that impact will occur	2
Highly probable	Most likely that impact will occur	3
Definite	Impact will definitely occur	5

15.5.3. Significance Rating

Following from the above, the Significance rating can now be determined as follows:

Significance = severity x probability

The significance rating thus determined should influence the proposed project as described below:

Negligible (calculated Significance Rating < 25)

- *Positive and negative impacts of negligible significance are unsubstantial and should have little or no influence on the proposed development project.*

Low (calculated Significance Rating 25 < 50)

- *The impact is limited and should not have a material effect on the decision to continue. Management intervention is required.*

Moderate (calculated Significance Rating 50 < 90)

- *Positive impact: Should weigh towards a decision to continue, should be enhanced in final design.*

- *Negative impact: Should weigh towards a decision to terminate proposal, or mitigation should be performed to reduce significance to a low significance rating.*

High (calculated Significance Rating > 90)

- *Positive impact: Continue*
- *Negative impact: If mitigation cannot be implemented effectively (into the moderate category), proposal should be terminated.*

The table below provides an example of how the unmitigated significance ratings are calculated:

Table: 14. Calculating of Significance Ratings (Unmitigated)

Probability		Severity						Severity Rating	Significance Rating (Probability x Severity rating)	
		Intensity		Duration		Extent				
Probable	**2**	*Low*	*4*	*Short Term*	*1*	*Local*	*2*	**7**	**14**	**Negligible**
Probable	**2**	*Low*	*4*	*Medium Term*	*3*	*Regional*	*3*	**10**	**20**	**Low**
Definite	**5**	*Medium*	*12*	*Medium Term*	*3*	*Local*	*2*	**19**	**85**	**Moderate**
Definite	**5**	*High*	*20*	*Permanent*	*5*	*Site*	*1*	**26**	**180**	**High**

15.5.4. Mitigation

Mitigation will be calculated as follows:

Table: 15. Mitigation factor rating and description

Description	Factor Allocated
Mitigation is not possible or positive impact of mitigation is negligible. Impact remains irreversible.	1
Mitigation is possible to some extent with moderate levels of positive impact. Impact is largely reversible with only a small portion that remains as irreversible.	2
Mitigation is possible with moderate to high levels of positive impact. Impact is reversible.	3

Mitigation is possible to such an extent that all negative impacts are reduced significantly or eliminated. Impact is completely reversible.	4

$$Significance = \frac{intensity + duration + extent}{Mitigation\ potential}$$

15.6. Public participation process

The Public Participation Process (PPP) is an integral and critical part of the environmental process and careful attention is given to fulfilling the legislated requirements, ensuring that all directly affected parties have access to information and the opportunity to participate meaningfully in the project. The first phase of the PPP would entail an initial meeting with the client, a site visit (described above), the compilation of the database of Interested and Affected Parties (I&APs) and the preparation of the necessary project documentation. Review and commenting periods of I&AP's are prescribed in the legislation. The following section provides further information on the PPP (note that a public meeting may be required on request from the competent authority in addition to the process below):

- *Landowner Identification and Consultation*

Stakeholders will be identified through established databases, adjacent landowners and community-based organisations. Adjacent landowner's information will be sourced through a Windeed search and will receive a notification of the intended authorisation process and an invitation to register as I&AP's. Registered stakeholders will receive a Background Information Document (BID) by fax, email or registered mail. In addition, BIDs will be delivered by hand to landowners whose contact details cannot be acquired. Each recipient of such hand delivered BID notification will need to fill in a register and sign in confirmation of receipt of the BID. Each stakeholder identified will be listed in a database. In addition stakeholders will be requested to return the registration sheets and indicate whether they want to be involved in the process. Stakeholder identification will also be done through advertising the project in the newspapers as well as site notices along the boundary of the proposed area to be developed.

Stakeholders will be divided into two broad categories, namely land owners and other I&APs (including government, NGOs, CBOs, etc.).

- *Background Information Document*

An A4 Background Information Document (BID) with black and white maps will be compiled for registered I&AP's. The BID will be distributed in the project areas as well as to the identified stakeholders. The BID will comprise of information on the following:

- Project description;
- Description of environmental process;
- Locality map indicating the exact location; and

- Registration form for comments / issues.

  - *Site Notices*

Site notices in the applicable languages, will be erected at visible locations along the border of the proposed area to be developed. The site notices will serve as notification of the project, as well as notifying the public of the project process to be followed.

  - *Advertisement*

Newspaper advertisements will be placed in the relevant local newspapers in the applicable languages.

  - *Public Participation Report*

The final Public Participation Report will be included into the Draft and Final Assessment Report. The issues and concerns that were obtained through the entire process will form the basis of this report. The report will inter alia consist of the following:

- A description of the PP process followed (with proof, e.g. copies of the newspaper advertisement, written correspondences with I&APs);
- List of registered I&APs;
- Proof of meeting proceedings;
- Public Participation map, indicating adjacent landowner consultation and
- Issues and Response Report.

  - *Authorisation notification letter*

All registered stakeholders will be informed of the outcome of the authorisation and the right to appeal the decision.

15.7. Tasks that will be undertaken during the impact assessment process

The following tasks will be undertaken:

i. Management of the public participation process
ii. Management of the appointed specialists
iii. Engagement with the competent authority, local government and Sedibeng Municipality who is responsible for the Air Emission License Process
iv. Engagement with the Ward Councillor
v. Review of specialist reports
vi. Review of site lay-out plans
vii. Review of engineering design reports
viii. Review of geotechnical assessment

ix. Assessment of aspects and impacts in terms of the assessment methodology contained in this scoping report

15.8. Measures to avoid, reverse, mitigate or manage identified impacts and the determination of residual risks that need management and monitoring

All aspects and impacts will be assessed against the proposed mitigation measures. The risks associated with failures of the mitigation measures will be assessed and further mitigation and emergency procedures will be proposed.

The EMPr will include emergency procedures, monitoring and measurement of impacts.

No-go areas will be mapped by the EAP based on a site visit and specialist reports and the applicant will be advised to prevent accessing of no-go areas as defined.

15.9. Affirmation by the EAP in relation to the level of agreement between the EAP and I&AP's on the plan of study for undertaking the environmental impact assessment

The report will include a register of I&AP's, as well as their comments and inputs with the response of the EAP. The EAP hereby affirms that all comments and inputs from I&AP's will be objectively assessed, responded to and taken into account in terms of impact assessment, mitigation and management measures.

15.10. Specific information required by the competent authority

Currently none specified

15.11. Matters in terms of Section 24(a) and (b) of the Act

The draft scoping report will be submitted to the South African Heritage Resource Agency (SAHRA) for comments.

In terms of the Act, the following will be included in the assessment report:

- Investigation of the potential impacts, including cumulative effects, of the activity and its alternatives on the environment, socio-economic conditions and cultural heritage, and assessment of the significance of that potential impact;
- Investigation of mitigation measures to keep adverse impacts to a minimum, as well as the option of not implementing the activity;
- Public information and participation, independent review and conflict resolution in all phases of the investigation and assessment of impacts;

- Reporting on gaps in knowledge. the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;
- Investigation and formulation of arrangements for the monitoring and management of impacts, and the assessment of the effectiveness of such arrangements after their implementation.

15.12. Stages during which the competent authority will be consulted

The competent authority will be consulted:

i. When the final scoping report is submitted
ii. When comments are received from the competent author on the draft scoping report
iii. During the compilation of the draft impact assessment report
iv. When the final impact assessment report is submitted
v. When comments are received from the competent author on the final impact assessment report
vi. Notification of the I&AP's regarding the final decision of the competent authority – evidence will be provided.

16. Undertaking by the EAP

(j) an undertaking under oath or affirmation by the EAP in relation to—

(i) the correctness of the information provided in the report;

(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and

(iii) 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;

Adri Venter, as the EAP, hereby confirms:

iv. The correctness of the information provided in this report
v. That all comments and inputs from stakeholders and I&AP's are included in this report
vi. That all information provided by the EAP to I&AP's and responses by the EAP to comments or inputs are included in this report

Signature…….Date……

17. REFERENCES

Department of Agriculture, 2013: Agricultural GIS. http://www.agis.agric.za/agisweb/agis.html

SANBI, 2013: Biodiversity Geographical Information System. *www.sanbi.org*

SANS 10103, 2008: The measurement and rating of environmental noise with respect to annoyance and to speech communication

South African Government, 2011: The Vaal Triangle Priority Area Air Quality Management Plan

Presented at 13th CIRP Intern. Conf. on Life Cycle Engineering, Leuven, 31 May- 2 June 2006:

Environmental Impacts of Crystalline Silicon Photovoltaic Module Production. Erik A. Alsema1, Mariska J. de Wild-Scholten2,: Copernicus Institute of Sustainable Development and Innovation, Utrecht University, The Netherlands. Energy research Centre of the Netherlands (ECN), Petten, The Netherlands

Potential Health and Environmental Impacts Associated with the Manufacture and Use of Photovoltaic Cells. Final Report, November 2003. Co-sponsors: Public Interest Energy Research Program (PIER), California Energy Commission 1516 Ninth Street Sacramento, California 95814 PIER Project Manager L. ten Hope

Silane Safety Data Sheet P-4649 according to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1980 Revision date: 03/19/2015 Supersedes: 09/01/2014

Schmid Silicon Technology GmbH Robert-Bosch-Str. 32-36 Phone: 0049 7441 538-454 Fax: 0049 7441 538-260 72250 Freudenstadt Germany info@schmid-silicon.com www.schmid-silicon.com, undated)

Midvaal Integrated development Plan (IDP) of 2015/2016

18. Annexure A: Public Participation Evidence

Received by (Name) .....

Signature.....

Date.....

Bekker Road, Vorna Valley, South Africa

POSTAL ADDRESS
PO Box 12389, Vorna Valley
Midrand, 1686, South Africa

T +27 (0)11 564 2300
F +27(0)86 677 3558

info@eon.co.za
www.eonconsulting.co.za

TO: R.M. Ellis

Address Engen 1 Stop

19 July 2015

Ref Number: DEA: Ref No: 14/12/16/3/3/2/812

In terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and associated EIA regulations and listed activities: Public Participation Notice to register as an Interested and Affected Party: - PUBLIC PARTICIPATION PROCESS:

As a neighboring land owner/manager notice is hereby given to you in terms of the Environmental Impact Assessment Regulations (GN R982 of 4 December 2014) of the intentions of TFS Solar (Pty) to erect a Solar Farm and solar panel manufacturing plant on Portion 6 of the Farm Waterval 150IR, Meyerton, Gauteng and that the public participation has commenced and you are invited to participate in the process.

An application has been lodged with and registered by the National Department of Environment to fulfill the requirements associated with the **Regulation 983,984 and 985** for Listed Activities as set out in Listing Notice 1, 2 and 3 of the Environmental Impact Assessment Regulations (GN R982 of 4 December 2014) as Promulgated under Sections 24 and 24D of the National Environmental Management Act (Act No. 107 of 1998).

EON Consulting was appointed as the independent environmental practitioners to compile and submit the application for an environmental authorization and manage the associated processes as described by the regulations.
Eon Consulting would like to inform you, that you can participate in the public participation process by registering as an Interested and Affected Party (I&AP). By registering as an I&AP, you will be able to register your comments on the draft scoping report for an environmental authorisation or request further information. If you wish to register as an I&AP, please do so in writing before 1 July 2015 by submitting the attached form to the contact details as supplied.

Yours Faithfully,

Adri Venter
Principal Consultant, MSc, Pr. Sci. Nat.
EON CONSULTING
Contact Details: EON Consulting, Ms Adri Venter
E-Mail: adri.venter@eon.co.za; Phone: +27 (0)11 564 2300

SEEN

Each neighbouring land owner received a hand delivered notification regarding the EIA and providing them with detail regarding registering as an I&AO.

19. Annexure B: Site photos

A portion of the site is under cultivation for maize

View towards the Western side of the site

View towards the Southern part of the site: Degraded grasslands

View towards the Southern part of the site: Themeda triandra grass

View towards an eastern part of the site: A portion of the site is severely degraded due to illegal dumping

View towards the southern part of the site

Eastern part of the site:Termite mound on site: The presence of harlequin snakes need to be determined and if found on site, must be relocated

View towards the eastern part of the site: Eragrostis

20. Annexure C: EAP CV

Curriculum Vitae of Adri Venter

Position:	Principal Consultant	
First Name:	Adri	
Last Name:	Venter	
Qualifications:	MSc (Masters in Geography and Environmental Studies with specialization on Environmental Management, Air and Water Quality) B.Ed. (Adult Education) National and National Higher Diplomas in Public Health	
Specialisation:	Environmental Management Environmental Health Education and Training	
Nationality:	South Africa	
Citizenship:	South Africa	
Date of Birth:	18 August 1964	
Languages:	English, Afrikaans	
International Experience:	Singapore and Algeria	

20.1. Professional Associations

SACNASP: Professional Natural Scientist (Pr. Sc. Nat.:400062/14)
IAIA (International Association for Impact Assessors)

Education

Qualification: MSc (Masters in Geography and Environmental Studies: Air and Water Quality)

Institution: WITS

Year Completed: 2007

Certification: Environmental Management Inspector (as defined in the National Environmental Management Act) - University of Pretoria. Obtained with Distinction

Year Obtained: 2007

Certification: Wetland Training Course - University of Pretoria

Year Obtained: 2006

Certification:	Environmental Accounting - Tshwane University of Technology
Year Obtained:	2005

Certification:	Urban Environmental Management Singapore -Environmental Institute - Singapore
Year Obtained:	2003

Certification:	SABS ISO 14001: Environmental Management Systems: Environmental Law - SABS - Obtained with Distinction
Year Obtained:	2002

Certification:	SABS ISO 14001: Environmental Management Systems - South African Bureau of Standards (SABS) Obtained with Distinction
Year Obtained:	2002

Certification:	SABS ISO 14001: Environmental Management Systems Auditing - SABS - Obtained with Distinction
Year Obtained:	2002

Qualification:	B.Ed. (Adult Education). Obtained with Distinction
Institution:	WITS
Year Completed:	2001

Certification:	Certificate in Advanced Project Management - University of Pretoria
Year Obtained:	2000

Certification:	Certificate Senior Management - University of Stellenbosch - Directors Award for Best Student
Year Obtained:	1999

Qualification: Certificate in Management of Change and Organisational Development:

Institution: Louw du Toit and Associates in conjunction with University Of Pepperdine (USA) Obtained with Distinction

Year Completed: 1999

Certification: Environmental Management Programmes - University of Johannesburg

Year Obtained: 1998

Certification: People Centered Development - University of South Africa

Year Obtained: 1995

Qualification: National Higher Diploma in Public Health

Institution: Tshwane University of Technology

Year Completed: 1990

Qualification: National Diploma in Public Health

Institution: Tshwane University of Technology

Year Completed: 1987

Summarized Experience

Company	Sector / Industry	Position	Years of Experience
EON Consulting(Pty) Ltd	Consulting Services	Principal Consultant	4 years
MSA	Consulting Services	Operations Manager: Environmental, Legal and Mining Services	2 Years
Arup	Consulting Services	Senior Environmental Manager	1 Year
City of Tshwane	Local Government	Acting Executive Director: Environmental Management	6 months
City of Tshwane	Local Government	Manager/Director: Environmental Policy and Resource Management	7 Years

City Council of Pretoria	Local Government	Director: Health Education and Training	4 Years
Tshwane University of Technology	Academic	Part time lecturer and moderator	8 Years
City Council of Pretoria	Local Government	Health Education and Training Officer	6 Years
City Council of Pretoria	Local Government	Senior Environmental Health Officer	5 Years

Key Knowledge and Competency Areas

Adri Venter has had a varied career across several sectors that have produced a multi-skilled individual able to identify and integrate multi-disciplinary aspects of large and complex environmental projects. Her knowledge and understanding of environmental impacts are broad ranging and include air and water quality as well as human health. Adri has undertaken environmental projects across several industries, which include mining, construction, government and large corporations. Adri has a Master of Science degree in Geography and Environmental Studies, with specific reference to environmental management, air and water quality. She also holds a B(Ed) Adult Education which has supported her career in environmental education, lecturer and Education and Training Development Practitioner.

- Over 15 years' experience in a senior management position as well as in Environmental Management
- Wide environmental management experience across several sectors.
- **Environmental Auditing and due diligence assessments** (supported by formal training in environmental auditing, environmental law, environmental management programs and Environmental Management Inspector).
- In-depth understanding and knowledge of all South African environmental legislation based on experience and relevant training.
- Extensive experience in **Environmental Impact Assessments and Water Use License Applications**
- **Site Environmental Control Officer (ECO)** experience
- Extensive experience in the **policy and strategy environment**, especially in large corporations and government across a wide range of issues.
- Extensive experience with the Mineral and Petroleum Resources Development Act, mining and large construction projects as well **as water use licensing**.
- Implementation of **environmental management systems** (ISO 14001)
- Multi-skilled individual ensuring an integrated and advanced understanding of companies and challenges (advanced degrees in Adult Education and Environmental Health).
- Excellent presentation skills sharpened by years of formal lecturing and training.
- Extensive experience in dealing with stakeholders, government departments, communities, NGOs and politicians.

Software Skills

Software	Skill Level	Years of Experience
MS Word	Advanced	20
MS Excel	Standard	20
MS PowerPoint	Advanced	20
MS Project	Advanced	12
MS Visio	Basic	7
SAP	Basic	7
MS Access	Basic	7
MS Outlook	Advanced	20

GIS	Basic	3

Key Achievements

Year	Achievement
2013	Adri was acknowledged by EON Consulting as one of the top performers in the company during the year 2013.
2012	Adri was one of 4 nominees for Principal Consultant of the year
2010	Received award for second best paper at the IAIA National Conference 2010 for a paper on Environmental Management.
2006	Adri was nominated as one of 3 individuals in the organisation in the individual category for the Innovation Award, in the Municipal Managers Service Excellence Awards for a project related to wetlands.
2004	The environmental section headed up by Adri received an award in the Municipal Managers Service Excellence Awards. The team was awarded in the category of Team service excellence for exceptional contribution to the goals of the organisation.
2000	The division headed up by Adri received the award for the best cooperative training institution from the Tshwane University of Technology on two consecutive years
1999	Adri received the Directors Award for Best Student in the Senior Management Programme at the University of Stellenbosch in 1999.

Employment History (Current first)

Employer:	**EON Consulting(Pty) Ltd**
Position:	Principal Consultant
Duties & Responsibilities:	• Provide technical expertise on water and environmental projects • Business development and project management • Waste water risk abatement plans • Water Research • Fatal Flaw Analysis and Due Diligence Assessments • Water quality modeling • Water use licensing • Environmental Impact Assessments (EIAs) • Supportive environmental frameworks and strategies
Date From:	01 March 2011

Employer:	**MSA**
Position:	Operations Manager: Environmental, Legal and Mining Services
Duties & Responsibilities:	Overview of various duties provided below

	Operational management of a team of environmental consultants in the Environmental Division. The MSA Group offered a full suite of environmental services, from legal compliance, environmental authorisations, and specialist services such as waste and water management as well as due diligence assessments across a range of industries. Duties include project management of complex projects, compilation of complex proposals (with budgets in excess of R 3million) providing technical advice to project teams, directing specialist studies and reviews of specialist studies and the review of environmental impact assessment reports. As the operations manager of the division I was responsible for financial management (including invoicing, debtor management, income forecasting), managing and tracking project budgets (which amounts in some cases to several million rand), human resource management and development, resource planning, business development, quality and risk management as well as client liaison. I am also responsible for maintenance of ISO 9000 and occupational health and safety within the division. I was also responsible for reporting on key business indicators to group management. Examples of large projects managed: Pre-feasibility and feasibility studies for iron, gold and platinum mines. Mining Right Applications and full suite of environmental authorisations for new mines, EIA for regional waste water treatment works, housing developments (50 000 houses), the compilation of the environmental component of Kumba's asset development management (ADM) system as well as the compilation of an Environmental Regulatory and Enforcement Strategy for the City of Johannesburg. I have also reviewed and updated the environmental risk registers of two shafts and executed a regulatory waste management audit for Impala Platinum. Mine water projects for Kumba and Mogale Gold. Several projects were successfully completed and environmental authorizations issued.
Date From:	01 May 2009
Date To:	31 February 2011

Employer:	**Arup**
Position:	Senior Environmental Manager
Duties & Responsibilities:	Environmental consulting, environmental impact assessments, water use licensing, auditing, training and mentoring, environmental sustainability
Date From:	July 2008
Date To:	April 2009

Employer:	**City of Tshwane**
Position:	Director: Environmental Resource Management
Duties & Responsibilities:	Responsible for the management of the environmental resource management section of the Metropolitan Municipality. My role was focused on **a)** setting the sustainability agenda for the City by developing and implementing capacity building programs and through the development of integrated policies and strategies and **b)** ensuring corporate environmental responsibility and compliance. With respect to a) above: The development of **environmental policy, strategies and frameworks** as well as best practices. Linking environmental agendas with the City's Integrated Development Plan. The following policies and strategies were compiled:

- Tshwane integrated Environmental Policy
- Biodiversity Framework
- Green Building guidelines
- Water resource protection framework
- Education and awareness strategy for employees
- Community education and awareness strategy
- Urban agriculture guidelines
- Green construction guidelines
- Generic EMP for construction projects
- Best practice guidelines for water and energy use, waste management and green procurement
- Compilation of a wetlands inventory for the City.

Training and Education. Development and implementation of employee and community environmental education programs was a critical aspect of my duties. Based on a strategic needs analysis, a training and development strategy was developed for municipal employees, councilors and the community of Tshwane. The strategy was implemented by the development of training programs and courses and the delivering of targeted training programs and courses. Several large community education events were managed through the involvement of community forums.

Inter-Governmental Liaison: Synchronisation of the City's policies and strategies with Provincial and National Government.

Management Information: **Reporting on corporate environmental compliance** and progress towards targets, environmental indicator development and environmental risk analysis was an integral part of my duties. The development of **Management Information Systems** (MIS) in support of evaluation, monitoring and reporting was required.

I was also responsible for **environmental due diligence, legal compliance** and **the implementation of ISO 14001** related to the operations of the City. Examples of operations include: 2 coal fired power stations, several landfill sites, several waste water treatment works, the fresh produce market, several large workshops and the Bon Accord Quarry. All new infrastructure developments of the City were screened for legal implications pertaining to all relevant environmental legislation. My division was also responsible for auditing of waste management service providers for the City.

Setting and management of compliance targets. Reviewing the City's capital projects for environmental implications and compliance requirements.

Environmental Risk Management: Implementation of Risk Assessment and Risk Management Plans for municipal operations

Date From:	June 2001
Date To:	June 2008

Employer:	**City of Tshwane**
Position:	Acting Executive Director: Environmental Management
Duties & Responsibilities:	Responsible for the management of the Environmental Management Department of the Metropolitan Municipality. These included the City Waste Removal and Waste Management Services, Parks and Horticulture Services, Cemetery Services, Environmental Resource Management, Environmental Planning and Open Space Management as well as Nature Conservation and Resorts.
Date From:	01 October 2007
Date To:	30 December 2007

Employer	**City Council of Pretoria**
Position	Acting Director: Health Education and Training
Duties &	Oversee the training department

Responsibilities	Responsible for continued professional development of nursing and medical staff, Environmental Health Practitioners Experiential learning of health professionals Career development plans Management training and development Community education, training and awareness Management of the activities of 3 regional Aids Information, Training and Counseling Centers
Date From	March 1999
Date To	September 2001

Employer:	**Tshwane University of Technology**
Position:	Part time lecturer and moderator
Duties & Responsibilities:	Lecturing in various subjects in the department of Environmental Health and Occupational Health Nursing
Date From:	01 January 1994
Date To:	31 December 2002

Employer:	**City Council of Pretoria**
Position:	Health Education and Training Officer
Duties & Responsibilities:	– Health and environmental education, training and awareness programmes – Present training courses – Training needs analysis – Career development plans – Develop training courses – Aids Counseling and training
Date From:	01 January 1992
Date To:	31 December 2001

Employer:	**City Council of Pretoria**
Position:	Senior Environmental Health Officer
Duties & Responsibilities:	Food safety, Environmental pollution control, education and awareness, law enforcement
Date From:	01 January 1986
Date To:	31 December 1992

Project History

Company:	EON Consulting (Pty)Ltd
Project Name:	Gautrain Independent Environmental Consultant (IEC)
Project Description:	Review Gautrain environmental progress, express independent opinions, review EMP and annual reports, oversee expert consultants on behalf of Gautrain management
Project Duration:	2013 - 2015
Project Value:	R 550 000
Designation on Project:	SME and project manager
Responsibilities:	Subject matter expert, auditing and assessment

Company:	EON Consulting (Pty)Ltd
Project Name:	R21/Pomona Environmental Control Officer (ECO)
Project Description:	ECO for a water pipeline project
Project Duration:	2014 to 2015
Project Value:	R 124 000
Designation on Project:	ECO
Responsibilities:	Review construction activities for legal compliance

Company:	EON Consulting (Pty)Ltd
Project Name:	Ekurhuleni EIA's
Project Description:	Obtaining environmental authorisations and water use licenses for the Water and Sanitation department of the City of Ekurhuleni for a period of 3 years. Screening studies to determine authorisations required. Wetland studies.
Project Duration:	2014 to 2016
Project Value:	R 4 000 000
Designation on Project:	Principal Consultant and Environmental Assessment Practitioner (EAP)
Responsibilities:	Screen all projects, apply and manage authorisations, act as site Environmental Control officer

Company:	EON Consulting(Pty)Ltd
Project Name:	Catchment Profiles
Project Description:	Catchment risk profiles for 5 catchments in which Eskom operates for the purposes of

	compiling a Water Safety Plan
Project Duration:	2013
Project Value:	R 130 000
Designation on Project:	Project leader and SME
Responsibilities:	Catchment mapping, profile and risk assessment

Company:	EON Consulting(Pty)Ltd
Project Name:	Wynberg Dam
Project Description:	Environmental Fatal Flaw Analysis of a proposed dam and hydro-electric scheme
Project Duration:	2013
Project Value:	R 50 000
Designation on Project:	Project leader and SME
Responsibilities:	Pre-feasibility fatal flaw analysis

Company:	EON Consulting(Pty)Ltd
Project Name:	Arnot Power Station water use license audit
Project Description:	Auditing of all conditions attached to the water use license of the Arnot Power Station
Project Duration:	2013
Project Value:	R 60 000
Designation on Project:	Project leader and SME
Responsibilities:	Documentation review and site inspection

Company:	EON Consulting(Pty)Ltd
Project Name:	Sasol Water Quality Offsetting
Project Description:	Determination of Secunda Complex mass loadings and investigating offsetting opportunities in the Waterval catchment
Project Duration:	2013
Project Value:	R 1 000 0000
Designation on Project:	Project leader
Responsibilities:	Project management and SME

Company:	EON Consulting(Pty)Ltd
Project Name:	Busby EIA and WULA
Project Description:	Obtaining a water use license and NEMA authorization for a renewable energy project
Project Duration:	May 2012 – Present
Project Value:	R 350 000
Designation on Project:	Project leader and SME
Responsibilities:	Advising the client and managing of the legal process to obtain the relevant environmental authorisations

Company:	EON Consulting(Pty)Ltd
Project Name:	Lazy Bend EIA and WULA
Project Description:	Obtaining a water use license and NEMA authorization for a renewable energy project
Project Duration:	May 2012 – Present
Project Value:	R 350 000
Designation on Project:	Project leader and SME
Responsibilities:	Advising the client and managing of the legal process to obtain the relevant environmental authorisations

Company:	EON Consulting(Pty)Ltd
Project Name:	Ekurhuleni Environmental Authorisations
Project Description:	Obtaining all environmental authorisations for the Water and Sanitation Division
Project Duration:	April 2014 to April 2016
Project Value:	R 4 000 000
Designation on Project:	Project leader and SME
Responsibilities:	Basic Assessments, Water use licensing, project screening, environmental amendments

Company:	EON Consulting(Pty)Ltd
Project Name:	Water Research Commission: Framework for the management of Eskom wetlands
Project Description:	Research and pilot project on wetland management

Project Duration:	January 2013 to June 2014
Project Value:	R 1 000 000
Designation on Project:	Project leader and SME
Responsibilities:	Researcher and project lead

Company:	EON Consulting
Project Name:	CSIR Sediment Modeling
Project Description:	Modeling of the land-water linkages related to bacterial and sediment loads
Project Duration:	August 2012 to present
Project Value:	R 120 000
Designation on Project:	Subject Matter Expert
Responsibilities:	Subject matter expertise

Company:	EON Consulting
Project Name:	Public Investment Company
Project Description:	Environmental Due Diligence of a manufacturing plant
Project Duration:	November 2012
Project Value:	R87 000
Designation on Project:	Project Leader and Subject Matter Expert
Responsibilities:	The investigation of the status of environmental and occupational health and safety legal compliance, due diligence and compliance to the Equator principles

Company:	EON Consulting
Project Name:	Randfontein Local Municipality
Project Description:	Waste Water Risk Abatement Plan (WWRAP).
Project Duration:	01 August 2012 – Present
Project Value:	R87 000
Designation on Project:	Project Leader and Subject Matter Expert
Responsibilities:	The compilation of a WWRAP for the Randfontein waste water treatment works. All risks have been identified, rated and a management plan as well as incident management plan compiled Project successfully completed in September 2012. Received high accolades (100% in

satisfaction survey) from client

Company:	EON Consulting(Pty)Ltd
Project Name:	Tzaneen Waste Water Risk Abatement Plan
Project Description:	Waste Water Risk Abatement Plan (WWRAP).
Project Duration:	January 2013
Project Value:	R 50 000
Designation on Project:	Subject Matter Expert
Responsibilities:	The update of the WWRAP for the Tzaneen waste water treatment works. All risks have been identified, rated and a management plan as well as incident management plan compiled. Once again this project scored 100% from a feedback survey from the client.

Company:	EON Consulting
Project Name:	Environmental Risk Assessment and environmental screening of Energy Crops and associated combustion and biogas installation for the generation of electricity
Project Description:	Analyse water and environmental risks associated with the proposed planting and harvesting of biomass
Project Duration:	August 2012 to present
Project Value:	R 28 000
Designation on Project:	Subject Matter Expert
Responsibilities:	Subject matter expertise on legal environmental requirements

Company:	EON Consulting(Pty)Ltd
Project Name:	Water Conservation Water Demand Management (WCWDM) for Eskom
Project Description:	Implementation of WC/WDM program
Project Duration:	01 March 2011 – Present
Project Value:	R6 m
Designation on Project:	Subject Matter Expert
Responsibilities:	The compilation of a water trading study to investigate the feasibility of trading water through the promotion of improved agricultural efficiencies. Strategic support related to strategic planning over a 5-year period, of key water and environmental initiatives in the Primary Energy Division.

Company:	EON Consulting
Project Name:	Environmental Risk Assessment and environmental screening of Energy Crops
Project Description:	Analyse water and environmental risks associated with the proposed harvesting and generation of electricity from biomass by a local gold mine.
Project Duration:	1 month
Project Value:	R 15 000
Designation on Project:	Subject Matter Expert
Responsibilities:	Subject matter expertise

Company:	EON Consulting
Project Name:	Water Sector Skills Inventory
Project Description:	Analyse the skills levels in the water sector.
Project Duration:	01 March 2011 – Present
Project Value:	R 60 000
Designation on Project:	Subject Matter Expert
Responsibilities:	Subject matter expertise

Company:	MSA
Project Name:	Environmental legal compliance of Sishen, Sishen South and Thabazimbi iron ore mines and beneficiation plant
Project Duration:	01 August 2009 - 31 August 2010
Project Value:	R600 000
Designation on Project:	Project Manager and Lead Auditor
Responsibilities:	• Lead site visits • Audit against legal requirements pertaining to air, water and other requirements as well as EMPR and various RoD's • Compile and present report on findings. Make rectification recommendations. Present report to top management. • Successfully completed. Completed August 2010

Company:	MSA

Project Name:	Environmental legal compliance of Mogale Gold Mine and beneficiation plant
Project Duration:	February 2010 - 31 July 2010
Project Value:	R200 000
Designation on Project:	Project Manager and Lead Auditor
Responsibilities:	• Lead site visits • Audit against legal requirements pertaining to air, water and other requirements as well as EMPR and various RoD's. Investigate lawfulness of various historic activities. • Compile and present report on findings. Make rectification recommendations. Present report to top management. • Successfully completed. Completed August 2010

Company:	MSA
Project Name:	Feasibility Study of the Pan African Parliament in Salvokop, Pretoria
Project Duration:	01 April 2009 - Present
Project Value:	R80 000
Designation on Project:	Oversee the environmental feasibility study
Responsibilities:	• Ensure that all environmental risks are investigated and quantified. Make recommendations. • Successfully completed

Company:	MSA
Project Name:	Land-use management strategy for Kumba Iron Ore
Project Duration:	01 December 2008 - 31 December 2009
Project Value:	R800 000
Designation on Project:	Project Manager
Responsibilities:	• Develop a policy and strategy for Kumba Iron Ore to manage their land. Develop and apply assessment criteria to compile best management plans and practices for the respective pieces of land with reference to future use and rehabilitation requirements • Successfully completed and project accepted by the board.

Company:	MSA
Project Name:	Scoping study, mining right application and environmental impact assessment for Veremo Iron Ore Mine
Project Duration:	01 October 2008 - 31 January 2009
Project Value:	R4 m
Designation on Project:	Project Manager

Responsibilities:	Oversee the impact studies, specialist studies and compilation of the environmental impact assessment report. Liaise with the mining engineers and interpret mining methods with respect to projected environmental impacts and legislative requirements
Company:	MSA
Project Name:	Due Diligence: Afrisam
Project Duration:	September 2009
Project Value:	R85 000
Designation on Project:	Environmental Auditor
Responsibilities:	• Review of all plant operations and associated mining operations against legal requirements and the identification of environmental risks. Quantification of risks and corrective measures in financial terms • Successfully completed
Company:	MSA
Project Name:	Due Diligence: Kgalagadi Manganese Mine and beneficiation plant
Project Duration:	June 2009
Project Value:	R60 000
Designation on Project:	Environmental Auditor
Responsibilities:	• Review proposed mining operations against legal requirements and current approvals obtained and the identification of environmental risks. Quantification of risks and corrective measures in financial terms • Successfully completed
Company:	Arup (Pty)Ltd
Project Name:	Water use license for Transnet's New Multi-purpose Pipeline
Project Description:	Managing the water use authorizations associated with the 550km long petroleum pipeline.
Project Duration:	01 January 2008 - 31 December 2009
Project Value:	R 800 000
Designation on Project:	Senior Environmental Manager
Responsibilities:	• Assess water uses and water resource impacts on the 550 km long pipeline, which included in excess of 2000 river and wetland crossings. • Compile impact and significance tables, write technical reports, oversaw the compilation of GIS maps and data tables. Compile environmental management plans and emergency management plans • Water use license issued in record time
Company:	Arup (Pty) Ltd
Project Name:	Gautrain Construction

Project Description:	Independent Environmental Certifier
Project Duration:	01 July 2008 - 31 July 2009
Project Value:	R 10 billion (total value and not related to my role)
Designation on Project:	Independent Certifier
Responsibilities:	• Environmental auditing of various construction sites to certify environmental compliance related to legislative requirements.

Company:	Arup (Pty) Ltd
Project Name:	Gauteng Freeway Improvement Project (SANRAL)
Project Description:	Environmental legal compliance and ECO
Project Duration:	01 September 2008 - 31 July 2009
Project Value:	R 1 million
Designation on Project:	Oversee the Environmental Control Officer
Responsibilities:	• Environmental auditing of various construction sites to certify environmental compliance related to legislative requirements. • Quality control of the work of the ECO • Review audit reports as compiled by the ECO to the authorities

Company:	City of Tshwane
Project Name:	City Legal Compliance
Project Duration:	2002 - 2008
Project Value:	N/a
Designation on Project:	Project Leader
Responsibilities:	• Roll-out of a quarterly environmental audit program for all City operations. This included: Coal fired power stations, waste water treatment works, landfill sites, workshops, batching plants, Wonderboom Airport, stone quarries and asphalt plants etc. • Compilation of audit protocols and checklists • Verification of corrective measures • Reporting on legal compliance to the municipal manager and Council

Building 25, Thornhill Office Park, Bekker Road, Vorna Valley South Africa

PO Box 12389, Vorna Valley

Midrand, 1686, South Africa

T +27 (0)11 564 2300

info@eon.co.za

www.eonconsulting.co.za

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