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Final Environmental Impact Report for the Proposed Gas Engine Power Plant

DEA Reference No. 12/12/20/2001

Sasol New Energy Holdings (Pty) Ltd

February 2011

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WSP ENVIRONMENT & ENERGY

QUALITY MANAGEMENT

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft EIR	Final Draft EIR		
Date	October 2010	December 2010		
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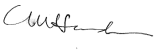
Signature				
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EXECUTIVE SUMMARY

PROJECT BACKGROUND

The Sasol One and Midland Sites located in Sasolburg operate a continuous production run and are therefore vulnerable to erratic or interrupted power supply. Combined with planned expansion projects and the subsequent increase in demand for electricity, Sasol New Energy Holdings (Pty) Ltd proposes to develop and build a gas engine power plant (GEPP) in Sasolburg, Free State Province.

The proposed GEPP will be developed in two phases. Phase 1 will entail an open cycle power plant with an output capacity of approximately 180 megawatts (MW), while phase 2 entails conversion to a combined cycle (heat recovery) that will generate an additional 20 MW. The plant will use several gas engines, with a natural gas consumption of approximately 10 Petajoules per annum (PJ/a). The capacity of individual gas engine units will vary between 4 MW and 10 MW per engine.

The proposed site is adjacent to the existing Steam Station Two power plant located in Bergius Road in Sasolburg. Sasol determined the site's suitability for the GEPP based on the fact that the land is owned by Sasol Infrachem and is in close proximity to the existing Steam Station Two power plant, which provides an opportunity for future integration. Furthermore, the GEPP will need to integrate into existing amenities and infrastructure located within the current Sasolburg operations.

Two alternative technologies have been considered: gas engines and gas turbines. The gas engines (commonly known as internal combustion engines) have been selected by Sasol as the preferred technology on the basis of their life-cycle cost, thermal efficiency, operational simplicity and construction timeframes.

LEGAL FRAMEWORK

The National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, is South Africa's overarching environmental legislation and has, as its primary objective, to provide for co-operative governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state and to provide for matters connected therewith (Government Gazette 33306, 2010).

The proposed Sasol GEPP project will trigger a number of listed activities according to the amended environmental impact assessment (EIA) regulations 2010 of the NEMA, Government Notice R543, R544 and R545 and is therefore subject to an environmental authorisation procedure that includes a scoping and environmental impact assessment (EIA) process.

WSP Environment and Energy (WSP) were appointed by Sasol New Energy Holdings (Pty) Ltd as the independent environmental assessment practitioner (EAP) to facilitate the environmental authorisation process. This process involves the following:

- Scoping Phase:
  - Environmental impact report (EIR) application form;
  - Stakeholder engagement process; and
  - Scoping report.
- EIA Phase:
  - Continued stakeholder engagement process;
  - EIR; and
  - Environmental management programme (EMP).

The scoping phase for this process is complete, and after the final scoping report having been reviewed by the relevant stakeholders, it was approved by the DEA on 23 November 2010. This report represents the environmental impact report (EIR) for the proposed project.

STAKEHOLDER ENGAGEMENT PROCESS

The stakeholder engagement process continued from the scoping phase to ensure continual communication with identified stakeholders. During the process, stakeholders were provided with an additional opportunity to raise issues or concerns regarding the project through the following means:

- The EIR feedback public meeting held on 17 January 2011 at the Boiketlong Community Hall; and
- Public review of the EIR and environmental management programme (EMP) undertaken from 4 January to 2 February 2011.

ISSUES TRAIL

All issues, comments and questions was continually documented within the issues trail (Appendix I). All issues brought up during the scoping and EIA phase have been responded to by WSP and Sasol within this issues trail.

ENVIRONMENTAL IMPACT REPORT

In line with the requirements of the NEMA EIA Regulations 2010 (Regulation 31) this EIR has provided:

- A motivation for the project (Section 3.1);
- A detailed project description (Section 3.2);
- A discussion on the assessment of all alternatives (Section 3.3);
- A pre-development environment description utilising information and findings from specialist studies (Appendix A, Section 7 of the Scoping Report and Section 4 respectively);
- A response to all issues raised by stakeholders and the continued stakeholder engagement process (Appendix I and Section 2.6 respectively);
- An impact assessment of impacts on the biophysical and socio-economic environments (Section 5); and
- An environmental impact statement providing a summary of the impact assessment, a comparative assessment of the positive and negative findings and the environmental assessment practitioner (EAP) opinion on this project (Section 5.5 and 6).

ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMP has been developed under the requirements of the NEMA to ensure that Sasol adopts a sound and sustainable environmental management approach in the construction, operation and decommissioning of the GEPP and to provide a framework for environmental monitoring throughout the construction, operational and decommissioning period.

The objectives of the EMP are to:

- Encourage good management practices through planning and commitment to environmental issues; and
- Provide rational and practical environmental guidelines for environmental awareness in terms of promoting sustainable use of natural resources, minimising all forms of pollution and promoting the reduction, re-use, recycling and recovery of waste.

SPECIALIST STUDIES

- Air Quality Impact Assessment

The GEPP project will be developed in an airshed where pre-project ambient levels of criteria pollutants are close to or, in the case of airborne particulate matter (PM_{10}) exceed the SA statutory limits. No significant air quality impacts due to the proposed GEPP were identified.

- Qualitative Noise Assessment

The noise assessment predicted no significant increase in ambient noise levels at selected receptors, provided that Sasol's specified design criteria are adhered to. Verification monitoring must be done, and if any exceedences of the relevant standards are identified, the implementation of additional mitigation measures are recommended.

- Heritage Impact Assessment

The heritage impact assessment made a finding of no significant impact on heritage resources.

SUMMARY

Overall, no significant impacts (of the proposed GEPP project) that cannot be mitigated were identified. All mitigation and management measures are contained in the EMP.

It is the opinion of WSP that the information contained in this document, read in conjunction with the final scoping report, is sufficient to make an informed decision.

WSP are of the opinion that the project should proceed provided the necessary mitigation and management measures are implemented. Furthermore, should the GEPP be constructed, the growth projects at the Sasol One Site will no longer be as vulnerable to short supply and power interruptions due to continuous projection, as the GEPP will be providing most of the necessary required electricity.

The GEPP project supports Sasol's ambition to grow its "low carbon electricity generation" capacity in order to reduce its greenhouse gas footprint, as well as priority pollutants over the medium to long term The GEPP will thus enable growth.

1 INTRODUCTION

1.1 TERMS OF REFERENCE

Sasol New Energy Holdings (Pty) Ltd (Sasol) proposes to construct a gas engine power plant (GEPP) on Erf 8037 adjacent to the Steam Station Two power plant in Sasolburg. (Figure 1).

WSP Environment and Energy (WSP) was appointed by Sasol as the independent environmental assessment practitioner (EAP) on 4 August 2010 to undertake the environmental authorisation process.

The proposed GEPP has triggered a number of listed activities according to the amended Environmental Impact Assessment (EIA) Regulations 2010 as per the National Environmental Management Act (No. 107 of 1998) (NEMA), Listing Notice 1, R. 544, Listing Notice 2, R. 545, and Listing Notice 3, R.546 (Government Gazette 33306, 2010). The project is therefore subject to an environmental authorisation procedure that includes a two-phase EIA process, namely scoping and environmental impact report (S&EIR).

An application was submitted to the National Department of Environmental Affairs (DEA) on 12 August 2010 and subsequently received the project reference number: 12/12/20/2001. DEA is the lead authority for the environmental authorisation of energy sector projects compliant with the National Energy Response Plan (NERP) criteria as per General Notice No. 162 of 2010, published in Government Gazette No. 10505 of 24 February 2010, *Guideline on Environmental Impact Assessments for Facilities to be Included in the Electricity Response Plan*.

A scoping report was compiled following the scoping phase of the project. The final scoping report was submitted to the DEA on 18 October 2010 for review and authorisation, following public and state department review during September and October 2010. The DEA approved the scoping report on 23 November 2010. Refer to Appendix A for the final scoping report, the letter of acknowledgement, as well as the approval letter from the DEA.

This document forms the EIR as per regulation 31 of the NEMA EIA process and includes:

- Summary of the final scoping report including a summary of the project alternatives, potential identified environmental impacts and expertise of the EAP (**Section 1**);
- The approach and methodology adopted for the EIR and environmental management programme (EMP) including the stakeholder engagement process undertaken during the EIA phase (**Section 2**);
- A reiteration of the project motivation, description, including site location and proposed project design (**Section 3**);
- A description of the existing environment that may be affected by the activity contained in **Appendix A, Section 7** of the final scoping report;
- A summary of the findings and recommendations of all specialist studies undertaken for the proposed project (**Section 4**);
- The methodology used in determining the significance of potential environmental impacts as well as the assessment of impacts **(Section 5);**
- Knowledge gaps and adequacy of predictive methods **(Section 5);**
- Discussion of the significant impacts **(Section 5);** and
- Environmental impact statement and conclusion **(Section 6)**.

Furthermore, the report will include information from three specialist studies undertaken during the EIA phase, namely:

- Air Quality Assessment;
- Noise Assessment; and
- Heritage Impact Assessment.

The EIR will be followed by the compilation of the draft EMP **(Appendix R).**

Please refer to Appendix B for the inventory of EIR requirements as per regulation 31 of the NEMA, as amended EIA process which is linked to the EIR (this report).

1.2 PROJECT BACKGROUND

South Africa's electricity demand started challenging Eskom's reserve margin during the winter of 2004 and more so from mid-2007. The sharp rise in demand required load shedding measures to be implemented during the first quarter of 2008. The global recession at the end of 2008 brought some relief to the continuous growth in energy demand but normalisation of the market will see the energy gap continue to grow as early as the fourth quarter of 2010.

Sasol's Sasolburg operations have increased electricity demands due to growth projects planned for the site. The operation is vulnerable to short supply and power interruptions during their continuous production processes and therefore Sasol proposes to develop a GEPP in two phases.

Phase 1 will entail an open cycle power plant with an output capacity of approximately 180 MW; and Phase 2 will entail conversion of phase 1 from an open cycle to a combined cycle (including heat recovery) that will generate an additional 20 MW. The plant is expected to produce the specified electrical output, using several gas engines based on a natural gas consumption of approximately 10 Petajoules (PJ) per annum. This will ensure Sasol meets its critical requirements for long-term reliability and plant performance at the Sasolburg operations.

The GEPP fuel source, namely natural gas, will be piped from Mozambique to Secunda, and then diverted to Sasolburg. The proposed pipeline project is a separate project to the GEPP and was subjected to its own EIA process undertaken by Nature & Business Alliance Africa. The title of the EIR is "The installation, commissioning and operation of a high-pressure natural gas transmission pipeline from Sasol Synfuels in Secunda to Sasol Chemical Industries in Sasolburg, via Balfour" DEA reference number 12/12/20/1067. Environmental authorisation was granted on 12 October 2009. An application for amendment for route deviations was granted on 2 August 2010. The pipeline construction will happen in parallel to the GEPP construction process.

1.3 SITE LOCATION

The proposed site is located on Erf 8037 adjacent to the Steam Station Two power plant in Sasolburg, within the Metsimaholo Local Municipality, Free State Province. The brownfield site is 400 m long and 230 m wide (Figure 1 and Figure 2). Furthermore, refer to Appendix C for A3 size of the locality map and Google image of the proposed site.

The site is owned by Sasol Chemical Industries (Pty) Ltd and they are aware of Sasol New Energy Holdings (Pty) Ltd intention to use the site for the development of the GEPP project.

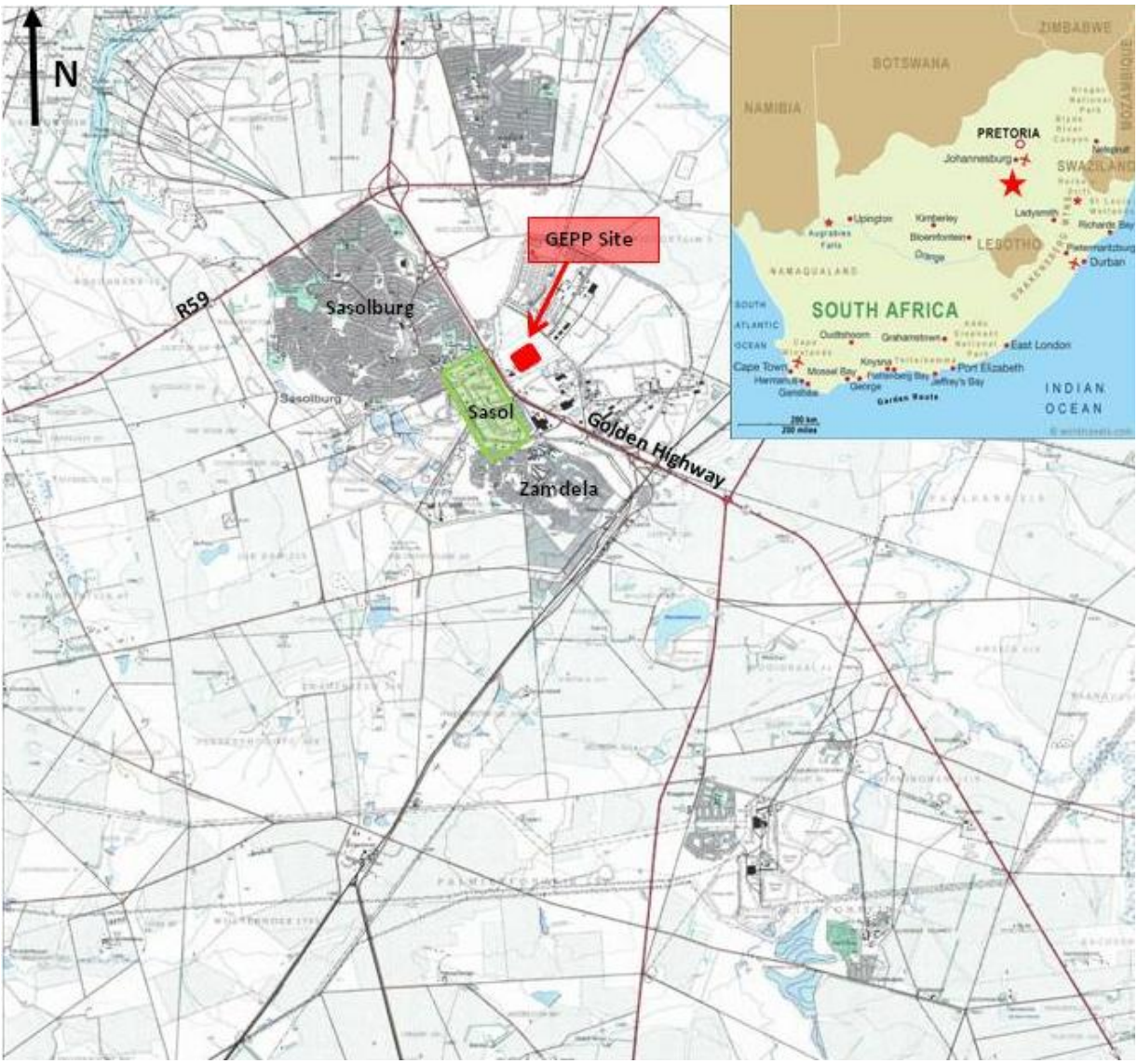

Figure 1: Site Locality Map (1:50 000 Topographical Map, 2627DD).

Figure 2: Google earth image of the proposed GEPP site

1.4 SUMMARY OF ALTERNATIVES CONSIDERED IN THE SCOPING PHASE

The following alternatives were considered and evaluated in the scoping report. These were deemed to be non-viable and/or unreasonable and were therefore not assessed further during the EIA Phase. For further details, please refer to Section 5 and 6 of the final scoping report in Appendix A.

1.4.1 No-Project Option

According to the EIA Regulations, consideration must be given to the option not to act (the no-project option). Without the implementation and construction of the GEPP project, the growth projects in Sasolburg will not be guaranteed 100% electricity availability. This will prevent Sasol from meeting their critical requirements for long-term reliability and plant performance at the Sasolburg operation.

Furthermore, South Africa's current dependence on coal as a fossil fuel based energy supply is the country's main contributor to CO_2 emissions, which is the primary greenhouse gas that has been linked to climate change. With South Africa's commitment to reducing its CO_2 emissions by 34 % by 2020 (UNFCCC, 2009), coupled with the increasing demand for electricity, the 'no-go option' is not considered a viable option for this project.

1.4.2 Alternative Sites

The objective of the project is to assist with electricity supply to the Sasol sites located in Sasolburg in order to accommodate the sites' projected growth. Therefore, the existing operations necessitate the proposed GEPP location within close proximity, thus providing for the required connection to the existing facilities, infrastructure and utilities associated with the existing Sasolburg operations.

The specific site was ideal due to the landowner being Sasol Infrachem and to the close proximity of the existing Steam Station Two power plant, making integration into the operations cost effective. No additional land owned by Sasol is located in close proximity to the existing electricity infrastructure; therefore this site is the preferred location. Furthermore, the site is not adjacent to any residential areas. No other sites/properties were further investigated.

1.4.3 Alternative Technology

Technology alternatives for the proposed project included:

- Gas turbines versus internal combustion engines as a means of primary electricity generation;
- Reciprocating engine technology options including spark ignition engines, duel fuel engines, and high pressure gas injection engines; and
- Heat recovery techniques including combined cycle plants with and without supplementary firing, and the utilisation of water and/or solvents as possible working fluid/s.

These considerations were dealt with in further detail in the scoping report – Refer to the project description in **Section 4** of the final scoping report (Appendix A).

The spark-ignited internal combustion (reciprocating) engine was selected on the basis of 100% plant availability, life-cycle cost, thermal efficiency, operational simplicity and construction timeframes. However, a preferred service provider/technology partner has not yet been selected.

1.4.4 Process alternatives

On the basis of the design the assumed chemical and/or catalysts expected in the GEPP include:

- Industrial degreasers for engine washing (100 ℓ);
- Propylene glycol as water additive to the GEPP (1000 ℓ);
- Lubrication oil for the gas engines (2 x 50m^3 tanks);
- Used oil tank (no more than 1 x 35 m^3); and
- The solvent propane (which initially was the solvent heptane in the final scoping report) (approximately 10 000 ℓ).

The volumes indicated above will not exceed 500 m^3 (combined capacity). Storage facilities will be designed in accordance with the South African legislative requirements to ensure adequate provisions for containment and control of emissions.

The solvent heptane has been changed to the use of propane since a decision on the proposed technology for heat recovery has been taken. A major hazardous installation (MHI) is not required for propane however, environmental awareness training will be provided to all employees of the GEPP during the implementation of Phase 2, in terms of handling and management of propane in accordance to the EMP to prevent accidental spills resulting in impacting the receiving environment.

1.5 SUMMARY OF ENVIRONMENTAL ISSUES IDENTIFIED IN THE SCOPING PHASE

The following environmental issues displayed in Table 1 were identified in the scoping phase of the project:

Table 1: Summary of environmental issues identified in the scoping phase

Issue	Required Investigation in EIA Phase	Section Reference
1.5.1 Waste Management Once operational, the predominant waste output from the GEPP will be used oil from the lubricating regime. In addition the project will also generate a range of typical industrial wastes including hazardous waste (e.g. oil contaminated materials, lubrication oils, propane (**not** heptane as stated in the final scoping report)), recyclable waste such as steel, plastic and glass, as well as a non-recoverable fraction. Operational phase impacts primarily relate to potential accidental releases of hazardous substances into the environment as a result of operator negligence, storage tank / secondary containment failures, or catastrophic incidents such as fire or explosion. This will result in potential contamination of the surrounding soil or local storm water drainage system, as well as air pollution in the event of solvent release or fire. Secondary effects could potentially include impacts on human and ecological health in the receiving environment.	No	-
1.5.2 Surface Water As per the waste management section above, any potential accidental releases of hazardous substances into the environment, as a result of operator negligence, storage tank / secondary containment failures, or catastrophic incidents such as fire or explosion, will result in contamination of the surrounding local storm water drainage system. This could potentially reduce the water quality resulting in secondary adverse effects on the health of human and ecological water users.	No	-
1.5.3 Effluent Emissions The main sources of effluent streams in a gas fired combustion plant anticipated are: ■ Open & Combined Cycle: – Oily washing effluents associated with the cleaning and maintenance of equipment and runoff from potential contaminated areas. ■ Combined Cycle: – Organic fluid (propane) from the new technology selected by Sasol: Oganic Rankine Cycle (ORC). On the basis of the above no effluent related impacts are anticipated to arise from the project.	No	-
1.5.4 Air Quality The primary criteria pollutants from natural gas-fired reciprocating engines are nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC). The formation of NO_x is exponentially related to combustion temperature in the engine cylinder. The other pollutants, CO and VOC species, are primarily	Yes	Section 5.1

Issue	Required Investigation in EIA Phase	Section Reference
the result of incomplete combustion. Particulate matter (PM) emissions include trace amounts of metals, non-combustible inorganic material, and condensable, semi-volatile organics which result from volatized lubricating oil, engine wear, or from products of incomplete combustion. Sulphur oxides are very low since sulphur compounds are removed from natural gas at processing plants. It should be emphasised that the actual emissions may vary considerably due to variations in the engine operating conditions. This variation is due to engines operating at different conditions, including air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors. The primary potential impact relates to the deterioration of ambient air quality in the vicinity of the project. Secondary potential impacts relate to the potential for adverse health effects on human receptors in the vicinity of the GEPP, and in the surrounding areas. In this regard, sensitive receptors include personnel working on the site, and communities residing in areas beyond the fence line. An air quality impact assessment was undertaken during the EIA phase. In this study particular emphasis will be placed on the identification of all sources of emissions and undertaking atmospheric dispersion modelling using CALPUFF.		
1.5.5 Noise Natural gas-fired, spark ignition reciprocating engines emit noise during their operation. In almost all instances, some degree of sound attenuation will be necessary to protect employees working in the vicinity of such engines from noise-induced hearing loss (this issue will be dealt with through inclusion into Sasol's existing occupational health and safety procedures), as well as to reduce off-site noise transmission to the point where complaints and community impacts are minimized. The primary noise sources associated with these types of installations are typically exhaust discharges, intake "roar", mechanical noise (e.g. engine valves) and ancillary cooling equipment (i.e. radiators and fans). However, the potential for any discernable changes to the noise environment surrounding the project area is reduced by the numerous ambient noise contributors that exist in the industrially zoned area. This would tend to mask or buffer the additional contribution of the GEPP. Based on the abovementioned noise emission characteristics of the proposed infrastructure, it is clear that the potential exists for noise impacts to occur at areas surrounding the project site. That said however, various means of noise abatement can be employed to reduce noise emitted to the external environment, thus reducing the potential for these impacts to occur. A qualitative noise assessment was undertaken to identify further potential noise related impacts.	Yes	Section 5.2

The way in which these issues have been incorporated into the EIR is elaborated in Section 2.2 below. In summary, the following specialist reports were commissioned:

- Air quality impact assessment;
- Qualitative noise assessment; and
- Heritage impact assessment.

A geotechnical study was provided by Sasol as additional information for the project.

1.6 PROJECT PROPONENT

The applicant for the proposed GEPP is Sasol New Energy Holdings (Pty) Ltd (Sasol). The relevant details are in Table 2.

Table 2: Project Proponent Details

Project Applicant	Sasol New Energy Holdings (Pty) Ltd
Company Registration/ Identity number for individuals:	2009/000331/07
Contact Person:	Henri Loubser
Postal Address:	P.O. Box 5486 Johannesburg 2000
Telephone:	+27 (0) 11 344 2710
Fax:	+27 (0) 11 219 0925
E-mail:	henri.loubser@sasol.com

1.7 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP Environmental (Pty) Ltd (WSP) was appointed by Sasol as the independent environmental assessment practitioner (EAP) to facilitate the environmental authorisation process. WSP is a leading international environmental consultancy with a broad range of expertise in the environmental industry. WSP is a subsidiary of WSP Group plc, a global consultancy which is listed on the London Stock Exchange. WSP has successfully project managed a number of high profile environmental projects in South Africa over the past 20 years (refer to WSP's Capability Statement in Appendix D). WSP's details are displayed in Table 3.

Table 3: Environmental Assessment Practitioner Details

Environmental Assessment Practitioner:	WSP Environment and Energy	WSP Environment and Energy
Contact Person:	Dr Caroline Henderson	Kylie Farrell
Physical Address:	WSP House Bryanston Place 199 Bryanston Drive Bryanston Sandton 2021	WSP House Bryanston Place 199 Bryanston Drive Bryanston Sandton 2021

Environmental Assessment Practitioner:	WSP Environment and Energy	WSP Environment and Energy
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2 Approach and Methodology for the EIA Process

2.1 OVERALL EIA PROCESS AND METHODOLOGY

WSP has completed the scoping phase of the environmental assessment process which included a review of existing information, the gathering of baseline data, stakeholder engagement and the compilation of a scoping report which was submitted to the DEA on 18 October 2010 and approved by DEA on 23 November 2010. The overall EIA process to be followed, including the technical and stakeholder inputs and process schedule is illustrated below (Figure 3) in accordance to Section 31 of the NEMA, as amended.

The planned schedule of days follows the draft NERP which was compiled in response to the electricity supply crisis in 2008. Essentially the NERP focuses on the acceleration of the built programme for construction facilities relating to the generation, transmission and distribution of electricity in the short to medium term (2008 to 2013). The streamlined environmental authorisation process states that state department and stakeholder review of the draft EIR and EMP occurs simultaneously, over a period of 40 days.

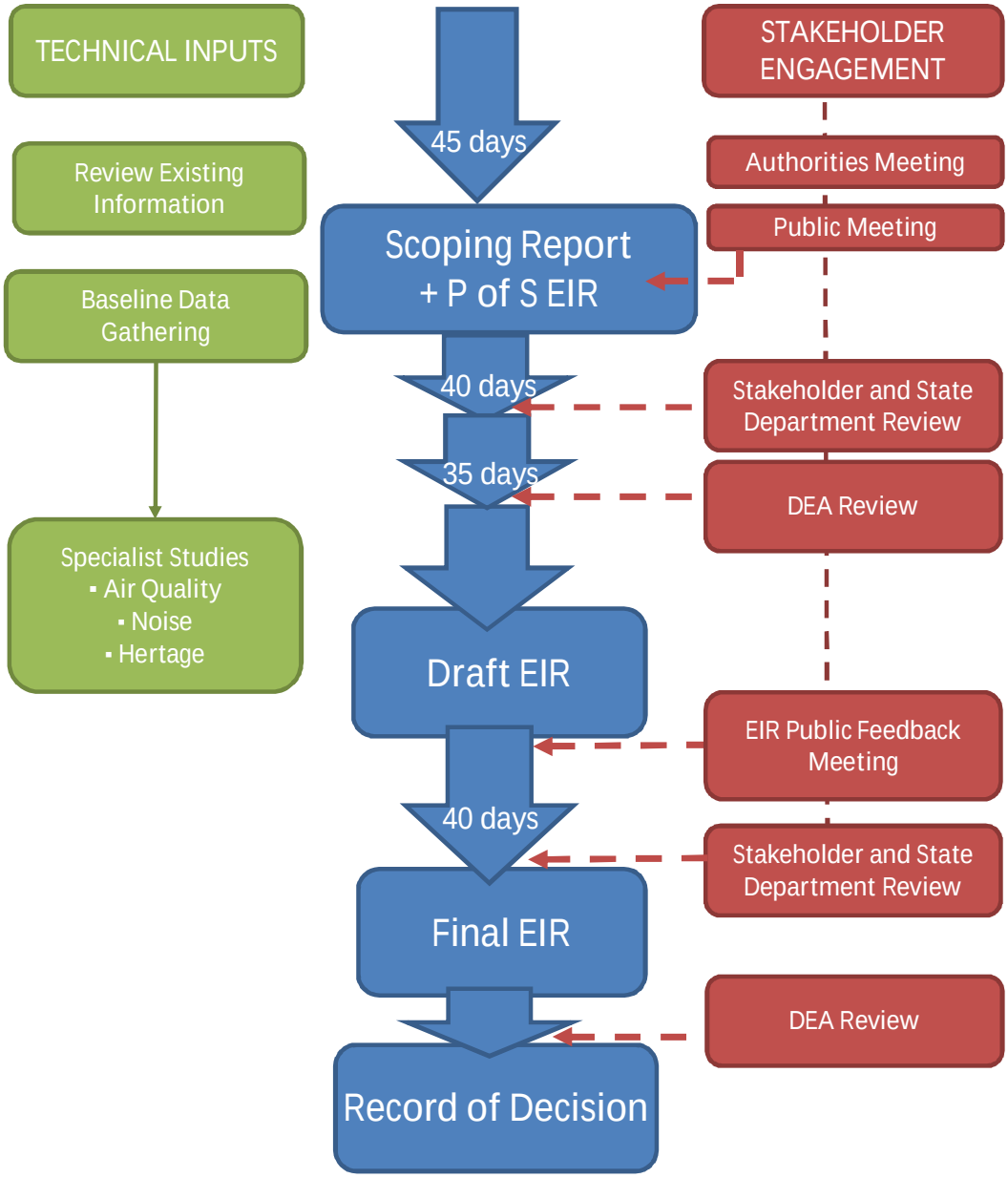


Figure 3: Diagram of EIA Process

2.1 OBJECTIVES OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objectives of the EIR, as mentioned in the Plan of Study contained in the final scoping report, are to provide:

- An assessment of the environmental aspects likely to be affected by the proposed project;
- An assessment of the environmental aspects likely to be affected by any identified alternatives;
- An assessment of the nature, extent, duration, probability and significance of the identified potential environmental, social and cultural impacts of the proposed project;
- A comparative assessment of the identified land use and development alternatives and their environmental, social and cultural impacts;
- The appropriate mitigation measures of each significant impact of the proposed project;
- Details of the continued stakeholder engagement process followed during the course of the assessment and an indication of how the issues raised have been addressed;
- Identification of knowledge gaps and reporting on the adequacy of predictive methods, underlying assumptions and uncertainties encountered in compiling the required information;
- A description of the arrangements for monitoring and management of environmental impacts; and
- Inclusion of technical and supporting information as appendices, if available.

2.2 SPECIALIST REPORTS

The environmental scoping process identified potential issues relating to airborne emissions and noise intensities resulting from the proposed GEPP. In order to ensure that the above environmental issues are sufficiently investigated, a detailed air quality study and qualitative noise study were carried out in the EIA phase in order to ensure that potential environmental impacts are fully understood, and that appropriate mitigation measures developed.

Further to the above, on 1 October 2010, a letter was received from SAHRA regarding the draft scoping report (Appendix E). They stipulated that due to the proposed project exceeding 5 000 square meters (m^2), a heritage impact assessment (HIA) in terms of Section 38 of the National Heritage Resources Act (No. 25 of 1999) (NHRA) is required for the proposed project.

> *Section 38 (1): Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:*
>
> *(c) Any development or other activity which will change the character of a site—*
>
> *(i) exceeding 5 000 m^2 in extent.*

The other specialist studies completed during the EIA phase were an:

- Air quality impact assessment, including atmospheric dispersion modelling using CALPUFF/CALMET; and a
- Qualitative noise assessment.

2.2.1 Legal Requirements for Specialist Reports

The EIA process being undertaken meets the requirements of South Africa's overarching environmental legislation, the NEMA, Government Notice Regulation (GNR.) 543 of 18 June 2010. Specialist reports were undertaken in accordance with Section 32 of the NEMA EIA Regulations which specify the inclusion of the following information:

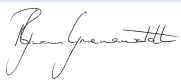
- Details of the person who prepared the report, and the expertise of that person to carry out the specialist study;
- Declaration that the person is independent;
- Indication of the scope of, purpose for which the report was prepared;

- Description of the methodology adopted in preparing the report;
- Description of any assumptions made, any uncertainties or gaps in knowledge;
- Description of findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;
- Recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;
- Description of any consultation process that was undertaken during the course of carrying out the study;
- Summary and copies of any comments that were received during any consultation process; and
- Any other information requested by the competent authority.

2.2.2 Approach and Methodology for the Specialist Studies

Refer to Table 4 for details of specialists who compiled the above mentioned specialist study reports including their declaration of independence that they are fully aware of their responsibilities in terms of the NEMA EIA Regulations and that they have no financial or other interest in the undertaking of the proposed activity other than the imbursement of consultant's fees. Refer to Appendix F for the specialists curriculum vitae's.

Table 4: Specialists

Specialist Study	Specialist	Organisation	Qualifications	Declaration of Independence Signature
Air quality impact assessment	Mrs Renee von Gruenwaldt	Airshed Planning Professionals (Pty) Ltd	Qualified air quality specialist with a Master's degree of Atmospheric Sciences: Meteorology from the University of Pretoria. She has eight years' experience in air pollution impact assessment and air quality management.	
Qualitative noise assessment.	Mr Barry Roberts	WSP	Qualified environmental scientist with an Honours Bachelor of Science (Environmental Monitoring and Modelling) obtained from the University of South Africa. He has more than four years' experience in environmental consulting, the majority of which have been focused on air and noise quality.	
Heritage impact assessment.	Dr Anton van Vollenhoven	Archaetnos	Qualified heritage scientist with the following qualifications: ■ BA (UP) 1986; ■ BA (HONS) UP 1988; ■ MA (ARCHAEOLOGY) UP 1992; ■ Post-Graduate Diploma in Museology UP 1993; ■ Diploma in Tertiary Education UP 1993; ■ MA (Afrikaans Cultural History) US	

			1998; ■ DPhil (Archaeology) UP 2001; ■ Management Diploma TUT 2007; and ■ DPhil (History) US 2010. He has published more than 70 articles in scientific and popular journals on archaeology and history, and also has been the author and co-author of over 200 unpublished reports on cultural resources surveys and archaeological work. He has also published a book on the Military Fortifications of Pretoria. He has 22 years' experience in museums, archaeology and heritage management.	

- Methodology for Air Quality Impact Assessment

Atmospheric dispersion modelling was undertaken for the proposed GEPP using the CALPUFF modelling suite recommended for regulatory use by the US-EPA for complex terrain environments and regional-scale modelling domains. Phase 1 and phase 2 of the GEPP were assessed using the following source parameters and emission rates provided by Sasol for the nine stacks for each phase (Table 5 and Table 6 respectively):

Table 5: Stack parameters for the GEPP

Phase	Height above ground (m)	Diameter (m)	Exit temperature (°C)	Exit velocity (m/s)	Volume flux (m3/s)
Phase 1	27	1,8	400	25	64.4
Phase 2	27	1.8	138	15.3	38.9

Table 6: Emission rates for the GEPP

Phase	No_x	PM	CO
Phase 1	7.5	0.4	12.6
Phase 2	7.5	0.4	12.6

The air quality study modelled three scenarios for phase 1 and phase 2:

- Project baseline situation, which comprises the ambient concentrations of criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), and airborne particulate matter (PM_{10}) due to all existing sources of emissions in the operating Sasol industries;
- Ambient concentrations of the same criteria pollutants arising from routine emissions from the GEPP project *only*; and
- The cumulative ambient concentrations including all current sources of emissions, proposed Sasol operations *plus* the GEPP

- Methodology for Qualitative Noise Assessment

Screening-level predictive modelling was used to ascertain indicative residual noise levels which could be experienced at key receptors. Model inputs were obtained from technical equipment specifications and site-specific parameters. These included aspects such as engine noise (mechanical, exhaust and intake), steam turbine noise (associated with potential combined cycle generation at a later stage in the project lifespan) and typical abatement measures. Also accounted for, were the type and relative location of receptors, the existing surrounding environment and previous boundary noise measurements.

- Methodology for Heritage Impact Assessment

A survey of literature was initially undertaken in order to obtain background information regarding the area prior to undertaking a field survey with the aim to locate all possible objects, site and features of cultural significance in the area of proposed development.

Summaries of the specialist studies are incorporated in Section 4 of this report.

2.3 APPROACH AND METHODOLOGY FOR THE ENVIRONMENTAL IMPACT REPORT

The EIR and draft environmental management programme (EMP) have been developed in accordance with legal requirements along with the objectives detailed for the EIR.

The methodology applied for conducting the EIR consisted of the following processes:

- The environmental scoping report was submitted to DEA on 18 October 2010 and approved on 23 November 2010;
- All comments received from the DEA, (including state departments) and stakeholders were addressed in this EIR and the draft EMP;
- The environments likely to be affected by the project were assessed without management measures in place including cumulative impacts;
- The identified potential environmental, social, cultural and cumulative impacts were identified and assessed with management measures in place;
- A draft EMP was compiled detailing the proposed management commitments as described in the EIR;
- The EIR (this report) and the draft EMP report will be placed on public review and submitted to the DEA and relevant state departments for a period of one month, from 4 January to 4 February 2011, in order for stakeholders to comment;
- The stakeholders were informed of the availability of these reports by means of personal communications, either by advertisement in a local paper, letter, email, fax, sms or telephonically;
- All comments received from the stakeholders will be addressed in the final EIR;
- This final EIR and final draft EMP report will be submitted to the DEA for consideration;
- An environmental authorisation of the final EIR and draft EMP will be issued by the DEA; and
- All stakeholders will be informed of the DEA decision on the proposed project.

The above tasks have been further detailed in the sections below.

2.4 ENVIRONMENTAL IMPACT RATING

The environmental impact rating was undertaken according to the WSP impact significance assessment methodology and is discussed in **Section 5** of this report.

2.5 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

The draft EMP provides recommendations for the mitigation of identified environmental impacts due to the proposed project as well as a detailed outline of the implementation programme to manage the environmental impacts.

The draft EMP includes the following for the planning, construction, closure/decommissioning and rehabilitation phases of the proposed project, as well as mitigation and management measures. The draft EMP report will consist of the following:

- Details and expertise of the person who prepared the programme;
- Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in the EIR (this report). This will include environmental impacts or objectives in respect of the pre and post-construction activities and rehabilitation of the environment where relevant;
- A detailed description of the aspects of the activity that are covered by the draft EMP;
- Identification of the persons who will be responsible for the implementation of the mitigation measures; and
- Proposed mechanisms for monitoring compliance with the draft EMP and reporting thereof.

2.6 STAKEHOLDER ENGAGEMENT PROCESS

2.6.1 Objectives of the stakeholder engagement process for the EIA Phase

The NEMA Section 56 is an important component for any environmental authorisation process. A full stakeholder consultation process was undertaken from the onset of the scoping phase of the project to ensure that the widest range of stakeholders was adequately and effectively consulted. Please refer to Section 3.5 of the final scoping report in Appendix A for a summary of the stakeholder engagement process that was undertaken during the scoping phase. All issues and concerns that were raised during the scoping phase have been included in this report.

As this process ensures an open and transparent EIA process, stakeholder engagement continued throughout the EIA phase of the proposed project.

2.6.2 EIA Phase – EIR Feedback Public Meeting

An EIR feedback public meeting was held at the Boiketlong Community Hall on 17 January 2011 from 17h30 until 19h30. The meeting, as well as public review process of the EIR and EMP, was advertised in the following newspapers:

The Star Newspaper: 13 December 2010 and 3 January 2011; and

The Vaal Vision: 16 December 2010 and 6 January 2011.

Refer to Appendix G for the two additional advertisement publications for the stakeholder engagement process.

The objective of the EIR pubic feedback meeting was as follows:

- Update the public with the details of the project;
- Inform the public of the outcome of the scoping phase;
- Notify the public of the identified biophysical and socio-economic environmental impacts identified during the EIA phase as well as possible mitigation and management measures to help guide Sasol to alleviate the significant impacts;
- The way forward following the EIA phase; and
- Provide an opportunity for stakeholders to raise issues, concerns and queries related to thereto.

The meeting minutes have been incorporated in Appendix H of the final EIR.

2.6.3 Issues trail

The issues trail details the outcome of all stakeholder engagement and/or consultation during both the scoping and EIA phase of the project. The issues trail is contained in Appendix I of this report as an input to the identification of potential issues and impacts. Furthermore, the issues trail further records the following:

- List of all issues raised;
- Record of who raised issues;
- Record of where the issues were raised; and
- Response to the issues (given by the project team).

Comments and queries, as per the EIR feedback public meeting, will be included in the final EIR.

2.6.4 Submission of the EIR and EMP for State Department and Stakeholder Review

In terms of the accelerated schedule for the EIA process proposed for NERP projects, public review of the draft EIR and EMP occurred simultaneously with state departments' review of the document over a period of 40 days. The draft EIR and EMP was made available for public review at the following venues:

- Boitjhorisongong Resource Centre;
- Zamdela Public Library;
- Sasolburg Main Library; and
- WSP Environmental's website (www.wspenvironmental.com/publicreview).

Furthermore, the draft EIR and EMP was made available for review at the following state departments in Table 7. Please refer to Appendix J for proof of receipt.

Table 7: State Departments

Free State Department of Economic, Tourism and Environmental Affairs		
Grace Nkhosana	051 400 4812	Nkhosana@detea.fs.go.za
Tsholo Melato	051 400 4815	melatot@dteea.fs.gov.za
Department of Water Affairs		
Lesiba Mabona	012 392 1357	mabonal@dwa.gov.za
Philimon Khwinana	012 392 1356	khwinap@dwa.gov.za
South African Heritage Resource Agency		
Gabriel Tlhapi	051 430 4139	vkheth@fs.sahra.org.za
Metsimaholo Local Municipality		
Josephina Mathunzi		thokozile.mathunzi@metsimaholo.gov.za
Mpho Mafsos	(016) 976 0029 ext 354	mpho.mafoso@metsimaholo.gov.za
Fezile Dabi District Municipality		
Dr Mongake	(016) 970 8607	rietieg@nfsdc.co.za

Land Development and Land Reform		
Mr S. Ogunronbi	012 312 9371	sogunronbi@ruraldevelopment.gov.za
DA Office		
Rothea Coetzer	016 973 3438	dametsi@telkomsa.net

2.6.5 Final EIR and EMP Submission

The final EIR and EMP will be subsequently submitted to the DEA on 4 February 2011 for consideration.

3 Project Motivation, Description and Potential Alternatives

3.1 PROJECT MOTIVATION

South Africa's demand in electricity started challenging Eskom's reserve margin during the winter of 2004, and more continuously from mid-2007. In spite of marginal attempts to implement energy efficient and demand side management, the sharp rise in demand required load-shedding measures to be implemented during the first quarter of 2008.

In 2004, the South African Government introduced the independent power producers (IPP) model which allowed the private sector to develop and operate up to 30% of new generation across conventional generation mixes. The enabling regulatory environment that is needed for private sector engagement is only now starting to take shape and there may be the potential for bankable IPPs as early as the first quarter of 2011.

Sasol's sites in Sasolburg have increased electricity demands due to growth projects planned for the sites. The sites are vulnerable to short supply and power interruptions due to continuous production, therefore Sasol proposes to develop a GEPP in two phases. Phase 1 will entail an open cycle power plant with an installed capacity of approximately 180 MW (the aim is to have a constant/baseload production of at least 140 MW); and phase 2 will entail conversion to a combined cycle (heat recovery) which will generate an additional 20 MW. The plant is expected to produce the specified electrical output, using several gas engines based on a natural gas consumption of approximately 10 PJ per annum. The GEPP projects support Sasol's ambition to grow its "low carbon electricity generation" capacity in order to reduce its greenhouse gas footprint, as well as priority pollutants over the medium to long term the GEPP will thus enable growth. .

The design of the GEPP is based on a commercial, proven vendor package for the Gas Engines while any tie-ins to existing infrastructure will adhere to Sasol specifications., Typical delivery periods for Gas Engines range from seven to nine months for the first engine sets with a total implementation period of 18 months (from order placement to start-up).

In order to capture the opportunity successfully and to provide electricity for the growth projects, a fast tract project schedule has been proposed to achieve the targeted start-up date of July 2012 (with ramp-up to full ready for operation in September 2012).

3.2 SITE LOCATION AND DESCRIPTION

The site is located on Erf 8037 which is situated just north of Berguis Road and opposite the Steam Station Two power plant within Sasol's Sasolburg Operations.

Erf 8037 is zoned for industrial uses (refer to Figure 4 for the site location and Figure 5 which displays a Google earth image of the proposed site including co-ordinates of the site). The proposed site is occupied by existing service infrastructure such as pipelines (carrying filtered water, blended filtered water, waste water and steam to and from the Sasol One operations), and cable trenches owned by Eskom (Figure 6).

Future developments for the surrounding area include a 88kV sub-station proposed by Sasol New Energy Holdings to be constructed adjacent to the proposed GEPP project and the Steam Station and Power Station Two. This new development does not trigger any additional listed activities from the NEMA.

The site is surrounded by industrial and commercial activities. The Golden Highway and Sasol One site are located to the west and southwest of the site respectively, with vacant land directly to the north and east. Adjacent to the proposed site directly south is Power Plant and Steam Station Two. Industrial land uses exist beyond the vacant land and comprise various chemical industries (Figure 6).

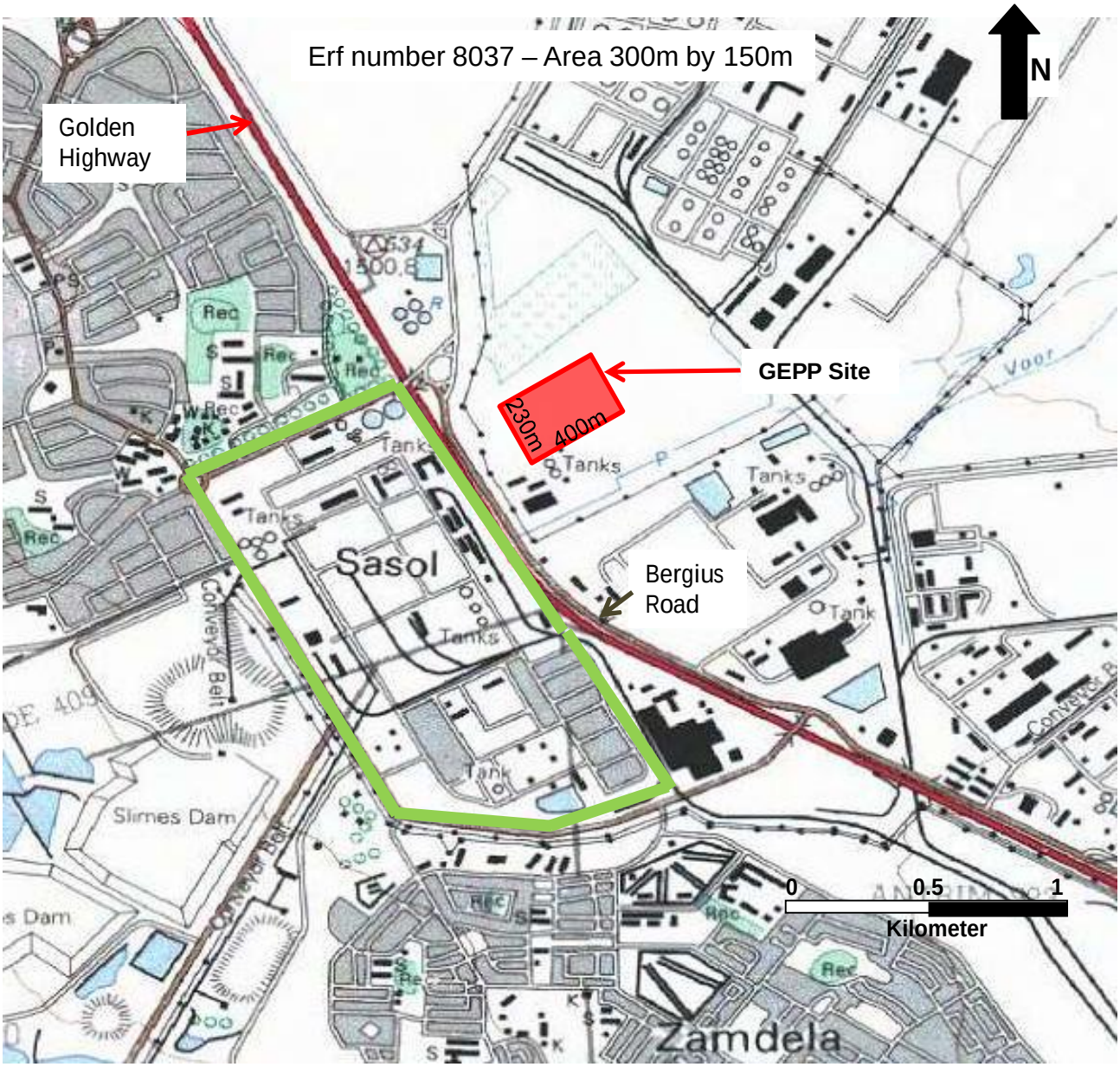


Figure 4: Portion of 1:50 000 Topographical Map, 2627DD.

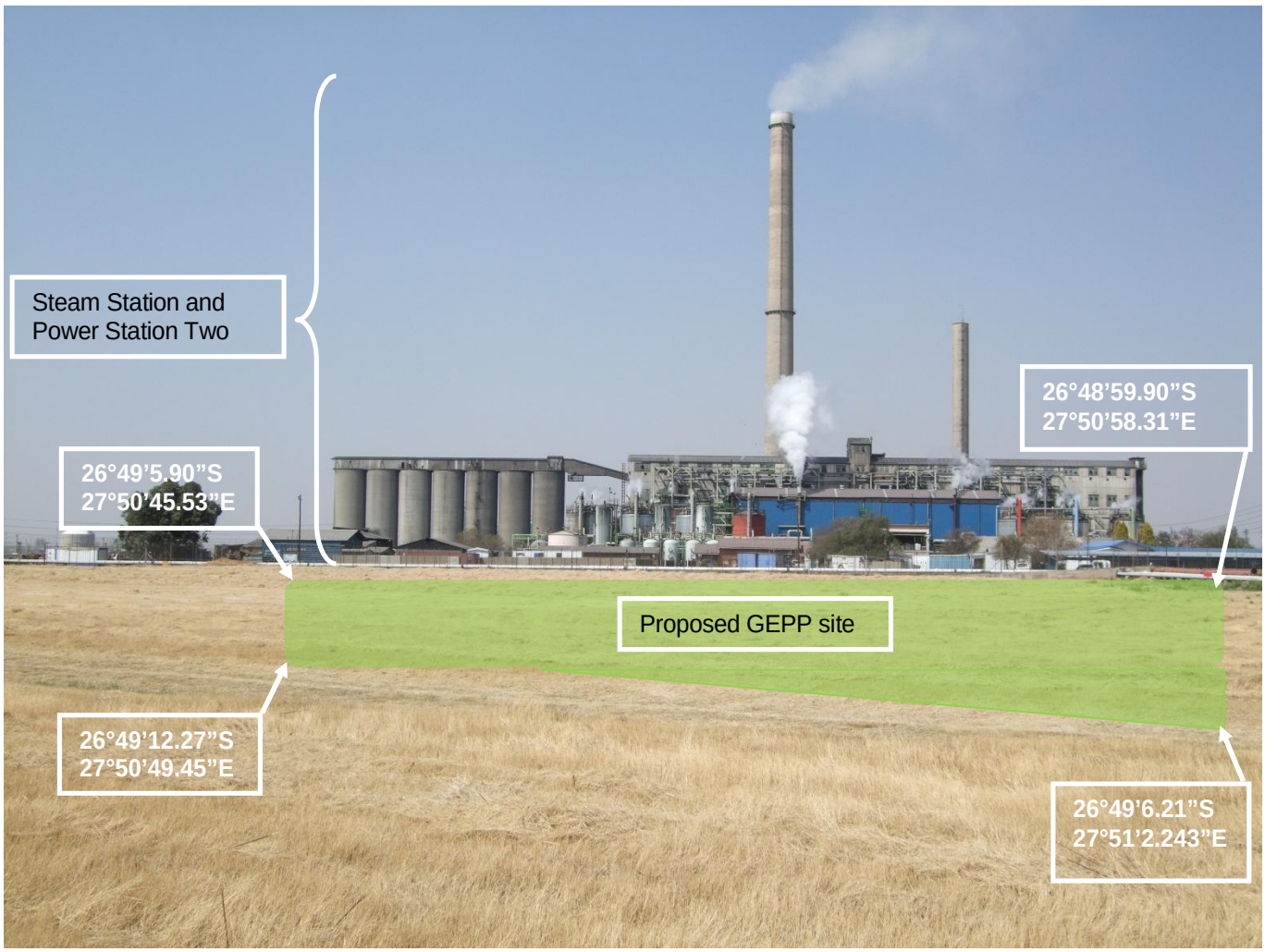


Figure 5: Site photo of the proposed site where the GEPP will be located.

Existing service infrastructure

Industrial land uses beyond the vacant land

Figure 6: Surrounding infrastructure

3.3 PROJECT DESCRIPTION AND PROJECT ALTERNATIVES

The project entails the establishment of a GEPP in two phases. Phase 1 will entail an open cycle power plant with an installed capacity of approximately 180 MW (the aim is to have a constant/baseload production of at least 140 MW); and phase 2 will entail conversion to a combined cycle (heat recovery) which will generate an additional 20 MW. In summary the GEPP will have an installed electrical capacity (including heat recovery) of 200 MW, and an assured electrical output capacity of approximately 140 MW (without heat recovery) and 160 MW (with heat recovery).

A detailed description of the main unit processes associated with the proposed project is categorised in three sections:

- Ancillary facilities (feedstock supply & utilities);
- Power generation plant; and
- Heat recovery unit.

Where relevant, potential alternatives are described and evaluated in order to rationalise the selection of the preferred option.

Abbreviated process schematics showing open cycle (without heat recovery) and combined cycle (with heat recovery) scenarios are included as Figure 7 and Figure 8 overleaf. Furthermore, refer to Appendix K and L for the plot plan of the GEPP (including the space allocated for the new sub-station proposed to be constructed adjacent to the GEPP) and the building footprint respectively. The building footprint of the GEPP will be as follows:

- The engine hall - 2700m^2 by 4500m^2;
- The office - 400m^2;
- Workshop – 400m^2; and
- Gatehouse – 30m^2.

Please refer to Section 5 and 6 of the final scoping report in Appendix A for further details regarding the above mentioned categories as well as the GEPP fundamental technology selection, natural gas supply, preferred technique, layout, engine configuration and project alternatives. Furthermore, additional information regarding the heat recovery unit of the GEPP is provided in Section 3.4 of this report.

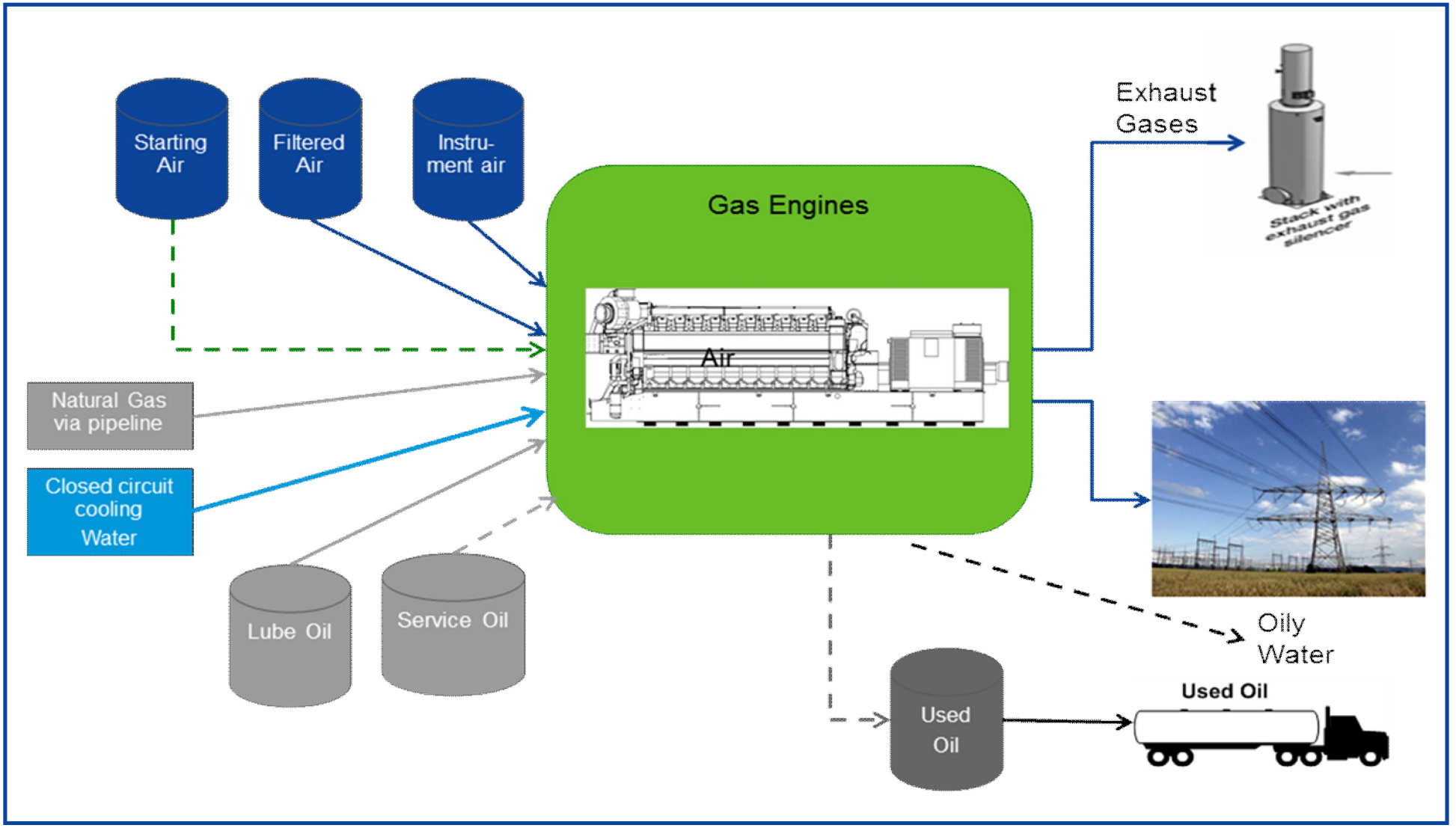


Figure 7: Open cycled gas engine

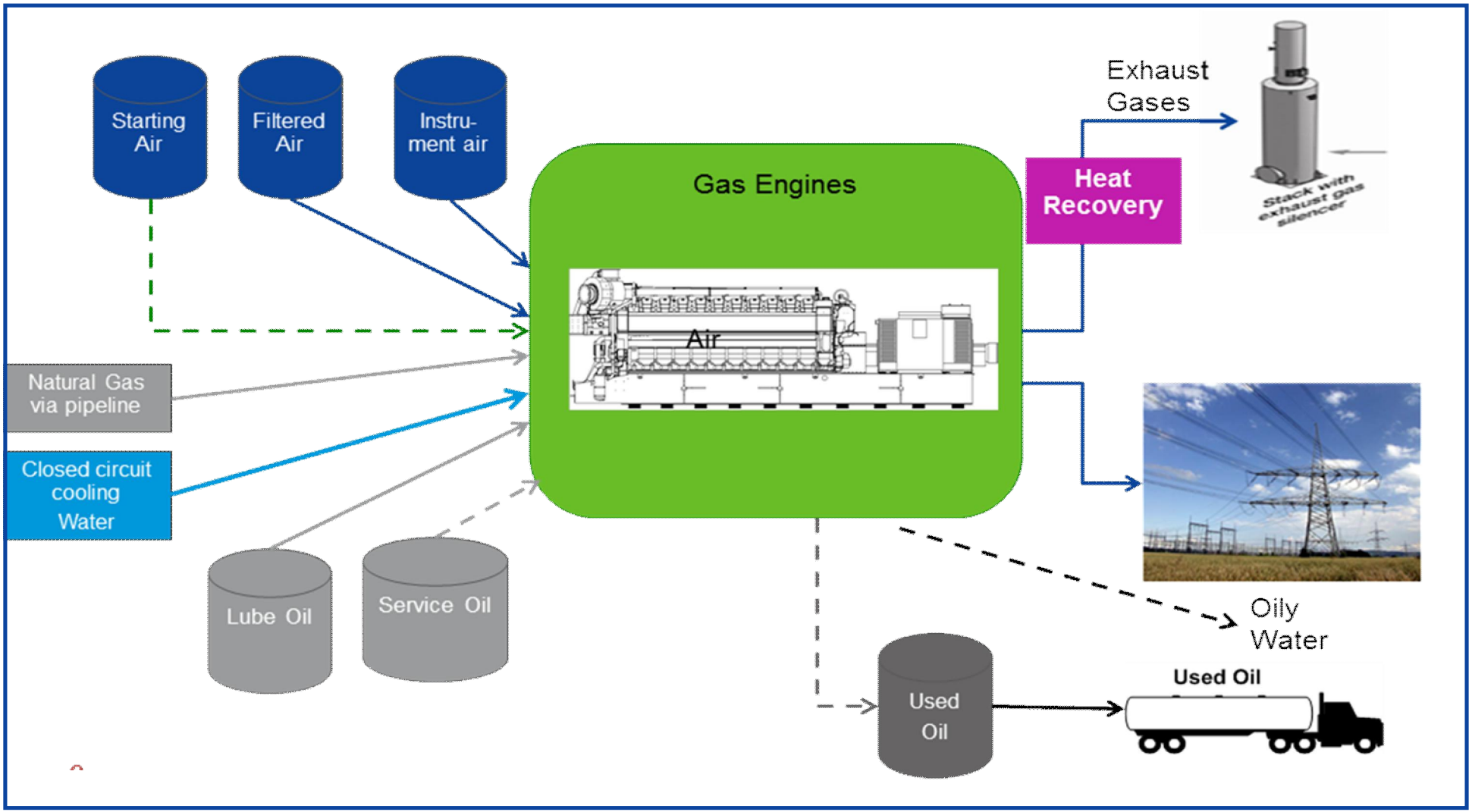


Figure 8: Combine cycled gas engine

3.4 HEAT RECOVERY UNIT

As mentioned above, the proposed GEPP will be developed in two phases. Phase 1 will entail an open cycle power plant with an output capacity of approximately 180 megawatts (MW), while phase 2 entails conversion to a combined cycle (heat recovery) that will generate an additional 20 MW. The plant will use several gas engines, with a natural gas consumption of approximately 10 Petajoules per annum (PJ/a). The capacity of individual gas engine units will vary between 4 MW and 10 MW per engine.

Both open and combined cycle GEPP designs were assessed in terms of potential environmental implications during the EIA phase of this project. It should be noted that there is a large variety of heat recovery technology options available for incorporation into the GEPP project. These technologies vary in efficiency and resource requirements, especially water consumption. Therefore, a cautious approach was taken during the EIA phase and the worst case scenario was evaluated.

Typical combined cycle power plants utilise a heat recovery steam generator (HRSG) to generate steam utilising the heat from the exhaust gas generated by the engines/generators. Such combined systems optimise the gas and steam processes to improve the electrical output efficiency of the system i.e. the additional 20 MW. Whilst the front ends engineering and design (FEED) phase is still to confirm whether this heat recovery component is technically and economically feasible, provision has been made in the EIR to assess this system. However, the European integrated pollution prevention and control bureau (EIPPCB) recognises various heat recovery systems, including the organic Rankine Cycle (ORC) technology. This technology has been selected by Sasol as the preferred heat recovery technology. The ORC is named for its use of an organic, high molecular mass fluid with a liquid: vapor phase change, or boiling point, occurring at a lower temperature than the water-steam phase change. The fluid allows heat recovery from lower temperature sources such as industrial waste heat (http://en.wikipedia.org/wiki/Organic_Rankine_Cycle, 10 November 2010).

According to Declaye, (2007), the goal of an ORC is to convert thermal energy into mechanical power. The organic fluid (propane), in a liquid state at low pressure, is pressurised by a pump. This pressurised flow is subsequently vaporised by means of a heat source using thermal oil, typically about 300 °C in a closed circuit, heated from the exhaust gasses of the engines. The superheated vapour, which is generated, is used to drive a turbine, thus generating mechanical power (Declaye, 2007). The fluid is subsequently condensed and flows back to the pump supply (Figure 9).

Preliminary information from the Sasol design indicates that this would be a completely closed circuit which utilises air cooling. Using the solvent propane as the organic fluid will reduce the water consumption associated with the combined cycle management.

Ultimately, the working principle of an ORC is thus identical to the traditional Rankine cycle, for which the working fluid is water but operates with lower temperature heat sources such as geothermal sources, waste heat from industrial processes and solar power (Declaye, 2007). More specifically the GEPP heat recovery system will utilise waste heat from exhaust gas generated during phase 1.

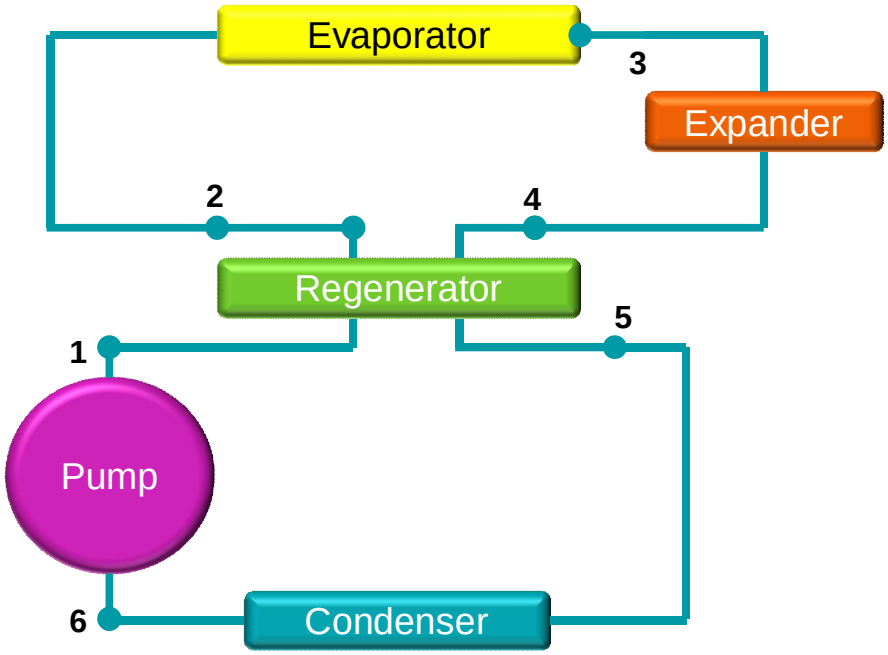


Figure 9: Components of the ORC (Declaye, 2007).

3.5 ANCILLARY PROCESS AND FACILITIES

3.5.1 Chemical and/or Catalyst Storage

On the basis of the preliminary design the assumed chemical and/or catalysts expected in the GEPP include:

- Industrial degreasers for engine washing (100 ℓ);
- Propylene glycol as water additive to the GEPP (1000 ℓ);
- Lubrication oil for the gas engines (2 x 50m^3 tanks);
- Used oil tanks (no more than 1 x 34 m^3); and
- Propane (approximately 10 000 ℓ).

The volumes indicated above are preliminary however, they will not exceed 500 m^3 (combined capacity). Storage facilities will be designed in accordance with the South African legislative requirements to ensure adequate provisions for containment and control of emissions.

3.5.2 Lube Oil Streams

Technical infrastructure of the lube oil facilities including loading and waste oil despatching, and storage tanks and associated pipe work for fresh, service and used oils are not available. Used lube oil will be stored in a tank on the GEPP site which will not exceed 35 m^3. Refer to 3.8 for storage capacities for lube oil. Whilst the use of used oil will be an on-going commercial consideration, it is currently envisaged that it would be sold for use as heavy furnace oil. An alternative option being investigated is to sell the used oil to Infrachem for use at Steam Station Two.

3.5.3 Water Streams

Potable Water will be taken from a tie-in point on the Steam Station Two site to the South of the GEPP site.

Filtered flocculated water will be used as the cooling water for the gas engines. The GEPP will tie-in inside the boundaries of the Steam Station Two site for the filtered flocculated water.

Two options will be investigated concerning the fire water and the fire water demands, which will determine which option, will be selected. The options are as follows:

- The fire water will tie into Steam Station Two or the Sasol One Sites fire water system. For this option no fire water pumps and reservoirs are required. However, provision should be made for a dual pipeline from the fire water main header to the GEPP creating a ring main header around the GEPP; or
- The fire water will tie into the blended filtered flocculated water for make up to the GEPP fire water tank or reservoir. For this option, provision should be made for the reservoir and pumps and for a ring main header around the GEPP.

Phase 1 of the GEPP includes the installation and operation of an open cycle system only. Water consumption during the open cycle is estimated at 4 litres (ℓ) per MW/h (Table 8).

Phase 2 of the GEPP includes the ORC technology selected by Sasol, opposed to the heat recovery steam generator (HRSG) technology described in the final scoping report. The ORC will use no water per annum, compared to the HRSG, calculated to use approximately 280 000m^3 of water per annum (Table 8).

Table 8: Water consumption comparisons between open and combined cycle engines

Cycle	Electricity Capacity	Water consumption per Annum (m^3)	Comments
Open	140 MW	+5000	Water is predominantly utilised for cooling and engine cleaning the engines.
Combined Cycle using the ORC technology	20 MW	None	None

3.5.4 Effluent and Storm Water Streams

Effluent streams associated with the open cycle (phase 1) of the project are limited to oily wash water from the process areas and generated during maintenance activities. Furthermore, during phase 2, the organic liquid (propane) associated with the heat recovery stage (phase 2) of the GEPP will be produced.

The oily water from phase 1 and 2 (intermittent stream) will be routed to an oil-water separator (lube oil tank). The lube oil tank, separation pond and spent oil tank on-site will be suitably bunded and the storage area floor made from an impervious surface. The bund will retain 110% of all the container volumes and tank capacity of the largest tank including a 1 in 100 year flood. The oil from the oil-water separator will be skimmed off in a separating pond and recovered in the spent oil tank on-site. The oil will be reused at Steam Station Two or sold.

Recovered water from the oil-water separator will be re-used in the process if the quality allows, it will be routed to an oily water source at the tie-in point at Steam Station Two.

Clean storm water is defined as rainwater which does not have the potential to be contaminated, i.e. storm water not in contact with the lube oil tank or any lube oil on site. This storm water will be allowed to follow the natural flow off-site into the receiving environment. The first-flush principle will not apply to the clean storm water.

A water use license application (WULA) will not be required for the above additional activity due to the following reasons as per Section 21 of the National Water Act (No. 36 of 1998):

- Water will not be sourced from a surrounding water resource. Water will be taken from a tie-in point on the Steam Station Two site to the South of the GEPP site; and

- Water containing waste will not be discharged into a water course through a pipe, canal, sewer or other conduit, but rather routed to an oily water source at the tie-in point at Steam Station Two.

3.5.5 Electricity Transmission

Electrical Infrastructure - the engine generator sets will carry a terminal voltage between 6 and 15 kV which will be stepped up to 88 kV using transformers for the transfer of electricity to the Sasol sites.

3.6 UTILITIES

The following major utilities in Table 9 will be sourced from existing facilities. The figures below are based on the worst case scenario, being 16 gas engines in operation. However, it must be noted that additional utilities and/or feedstock streams and volumes may be identified during the FEED phase.

Table 9: Preliminary Utility Requirements

Utilities		
Type	**Units**	**continuous**
Natural Gas	t/hr	21.1
Cooling water (potable)	kg/hr	576
Starting Air (Compressed air)	Nm^3/hr	208
Instrument and control air	Nm^3/hr	518
Lube oil	kg/hr	60
Fire water	t/hr	
Electricity	MW	140
Potable Water	L/day	150

3.7 CONSTRUCTION PHASE

The proposed GEPP will need to be commissioned in order to provide electricity to the Sasol One Site operations which is in line with project schedules for growth projects. As a result, construction of the proposed GEPP needs to commence no later than June 2011 and will take approximately 12 to 18 month to complete. Upon arrival of the gas engines at either the Durban or Richards Bay harbour.

Temporary construction infrastructure on-site will include the following:

- Site offices;
- Temporary (portable) sanitation facilities;
- One laydown area;
- Minimal construction vehicles;
- Construction equipment (e.g. generators, lightweight cranes etc.); and
- New access to site will be constructed.

The construction site will not include a construction accommodation camp.

Sasol have an agreement and confirmation of capacity by local contractors in which to remove the sewage from the portable toilets during the construction phase. Sewage accrued during the operational phase will tie-into the sewage

line at Steam Station Two and go to Sasolburg's Bioworks Facility. General waste will be sent to a registered or licensed landfill site.

3.7.1 Construction Approach

It is estimated that approximately 45 000m^3 of topsoil will be removed to a depth of 150mm and will be stockpiled at an on-site designated area, for use as topsoil on grassed areas following the construction phase. As clay soils have been identified on the site, it is anticipated that approximately 20 000m^3 of this unsuitable spoil material (expansive clays) will be removed to an on-site location for site remediation, and replaced with 20 000m^3 of imported G5-specificaion, crushed stone material which functions as a soil stabiliser. Moreover, 30 000m^3 of G5 material will be used to build a platform approximately 500mm higher than the surrounding area, as well as the access road to the GEPP.

3.8 CONSTRUCTION AND OPERATIONAL PHASE EMPLOYMENT OPPORTUNITIES

In terms of the proposed employment opportunities for the project, it is foreseen that approximately 150 temporary employment opportunities will be created during the construction phase. Permanent employment opportunities for the operational phase have yet to be confirmed. However, it is anticipated that it will vary between 10 to 30 employment opportunities and employees will work in shifts. .

3.9 DECOMMISSIONING PHASE

The GEPP will have a modular design that allows for the introduction and removal of gas engines using existing skets (infrastructure). This modular design is easily modified and accommodates for the potential introduction of new technologies as they arise/ are develop in the future without the need to dismantle or re-develop the existing power plant infrastructure.

Should the GEPP be decommissioned in the future, Sasol will remove everything on site and return the site, to some degree, to its formal state.

4 Assessments of Environmental Issues

4.1 BIODIVERSITY

4.1.1 Baseline Environment

The vegetation of the Sasolburg region is categorised as the Central Free State Grassland vegetation type (Mucina & Rutherford, 2006). The grass largely comprises predominantly of common grass species which is regularly cut down to reduce fire risks. Foraging flocks of birds, such as guinea fowl, frequent the site. Although no rare or endangered species listed below have been recorded and no threatened amphibians, reptiles or bats that are listed in the Red Data Book occur on or near the site, the following threatened bird and mammal species may however occur in the area:

- Grass Owl (*Tyto capensis*) - Indeterminate;
- African Finfoot (*Podica senegalensis*) - Indeterminate;
- Small spotted cat (*Felis nigripes*) – Rare;
- Aardwolf (*Proteles cristatus*) – Rare;
- African striped weasel (*Poecilogale albinucha*) – Rare;
- South Africa Hedgehog (*Atelerix frontalis*) – Rare;
- Antbear (*Orycteropus afer*) – Vulnerable; and
- White-tailed mouse (*Mystromys albicaudatus*) – Vulnerable.

4.1.2 Potential Impacts of the Project

An ecological impact assessment was deemed unnecessary for the proposed project based on the existing level of disturbance of the site. Although there have been sightings of guinea fowl on the site thus adding to the natural value to this habitat conversely, the site is adjacent to Steam Station and Power Station Two. Therefore, it is the least potential important area due to the site being subject to a variety of construction activities including several above ground gas and water pipelines and underground cable trenches owned by Eskom.

4.2 AIR QUALITY

A copy of the full air quality impact assessment report is provided in Appendix M. Below is a brief summary of the study.

4.2.1 Baseline Environment

The baseline air quality study was undertaken for the Sasolburg area in the Northern Free State. The baseline study includes the review of the site-specific atmospheric dispersion potential, relevant air quality guidelines and limits and existing ambient air quality in the region. In this investigation, use was made of readily available meteorological and air quality data recorded in the study area in the characterisation of the baseline condition.

Sensitive receptors were determined based on the fact that the proposed project is within built up residential areas and will be associated with elevated emissions (stacks). The proposed project has the potential to impact receptors in the near and medium fields.

Residential areas in the immediate vicinity of the proposed GEPP are Sasolburg and Zamdela. Smaller residential developments further afield include Bertha Village, Viljoensdrift, Taaibos, Holy Country, Deneysville, Refengkgomo, Bophelong, Boipatong, Tshepiso, Sharpville and Sebokeng. Larger residential areas further afield include Evaton, Meyerton, Vanderbijlpark and Vereeniging.

The air quality baseline was measured to understand the extent of air pollution levels in the region and identify significant contributing sources. Particular emphasis was placed on identification, qualification and quantification of the following significant pollutants in the region. These pollutants were then modelled (atmospheric dispersion modelling) for a comprehensive understanding of the existing air quality baseline.

4.2.2 Potential Impacts of the GEPP Project

The air quality study modelled three scenarios for phase 1 and phase 2:

- Project baseline situation, which comprises the ambient concentrations of criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), and airborne particulate matter (PM_{10}) due to all existing sources of emissions in the operating Sasol industries;
- Ambient concentrations of the same criteria pollutants arising from routine emissions from the GEPP project *only*; and
- The cumulative ambient concentrations including all current sources of emissions, proposed Sasol operations *plus* the GEPP

Atmospheric emissions released during the construction phase are primarily restricted to fugitive dust from land clearing and site development operations. Operational phase emissions comprise particulate and gaseous emissions. Pollutants releases include the following:

- CO and NO_2

CO and NO_2 concentrations from current Sasol operations (scenario 1) were modelled to be within the SA ambient air quality standards.

Predicted ambient CO and NO_2 concentrations for scenario 2 were well within the SA ambient air quality standards at both the *zone of maximum ground level concentration* and the monitoring stations. Scenario 3 also predicted ambient air quality concentrations to be within the national standards (Figure 4-20 and 4-25 to 4-32 in Appendix L respectively). Sasolburg and Zamdela, the closest communities to the proposed site, are approximately 700m and 2 km away respectively, therefore unlikely to be affected by the small incremental contribution made by the GEPP.

- PM_{10}

PM_{10} concentrations from scenarios 1 and 3 exceed the SA ambient air standards at the zone of maximum ground level concentration (Figure 4-13, Appendix L), that is, the pre-project baseline in places exceeds the applicable standard. However, various local and distant sources contribute to this suspended fine particulate load in the airshed under discussion (Sasol's operations were demonstrated to cumulatively contribute less than 4.5 % to current PM_{10} levels at various monitoring sites). The GEPP project will not add significantly to the PM_{10} issues in this area - it is expected that the GEPP will contribute only a fraction of up to 0.03 of current or future PM_{10} ambient standards.

4.2.3 Mitigation Measures

Effective dust mitigation measures must be undertaken in order to reduce dust emissions during the construction phase.

It is recommended that annual stack monitoring be undertaken during the operation phase in order to verify the emissions form the process. Further mitigation measures for air quality management have been incorporated into the EMP. Given the elevated levels of fine particulate concentrations measured/predicted to occur within parts of the study region, it is recommended that Sasol investigate means to reduce potential PM_{10} levels where possible, within their own plant designs.

4.3 NOISE

A copy of the full qualitative noise assessment report is provided in Appendix N. Below is a brief summary of the study.

4.3.1 Baseline Environment

The proposed site is surrounded by a number of different land uses including vacant land; industrial, major roadway and residential suburbs. Thre are a number of noise sources that already exist in the area, including:

- Major industrial activities (the most pertinent of these is the large, existing Sasol complex);
- Primary road transportation routes (Golden Highway (R57)); and
- Rail transportation routes (a large rail interchange approximately 3.8 km to the south and rail sidings as close as 500 m of the proposed site).

Furthermore, the main sensitive receptors which were identified surrounding the area were:

- Residential areas of Sasolburg;
- Schools in the Sasolburg area; and
- Other industrial receptors surrounding the site.

A basic visual indication of sounding land use at various distances from the proposed site is provided below in Figure 10. Isopleths indicating approximate distances of 500 m, 750 m, 1,000 m and 1,250 m from the middle of the site have been included for ease of interpretation. This is a useful depiction, as noise transmission is significantly affected by the distance from source to the receptor.

Figure 10: Annotated aerial photograph showing proposed site location (yellow star), approximate distance isopleths and surrounding land use descriptors (base image source: Google Earth).

As wind affects the transmission of noise, the most prevalent winds experienced in the vicinity of the proposed site generally emanate from the north, northwest and northeast during the year. The common northerly component will therefore tend to suppress (to some extent) noise transmission in the direction of the nearest residential receptors.

4.3.2 Potential Impacts of the Project

Although some of the predicted noise results, including the contribution of the operation of the GEPP at the nearest industrial (Table 10) and residential receptors (Table 11), were found to exceed the relevent South African National Standards (SANS) and/or International Fincance Corporation (IFC) guidelines, numerous conservative assumptions were made during the derivation of these results, as well as in the interpretation thereof. In effect, the residual noise

which the receptors (industrial and/or residential) are expected to be exposed to as a result of the operation of the GEPP, is anticipated to be lower than the results predicted by this study. It then follows that the potential significance of noise impacts is relatively low.

Table 10: Predictive Noise Modelling Results and Guidelines for Industrial Receptors

Scenario	GEPP-Related Noise Contribution @ 50 m (dB(A))		SANS Industrial Guideline (Day/Night)	IFC Industrial Guideline (Day/Night)
	Open Cycle	Combined Cycle		
18 Gas Engines	73.2	73.6	70 / 60	70 / 70
35 Gas Engines	76.1	76.7	70 / 60	70 / 70

Table 11: Predictive Noise Modelling Results and Guidelines for Residential Receptors

Scenario	GEPP-Related Noise Contribution @ 600 m (dB(A))		SANS Urban Guideline (Day/Night)	IFC Residential Guideline (Day/Night)
	Open Cycle	Combined Cycle		
18 Gas Engines	51.6	51.9	60 / 50	55 / 45
35 Gas Engines	54.5	55.1	60 / 50	55 / 45

4.3.3 Mitigation Measures

Noise control in this already-developed area will nonetheless be important in ensuring the overall environmental sustainability of the proposed facility. As such, it is strongly recommended that mitigation measures displayed in the EMP be adopted and implemented during the various stages of the proposed project. Successful implementation and maintenance of these recommendations will reduce potential noise-related impacts on the receiving environment (including the surrounding community)

4.4 CULTURAL HERITAGE

A copy of the full HIA report is provided in Appendix O. Below is a brief summary of the study.

4.4.1 Baseline Environment

The proposed environment is heavily disturbed by past human activities which includes ploughing, grazing and the cutting of grass. No natural shelter or building material exists and is therefore expected, that prehistoric people would have not settled on the site. However, it is suspected that the site was utilised during the past, as the abundance of grazing and water would have lured prehistoric people to the area.

4.4.2 Potential Impacts of the Project

One site of cultural heritage significance was located in the area to be developed. A fairly recent cattle fence and trough were identified. The trough was used for drinking by livestock (Figure 11). The position of this cultural heritage artefact is 25°49'05,2"S and 27°50'50,3"E.

Figure 11: Fence posts and trough

The site is regarded as having a **low** cultural significance, as the remains are not unique and younger than 60 years.

It therefore was confirmed that the cultural heritage artefact may be demolished during construction phase and that the development may continue.

4.4.3 Mitigation Measures

Limited mitigation and management measures have been incorporated into the EMP.

4.5 GEOTECHNICAL

A geotechnical study was undertaken by Sasol as part of the Steam Station Two Power Station and thus has been used in this EIR as additional information. Included in the report are the safe bearing capacities of soils and soil profiles. A copy of the full geotechnical report is provided in Appendix P.

5 Assessment of Impact Significance

5.1 INTRODUCTION

The project activities are described in Section 3 above. The environmental impact of these activities was determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The impact assessment has included all phases of the project, with specific emphasis on construction and operational phase, planning and design, pre-construction (construction) and rehabilitation with closure in mind.

5.2 METHODOLOGY

The potential environmental impacts of the proposed project were evaluated according to their severity, duration, extent and significance of the impact, and include the cumulative impact. The WSP impact assessment methodology was used for the ranking of the impacts.

This system derives environmental significance on the basis of the consequence of the impact on the environment and the likelihood of the impact occurring. Consequence is calculated as the average of the sum of the ratings of severity, duration and extent of the environmental impact. Likelihood considers the frequency of the activity together with the probability of an environmental impact occurring. The following tables (Table 12 to Table 14) describe the process in detail:

- Consequence

Table 12: Assessment and Rating of Severity, Duration and Extent and Determination of Consequence

Rating	Severity	Duration	Extent
1	Negligible / non-harmful / minimal deterioration (0 – 20%)	Less than 1 month / quickly reversible	Within immediate area of activity
2	Minor / potentially harmful / measurable deterioration (20 – 40%)	Less than 1 year / quickly reversible	Surrounding area within project boundary
3	Moderate / harmful / moderate deterioration (40 – 60%)	More than 1 year / reversible over time	Beyond project boundary
4	Significant / very harmful / substantial deterioration (60 – 80%)	More than 10 years / reversible over time / life of project or facility	Regional / provincial
5	Irreversible / permanent / death (80 – 100%)	Beyond life of project of facility / permanent	National / international
Determination of Consequence (C) = (Severity + Duration + Extent) / 3			

- Likelihood

Table 13: Assessment and Rating of Frequency and Probability and Determination of Likelihood

Rating	Frequency	Probability
1	Less than once a year	Almost impossible
2	Once in a year	Unlikely
3	Quarterly	Probable
4	Weekly	Highly likely
5	Daily	Definite
Determination of Likelihood (L) = (Frequency + Probability) / 2		

- Environmental Significance

Environmental significance is the product of the consequence and likelihood values.

Table 14: Determination of Environmental Significance

Environmental Significance (Impact) = C × L	Description
L (1 – 4.9)	Low environmental significance
LM (5 – 9.9)	Low to medium environmental significance
M (10 – 14.99)	Medium environmental significance
MH (15 – 19.9)	Medium to high environmental significance
H (20 – 25)	High environmental significance. Likely to be a fatal flaw.

5.3 KNOWLEDGE GAPS AND ADEQUACY OF PREDICTIVE METHODS

5.3.1 Knowledge Gaps

The environment that is likely to be affected by the proposed project was assessed and the EIR (this report) has covered all prevailing conditions of the environmental aspects identified, including cumulative impacts. It is believed that the environment is well understood. Hence, no significant knowledge gaps exist in terms of the current state of the environment, EIR (this report) and draft EMP.

5.3.2 Adequacy of Predictive Methods

Due to the nature of the existing environment, the local conditions of the area, and professional expertise, it is believed that the predictive measures are suitable and contain no limitations.

5.4 ENVIRONMENTAL IMPACT ASSESSMENT

An EIA has been undertaken for the proposed project for both the biophysical environment and socio-economic environment.

The EIR methodology (and associated numeric ratings) as per the WSP impact assessment methodology are provided in Section 6.2. A summary of the ratings is provided in Table 15 and Table 16 below, followed by an explanation of the *significant* impacts and the factors that contribute to their significance. A rating of Medium-High is set as the definition of significant, since such rating and above attracts an obligation for mitigation. The principles of mitigation are listed after each impact description. Ratings of Medium and below are assumed not to require mitigation, that is, they have no material effect on the project's implementation, and are therefore not discussed further in this report, although mitigation measures for them may be included in the EMP for auditing purposes.

The full ratings table of all identified potential impacts can be viewed in Appendix Q. To ensure that there is a clear linkage between the EIR tables in this section and the rating tables contained in Appendix Q, unique reference numbers have been assigned for each impact.

Table 15: Bio-physical Impact Assessment

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
Construction Phase				
Geology				
C.A1	No geological impacts due to the non-sensitive geological site (Johnson *et al* 2006), zoned as an industrial area within an existing brownfields site.	N/A	N/A	N/A
Surface Topography				
C.B1	There will minimal impacts to the sites topography due to civil and earth works as per Section 3.2.	Low (-)	Low (-)	▪ The temporary laydown area must be hard standing in the form of compacted gravel and ensure pollution prevention measures are implemented. G5 material must be imported to build the GEPP platform and access roads. ▪ The top 150 mm of the soils (the biologically active zone) shall be removed, temporarily stockpiled and protected for rehabilitation purposes. ▪ Refer to Section 2, 3 and 6 of the EMP for further mitigation and management measures.
Soils, Land Use and Land Capability				
C.C1	Disturbance to soil, land use and land capability due to civil and earth works and compaction of soil.	**Medium (-)**	**Low Medium (-)**	▪ Refer to C.B.1 for mitigation measures.

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
C.C2	Soil contamination and deterioration of land capability due to potential accidental releases or spillages of potential chemicals, propane, petrol, diesel and lubrication oil from construction vehicles, oily rags, paint, acetone benzene and cement mix.	Medium (-)	Low Medium (-)	▪ All hazardous materials are to be stored in designated and bunded areas, where the bunded area is impermeable. The bunded area contains 110% volume of the largest container stored. ▪ In the event of spillages, a depth of approximately 30cm of the contaminated soil must be excavated, removed and disposed of in the hazardous waste. ▪ Refer to Section 2, 3, 4, 5, 6, 14 and 15 of the EMP for further mitigation measures.
C.C3	Soil contamination due to inadequate waste management.	Medium (-)	Low Medium (-)	▪ General and hazardous waste disposal receptacles must be made available for separate disposal and must be clearly marked. ▪ All waste, including building rubble, must be reduced, reused or recycled where possible. Where this is not an option, waste must be segregated into their specific waste streams (hazardous, general or construction rubble) and disposed of appropriately at a waste disposal facility. General waste will be sent to a registered or licensed landfill site and hazardous waste will be disposed of at an approved waste disposal facility. ▪ Refer to Section 2, 5, 14 and 15 of the EMP for further mitigation measures.

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
C.C4	Soil erosion due to exposed roads and open areas.	**Medium (-)**	**Low Medium (-)**	▪ Any erosion channels which develop during the construction period must be suitably filled compacted and restored to as natural a state as possible. ▪ Refer to Section 6 of the EMP for further mitigation measures.
Fauna and Flora				
C.D1	As per the baseline description in section 4.1, there will be minimal impacts to flora and fauna species within the construction site	Low (-)	Low (-)	▪ The extent of the area disturbed should be kept to the minimum required to successfully implement the construction activities, thus minimising the destruction of any fauna and flora. ▪ Refer to Section 10 of the EMP for further mitigation measures.
C.D2	Existing flora and potential fauna impacts from potential accidental releases or spillages of potential chemicals, propane, petrol, diesel and lubrication oil from construction vehicles, oily rags, paint, acetone benzene and cement mix.	Low (-)	Low (-)	▪ All construction activities are to be undertaken from the designated contractor laydown area and materials storage areas. ▪ In instances of a spillage, 30cm of the contaminated soil and vegetation must be excavated and removed and disposed of in the hazardous waste receptacle. ▪ Refer to Section 3, 4, 5, 10, 14 and 15 of the EMP for further mitigation and management measures.
C.D3	Destruction of rare or endangered fauna species.	Low (-)	Low (-)	▪ Should rare or endangered fauna species be encountered [eg. White-tailed mouse (*Mystromys albicaudatus*)] during the

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
				construction phase, these are to be reported to the EAP or alternatively the environmental control officer immediately. ■ Refer to Section 10 of the EMP for further mitigation and management measures.
Surface and groundwater				
C.E1	Surface and groundwater contamination from potential accidental releases or spillages of potential chemicals, propane, petrol, diesel and lubrication oil from construction vehicles, oily rags, paint, acetone benzene and cement mix.	**Medium (-)**	**Low Medium (-)**	■ All effluent handling is to be undertaken in accordance with Standard Operating Procedures and the associated MSDS for the hazard material (where applicable). ■ Effluent expected to be contaminated must be routed to the oil-water separator (lube oil tank) on-site. ■ The lube oil tank, separation pond and spent oil tank on-site must suitably bunded and the storage area floor made from an impervious surface. The bund will retain 110% of all the container volumes and tank capacity of the largest tank including a 1 in 100 year flood. ■ Refer to Section 3, 4, 5, 7 and 14 of the EMP for further mitigation measures.
Air Quality				
C.F1	Air quality deterioration from the release of fugitive dust emissions from potential stockpiles, land clearing, site development operations, construction vehicles and equipment.	**Medium (-)**	**Low Medium (-)**	■ Newly constructed access roads must be adequately maintained so as to minimise dust, erosion or undue surface damage.

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
				▪ The liberation of dust into the surrounding environment must be effectively controlled by the use of water spraying and/or other dust-allaying agents. ▪ Topsoil and temporarily soil stockpiles must be watered during windy conditions to reduce dust emissions. ▪ Refer to Section 8 of the EMP for further mitigation measures
C.F2	Gaseous pollution due to vehicle emissions.	**Medium (-)**	**Low Medium (-)**	▪ All earth moving vehicles and plant must be regularly maintained to ensure their integrity and reliability.
C.F3	Release of odours as a result of the chemical toilets on site.	Low (-)	Low (-)	▪ The chemical toilets must be cleaned and maintained on a weekly basis, minimising the potential for the generation of odours on site.
Noise				
C.G1	Elevated noise levels during site compaction and the laying of foundations due to operation of heavy plant and equipment such as excavators, dump trucks, and portable generators. However, the site is in an area zoned industrial.	**Low Medium (-)**	Low (-)	▪ All operations should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993) for industrial areas (specifically day/night decibels). ▪ Refer to Section 9 of the EMP for further mitigation measures.
Sites of Archaeological, Historical and Cultural Significance				
C.H1	Sites and artefacts of archaeological, historical or cultural significance not identified during the HIA may be impacted upon or	Low (-)	Low (-)	▪ If an artefact on site is uncovered on-site, work in the vicinity must be stopped immediately.

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
	disturbed by construction activities.			▪ SAHRA is to be contacted and will appoint an archaeological consultant. ▪ Refer to Section 11 of the EMP for further mitigation measures.
Operational Phase				
Soils, Land Use and Land Capability				
O.B1	Soil contamination from spillages of substances classified as hazardous.	**Medium (-)**	**Low Medium (-)**	▪ All hazardous materials are to be stored in designated and bunded areas, where the bunded area is impermeable. The bunded area contains 110% volume of the largest container stored. ▪ In the event of spillages, a depth of approximately 30cm of the contaminated soil must be excavated, removed and disposed of in the hazardous waste. ▪ Refer to Section 2, 3, 4, 5, 6 and 14 of the EMP for further mitigation measures.
Surface and groundwater				
O.C1	Surface and groundwater contamination from potential accidental releases or spillages of the following:	**Medium High (-)**	**Low Medium (-)**	▪ All effluent handling is to be undertaken in accordance with Standard Operating Procedures and the associated MSDS for

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
	• Lubrication oil; • Lube oil; • Oily washing effluents; and • Solvents (propane).			the hazard material (where applicable). ▪ All oily water from phase 1 and 2 (intermittent stream) must be routed to the oil-water separator (lube oil tank) on-site. ▪ The lube oil tank, separation pond and spent oil tank on-site must suitably bunded and the storage area floor made from an impervious surface. The bund will retain 110% of all the container volumes and tank capacity of the largest tank including a 1 in 100 year flood. ▪ Refer to Section 4, 5, 7 and 14 of the EMP for further mitigation measures.
Air Quality				
O.D1	As per Section 4.2.2, predicted NO_2 concentrations for the GEPP (including cumulative concentrations due to existing sources of emissions from Sasol operations) were within SA standards.	**Low Medium (-)**	Low (-)	▪ NO_2 should be operated in accordance with their design specification and all maintenance and repair operation requirements must be maintained in order to ensure optimum performance and minimal emissions. ▪ Annual air quality stack monitoring and modelling must be initiated for the GEPP to verify the emissions from the process at the start of commissioning at least once a year. The air quality monitoring and modelling must also continue as part of the Sasol air quality monitoring programme. ▪ Refer to Section 8 of the EMP for further mitigation measures.

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
				▪ Refer to the air quality impact report in Appendix M
O.D2	As per Section 4.2.2, predicted PM_{10} concentrations (including cumulative concentrations due to existing sources of emissions of Sasol's operations) exceeded the SA limits.	**Medium (-)**	**Low Medium (-)**	▪ PM_{10} should be operated in accordance with their design specification and all maintenance and repair operation requirements must be maintained in order to ensure optimum performance and minimal emissions. ▪ Refer to O.D2 for further mitigation measures.
O.D3	As per Section 4.2.2, predicted CO concentrations for the GEPP were within the SA standards. For cumulative concentrations (including current Sasol sources of emissions and the GEPP) the predicted CO concentrations were within SA standards.	**Low Medium (-)**	Low (-)	▪ Sasol's design specification and all maintenance and repair operation requirements must be maintained in order to ensure optimum performance and minimal emissions. ▪ Refer to O.D2 for further mitigation measures.
Noise				
O.E1	Noise impacts to surrounding areas due to the natural gas-fired spark ignition reciprocating engines, exhaust charges, intake "roar', mechanical noise (engine valves) and ancillary cooling (radiators and fans).	**Medium (-)**	**Low Medium (-)**	▪ Once the GEPP is operations, a boundary noise survey is recommended to be undertaken to confirm that any areas in close proximity to sensitive receptors are not subjected to levels of noise above the typical rating levels provided in SANS 10103:2008 or alternatively, levels which have caused a significant upward shift in noise levels from the baseline condition (e.g. those measured in previous surveys). In the (unlikely) event of a significant impact being identified, steps should be taken to implement additional mitigation measures. ▪ Occupational noise monitoring should be undertaken

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
				immediately after commissioning, in order to ensure that employee exposures are adequately assessed and mitigation measures for hearing protection are provided. ■ Refer to Section 9 and 12 of the EMP for further mitigation measures. ■ Refer to the qualitative noise report in Appendix M.
Decommissioning and Rehabilitation Phase				
Surface Topography				
D.A1	Degradation of the surface topography may occur due to the temporary haul, access roads, stockpiles and the concrete batching plant that was within the construction camps.	**Medium (-)**	**Low Medium (-)**	■ Refer to Section 15 of the EMP for further mitigation and management measures.
Soils, Land Use and Land Capability				
D.B1	Soil contamination from potential accidental releases or spillages of potential chemicals, petrol, diesel and lubrication oil from construction vehicles, oily rags, paint, acetone benzene and cement mix.	**Medium (-)**	Low (-)	■ Refer to Section 15 of the EMP for further mitigation and management measures.
D.B2	The final closure and rehabilitation of the construction laydown area may result in a residual impact on existing and surrounding (cumulative) soil and land use resources.	**Medium (-)**	Low (-)	■ Refer to Section 15 of the EMP for further mitigation and management measures.

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
Fauna and Flora				
D.C1	The final closure and rehabilitation of the construction laydown area may result in a residual impact on and surrounding (cumulative) fauna and flora.	Low (-)	Low (-)	▪ Refer to Section 15 of the EMP for further mitigation and management measures.
Surface and groundwater				
D.D1	Contamination of surface and groundwater due to spillages of hazardous material and poor waste management practices.	**Medium (-)**	**Low Medium (-)**	▪ Natural resources must be protected during the decommissioning phase within the surrounding area. ▪ Refer to Section 4, 5, 7 and 14 of the EMP for further mitigation and management measures.
Air Quality				
C.F1	Air quality deterioration from the release of fugitive dust emissions from stockpiles, land clearing, construction vehicles and equipment.	Low (-)	Low (-)	▪ The liberation of dust into the surrounding environment must be effectively controlled by the use of water spraying and/or other dust-allaying agents. ▪ Refer to Section 8 of the EMP for further mitigation measures.
Noise				
D.F1	Elevated noise levels during site demolition activities. However, the site is in an area zoned industrial and the closest residential area is approximately 2km away and thus will not affect the community at	Low (-)	Low (-)	▪ Options for demolition methods should be considered in terms of noise impacts. For example, manual demolition (people using pneumatic jackhammers etc.) generates more noise, over a far prolonged period than, say, demolition by means of

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
	large.			building implosion (using explosives). ■ All demolition activities should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993). ■ Refer to Section 9 and 12 of the EMP for further mitigation and management measures.

Table 16: Socio-Economic Impact Assessment

Ref No.	Impact Description	Significance		Mitigation and Management Measures
		Without Mitigation	With Mitigation	
Construction Phase				
Employment				
SC.A1	Creation of approximately 150 temporary jobs during the construction phase	**Medium (+)**	**Medium High (+)**	▪ Employment is to be undertaken in accordance with Sasol's employment policy. ▪ The labour and recruitment policy must be developed, displayed and implemented by the construction phase contractor. ▪ Refer to Section 13 of the EMP for further mitigation and management measures.
Health and Safety				
SC.B1	Health and safety impacts from spillages of handling hazardous wastes and/or fires.	**Medium (-)**	**Low Medium (-)**	▪ Wear the appropriate PPE at all times. ▪ Refer to Section 12 of the EMP for further mitigation and management measures.
Operational Phase				
Employment				
SO.A1	The proposed project will result in the creation of permanent job opportunities, however the number is tentative. This will result in a cumulative positive impact in the surrounding area.	**Medium (+)**	**Medium High (+)**	▪ Refer to Section 13 of the EMP for mitigation and management measures.

Health and Safety				
SO.B1	Elevated noise levels during site demolition activities. However, the site is in an area zoned industrial and the closest residential area is approximately 2km away and thus will not affect the community at large.	**Medium (-)**	**Low Medium (-)**	▪ All operations should meet the noise standard requirements of the Occupational Health and Safety Act (No. 85 of 1993). ▪ Refer to Section 9 and 12 of the EMP for further mitigation and management measures.
SO.B2	Health hazards and explosive hazards from incorrect handling of hazardous materials.	**Medium High (-)**	**Low Medium (-)**	▪ Wear the appropriate PPE at all times. ▪ Comprehensive safety training must be undertaken on a continual basis. ▪ Refer to Section 12 of the EMP for further mitigation and management measures.
SO.B3	Stakeholders may raise queries associated with the operational phase of the proposed project. Negative perceptions could be created if these queries are not appropriately addressed.	**Medium (-)**	**Low Medium (-)**	▪ Community complaints will be handled through the existing Sasol complaints line. ▪ The sites performance information should be included in the Sasol report submitted to the Sasolburg Community Working Group (SCWG) ▪ Refer to Section 13 of the EMP for further mitigation and management measures.

5.5 DISCUSSION OF IMPACTS

5.5.1 Air Quality

The air quality study modelled three scenarios for phase 1 and phase 2:

1. Project baseline situation, which comprises the ambient concentrations of criteria pollutants CO, NO_2, and PM_{10}, due to all existing sources of emissions in the operating Sasol industries;
2. Ambient concentrations of the same criteria pollutants arising from routine emissions from the GEPP project *only*; and
3. The cumulative ambient concentrations including all current sources of emissions, proposed Sasol operations *plus* the GEPP

CO and NO_2 concentrations from current Sasol operations (scenario 1) were modelled to be within the SA ambient air quality standards.

Predicted ambient CO and NO_2 concentrations for scenario 2 were well within the SA ambient air quality standards at both the *zone of maximum ground level concentration* and the monitoring stations. Scenario 3 also predicted ambient air quality concentrations to be within the national standards (Figure 4-20 and 4-25 to 4-32 in Appendix M respectively). Sasolburg and Zamdela, the closest communities to the proposed site, are approximately 700m and 2 km away from the proposed site respectively, therefore unlikely to be affected by the small incremental contribution made by the GEPP. For this reason, NO_2 and CO concentrations were not identified as significant impacts of the GEPP (Table 15).

PM_{10} concentrations from scenarios 1 and 3 exceed the SA ambient air standards at the *zone of maximum ground level concentration* (Figure 4-13, Appendix M), that is, the pre-project baseline in places exceeds the applicable standard. However, various local and distant sources contribute to this suspended fine particulate load in the airshed under discussion (Sasol's operations were demonstrated to cumulatively contribute less than 4.5 % to current PM_{10} levels at various monitoring sites). The GEPP project will not add significantly to the PM_{10} issues in this area - it is expected that the GEPP will contribute only a fraction of up to 0.03 of current or future PM_{10} ambient standards. The impact on air quality elevated particulate concentration was rated medium (Table 15).

5.5.2 Natural Resources: Water

Subsequent to various investigations undertaken by Sasol, the total water consumption from phase 1 will be approximately 5000m^3 per annum, not a considerable amount compared to other existing Sasol operations. There will be no water utilised during Phase 2 using the ORC technology.

Research on the water consumption rates of electricity generation technologies reveals that natural gas uses less than half the water used by either other fossil fuel or biomass fuelled steam generators, or nuclear steam generators (Table 17).

Table 17: Water consumption rates of various electricity generation processes (**http://www2.cera.com/docs/WEF_Fall2008_CERA.pdf.** Retrieved 2010-11-01).

Feedstock/Fuel	Typical Water Consumption (litres/MWh)
Fossil Fuel/biomass/waste fuelled steam power (cooling towers)	+1,220-2,270
Nuclear steam power, cooling towers	+2,870-3,270
Natural gas/oil combined-cycle, cooling towers	+ 850-900

Surface and groundwater contamination due to spillages and accidents were identified as significant negative impacts. Sasol's Sasolburg site procedures will be adapted to suit the design and process specifications of the proposed GEPP project, and they will include the Spillage and Incidents Procedure, amongst others.

5.5.3 Employment

The proposed project will have a positive impact on the local community in terms of job opportunities and job creation. Sasol proposes to employ people in accordance with its employment policy, which states that where possible, all labour and contractors will be sourced from within the local municipality. Approximately 150 temporary jobs will result during the construction phase. Furthermore, it is anticipated that between 10 to 30 permanent jobs will arise during the operational phase of which employees will work in shifts. This will contribute to reducing the high unemployment rates in Sasolburg and will also address skills development.

6 Environmental Impact Statement and Conclusion

6.1 ENVIRONMENTAL IMPACT STATEMENT

The environmental assessment found no significant impacts due to the GEPP project for most receiving environment parameters. Concerns were raised in the scoping phase regarding noise, air quality and heritage resources. Specialist studies on the latter three issues were therefore undertaken and their findings are summarised below.

- **Air quality**: The GEPP project will be developed in an airshed where pre-project ambient levels of criteria pollutants are close to or, in the case of PM_{10}, exceed the SA statutory limits. No significant air quality impacts due to the proposed GEPP have been identified.
- **Noise:** The noise assessment predicted no significant increase in ambient noise levels at selected receptors, provided that Sasol's specified design criteria are adhered to. Verification monitoring must be done, and if any exceedences of the relevant standards are identified, the implementation of additional mitigation measures are recommended.
- **Heritage resources**: The heritage impact assessment made a finding of no significant impact on heritage resources.

Overall, no significant impacts (of the proposed GEPP project) that cannot be mitigated were identified. All mitigation and management measures are contained in the EMP.

It is the opinion of WSP that the information contained in this document, read in conjunction with the final scoping report, is sufficient to make an informed decision.

6.2 ENVIRONMENTAL MANAGEMENT PROGRAMME/SYSTEM

EMPs aim to identify and minimise the potential impacts that the proposed construction and operational phases of the project may have on the receiving environment.

A draft **EMP** has been developed which is contained in Appendix R and includes detailed migratory measures for the construction phase. In terms of operational phase provisions, Sasol will either develop a new EMS for the proposed plant or may potentially update an existing ISO: 14001 EMS with the proposed GEPP project. However, this is not a legislative requirement. In order to avoid duplication, the operational phase detailed in the EMP has been limited to the key environmental objectives of the operation, which will inform the EMS development process.

As a general guideline, the **EMS** should be based on a comprehensive set of environmental aspects (elements of the facility that can interact with the environment), and should include the following key components:

- Mechanisms for the on-going identification and assessment of environmental aspects and impacts;
- Environmental management programmes; objectives and targets;
- Environmental monitoring and reporting framework;
- Environmental management procedures; and,
- Mechanisms for the recording of environmental incidents and implementing corrective and preventative actions.

6.3 EAP OPINION

The information contained in this EIR provides a detailed and comprehensive description of the proposed project, baseline environment and potential environmental impacts associated with the GEPP project.

As no significant impacts (of the proposed GEPP project) that cannot be mitigated were identified, WSP are of the opinion that the project should proceed provided the necessary mitigation and management measures are implemented. Furthermore, should the GEPP be constructed, the growth projects at the Sasol One and Midlands Sites will no longer be as vulnerable to short supply and power interruptions due to continuous projection, as the GEPP will be providing the necessary required electricity opposed to Eskom.

The GEPP project supports Sasol's ambition to grow its "low carbon electricity generation" capacity in order to reduce its greenhouse gas footprint, as well as priority pollutants over the medium to long term The GEPP will thus enable growth.

7 References

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Appendix A Final scoping report, the letter of acknowledgement, as well as the approval letter from the DEA

Appendix B Inventory of EIR Requirements that are linked to the EIR (This Report)

Appendix C A3 Size Locality Map and Google Image

Appendix D WSP Capability Statement

Appendix E SAHRA Letter of Acknowledgment

Appendix F Specialists Curriculum Vitae

Appendix G Advertisement Publication for the EIR Public Feedback Meeting and EIR and EMP Public Review Process

Appendix H EIR Feedback Meeting Minutes

Appendix I Issues Trail

Appendix J State Departments Proof of Receipt of EIR and EMP

Appendix K GEPP Plot Plan

Appendix L GEPP Building Footprint

Appendix M Air Quality Impact Assessment Report

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Appendix N Qualitative Noise Report

Appendix O Heritage Impact Assessment Report

Appendix P Geotechnical Assessment Report

Appendix Q EIR Ratings Table

Appendix R Environmental Management Programme