# Secunda Synfuels Operations

# Motivation for the Postponement of Compliance Timeframes in terms of Regulation 11 of Section 21 NEM:AQA Minimum Emission Standards

**Motivation Report Prepared by**

**March 2017**

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## Sasol South Africa (Pty) Limited, operating through its Secunda Synfuels Operations ("SSO")

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**March 2017**

# Executive Summary

This is a motivation in support of an application for a further postponement of the compliance timeframes applicable to existing and new plants contained in the Minimum Emissions Standards (MES) published in terms of the National Environmental Management: Air Quality Act in Government Notice No. 893 in Government Gazette 37054 of 22 November 2013 (GN 893), for sources regulated under categories 3.6 and 8.1 of the MES at Sasol's Secunda Synfuels Operations (SSO) in the Mpumalanga Province.

Between 2013 and 2014 SSO (formerly known as Sasol Synfuels (Pty) Limited) as well as other Sasol operating entities operating in Secunda applied for postponements from the 2015 compliance timeframes of the MES (hereafter referred to as the "2014 Postponement Application") for various sources regulated by the MES. SSO was granted postponements by the National Air Quality Officer (NAQO), with the concurrence of its licensing officer. The postponement decisions for these sources were subsequently reflected in the various Atmospheric Emissions Licences (AELs) applicable to the Sasol entities operating in Secunda.

This application pertains to sources under two Listed Activities regulated by the MES for which an extended compliance time frame of only three years to 31 March 2018 was granted. Application had been made in the 2014 Postponement Application for five years. As set out in this application (hereafter referred to as the "2017 Postponement Application"), SSO will be challenged to meet the MES for three sources regulated by sub-categories 3.6 (Phenosolvan plant) and 8.1 (High Organic Waste incinerators and Biosludge incinerators), as reflected within its varied AEL, by 31 March 2018. SSO is therefore applying for a further postponement to extend the compliance timeframes to complete the necessary technical investigations and if proved feasible safely implement the most appropriate solutions for these sources, to ensure sustainable simultaneous compliance with existing and new plant standards.

Tables 8-1 and 8-2 summarise the postponements requested for the Phenosolvan plant and the incinerators respectively, including the proposed alternative emissions limits and special arrangements to be complied with during the extended compliance period. The postponement period of five years requested for the incinerators and the Phenosolvan plant extends beyond 1 April 2020, the date when the new plant standards take effect. Therefore, application is being made for postponement of both the existing and new plant standards for the abovementioned activities

It is emphasised that SSO does not seek through this postponement application, to increase its current average baseline emissions.

This application is made in terms of Regulation (11) of GN 893 which entitles a person, to apply in writing, to the National Air Quality Officer (NAQO) for a postponement from the compliance timeframes set out in Regulations (9) and (10). As required by Regulation (12) the application includes –

1. This motivation report outlining detailed reasons and a justification for the postponement application.
2. An independently compiled Atmospheric Impact Report (AIR) prepared by Airshed Planning Professionals (Annexure A) in accordance with the Atmospheric Impact Report Regulations of October 2013 (Government Notice No. 747 in Government Gazette 36904 of 11 October 2013), along with a further independent peer review report (Annexure B) on the modelling methodology employed in the AIR. The modelling that informed that AIR was conducted in accordance with the Regulations Regarding Air Dispersion Modelling (Government Notice No. 533 in Government Gazette 37804 of 11 July 2014).
3. A Public Participation Report (Annexure C) prepared by SRK Consulting outlining the public participation process conducted to date in accordance with the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment Regulations. A Comments and Response Report (CRR) detailing all comments received on the project has been collated and is included at as Annexure D. It will be submitted together with the motivation and AIR to the NAQO.

With the benefit of the postponement granted, SSO will be able to advance its roadmap towards implementation as contained in section 9 of this document, to consequently also comply with the new plant standards at Phenosolvan plant and the incinerators.

It must be noted that also for SSO, for three pitch tanks in Tar Value Chain – Phase 2, an extension was granted until 31 March 2017 where five years had been requested. Thus during 2016 SSO submitted an application for a further postponement to allow time to implement the necessary compliance project (referred to as the “2016 Postponement Application”). It is noted that this application is separate and distinct from that application.

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# Glossary

Definitions in terms of NEM:AQA and MES (GN 893) that have relevance to this application:

**Existing Plant** – Any plant or process that was legally authorised to operate before 1 April 2010 or any plant where an application for authorisation in terms of the National Environmental Management Act (Act No.107 of 1998) was made before 1 April 2010.

**Fugitive emissions** - emissions to the air from a facility, other than those emitted from a point source.

**Licencing Authority** – refers to an authority responsible for implementing the licensing system.

**Listed activity** – In terms of Section 21 of the NEM:AQA, the Minister of Environmental Affairs has listed activities that require an AEL. Listed Activities must comply with prescribed emission standards. The standards are predominantly based on 'point sources', which are single identifiable sources of emissions, with fixed location, including industrial emission stacks, called a "point of compliance".

**Minister** – The Minister of Environmental Affairs.

**New Plant** – Any plant or process where the application for authorisation in terms of the National Environmental Management Act (Act No.107 of 1998) was made on or after 1 April 2010.

**Point of compliance** – means any point within the off gas line, where a sample can be taken, from the last vessel closest to the point source of an individual listed activity to the open-end of the point source or in the case of a combination of listed activities sharing a common point source, any point from the last vessel closest to the point source up to the point within the point source prior to the combination/interference from another Listed Activity.

**Point source** – A single identifiable source and fixed location of atmospheric emission, and includes smoke stacks.

**Priority area** - means an area declared as such in terms of Section 18.

**Priority area air quality management plan** - means a plan referred to in Section 19.

**Total volatile organic compounds (VOCs or TVOCs)** – means organic compounds listed under US-EPA Compendium Method TO-14.

Additional definitions provided for the purpose of clarity:

**Alternative emissions limits** – the standard proposed by SSO based on what is considered reasonable and achievable as a consequence of the various technical and environmental assessments conducted and which SSO proposes as an alternative standard to be incorporated as a licence condition with which it must comply during the period of postponement. The alternative emissions limits are specified as ceiling emissions limits or maximum emission concentrations, as defined in this Glossary. In all instances, these alternative emissions limits seek either to maintain emission levels under normal operating conditions as per current plant operations, or to reduce current emission levels, but to some limit which is not identical to the promulgated MES (as defined). Specifically, these alternative emissions limits do not propose an increase in current average baseline emissions.

**Alternative special arrangements** – An arrangement different to that contained in Part 3 of GN 893 and proposed by SSO based on what is considered reasonable and achievable as a consequence of the assessments conducted and which Sasol proposes as an alternative special arrangement to be incorporated as a licence condition with which it must comply during the period of postponement. The alternative special arrangement proposed for the Phenosolvan plant pertaining to the inclusion of this source in the site fugitive emission monitoring plan.

**Ambient standard** - The maximum tolerable concentration of any outdoor air pollutant as set out in the National Ambient Air Quality Standards in terms of Section 9(1) of the NEM:AQA.

**Atmospheric Emission License** – SSO Atmospheric Emission Licence: Licence no. Govan Mbeki/Sasol Chemical Industries (Pty) Ltd 0016/2015/F02 31 March 2015 issued to Sasol in respect of its Secunda Synfuels Operations, formerly Sasol Synfuels.

**Atmospheric Impact Report** - in terms of the Minimum Emission Standards an application for postponement must be accompanied by an Atmospheric Impact Report as per Section 30 of NEM:AQA. Regulations prescribing the format of the Atmospheric Impact Report (AIR) were published in Government Notice 747 of 2013.

**Ceiling emissions limit** – Synonymous with “maximum emission concentrations”. The administrative basis of the MES is to require compliance with the prescribed emission limits specified for existing plant standards and new plant standards under all operational conditions, except shut down, start up and upset conditions. Whereas average emission values reflect the arithmetic mean value of emissions measurements for a given process under all operational conditions, the ceiling emission would be the 100th percentile value of emissions measurements obtained. Hence, ceiling emission values would be higher than average emission values, with the extent of difference between ceiling and average values being dependent on the range of emission levels seen under different operational conditions. Since the MES specify emissions limits as ceiling emissions limits or maximum emission concentrations, SSO has aligned its proposed alternative emissions limits with this format, to indicate what the 100th percentile emissions measurement value would be under any operational condition (excluding shut down, start up and upset conditions). It is reiterated that SSO does not seek to increase emission levels relative to its current emissions baseline through its postponement applications and proposed alternative emissions limits (specified as ceiling emission limits), but rather proposes these limits to conform to the administrative basis of the MES.

**Criteria pollutants** – Section 9 of NEM:AQA provides a mandate to the Minister to identify a national list of pollutants in the ambient environment which present a threat to human health, well-being or the environment, which are referred to in the National Framework for Air Quality Management as “criteria pollutants”. In terms of Section 9, the Minister must establish national standards for ambient air quality in respect of these criteria pollutants. Presently, eight criteria pollutants have been identified, including sulfur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), ozone ($O_3$), carbon monoxide (CO), lead (Pb), particulate matter ($PM_{10}$), particulate matter ($PM_{2.5}$), benzene ($C_6H_6$). In this document, any pollutant not specified in the National Ambient Air Quality Standards (“NAAQS”) is called a “non-criteria pollutant”.

**Existing plant standards** - The emission standards which existing plants are required to meet. Emission parameters are set for various substances which may be emitted, including but not limited to, for example, $PM_{10}$, nitrogen oxides ($NO_x$) and $SO_2$.

**Fugitive emission monitoring plan** – The plan detailing monitoring of fugitive emissions from equipment, pumps, tanks and other non-point sources on the Secunda site and the associated corrective actions to manage these emissions.

**GN 551** – Government Notice 551, Gazette No. 38863 dated 15 June 2016, published in terms of Section 21 of the NEM:AQA and entitled '*Amendments to the list of Activities which result in Atmospheric Emission which have or may have a Significant Detrimental Effect on the Environment, including Health, Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage'*.

**GN 893** – Government Notice 893, Gazette No. 37054 dated 22 November 2013, published in terms of Section 21 of the NEM:AQA and entitled '*List of Activities which Result in Atmospheric Emissions which have or may have a Significant Detrimental Effect on the Environment, Including Health and Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage'*. GN 893 repeals the prior List of Activities published in terms of Section 21, namely GN 248, Gazette No. 33064 dated 31 March 2010. GN 893 deal with aspects including: the identification of activities which result in atmospheric emissions; establishing minimum emissions standards for listed activities; prescribing compliance timeframes by which minimum emissions standards must be achieved; and detailing the requirements for applications for postponement of stipulated compliance timeframes.

**Maximum Emission Concentrations** – Synonymous with "ceiling emissions limits". Refer to glossary definition specific to this application for ceiling emissions limits.

**Minimum Emissions Standards** – Prescribed maximum emission limits and the manner in which they must be measured, for specified pollutants. These standards are published in Part 3 of GN 893, as amended by GN551. These standards are referred to herein as "MES".

**New plant standards** - The emission standards which existing plants are required to meet, by April 2020, and which new plants have to meet with immediate effect. MES are set for various substances which may be emitted, including, for example, $PM_{10}$, $NO_x$ and $SO_2$.

**Postponement** – a postponement of compliance timeframes for existing plant standards and new plant standards and their associated special arrangements, in terms of regulations 11 and 12 of GN 893.

**Sasol –** refers generally to Sasol South Africa (Pty) Limited and its various operations and operating entities.

**Shutdown schedule** - A programme for the scheduled period for which a plant, or a portion thereof or piece of equipment, such as a tank, is out of commission for maintenance for an extended period of time.

**Special arrangements** – Any specific compliance requirements associated with a listed activity's prescribed emissions limits in Part 3 of GN 893, as amended by GN 551. These include, amongst others, reference conditions applicable to the prescribed emission limits of the listed activity, abatement technology prescriptions and transitional arrangements.

**SSO** – the applicant in this postponement application, Sasol South Africa (Pty) Limited operating through its Secunda Synfuels Operations.

**2014 Postponement Application** - Postponement application submitted ahead of the 1 April 2015 compliance timeframe for existing plant standards, for various sources at the Secunda facility and incorporated into the AEL.

**2016 Postponement Application -** Postponement application submitted by SSO to extend the initial two year compliance extension granted ahead of the 1 April 2015 compliance timeframe for existing plant standards, for three pitch tanks.

**2017 Postponement Application –** This postponement application to be submitted by SSO to extend the initial three year compliance extension granted ahead of the 1 April 2015 compliance timeframe, for the Phensolvan plant and HOW and Biosludge incinerators.

# List of Abbreviations

AEL – Atmospheric Emission Licence

AIR – Atmospheric Impact Report

CTL – Coal-to-liquid

CO – Carbon Monoxide

$CO_2$ – Carbon Dioxide

CRR – Comments and Response Report

DEA – Department of Environmental Affairs

EIA – Environmental Impact Assessment

FT – Fischer-Tropsch

GN – Government Notice

HCL – Hydrogen Chloride

HF – Hydrogen Fluoride

HOW – High Organic Waste

I&APs – Interested and Affected Parties

MES – Minimum Emission Standards

NAQO – National Air Quality Officer

NAAQS – National Ambient Air Quality Standards

NEMA – National Environmental Management Act (Act No. 107 of 1998)

NEM:AQA - National Environmental Management: Air Quality Act (Act No. 39 of 2004)

$NH_3$ - Ammonia

$NO_x$ – Oxides of Nitrogen

PM – Particulate Matter

$PM_{2.5}$ – Particulate Matter with radius of less than 2.5 µm

$PM_{10}$ – Particulate Matter with radius of less than 10 µm

ppb – parts per billion

RTO - Regenerative Thermal Oxidation

SANS- South African National Standards

SSO – Secunda Synfuels Operations

t/h – Tons per hour

TOC – Total Organic Compounds

US EPA – United State Environmental Protection Agency

VOC – Volatile Organic Compound; equivalent to TVOC (Total Volatile Organic Compounds)

WSA – Wet Sulfuric Acid

# 1 Introduction

Sasol South Africa (Pty) Ltd (Sasol) is an international integrated chemicals and energy company that leverages technologies and the expertise of 30 100 people working in 33 countries. Sasol develops and commercialises technologies, and builds and operates world-scale facilities to produce a range of high-value product streams, including liquid fuels, chemicals and low-carbon electricity. Sasol is a significant business partner in the South African economy and has manufacturing operations located predominantly in Secunda, Mpumalanga and Sasolburg, Free State.

This 2017 Postponement Application pertains to the Secunda Synfuels Operations (SSO) in the Mpumalanga Province.

The Secunda complex includes activities undertaken by:

- Sasol South Africa (Pty) Limited, operating through its Secunda Synfuels Operations (SSO) and through its Secunda Chemicals Operations.
- Sasol Oil (Pty) Limited, which markets fuels blended at Secunda (as well as those produced at Sasol's joint venture refinery, Natref, in Sasolburg).
- Sasol Mining (Pty Limited, which mines the gasification feedstock and utilities coal used at the Secunda complex.

Between 2013 and 2014 Sasol applied for postponements from the 2015 compliance timeframes of the Minimum Emissions Standards which were published in (MES) Government Notice No. 893 in Government Gazette 37054 of 22 November 2013 ("GN 893") and published in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) hereafter referred to as the "2014 Postponement Application".

Following the 2014 Postponement Application, SSO was granted extended compliance time frames by the National Air Quality Officer (NAQO) with the concurrence of the licensing officer for a number of the activities conducted on the SSO site. In some instances, and for some sources, these were granted for less than five years as initially requested. These include Phenosolvan plant, HOW incinerators and biosludge incinerators where postponements were only granted for three years, namely until 1 April 2018. In these instances, SSO will be challenged to meet the compliance requirements within the extended compliance timeframes.

As indicated in the 2014 Postponement Application, SSO would be challenged to comply within a five-year timeframe for the abovementioned incinerators and therefore requested a five-year postponement. The present postponement application therefore constitutes a further postponement application for these sources, to extend the initial three year compliance extension granted. These further postponement applications are requested for purposes of completing the associated projects in the interest of sustained compliance with the existing plant standards.

Thus, in the present application, SSO therefore makes application for further postponements from the 2015 MES for its Biosludge and High Organic Waste (HOW) Incinerators and Phenosolvan Plant (the "2017 Postponement Application"). As was indicated in the 2014 Postponement Application, more than the granted three years is necessary to allow for the completion of the necessary technical investigations and if proved feasible, safely implement the most appropriate solutions for these sources, to ensure sustainable simultaneous compliance with existing and new plant standards. It is likely that a further postponement application will be required to be made to extend the postponement period beyond 2023 to complete execution of the projects, if proved feasible

In addition, since the five year postponement periods being requested will extend beyond 1 April 2020, postponements of the associated 2020 new plant standards, which will come into effect on that date, are also simultaneously applied for. Alternative emissions limits and alternative special arrangements will be requested to be applicable during the postponement period.

The application[1] includes:

- This motivation report outlining detailed reasons and a justification for the postponement application.
- An independently compiled Atmospheric Impact Report (AIR), Annexure A, prepared by Airshed Planning Professionals in accordance with the Atmospheric Impact Report Regulations of October 2013 (Government Notice No. 747 in Government Gazette 36904 of 11 October 2013), along with a further independent peer review report, Annexure B, on the modelling methodology employed in the AIR. The modelling that informed that AIR was conducted in accordance with the Regulations Regarding Air Dispersion Modelling (Government Notice No. 533 in Government Gazette 37804 of 11 July 2014).
- A Public Participation Report, Annexure C, prepared by SRK Consulting outlining the public participation process conducted in accordance with the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment Regulations.
- A Comments and Response Report (CRR), Annexure D. detailing all comments received on the project.

This motivation report therefore provides:

- Background to the application and the MES (Section 2).
- Detailed information on the activities of the affected SSO activities at the Secunda complex, the MES in general (Section 3), together with the specific requirements for the Biosludge and HOW Incinerators and Phenosolvan Plant at Secunda including progress towards compliance achieved thus far (Section 4) and technology options considered (Section 5).
- Reasons for the postponement request (Section 6).
- Key findings of the stand-alone AIR (Section 7), in order to demonstrate the implications of the postponement request on ambient air quality. The full AIR is included at Annexure A
- Details of the proposed alternative emissions limits (Section 8) and a roadmap to compliance (Section 9).
- A summary of the public participation process conducted in support of this application (Section 1) (Section 4). The Public Participation Report reflecting the process is included in Annexure C and the Comments and Response Report at Annexure D.

It should be noted that this application is separate and distinct from the application which SSO submitted in 2016 in respect of three pitch tanks, where an extended compliance time frame was granted to 1 April 2017 (referred to as the "2016 Postponement Application"). Extended compliance time frames previously granted and valid until 31 March 2020 are not the subject of this application.

[1] As these documents are subject to public participation as contemplated above, they are drafts available for public comment and will be updated and finalised subsequent to the finalisation of the public comment period, prior to submission to the NAQO. A comments and response report detailing all comments received on the project will be collated and included as an Appendix to the final motivation to be submitted to the NAQO.

# 2 Background

## 2.1 Overview

Sasol was established in 1950 and started producing synthetic fuels and chemicals in 1955, from the world's first commercial coal-to-liquids (CTL) complex in Sasolburg. The company privatised in 1979 and listed on the JSE Ltd in the same year. In the late 1970s and early 1980s, Sasol constructed two additional coal-to-liquid plants at Secunda. Sasol's activities in South Africa are both diverse and yet highly interdependent with main activities at facilities located in Secunda, Mpumalanga and Sasolburg, Free State.

Sasol is well known both locally and internationally for its core activity of converting coal to liquid fuels (known as coal-to-liquids or CTL). What is perhaps less well known is the range of other activities that are built on and around that core CTL process. These various activities serve to maximise the range of products and associated value that can be derived from the basic raw materials that are used in the Sasol process, as well as the provision of so-called utilities (most notably steam) that are critical inputs to the industrial process. Sasol describes its business as one of 'integrated value chains'. Integrated value chains contemplates a high degree of integration between all the process units whereby the maximum utility (and thus commercial value) can be derived from the basic material inputs of coal, water and air. In this section the Sasol integrated value chain concept is presented in order to gain an understanding of Sasol's operations in Secunda.

Coal is mined and then gasified to liberate the carbon in the form of carbon monoxide (CO). However, because coal is low in hydrogen content, an additional source of hydrogen is required and that is derived from water. The gasification process thus results in a raw gas stream of CO and hydrogen, which is later combined to form hydrocarbon chains in the Fischer-Tropsch (FT) process. The hydrocarbon chains are then used principally in the manufacturing of liquid fuels. During the gasification process, tars and other components are formed which also have to be removed from the raw gas. Instead of treating these components as waste, Sasol's industrial process converts these components to other chemical products, which have commercial value.

SSO produces synthetic fuel components, along with a range of intermediate streams that serve as chemical feedstocks for the production of products including ethylene, propylene, detergent alcohols, phenols, alcohols and ketones. Importantly, in addition to producing key components to manufacture saleable products, SSO is self-sufficient in producing the oxygen and steam required for the production process and generating some 40% to 45% of the complex's total electricity demand. SSO operates one of the world's largest oxygen production facilities, currently consisting of 16 trains.

Sasol's fuel and chemical value chains are intimately integrated, not only among different entities within the Secunda complex (for example, SSO and Sasol's Secunda Chemicals Operations), but also between the Secunda complex, Sasol's Sasolburg complex and even with a joint venture refinery in Sasolburg. Within the SSO process, for example, the extensive linkages mean that decisions to retrofit or modify components of the process have to consider all possible upstream and downstream knock-on effects. These knock-on effects, if not properly assessed and managed, could result in significant process disruptions for a whole range of other Sasol activities.

## 2.2 The Secunda Complex

The town of Secunda is located in Govan Mbeki Local Municipality, which is part of the Gert Sibande District Municipality in Mpumalanga Province. The Sasol Secunda industrial complex lies to the south-southwest of the town, with the associated coal mining activities occurring in various directions from the town.

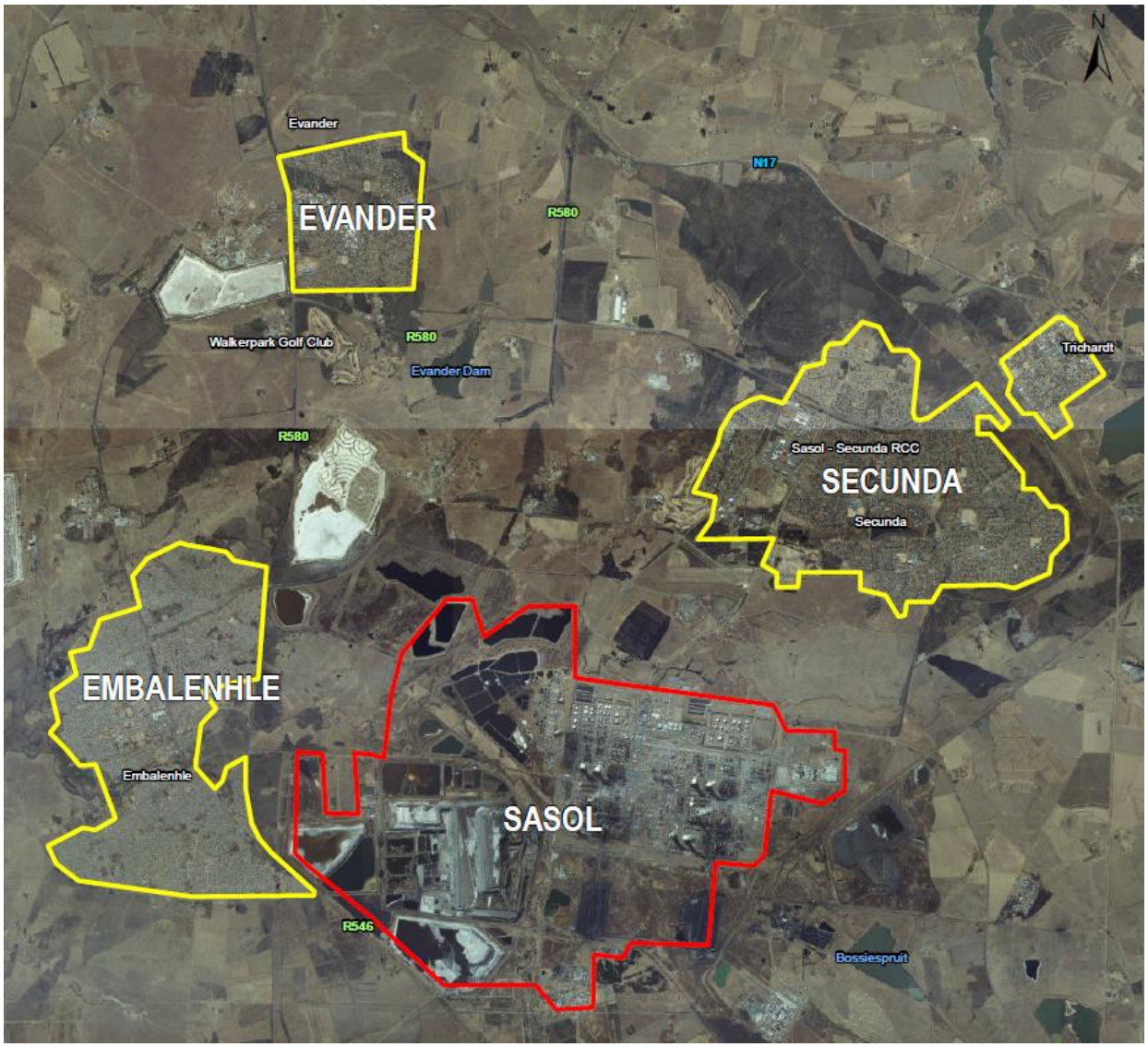


**Figure 2-1: Map showing the position of Sasol's Secunda complex, in which the activities in question are undertaken as part of SSO**

## 2.3 Atmospheric emissions

Sasol's operations in Secunda generate a range of atmospheric emissions which are regulated in terms of an atmospheric emission license. The emissions are presented below as a function of the activities and facilities where they are emitted. These sources include the steam plants, the Synfuels Catalytic Cracker, the Tar Value Chain, the storage tanks at the tank farm and in other locations, the sulfur recovery process, rail loading facilities, incinerators and others. These sources are illustrated schematically in Figure 2-2.

This postponement application pertains to the HOW and Biosludge incinerators as well as the Phenosolvan Plant. These plant processes are described in more detail below.

### 2.3.1 Phenosolvan Plant

The Phenosolvan plant is located downstream of gas cooling and separation processes. The purpose of the Phenosolvan plant is to extract valuable products from a water stream emanating from the gasification process. At the Phenosolvan plant, carbon dioxide ($CO_2$) is passed through the water stream in saturation columns, in order to alter the pH of the stream. The pH change promotes the extraction of products from the water stream, and entrains or entraps a portion of the VOC components

in the $CO_2$ gas that passes through the water stream. This results in VOCs exiting the column with the $CO_2$ gas. While VOC emissions are high in concentration, the streams are low in volume as measured during the sampling campaign which generally implies a limited pollution footprint and associated ambient footprint.

### 2.3.2 HOW incinerators

The purpose of the two High Organic Waste (HOW) incinerators is to treat effluent streams from the SSO Phenosolvan and Secunda Chemicals Operations (SCO) facilities. HOW from the SSO Phenosolvan plant (Ammonia recovery) and HOW from the SCO plant (Carbonyl recovery) is treated at the water recovery plant area, where the HOW is combusted in the presence of fuel gas and air, for safe disposal of this waste stream.

### 2.3.3 Biosludge incinerators

Process effluent streams including Reaction Water and Stripped Gas Liquor, along with oily water sewer and storm water streams, are treated in an aerobic activated sludge wastewater treatment process, as well as an anaerobic digester, which generates excess activated sludge (biosludge) requiring disposal. This excess activated biosludge, together with a smaller stream of neighbouring town Secunda's domestic sewage sludge which Sasol treats on behalf of the municipality, is thickened. This de-watered sludge has a solids concentration of ~12%, which is the upper limit of what can be achieved through mechanical de-watering. The centrifuged sludge is then pumped to four Lurgi multiple-hearth incinerators for incineration.

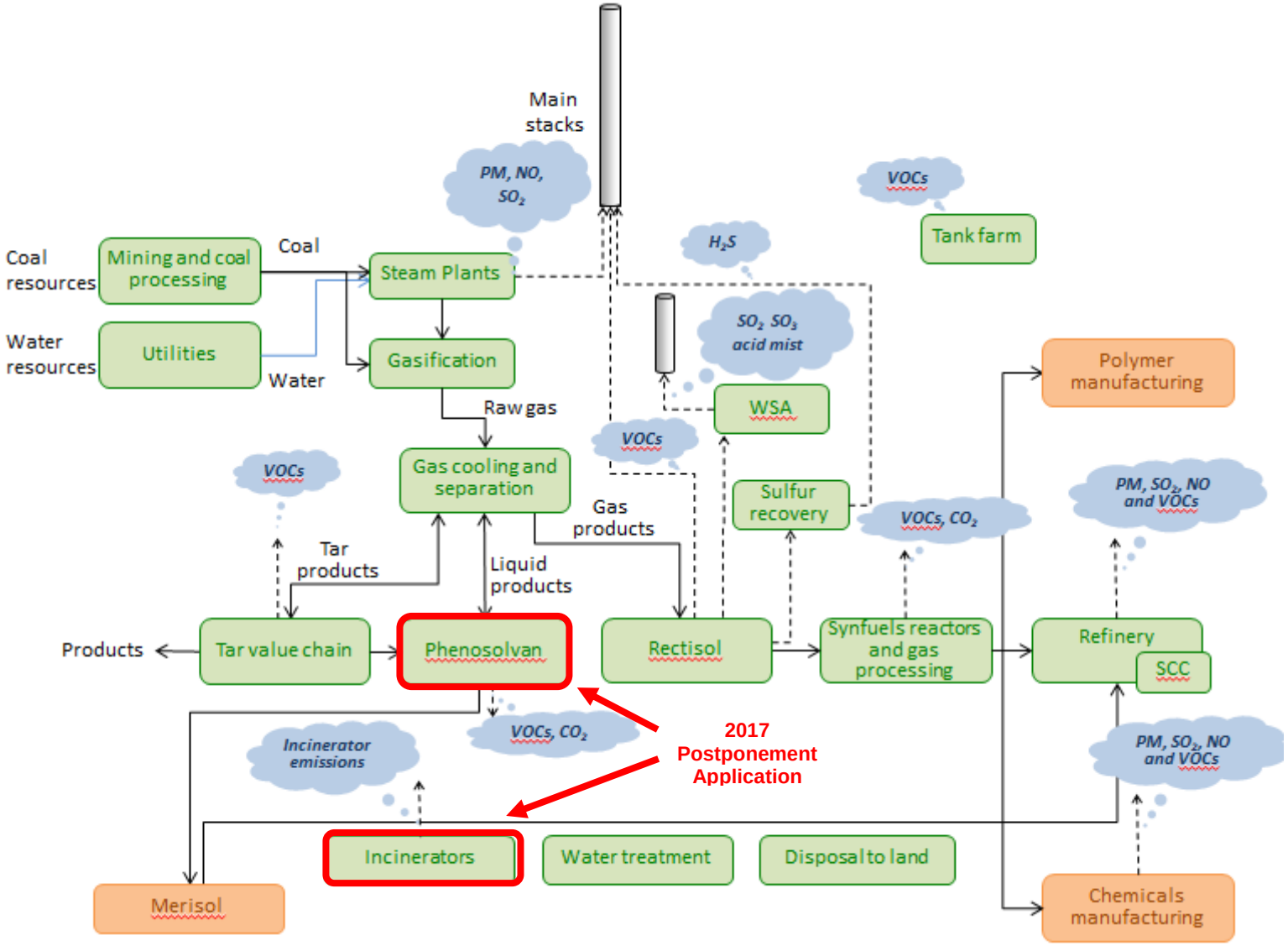


**Figure 2-2: Schematised illustration of the industrial process at SSO, highlighting sources of atmospheric emissions**

**Note that this represents the East factory, since the West factory is largely identical, but does not, for instance, have a Wet Sulfuric Acid (WSA) plant*

# 3 The Minimum Emissions Standards

## 3.1 Overview

The NEM:AQA is a specific environmental management act as contemplated in the NEMA, and aims to give effect to the Constitutional right to an "environment that is not harmful to health or wellbeing and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development". In this context, therefore, SSO makes this application.

In March 2010, the Department of Environmental Affairs (DEA) published MES, in terms of the NEM:AQA. The MES serve to define maximum allowable emissions to atmosphere for a defined range of pollutants and specific activities that can generate such emissions and which require a license. Maximum allowable emissions are then included in Atmospheric Emission Licences ("AELs") which regulate these specific activities according to the categories within which they fall in the MES.

In November 2013, the Regulations within which the MES were contained were repealed and replaced by Government Notice No. 893 which was published in Government Gazette 37054 of 22 November 2013 (GN 893) and thereafter amended in terms of Government Notice No. 551 in Government Gazette 38863 of 12 June 2015 (GN 551). This application is therefore aligned with the 2013 MES as reflected in GN 893 read together with GN551. Unless otherwise specified or granted a postponement following an application such as this one, existing production facilities are required to comply with MES prescribed for existing plants by 1 April 2015 ("existing plant standards"), as well as with MES applicable to new plants by 1 April 2020 ("new plant standards").

## 3.2 The MES categories applicable to this postponement application

The following MES categories are applicable to this postponement application:

- Phenosolvan - Category 3: Sub-category 3.6 The production and clean-up of a gaseous stream derived from coal gasification and includes gasification, separation and cleanup of a raw gas stream through a process that involves sulfur removal and Rectisol as well as the stripping of a liquid tar stream derived from the gasification process.
- Incinerators - Category 8.1: Thermal Treatment of Hazardous and General Waste

The Phenosolvan plant already meets the new plant standards for Hydrogen Sulphide and Sulfur Dioxide but does not yet meet the prescribed existing and new plant standards for Total Volatile Organic Compounds (TVOC or simply VOC). Hence the implementation of a technical solution to reduce VOC emissions, as described in Section 5,1 is required to bring about compliance with the existing and new plant standards.

Although the HOW incinerators currently employ steam flow, pressure control and a trip system to manage PM emission impacts, they currently do not meet existing plant standards and new plant standards.

The HOW incinerators are designed to operate at high temperatures to ensure complete combustion of its feed streams. As a result of high combustion temperatures, flue gas temperatures range from 300 to 400 °C, which is higher than the requirement prescribed under Sub-category 8.1 special arrangement (a)(vi) for exit gas temperature to be maintained below 200 °C.

Emissions from the biosludge incinerators are mitigated by Venturi scrubber towers, which reduce emission concentrations of PM, metals, $NH_3$, HF and HCl. However, the biosludge incinerators currently do not meet existing plant standards and new plant standards for prescribed substances.

The exit gas temperature is below 200°C, therefore meets the requirement prescribed under Sub-category 8.1 in special arrangement (a)(vi).

Category 8.1 and Category 3.6 are applicable to this postponement application. Compliance with the applicable standards are summarised below.

**Table 3-1: Summary of applicable MES (Those highlighted in orange require postponement in terms of this application)**

| MES Category | Substance(s) | Emission limits or special arrangements* | | Applicable SSO Activities |
|---|---|---|---|---|
| | | New plant standards | Existing plant standards | |
| Category 3: Sub-category 3.6 | Hydrogen sulfide | 3 500 | 4 200 | Phenosolvan |
| | Total Volatile Organic Compounds | 130 | 250 | |
| | Sulfur dioxide | 500 | 3 500 | |
| Category 8: Sub-category 8.1 | Particulate matter | 10 | 25 | HOW incinerators |
| | Carbon Monoxide | 50 | 75 | |
| | Sulfur dioxide | 50 | 50 | |
| | Oxides of nitrogen | 200 | 200 | |
| | Hydrogen chloride | 10 | 10 | |
| | Hydrogen fluoride | 1 | 1 | |
| | Sum of Lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium | 0.5 | 0.5 | |
| | Mercury | 0.05 | 0.05 | |
| | Cadmium + Thallium | 0.05 | 0.05 | |
| | Total Organic Compounds | 10 | 10 | |
| | Ammonia | 10 | 10 | |
| | Dioxins and furans | 0.1 | 0.1 | |
| | n/a | Exit gas temperatures must be maintained below 200ºC | | |
| Category 8: Sub-category 8.1 | Particulate matter | 10 | 25 | Biosludge Incinerators |
| | Carbon Monoxide | 50 | 75 | |
| | Sulfur dioxide | 50 | 50 | |
| | Oxides of nitrogen | 200 | 200 | |
| | Hydrogen chloride | 10 | 10 | |
| | Hydrogen fluoride | 1 | 1 | |
| | Sum of Lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium | 0.5 | 0.5 | |
| | Mercury | 0.05 | 0.05 | |
| | Cadmium + Thallium | 0.05 | 0.05 | |
| | Total Organic Compounds | 10 | 10 | |
| | Ammonia | 10 | 10 | |
| | Dioxins and furans | 0.1 | 0.1 | |
| | n/a | Exit gas temperatures must be maintained below 200ºC | | |

**In the case of emission limits, these are specified as mg/Nm$^3$ under normal conditions of 273 Kelvin and 101.3 kPa, at respective $O_2$ reference conditions for each listed activity as specified in the MES; in the case of dioxins and furans this is specified in the MES as ng I-TEQ/Nm$^3$*

# 4 Monitoring and Improvements made to date

Over the past decade, Sasol has spent in excess of R20 billion on various projects that have delivered significant environmental improvements. This expenditure excludes very significant regulatory-driven investments in the Department of Energy's Clean Fuels 1 programme and pending Clean Fuels 2 programme, which has resulted in, and will further result in reduced motor vehicle emissions. Further, SSO made commitments to certain emissions abatement interventions as part of the Highveld Priority Area Air Quality Management Plan, and has made significant progress towards achieving these commitments. Details of historical improvements were provided in the 2014 Postponement Application, available at http://www.srk.co.za/en/sasol-postponements. Improvements made since the 2014 postponement application for the plant processes which are subject to this 2017 Postponement Application are detailed below.

## 4.1 Phenosolvan Plant

In the technical appendix accompanying the 2014 Postponement Application the project plan highlighted the first important step towards compliance being to reduce VOC emissions from the saturation column. This required a test run to establish whether or not the $CO_2$ added to the saturation column is the driving force behind the VOC emissions by capturing the VOCs while passing through the water stream in the column. A sampling campaign was carefully planned, as explained in detail below. The intent was for this to accompany the test run under normal operation (i.e. with $CO_2$) and without $CO_2$ to carefully evaluate the impact of the removal of the $CO_2$, as this could impact on the operation of the unit and could have downstream consequences to production. The test run and sampling campaign was planned, taking into account various scenarios that could occur during normal operation.

VOC emissions measurements are generally conducted in accordance with US EPA method 18 as prescribed by the GN893 (Annexure A). Samples are collected in Tedlar bags, where after the samples are transferred in charcoal tubes for Gas Chromatography analysis. As the engineering team identified droplets (liquid) exiting with the VOC emissions from the top of the saturation column, an alternative method of sampling the VOC emissions was required in order to establish a correct basis for appropriate abatement technology to be installed. With the droplet portion present, sampling in accordance with US EPA method 18 would not yield accurate results, as the liquid collected in the bag would not be accounted for during analysis. It was therefore deemed appropriate to sample the VOC emissions from the saturation column isokinetically, a method generally used for particulate sampling, but also effective for aerosols and droplets. This involves taking the sample at the same rate as what the emissions are leaving the column, condensing the liquid in an impinger train and collecting the VOCs on an activated carbon bed, with an FID (Flame Ionisation Detector) at the back to pick up any breakthrough of the VOCs. By using this method, both the gaseous and liquid VOC emissions can be accounted for, which is a much more accurate measurement of the emission concentrations.

The existing sample point at the saturation column was not meeting the criteria of US EPA method 1 and 2 in terms of traverse point and flow measurement, which are prerequisites for isokinetic sampling. Therefore, a modification of the sampling port was required in order to adhere to the isokinetic sampling method requirements. Due to safety concerns at the existing saturation columns, as well as adherence to US EPA method 1 and 2 requirement, numerous inspection and design activities were required before the design of the sampling port could be finalised. This required modification and involved an extension of the existing vent of the saturation column. The extension had to be designed and manufactured according to specific engineering design requirements, taking into consideration the additional load this extended vent will put on the saturation column and the associated safety risks. Due to manufacturing challenges, the extension (sample point) had to be re-manufactured and was subsequently safely and successfully installed in August 2016.

While VOC emissions measured are high in concentration, the streams are low in volume as measured during the sampling campaign which generally implies a limited pollution footprint and associated ambient footprint.

The test run with and without $CO_2$ along with the sampling campaign was conducted in August 2016 while the engineering team carefully monitored the plant conditions during the different identified operating scenarios. Contrary to SSO's plant process engineers' initial expectations, the results of the sampling campaign concluded that removal of the $CO_2$ from the column does not have a significant effect on reducing VOC emissions from the column, and therefore this option will not be pursued further. As indicated in the 2014 Postponement Application, if the test run was not successful, SSO would advance a prefeasibility package on other technical options to achieve the new plant standard. SSO is therefore busy evaluating additional technical options in support of the implementation of a sustainable compliance solution for both new and existing MES. This is detailed in Table 5-1 below.

## 4.2 HOW incinerators

Emissions monitoring at the HOW incinerators is conducted and reported to the licensing authority on a quarterly basis in accordance with the requisite AEL condition which incorporates the 2014 postponement requirement in this regard. These incinerators, though decades old, are maintained to operate at optimal performance for their design intent. As such, investigations did not identify any material potential for waste volume and emissions reductions via operational improvements to the incinerators, but some incremental opportunities were identified and these have been implemented. Work to determine the range of composition of the waste streams to the HOW incinerators and thus understand the impact of the composition of the streams on the incineration process and associated emissions was also completed. This work allowed for optimal burning of HOW at optimal temperatures and reduced the amount of fuel gas used during incineration. These operational improvements have marginally reduced PM, HF and HCl emissions from the HOW incinerators.

## 4.3 Biosludge incinerators

Emissions monitoring at the biosludge incinerators is conducted and reported to the licensing authority on a quarterly basis in accordance with the requisite AEL condition which incorporates the 2014 postponement requirement in this regard. Over the past two years, operational improvements previously identified and implemented by a focused task team, have been tracked on a continuous basis by the engineering and operational teams, to ensure sustainable improvements. These operational improvements include:

1. Operating the incinerators in the optimal temperature zones for incineration to ensure a smoother temperature profile, with a resultant reduction in PM emissions;
2. Optimal polyelectrolyte dosage for dewatering of biosludge prior to its incineration;
3. Continuous improvements in the availability of critical equipment;
4. Commissioning of a water recovery growth plant which has reduced the total sludge load to the biosludge incinerators; and
5. Emphasis on quality monitoring of incoming streams.

These measures have marginally reduced emissions through optimisation of the operation of the biosludge incinerators. Operational improvements are constrained by the limits of performance of the installed technology, which is operating within its original design intent.

Significant work and developments have taken place since the 2014 Postponement Application in relation to the waste beneficiation solution through composting. At the time of that application, this solution, which would have had the spin-off benefit of creating new job opportunities, was thought to

be the most promising solution and one which was also appropriately informed by an integrated environmental management approach, aligned with the waste hierarchy. Since then, however, continued testing at an expanded scale has been undertaken over the period of two years, with disappointing technical results. As a result, the composting project was stopped. Alternative methods of composting have also been investigated on request of Sasol by two universities (North West University and University of Stellenbosch). These studies will be advanced on the basis of preliminary findings that composting remains a potential viable option.

# 5 Technology options for compliance

In this motivation, statements are incorporated regarding the feasibility of identified technologies as emissions abatement solutions through which to achieve compliance. Assessments of these technologies were triggered in some instances by Sasol's internal policies regarding continuous improvement, and in others, by the requirement to comply with the MES. The consideration of the feasibility of a compliance technology requires a holistic assessment of the implications of simultaneous compliance to 2015 and 2020 MES standards from multiple perspectives, including but not limited to:

- The viability of a technology to achieve the desired emission reduction outcome
- The unintended consequences of implementing a technology, including upstream and downstream impacts
- Operability of the technology
- Implementation considerations including process safety risks, construction risks, production risks and integrated planned maintenance scheduling implications
- Financial implications, including upfront capital expenditure and lifecycle operating costs
- Environmental cross-media impacts
- Ambient air quality benefits arising

While projects to realise reduced emissions have been implemented since the 2014 Postponement Application, extensive investigations have also been undertaken since then to identify feasible solutions that would sustainably reduce emissions to below the MES. These are detailed further below.

## 5.1 Phenosolvan Plant

The results from the sampling campaign for the Phenosolvan Plant provided more comprehensive emissions information (including a mass balance across the column) which enables more appropriate consideration of technical evaluations of potential solutions. Since, as indicated above, the option of removing $CO_2$ from the saturation column has now been confirmed to be technically unviable, the technical evaluation of more possible solutions will be widened to also include technical options that were previously regarded as significantly less feasible than this solution.

The potential solutions for improvement that are now being further investigated are summarised in Table 5-1 below. Further details of the investigations and their findings are included at Annexure E.

**Table 5-1: Potential solutions to achieve compliance at the Phenosolvan Plant**

| TECHNICAL OPTION | OUTCOME OF TECHNOLOGY FEASIBILITY ASSESSMENT | SUMMARY OF REASONS FOR FEASIBILITY ASSESSMENT OUTCOME |
|---|---|---|
| Remove $CO_2$ to the saturation column | Infeasible | The test run to remove $CO_2$ to the saturation column confirmed that the VOCs emitted cannot be significantly reduced by removing $CO_2$ to the saturation column, and this option will therefore not be investigated further |
| Flaring to combust the VOC emissions to carbon dioxide | To be further investigated | Low heating value and oxygen content of the stream exiting the saturation columns makes it a potentially challenging option. However, mixing with existing streams going to flare will be investigated to determine viability. |
| Liquid removal prior to abatement | To be further investigated | Will reduce the volume of the stream requiring abatement. Liquid removal on its own is not sufficient and additional abatement will be required. |
| Membrane separation | To be further investigated | Information received from the VOC emissions sampling campaign indicated much lower than anticipated $CO_2$ content in the off-gas and therefore membranes may be investigated further.<br>This may have other potential risks since this is an abatement technology that Sasol is not familiar with. |
| Catalytic oxidation | Not feasible | Creates a significant operations risk, since compounds are present in the off-gas which may render the catalyst used in the catalytic oxidation process ineffective. |
| Absorption | To be further investigated | This option would potentially have negative cross-media environmental impacts, as the absorption medium will be an additional effluent stream that increases the site's waste footprint. Additional waste management solutions will be required.<br>Recycling of the effluent stream is a high risk option due to potential contaminants in the effluent stream that may impact negatively on production. |
| Adsorption | To be further investigated | A waste stream will be generated with this technology which would require additional waste management solutions and a comparison of the negative cross-media environmental impacts will be required.<br>Compounds present within the off-gas stream may also render several of the possible adsorbent options used in the process ineffective. |
| Condensation | Not favourable | Additional energy input (electricity) required, which counters Sasol's energy efficiency objectives |
| Regenerative Thermal Oxidation (RTO) | To be further investigated | This is currently identified as the preferred option. Spare capacity availability at RTOs to be installed at neighbouring plants, to be evaluated after March 2018 once a dependent project at the Coal Tar Filtration East plant is commissioned |

## 5.2 Incinerators

As described in Section 4.2, the HOW incinerators currently employ steam flow, pressure control and a trip system to manage PM emission impacts. Emissions from the Biosludge incinerators are currently mitigated by Venturi scrubber towers, which reduce concentrations of PM, metals, $NH_3$, HF and HCl.

SSO's approach to further emission reductions from its incinerators is informed by the waste hierarchy, which places preference on solutions to avoid and reduce waste over disposing of it (to landfill, or to atmosphere, via incineration), since this averts negative environmental impacts and could improve process and energy efficiency. Sasol endeavours to apply the waste hierarchy however should it not be feasible to apply the approach to the entire stream volume; incineration may still be the most appropriate solution.

In the 2014 Postponement Application, SSO indicated that it had not yet found a feasible solution to meet the MES. Based on a comparison of the total investment cost associated with a shut down and replacement of the incinerators at both Sasolburg and Secunda and the limited ambient air quality improvements to be realised by doing so, not only was the business impact considered infeasible but any such action would have been in conflict with, amongst other things, the best practicable environmental option.

However, as committed in the 2014 Postponement Application, Sasol has continued to explore alternatives to identify and implement feasible compliance options. These are summarised in Table 5-2 (HOW Incinerators) and Table 5-3 (Biosludge Incinerators). Further detail of the investigations and their findings are included at Annexure E.

**Table 5-2: HOW Incinerator Improvement Options Investigated**

| POTENTIAL TECHNICAL OPTION | OUTCOME OF TECHNOLOGY FEASIBILITY ASSESSMENT | SUMMARY OF REASONS FOR FEASIBILITY ASSESSMENT OUTCOME |
|---|---|---|
| Operational improvements | Feasible and already implemented | To the extent that operational improvements have been identified, these have been implemented The improvements in emission concentrations are insufficient to meet the MES. |
| Reduction in exit temperature | Undesirable Outcome | Low temperature quench required to reduce exit gas temperature would reduce plume buoyancy and have an unintended negative impact on the dispersion potential of the plume, thereby increasing ambient impacts of emissions rather than reducing them.<br><br>The special arrangement for exit gas temperature will be addressed as part of the design basis for the new incinerator. |
| HOW as an alternative fuel to a third party | Most likely infeasible | Current information indicates substantial logistics capital investment for material to be transported. This requires further investigation but based on current information, feasibility is unlikely. This will be confirmed through further investigations to be conducted. |
| Installation of abatement technology on existing equipment | In progress - to be determined | Negative impacts on upstream operations during technology installation (limited installation opportunities during factory shutdown is foreseen to impact the achievable completion date)<br>Negative environmental impacts since the feed to the incinerator will have to be disposed of when required modifications to existing equipment are made. The waste cannot be landfilled due to waste legislation prohibitions<br>The potentially high capital required will need to be appropriately evaluated against the benefits associated with this option<br>High risk for retrofitted equipment not achieving the special arrangement stipulated under subcategory 8.1 (a) (vii) of MES (daily availability of 98%) |
| Installation of new incinerator | In progress - to be determined | Shutting down existing equipment before end of useful life is financially unsustainable and misaligned with the principle of Best Practicable Environmental Option<br>The potentially high capital required will need to be appropriately considered against the actual air quality improvements associated with this option<br>In the 2014 Postponement Application, SSO indicated that the total investment cost associated with a shut down and replacement of the incinerators at both Sasolburg and Secunda and the limited ambient air quality improvements to be realised by doing so, rendered the option infeasible. |
| Integrated incinerator option | In progress - to be determined | New option identified; still under investigation – options to combine HOW and biosludge from SSO versus option to combine |

| POTENTIAL TECHNICAL OPTION | OUTCOME OF TECHNOLOGY FEASIBILITY ASSESSMENT | SUMMARY OF REASONS FOR FEASIBILITY ASSESSMENT OUTCOME |
|---|---|---|
| | | HOW, biosludge from SSO and waste from Sasolburg Operations. |
| Reduction of the waste streams being incinerated at source and beneficial utilisation | Feasibility being determined – but it is known that this will not change emissions concentrations | No negative externalities identified<br>Aligned with waste hierarchy priorities<br>May be more cost-effective than other solutions<br>Though on an integrated basis this is an environmentally responsible option reducing total load of emissions, the emission concentrations will not change materially and therefore will not meet the concentration-based MES<br>Risk of not meeting heating fuels market product specification on the Secunda Chemicals Operations HOW stream during plant upset conditions – alternative options are investigated further to handle off-specification HOW product that are not suitable for heating fuels market. |

**Table 5-3: Biosludge Incinerator Improvement Options Investigated**

| POTENTIAL TECHNICAL OPTION | OUTCOME OF TECHNOLOGY FEASIBILITY ASSESSMENT | SUMMARY OF REASONS FOR FEASIBILITY ASSESSMENT OUTCOME |
|---|---|---|
| Operational improvements | Already implemented | To the extent that operational improvements have been identified, these have been implemented. Improvements in emission concentrations are insufficient to meet MES. |
| Refurbishment of existing equipment and installation of additional abatement technology on existing equipment | In progress - to be determined | Risks of disrupting upstream operations during technology installation – modifications and tie-ins will have to be done during planned statutory maintenance cycles which will require additional time to implement.<br>The potentially high capital required will need to be appropriately evaluated against the benefits associated with this option<br>High risk for retrofitted equipment not achieving the special arrangement stipulated under subcategory 8.1 (a) (vii) of MES (daily availability of 98%) |
| Installation of a new incinerator | In progress - to be determined | Shutting down existing equipment before end of useful life is financially unsustainable and contrary to the principle of Best Practicable Environmental Option<br>The potentially high capital required will need to be appropriately evaluated against the benefits associated with this option<br>In the 2014 Postponement Application, SSO indicated that the total investment cost associated with a shut down and replacement of the incinerators at both Sasolburg and Secunda and the limited ambient air quality improvements to be realised by doing so, rendered the option infeasible. |
| Integrated incinerator option | In progress - to be determined | New option identified; Still under investigation – options to combine HOW and Biosludge from SSO versus option to combine HOW, Biosludge from SSO and waste from Sasolburg Operations. |
| Alternative technology (super critical water oxidation) | Not feasible | This is a Novel technology with no references to current commercial running plants and it thus poses a high technical risk. |
| Landfilling | Not feasible<br>(bio-gas harvesting possibility) | The potentially high capital required will need to be appropriately considered against the air quality improvement benefits associated with this option, particularly since this option can only |

| POTENTIAL TECHNICAL OPTION | OUTCOME OF TECHNOLOGY FEASIBILITY ASSESSMENT | SUMMARY OF REASONS FOR FEASIBILITY ASSESSMENT OUTCOME |
|---|---|---|
| | | be used for a limited timeframe before the waste-to-landfill prohibition comes into effect.<br>Landfilling with bio-gas harvesting to recover energy is currently investigated as a potential alternative. |
| Reduction of the waste streams being incinerated at source and beneficial utilisation | Feasibility being determined – but it is known that this will not change emissions concentrations | No negative externalities identified<br>Aligned with waste hierarchy priorities<br>May be more cost-effective than other solutions<br>Though environmentally responsible, the emission concentrations will not meet both the 2015 and 2020 MES requirements. |
| Utilisation as alternative fuel resource by third party | In progress - to be determined | The costs associated with drying sludge with high (90-95%) water content before transporting to third party for use may be prohibitive in so far as they may outweigh the associated benefit. Further work required to determine if the option will be feasible.<br>Due to the high volumes, transporting of biosludge via road to third parties poses logistical risks and challenges. |

# 6 Reasons for the Postponement Application

As indicated in Section 5, the 2014 Postponement Application noted that a feasible solution to meet the MES had not, at the time, been identified for the incinerators. SSO has, as committed in the 2014 Postponement Application, continued to explore alternatives to identify potentially feasible compliance options as detailed in Section 5 and Annexure E.

Based on pre-feasibility studies conducted and in particular, the new options identified for the incinerators through ongoing technology scans, SSO now believes that it may be feasible to meet the new plant standards for Category 8 of the MES. More time is however required to confirm this position as the projects progress through Sasol's capital project governance framework. The various reasons that SSO will require more time to identify solutions, which if feasible, will require time to be implemented are detailed below.

Similarly results from the test run and associated sampling campaign on the Phenosolvan Plant have provided greater emissions information. Attempts to reduce VOC emissions by removing $CO_2$ from the saturation column have not yielded the anticipated reductions and therefore SSO, for the reasons outlined below, requires more time to investigate and implement more complex and feasible technology alternatives if identified.

## 6.1 Previous Postponement Application

As indicated above, a feasible solution to meet the MES was not identified for the incinerators at the time of the 2014 Postponement Application. Regulation 13 of the MES allows for the period for which a postponement may be granted to 5 years per postponement application. SSO therefore anticipated that a postponement for 5 years would be granted during which time the incinerators and Phenosolvan plant would be operated in terms of the Alternative Emissions Limits and Alternative Special Arrangements proposed in that postponement application, and while it continued to investigate options to achieve compliance. The NAQO decision dated 23 February 2015 however granted extended compliance for three years only until 31 March 2018 for these facilities.

As for the Phenosolvan plant, it was indicated in the 2014 Postponement Application that a sample point would be installed and test runs would be completed to obtain further information to inform possible technical solutions, with the goal of ultimately complying with the 2020 MES.

While SSO has since the NAQO decision undertaken investigations and been able to identify potentially feasible options to achieve compliance, the three year postponement does not allow sufficient time to identify and implement the most feasible solution as explained further below. Hence, the request for a further extension to the compliance timeframes.

## 6.2 Due Diligence obligations

As is the case with all Sasol operations and for all types of capital projects, SSO uses a project development and governance framework to manage an extensive portfolio of capital projects, which is a "stage-gate" model. The model provides a framework to carefully guide projects towards successful implementation. This requires detailed investigations and design considerations to address complexities in installing equipment into an integrated and operational brownfields facility. The model prescribes rigorous project development quality standards and business requirements to be met at each successive stage of project development, before a project is approved to proceed to the next development stage. Good project governance requires that all projects need to be properly motivated, evaluated and approved in a systematic and consistent manner.

**Table 6-1: Overview of Sasol's stage-gate project governance model**

| Project Phase | Purpose |
|---|---|
| Idea Generation | Formulate a project's "opportunity statement", to crisply explain the driver for the project. In so doing, articulate the nature and scope of a project. |
| Prefeasibility | Identification of possible operational improvements and technology options to address the opportunity statement, and initial assessment of each option's applicability/feasibility, to narrow down a sub-set of prioritised solutions. Depending on the project, this phase could require extensive piloting to ensure identified options are operationally feasible. |
| Feasibility | Identify the most feasible technology option following appropriately detailed technical, business and operations investigations; evaluate potential technology providers; obtain necessary authorisations and approvals from authorities for the preferred solution. |
| Engineering | Detail design of the identified technology including design of the interfaces with the rest of the existing facility, including upstream and downstream process impacts; detailed resource planning including sourcing equipment and other project resources. |
| Final investment decision | Governance step for the final authorisation on the selected business, technical and project execution option. The decision sanctions all the necessary resources for project implementation. |
| Construction | Execution of the project; construction of the required technology; physical integration of the new technology with existing equipment and systems. The construction phase for new equipment within an operational facility is coordinated within plant maintenance schedules, to mitigate against production impacts. |
| Commissioning | Commissioning of the installed equipment and ensuring the technology operates in accordance with the equipment's design basis; modifications to equipment or plant operating philosophy if required to reach equipment's design basis. |

The duration of the various development phases (the "stages") is determined by the complexity of the project. The governance processes (the "gates") serve as a crucial quality control to ensure that effective projects are ultimately successfully implemented and integrated into the facility's business model.

Sasol thoroughly investigated the technology options available for compliance to ensure that the most suitable technology is selected for implementation. SSO will however require more time to take these options through the various stages to implementation.

Given the requirements of the "stage-gate" model SSO will not be able to implement the compliance interventions in a safe and complete manner, in less than 5 years. Technical solutions for the Phenosolvan and incinerators are in Prefeasibility phase of investigation, and once a decision is taken considering the feasibility of all options in the third quarter of 2019, the Engineering phase on the

selected compliance technology option, in accordance with a project schedule aligned with that technology choice, will commence.

## 6.3 Modifying a brownfields operation

Modifying an existing brownfields operation is in some instances considerably more challenging than building a new greenfields plant. In the case of a greenfields plant the entire plant can be designed in a manner that caters for all requirements and the plant can be conceptualised and 'packaged' in a specific way. In the case of a brownfields operation that benefit does not exist, and every modification or retrofit has to be developed around the existing plant. In the case of the plant location where the saturation columns of Phenosolvan are situated, limited space will require extensive planning to get an abatement technology to fit in the available space. The lack of space is challenging enough in its own right, but it also creates further access problems for construction teams. Not only is access a problem for workers but also the required equipment needed to install retrofits is even more challenging.

On-going maintenance requirements of an operational plant mean that there will be competition for both access to the plant and working space. Construction crews would have to be very carefully scheduled and coordinated so that the construction process does not limit the ability of teams to complete their maintenance obligations. This is not to say that such coordination is not possible, but simply that the timeframes for implementation are, in practice, considerably longer. A brownfields site also presents multiple occupational health and safety hazards that do not exist on a greenfields site. These hazards relate principally to having energised systems, in terms of electricity, gas, steam and other utilities, as well as pipelines transporting flammable or explosive products around the site.

Retrofits to existing equipment in a brownfields area creates risks of disrupting upstream production, since the plant cannot operate without incinerators and Phenosolvan saturation columns capacity online, for management of continuous process stream. Therefore, required modifications and tie-ins will have to be done during planned statutory maintenance cycles of the equipment, which will require additional time to implement.

# 7 The Atmospheric Impact Report

## 7.1 Overview

The AIR is a regulatory requirement which is required to be compiled and submitted as part of an application for postponement. The purpose of the AIR is to provide an assessment of the implications for ambient air quality and associated potential impacts. The impact on climate change has not been considered as current greenhouse emissions will not increase or decrease as a result of this application. The AIR specifically focusses on compliance with the MES, and is fit for purpose. The AIR was prepared by Airshed Planning Professionals, an independent consultant, in accordance with the Atmospheric Impact Report Regulations and was independently peer reviewed by the firm Exponent Inc. The full AIR is included in Annexure A, with key elements of the report and the findings being summarised in this section of the motivation report. The AIR conducted as part of the 2014 Postponement Application includes further information on sources not addressed by this postponement application, given its fit for purpose scope, and is available from the SRK website at: http://www.srk.co.za/files/File/South-Africa/publicDocuments/Sasol_Postponement/SOGS_/ANNEXURE_A_SYNFUELS_Atmospheric_Impact_Report.pdf.

## 7.2 Study approach and method

### 7.2.1 Dispersion modelling

Dispersion modelling is a key tool in assessing the ambient air quality implications of atmospheric emissions. A dispersion model serves to simulate the way in which emissions will be transported, diffused and dispersed by the atmosphere and ultimately how they will manifest as 'ground-level' or 'ambient' concentrations. For the purposes of this assessment, the Regulations Regarding Air Dispersion Modelling determined the dispersion model selection. The CALPUFF model was selected because it can simulate pollution dispersion in low wind (still) conditions, which occur frequently in the area where SSO operates and because CALPUFF is able to perform chemical transformations.

### 7.2.2 Ambient air quality monitoring stations

As opposed to predicted ambient concentrations using a dispersion model, ambient air quality monitoring serves to provide direct physical measurements of selected key pollutants. SSO operates three accredited ambient air quality monitoring stations in and around Secunda, namely at Secunda Club, eMbalenhle and Bosjesspruit. These stations are specifically sited to monitor Sasol's impacts on ambient air quality. The monitoring stations are accredited (ISO/IEC17025) to ensure data quality and availability, with 90% data availability for the three years. Meteorological data for calendar years 2013 to 2015 from all three stations was included in the AIR investigation.

### 7.2.3 Emissions scenarios

In order to assess the impact of the emissions associated with the postponements for which SSO is applying, four emissions scenarios were modelled:

1. **Current baseline emissions**, reflective of the impacts of present operations, which are modelled as *averages* of measurements taken from periodic emission monitoring. This scenario is represented by the first column in the presentation of all AIR graphs (shown in blue in Figure 7-1). The reason baseline emissions were modelled as averages of measured point source emissions was to obtain a picture of long-term average impacts of SSO's emissions on ambient air concentrations, which could be reasonably compared with monitored ambient concentrations, as a means of assessing the representativeness of the dispersion model's predictions. Modelling

baseline emissions at a ceiling level, which is seldom reflective of actual emissions, would over-predict ambient impacts, and therefore not allow for reasonable assessment of the model's representativeness.

2. **Compliance with the 2015 existing plant standards**. This is modelled as a ceiling emissions limit (i.e. maximum emission concentration) aligned with the prescribed standard, and reflects a scenario where abatement equipment is introduced to theoretically reduce emissions to conform to the standards. This scenario is represented by the second column in the presentation of all AIR graphs (shown in red in Figure 7-1).
3. **Compliance with the 2020 new plant standards.** This is modelled as a ceiling emissions limit (i.e. maximum emission concentration) aligned with the prescribed standard, and reflects a scenario where abatement equipment is introduced to theoretically reduce emissions to conform to the standards. This scenario is represented by the third column in the presentation of all AIR graphs (shown in green in Figure 7-1).
4. **A worst-case scenario of operating constantly at the requested alternative emissions limits**, which have been specified as ceiling emissions limits (i.e. maximum emission concentrations) under normal operating conditions, to align with the manner in which the MES are specified. This scenario is represented by the fourth column in the presentation of all AIR graphs (shown in purple in Figure 7-1). It is re-emphasised that by asking for an alternative emissions limit specified as a ceiling limit, SSO will not physically increase its current baseline emissions (expressed as an average of measurements taken from periodic emission monitoring).

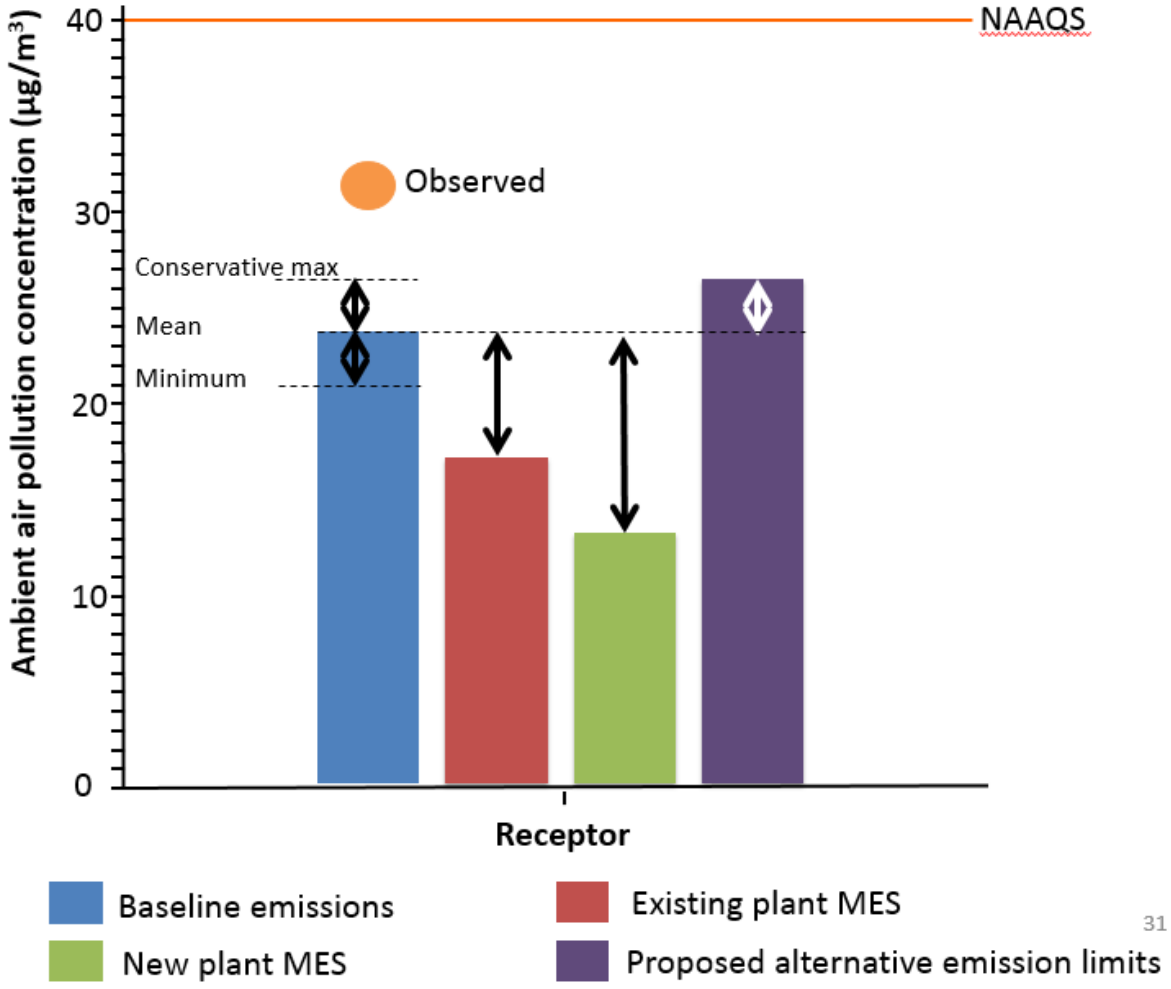


**Figure 7-1: Schematic displaying how the dispersion modelling scenarios are presented, for each monitoring station receptor in the modelling domain**

### 7.2.4 National Ambient Air Quality Standards

Once ambient concentrations have been predicted using the dispersion model, the predicted or measured concentrations are typically compared to defined standards or other thresholds to assess the health and/or environmental risk implications of the predicted or measured air quality. In South Africa, NAAQS have been set for criteria pollutants at limits deemed to uphold a permissible or tolerated level of health risk and the assessment has accordingly been based on a comparison between the predicted concentrations and the NAAQS. Where no NAAQS exists for a relevant non-criteria pollutant, health screening effect levels based on international guidelines are used. The measured concentrations have been used to ascertain the representativeness of the modelling and to assess the extent to which the NAAQS are met as a function of all sources of emissions.

### 7.2.5 Sensitive receptors

Prior to dispersion modelling, 53 receptors were identified in the vicinity of SSO (within the 50-by-50 km modelling domain). Sensitive receptors included residential areas, schools, hospitals and clinics, monitoring stations (Figure 7-2 and Table 7-1). Ambient air quality monitoring stations (AQMS) were the first receptors identified because comparison of the predicted concentrations could be compared with measured concentrations for model validation. Schools, hospitals and clinics within the domain were identified and included as sensitive receptors in the dispersion model. All receptors are presented in the isopleth plots, where the AQMS are included in results figures and 20 closest receptors are included in the results tables at increasing distance from the centre of SSO.

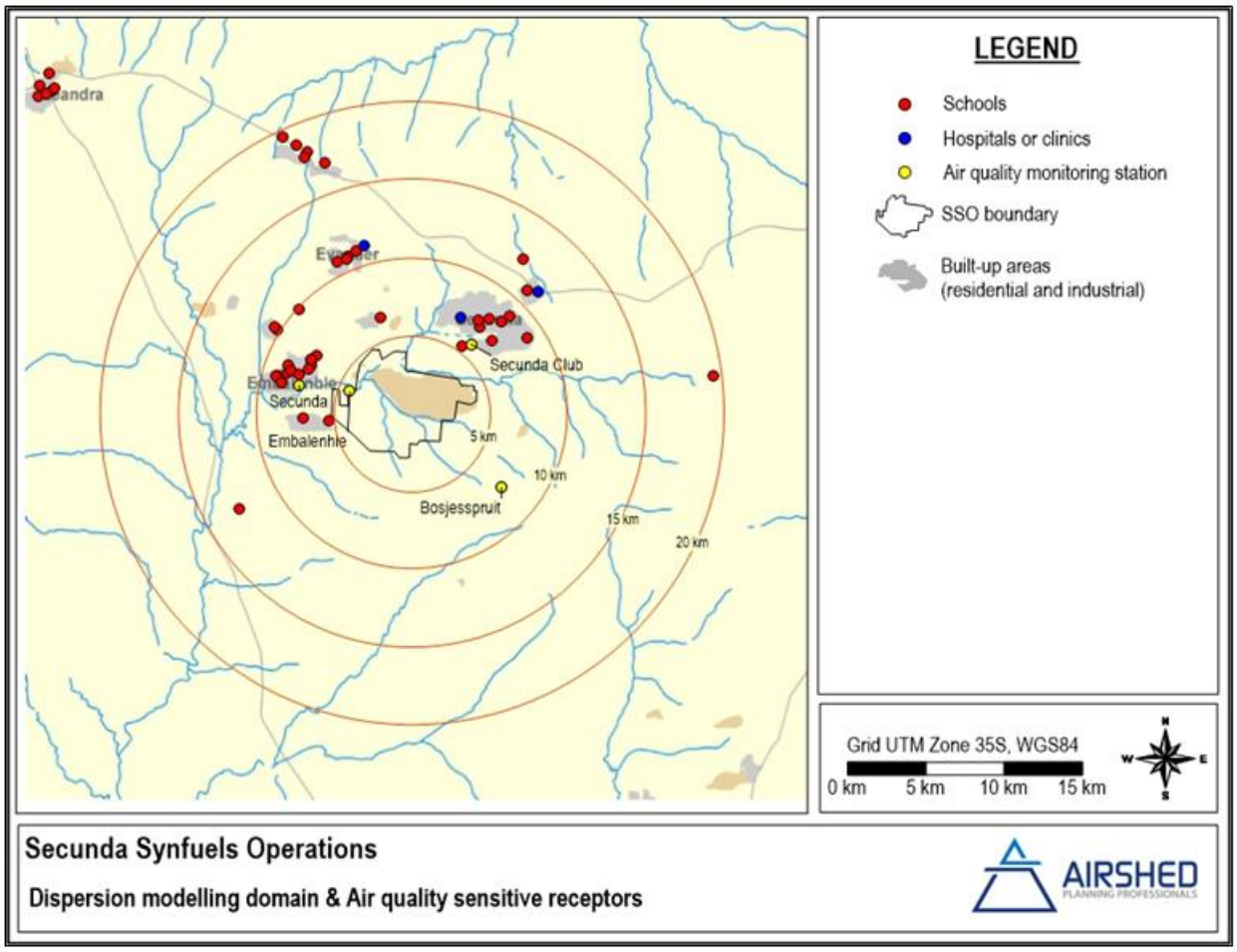


**Figure 7-2: Map showing the positions of the 53 sensitive receptors identified for presenting the predicted ambient air quality**

**Table 7-1: Summary listing of the sensitive receptors illustrated in Figure 7-2**

| Receptor code name | Receptor details | Distance from centre of operations (km) |
|---|---|---|
| Embalenhle | Sasol Embalenhle Monitoring Station (previously Langverwacht) | 3.3 |
| Secunda Club | Sasol Secunda Club Monitoring Station | 6.3 |
| Secunda | DEA Secunda Monitoring Station | 6.0 |
| Bosjesspruit | Sasol Bosjesspruit Monitoring Station | 8.3 |
| 42 | Roodebank Combined School | 4.5 |
| 60 | Zamokuthle Primary School | 5.8 |
| 46 | Osizweni Secondary School | 6.1 |
| 55 | Isibanisesizwe Primary School | 6.3 |
| 41 | Maphala-Gulube Primary School | 6.3 |
| 56 | Kiriyatswane Secondary School | 6.3 |
| 48 | Osizweni Primary School | 6.4 |
| 57 | Kusasalethu Secondary School | 6.5 |
| 58 | Laerskool Oranjegloed | 6.7 |
| 62 | Highveld Medi Clinic/Hydromed | 7.2 |
| 53 | Tholukwazi Primary School | 7.3 |
| 30 | TP Stratten Primary School | 7.3 |
| 59 | School | 7.5 |
| 33 | Laerskool Goedehoop | 7.5 |
| 38 | Laerskool Kruinpark | 7.5 |
| 52 | Lifalethu Primary School | 7.6 |
| 61 | Secunda Medi Clinic | 7.7 |
| 50 | Embalenhle Primary School | 7.8 |
| 51 | Buyani Primary School | 8.0 |
| 54 | Allan Makhunga Primary School | 8.1 |

### 7.2.6 Model performance

Although atmospheric models are indispensable in air quality assessment studies, their limitations should always be taken into account. As detailed in the AIR, dispersion modelling has inherent uncertainty. The accuracy of the model predicted ambient concentrations are vulnerable to three main sources of errors resulting from: incorrect input emissions data; inaccurate meteorological data and inadequate scientific formulation of the model. Model uncertainty is discussed in further detail in Section 5.1.6 of the AIR.

### 7.2.7 Compliance with AIR Regulations

As summarised in Section 5.1.3 of the AIR, the air quality assessment was compiled in accordance with the Regulations prescribing the format of the Atmospheric Impact Report of 2013 (as contemplated in Section 30 of the NEM:AQA), unless otherwise indicated.

### 7.2.8 Peer review of the dispersion modelling methodology and datasets

The dispersion modelling methodology and datasets were reviewed by E$^x$ponent Inc, which was identified as the appropriate peer reviewer in light of its extensive international experience in the

design, development and application of research and regulatory air quality models. Airshed's Plan of Study, the peer reviewer's report and Airshed's comments on each of the findings are included as Annexure B.

## 7.3 Dispersion Modelling Results

### 7.3.1 Sulfur Dioxide ($SO_2$)

The $SO_2$ sources as listed in the Secunda AELs are included in the AIR. Simulated $SO_2$ concentrations for SSO's emissions are below the NAAQS for all four scenarios for all three averaging periods. Changes in ambient $SO_2$ concentrations between the four scenarios are minor, demonstrating that compliance with the MES has little effect on the ambient $SO_2$ concentrations. This is due to the relatively small contribution of the thermal oxidation units to the overall $SO_2$ emissions from the SSO facility.

Simulated hourly $SO_2$ concentrations for the four scenarios are illustrated in Figure 7-3. Simulated daily and annual concentrations are illustrated in Section 5.1.8 of the AIR together with isopleth plots and tabulated results of the modelling.

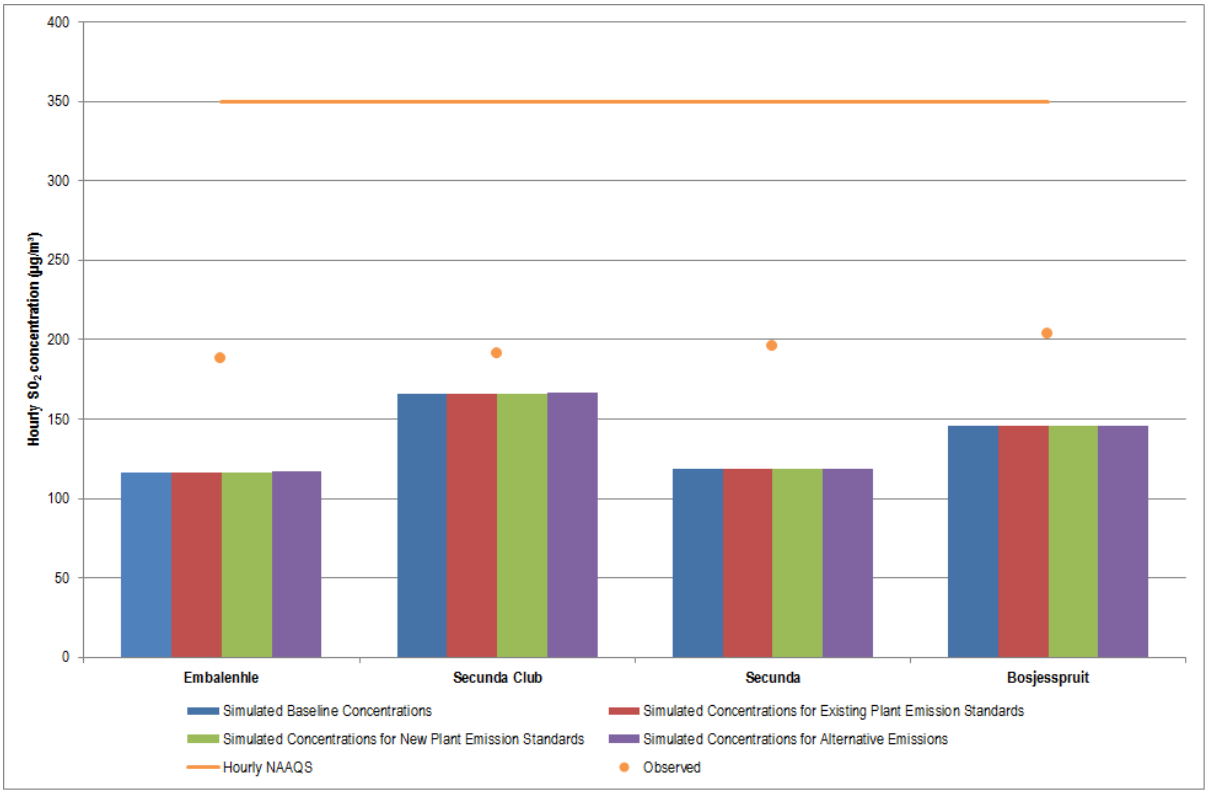


**Figure 7-3: Simulated and observed $SO_2$ concentrations**

### 7.3.2 Nitrogen Dioxide ($NO_2$)

The $NO_x$ sources as listed in the Secunda AELs are included in the AIR. Simulated $NO_2$ concentrations for SSO's emissions are below the NAAQS for all four scenarios for both averaging periods. Theoretical compliance with the existing and new plant emission standards would result in a reduction in ground-level concentrations while the alternative emission scenario would result in slight increases in hourly and annual $NO_2$ concentrations.

Simulated hourly $NO_2$ concentrations for the four scenarios are illustrated in Figure 7-4. Simulated annual concentrations are illustrated in Section 5.1.8 of the AIR together with isopleth plot's and tabulated results of the modelling.

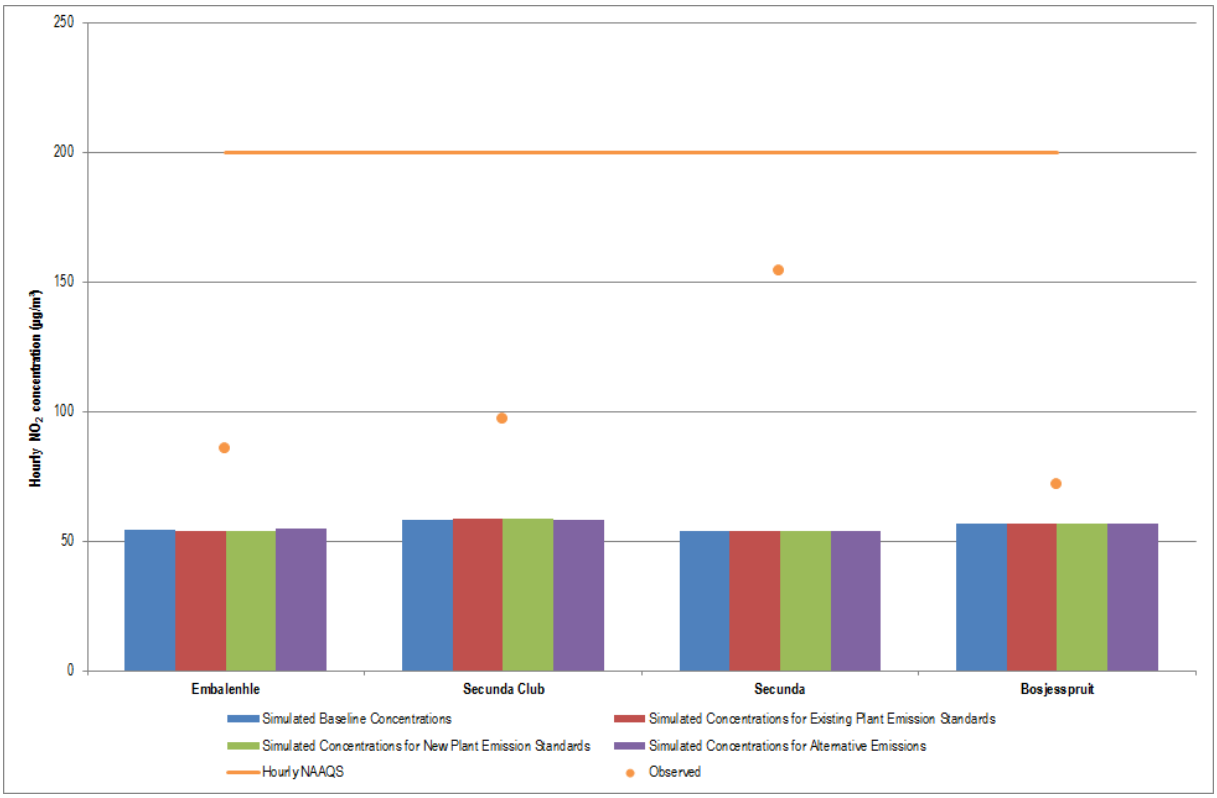


**Figure 7-4: Simulated and observed hourly $NO_2$ concentrations**

### 7.3.3 Particulate Matter ($PM_{2.5}$ and $PM_{10}$)

The PM sources as listed in the Secunda AELs are included in the AIR.

NAAQS are available for both $PM_{10}$ and $PM_{2.5}$. Ambient air quality impacts therefore need to be considered for both particulate fractions. Simulated concentrations of particulate matter (PM) were conservatively assumed to be $PM_{2.5}$ since it was not possible to establish the $PM_{2.5}$/$PM_{10}$ split.

While the observed PM concentrations for both averaging periods are above the NAAQS, the simulated concentrations for SSO's emissions are well below the NAAQS. This illustrates the impact of other sources of PM on ambient concentrations.

Theoretical compliance by SSO with the existing and new plant emission standards would result in a negligible reduction in ground-level concentrations, insufficient to meet the NAAQS, while the alternative emission scenario would result in negligible increases in daily and annual PM concentrations. Simulated daily PM concentrations for the four scenarios are illustrated in Figure 7-4. Simulated annual concentrations are illustrated in Section 5.1.8 of the AIR together with isopleth plots and tabulated results of the modelling.

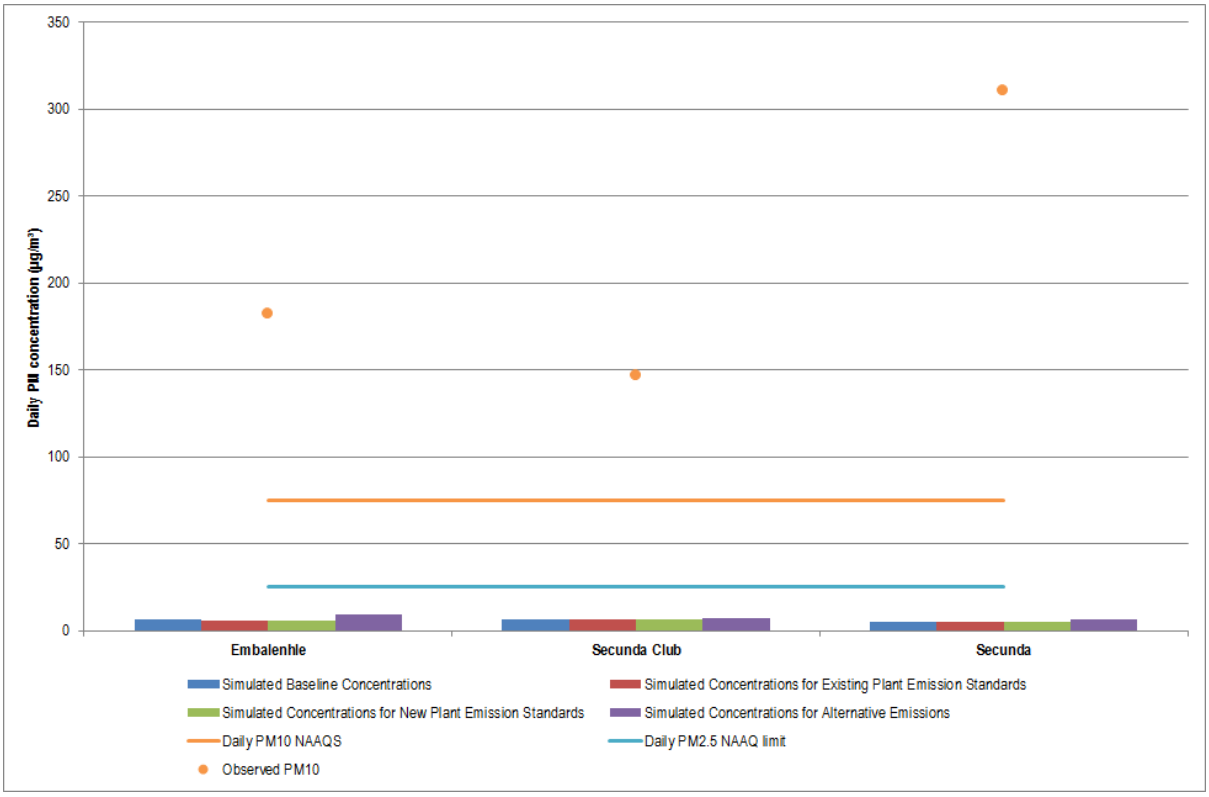


**Figure 7-5: Simulated and observed daily PM concentrations**

### 7.3.4 Carbon Monoxide (CO)

Only sources of CO included in the AEL were simulated, namely the incinerators. Simulated hourly CO concentrations are meeting NAAQS. Theoretical compliance with the existing and new plant emission standards results in a reduction in ground-level concentrations while the alternative emission scenario results in substantial increases in hourly CO concentrations. This is because there are a small number of CO sources with highly variable emission rates.

Simulated hourly CO concentrations are illustrated in Figure 7-4. Isopleth plots and tabulated results of the modelling are also provided in Section 5.1.8 of the AIR.

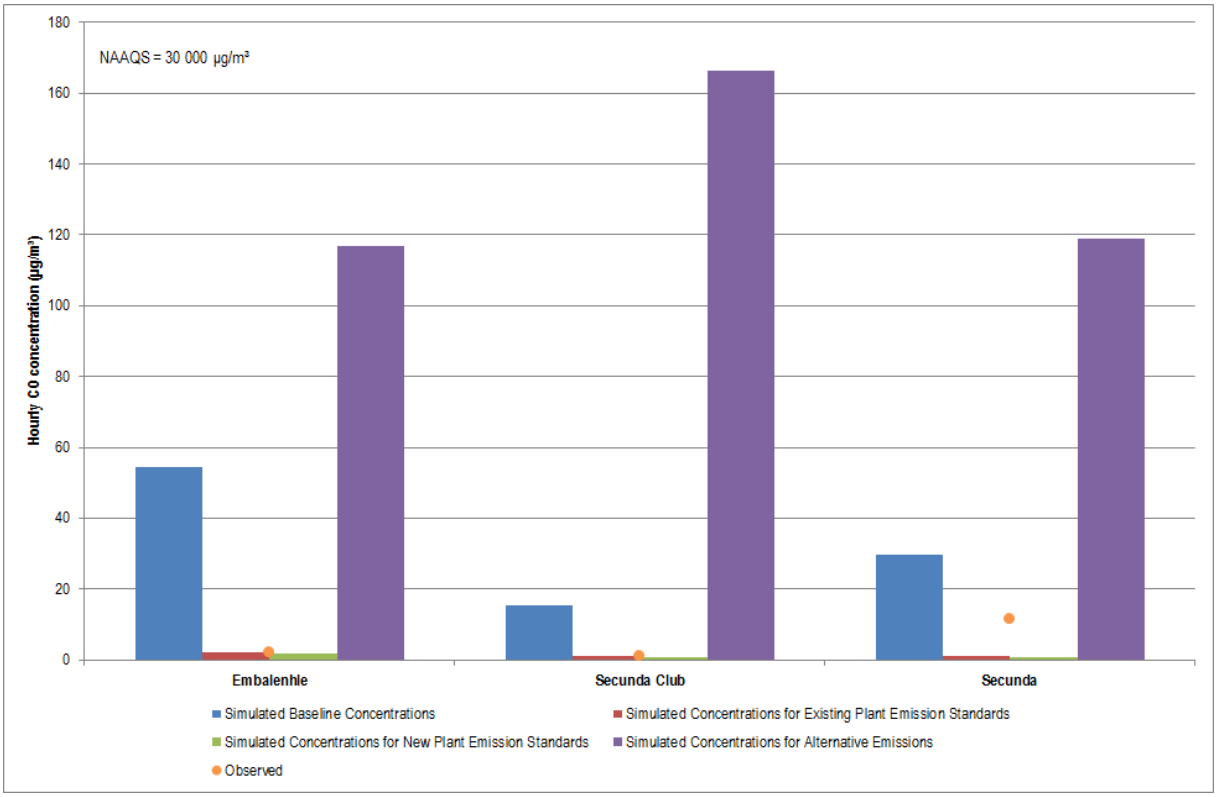


**Figure 7-6: Simulated and observed hourly CO concentrations (without NAAQS)**

The modelled CO concentrations are less than 0.6% of the NAAQS. Figure 7-6 therefore does not include the NAAQS on the scale. Figure 7-7 illustrates how far below the NAAQS the modelled ambient concentration is.

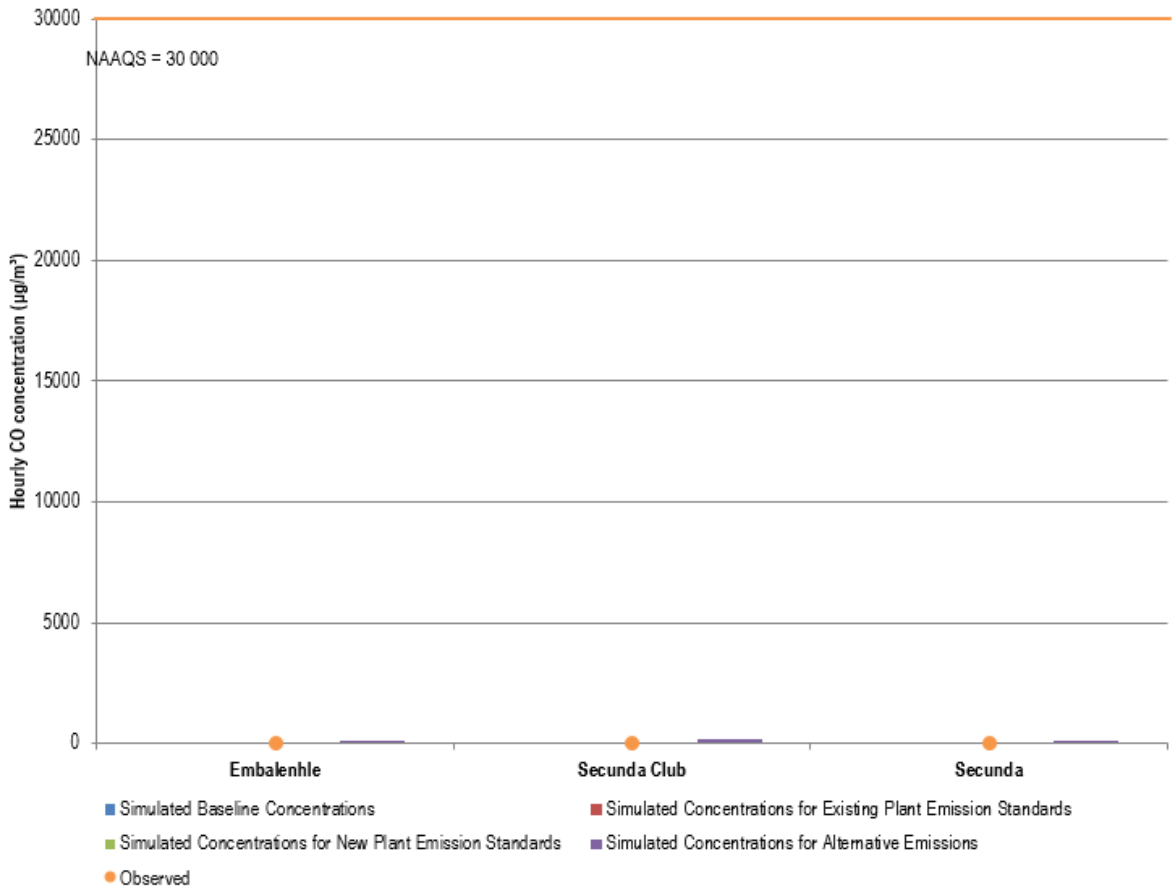


**Figure 7-7: Simulated and observed hourly CO concentrations (with NAAQS)**

### 7.3.5 Non-Criteria Pollutants

In South Africa, NAAQS have been set for criteria pollutants. A number of the emissions from the incinerators however are not criteria pollutants. NAAQS have therefore not been set for these emissions. In these instances, health-effect screening levels were identified by Airshed from literature reviews and internationally recognised databases. The health-effect screening levels identified through literature reviews and internationally recognised databases are included in Table 7-2 of the AIR.

#### Metal elements

A screening exercise of metal elements non-criteria pollutants emitted from the incinerators at SSO was undertaken. As, Cr, Co, Mn, Ni, and V were noted as pollutants that would require further analysis based on the initial screening. The emission rate of each metal element, rather than the sum of metals, was subsequently modelled. Based on the strictest health effect screening level it was found that no simulated predicted ground-level concentrations for the alternative emission scenario were predicted to exceed the evaluation criterion outside the SSO boundary.

#### VOCs

Total VOC emissions from four source groups (Rectisol, tar value chain storage tanks, Phenosolvan saturation columns, and incinerators) at SSO were simulated for the four emission scenarios. Simulated annual VOC concentrations are below the (non-statutory) evaluation criterion of 200 µg/m³ identified in the Guidelines for Ventilation Requirements in Buildings by the European Collaborative Action Luxembourg: Commission of the European Communities for four scenarios.

Theoretical compliance with the existing and new plant emission standards results in a reduction in ground-level concentrations while the alternative emission scenario results in increases in benzene concentrations. Simulated annual benzene concentrations are illustrated in Figure 7-4. Isopleth plots and tabulated results of the modelling are also provided in Section 5.1.8 of the AIR.

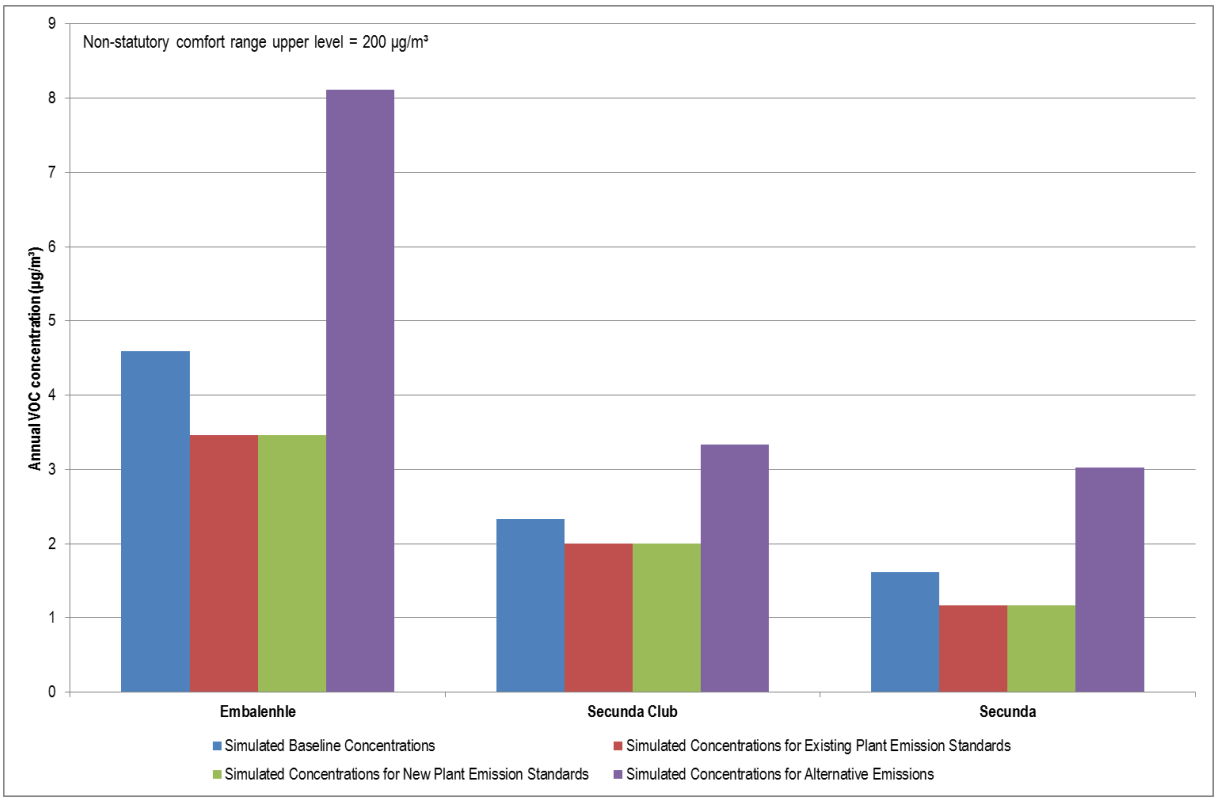


**Figure 7-8: Simulated annual VOC concentrations**

## Hydrogen Sulphide ($H_2S$)

No $H_2S$ point sources from the Secunda complex were excluded from the AIR.

Dispersion modelling included assessing the ambient impact of baseline $H_2S$ emissions from the SSO Sulfur Recovery Plant. Predicted daily $H_2S$ concentrations were compared against the World Health Organisation (WHO) 24-hour health-based guideline (150 µg/m$^3$) for Sulfur Recovery Plant Emissions. No exceedances of the guideline were predicted.

After consultation with Dr WCA van Niekerk (Infotox[2]), the simulated 4-hourly ambient $H_2S$ concentrations were also compared against the more conservative 135 µg/m$^3$ health effect screening level (4-hour average), from Haahtele et al. (1992). Exceedance of this health effect screening level is not anticipated to occur at off-site receptors as illustrated in Figure 7-9.

[2] Report to SASOL Document number 032-2013 Rev 1.0: Toxicological review for Hydrogen Sulphide Available at http://www.srk.co.za/files/File/South-Africa/publicDocuments/Sasol_Postponement/SOGS_/DrafAdd/ANNEXURE_C_SYNFUELS_AP_Toxicological_Review_Hydrogen_Sulphide.pdf)

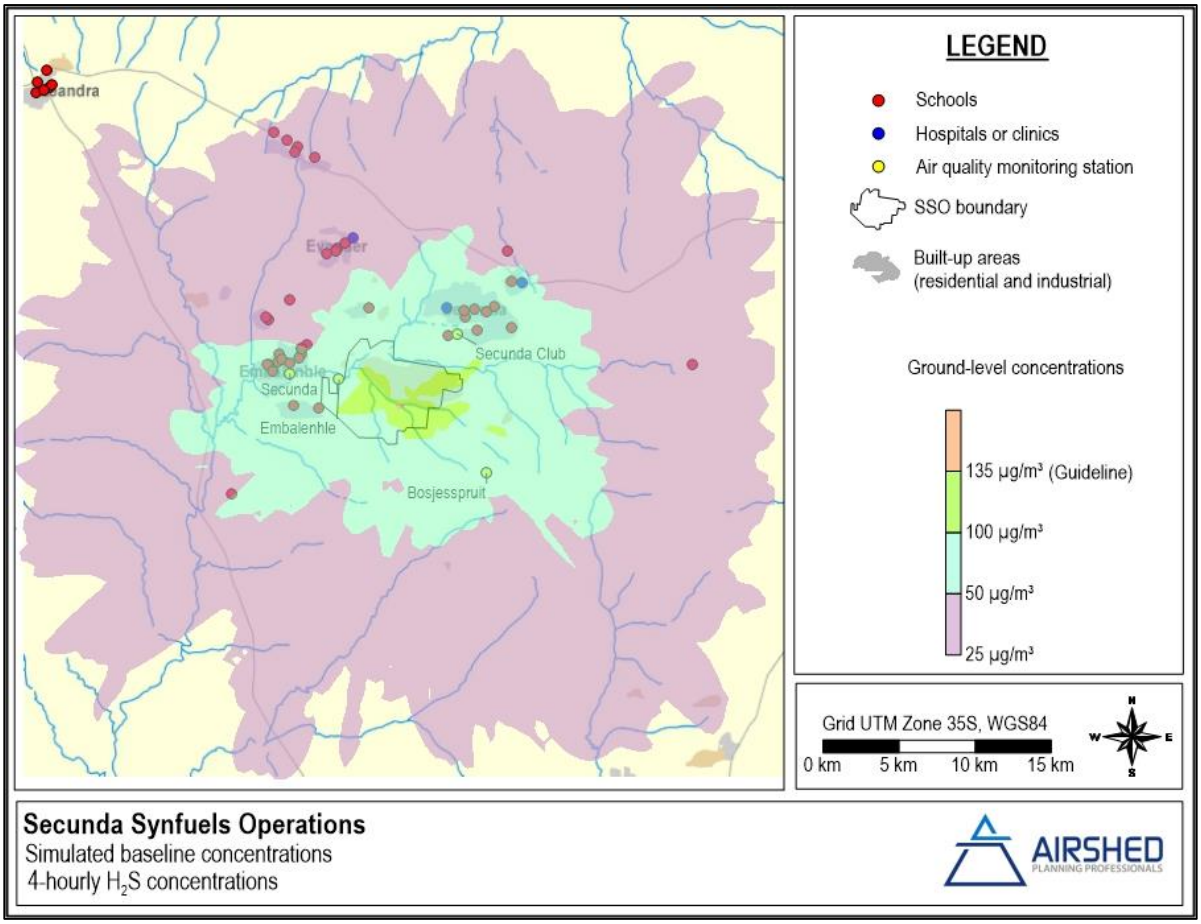


**Figure 7-9: Simulated 4-hourly $H_2S$ concentrations as a result of baseline emissions from the Sulfur Recovery Plant**

## 7.4 Overall findings of the AIR

### 7.4.1 Meeting the NAAQS

The purpose of the MES aims to achieve the intent of the NEM:AQA which means ensuring that ambient air quality is achieved that does not pose a threat to the health or well-being of people and the environment. To all intents and purposes that means ambient air quality that meets the NAAQS. Thus in considering the request for postponements, the resultant implication for ambient air quality should be considered as well.

For all criteria pollutants, barring PM, both the simulated and observed ambient concentrations are below the NAAQS. For PM, while the observed ambient concentrations are above the NAAQS, the simulated ambient concentrations of PM emanating from SSO's sources are well below the NAAQS demonstrating the contribution to ambient concentrations to emanate from other sources. To address these other sources SSO is in the process of executing an Offset Implementation Plan that aims to achieve a reduction in PM emissions from some of the other sources.

### 7.4.2 The effect of the alternative emissions limits

The alternative emissions limits proposed by SSO to be complied with during the extended compliance period are in some instances significantly higher than the MES, i.e. as reported on a concentration basis. It is reiterated that the administrative basis of the MES is to comply under all operational circumstances, with emissions exceeding the MES only being tolerated for a limited period for shut down, start up and upset conditions. That administrative requirement means that SSO must request ceiling emissions limits (i.e. maximum emission concentrations) rather than average emissions limits to ensure that it can comply under all operating conditions given the known variability of emissions under normal operational circumstances.

The predicted ambient concentrations for the alternative emissions limits are a worst-case depiction because they have been modelled as if the emission will be maintained at those levels continually, which they will not. Yet even under the worst-case emissions scenario meeting the NAAQS is predicted in all circumstances for SSO's emissions.

The key finding is that compliance with the MES will in most (but not all) circumstances reduce ambient concentrations, but provided that the NAAQS are met in the applicable area. In the case of PM, compliance by SSO with the MES will not result in the NAAQS being met in the airshed, hence reliance is placed on the implementation of an Offset Plan as per the conditions of the 2014 Postponement application.

### 7.4.3 Health effects

The AIR Regulations prescribe an assessment of the health effects of the emissions for which temporary relief is sought from the MES through a request for extended compliance periods based on the degree to which the NAAQS are met in the airshed. The World Health Organisation indicates that there is no safe limit in respect of exposure to PM. However, the NAAQS are premised on a permissible or tolerable level of health risk. The overall findings of the AIR are that the alternative emissions limits requested by SSO in the interim will not result in an increase in ambient pollutant concentrations beyond the permissible health risk thresholds of the NAAQS.

### 7.4.4 Ecological effects

The impact of emissions on the environment is assessed in terms of Section 5.2 of the AIR. The analysis covers impacts to vegetation, of dustfall, potential corrosion, impacts associated with sulfur and nitrogen deposition and the environmental impact of benzene emissions. Formal benchmarks for

assessment of ecological effects have not been set and therefore screening levels were identified by Airshed through literature review.

The simulated off-site annual concentrations of $SO_2$ and $NO_x$ for all emission scenarios are not likely to exceed the levels for even the most sensitive vegetation types. Estimated dustfall rates for the four simulation scenarios were less than 22 mg/m$^2$.day which is substantially below the target dustfall rate of 300 mg/m$^2$.day recommended in SANS 1929:2005. Corrosion rates were calculated using the ISOCORRAG method and are listed in Table 5-43 of the AIR. It is noted that corrosion rates for the baseline and alternative emissions scenario are generally higher than corrosion rates for the MES compliance scenarios.

Estimates of S and N deposition rates for the Highveld are comparable with some of the industrialised regions of Europe and North America raising concern that the acidic loading of sulfur and nitrogen on the ecosystems of the Highveld could have implications for ecosystem functioning. While investigating the impact of S and N deposition rates as a result of SSO was beyond the scope of the AIR, some research findings suggest that grassland ecosystems of the Highveld are not yet affected by S and N deposition but that some areas may be approaching critical loads. More details regarding these investigations are provided in Section 5.2.4 of the AIR.

Benzene (together with other VOCs) is a precursor pollutant involved in the formation of secondary atmospheric pollutants, such as smog (generally) and ozone (specifically). Ozone is a strong oxidant known to reduce crop plant yield, especially above a threshold of 40 ppb. An attempt to study ozone concentrations in a local area would require a comprehensive emissions inventory of $NO_x$ and VOC sources beyond those emanating from Sasol and which is outside the scope of the AIR. Recent assessments of ozone concentrations on the Highveld, to which the SSO benzene emissions would contribute, however, note that ambient monthly ozone concentrations across the Highveld measured between September 2005 and August 2007 rarely exceeded 20 ppb. More details regarding these investigations are provided in Section 5.2.5 of the AIR.

# 8 Postponement request

## 8.1 Phenosolvan Plant

SSO applies for a further five-year postponement (1 April 2018 to 1 April 2023) for the TVOC emission limits under Category 3.6 for the Phenosolvan plant, as indicated in Table 8-1. As the postponement period of five years requested extends beyond 1 April 2020, the date when the new plant standards take effect, this application consequently simultaneously includes a request for postponement of both the compliance timeframes for existing plant standards for the period 1 April 2018 to 31 March 2020 and the new plant standards for the period 1 April 2020 to 1 April 2023 in order to align with the five year postponement being requested.

The postponement is required to conduct the necessary investigations to confirm viability of the identified options. As indicated, the previously identified preferred option to comply was proven unsuccessful, and therefore additional time is now required to research and develop newly identified options where after the preferred and feasible solution will be implemented.

During the extended compliance period, SSO proposes the following maximum emission concentrations as alternative emissions limits to be complied with in the interim, as set out in Table 8-1. The alternative emissions limits are informed by actual emissions measured.

**Table 8-1: Alternative emissions limits and alternative special arrangement request for SSO Phenosolvan Saturation Columns**

| Emission component | MES for existing plants | MES for new plants | Alternative Emissions Limit Requested | Averaging period for compliance monitoring |
|---|---|---|---|---|
| | All values specified at 273 K and 101.3 kPa, mg/Nm3 | | | |
| VOCs | 250 | 130 | 58000<br>In the interim, the VOC emissions from the Phenosolvan plant will be managed as part of the quarterly emissions monitoring | Daily average |

While VOC emissions measured from the Phenosolvan saturation columns are high in concentration, the streams are low in volume as measured during the sampling campaign which generally implies a limited pollution footprint and associated ambient footprint.

## 8.2 Incinerators

SSO applies for a further five-year postponement (1 April 2018 to 1 April 2023) for the HOW and Biosludge Incinerators under Category 8.1, as indicated in Table 8-2. As the extended compliance period of five years requested extends beyond 1 April 2020, the date when the new plant standards take effect, this application consequently simultaneously includes a request for postponement of both the compliance timeframes for existing plant standards for the period 1 April 2018 to 31 March 2020 and the new plant standards for the period 1 April 2020 to 1 April 2023 in order to align with the five year postponement being requested.

This postponement provides for the conclusion of the feasibility studies, in order to select the optimal compliance solution, and thereafter, pending the outcome of that decision, to allow for the approval and commencement of the safe execution of the associated projects, which, if proved feasible, will eventually bring about simultaneous compliance with the existing and new plant standards. This total project timeline will extend beyond the five year extension requested in this postponement application.

Based on the current project schedule, the outcome of the feasibility study to assess the viability of this option as a viable compliance solution, will be made by the third quarter of 2019, where after, if assessed as viable, this option will advance through the remainder of Sasol's capital project governance and implementation model, as detailed in Section 6.2.

In place of the MES, SSO proposes the following maximum emission concentrations as alternative emissions limits and alternative special arrangements to be incorporated in its Atmospheric Emissions Licence for the duration of the postponement, as set out in Table 8-2. The alternative emissions limits are informed by actual emissions measured and the alternative special arrangement by actual flue gas temperature measured, as was required by the postponement decision on the 2014 Postponement Application and as per the AEL requirement.

**Table 8-2: Alternative emissions limits and alternative special arrangement request for SSO incinerators**

| Emission component | MES for existing plants | MES for new plants | HOW Incinerators | | Biosludge Incinerators | | Averaging period for compliance monitoring |
|---|---|---|---|---|---|---|---|
| | | | Limit granted in decision on 2014 Postponement Application | Alternative Emissions Limit Requested | Limit granted in decision on 2014 Postponement Application | Alternative Emissions Limit Requested | |
| | All values specified at 10% $O_2$, 273 K and 101.3 kPa, mg/Nm$^3$ unless otherwise specified | | | | | | |
| PM | 25 | 10 | 400[b] | 1354 | 300 [b] | 600 | Daily average |
| $SO_2$ | 50 | 50 | 50 [b] | 546 | 70 [b] | 205 | Daily average |
| CO | 75 | 50 | 75 [b] | 1400 | 3000 [b] | 4422 | Daily average |
| $NO_x$ | 200 | 200 | 1600 [b] | 3800 | 500 [b] | 714 | Daily average |
| Pb+As+Sb+ Cr+ Co+Cu+Mn +Ni+V | 0.5 | 0.5 | 21 [b] | 21 | 1 [b] | 2.6 | Daily average |
| Cd+Tl | 0.05 | 0.05 | 0.12 [b] | 0.12 | 0.12 [b] | 0.12 | Daily average |
| Hg | 0.05 | 0.05 | 0.27 [b] | 0.27 | 0.5 [b] | 0.95 | Daily average |
| $NH_3$ | 10 | 10 | 10 [b] | 12 | 30 [b] | 52 | Daily average |
| HF | 1 | 1 | 1 [b] | 10 | 20 [b] | 20 | Daily average |
| HCl | 10 | 10 | 10 [b] | 55 | 12 [b] | 29 | Daily average |
| TOC | 10 | 10 | 10 [c] | 38 | 10 [c] | 4216 | Daily average |
| Dioxin & Furan | 0.1 [ng I-TEQ/Nm$^3$, dry at 10% O2] | 0.1 [ng I-TEQ/Nm$^3$, dry at 10% O2] | 0.1 [b] | 4.2 [ng I-TEQ/Nm$^3$, dry at 10% O2] | 0.1 [b] | 0.31 [ng I-TEQ/Nm$^3$, dry at 10% O2] | Daily average |
| Flue gas exit temperature | Exit gas temperatures must be maintained below 200ºC | Operating at current flue gas exit temperatures between 300 and 400 °C | Operating at current flue gas exit temperatures between 300 and 400 °C | | | | |

[b] *In the decision on the 2014 Postponement Application the mean value was granted and subsequently a license condition added in the AEL "to determine actual emissions".*

[c] *In the decision on the 2014 Postponement Application the MES was granted and subsequently a license condition added in the AEL "to determine actual emissions"*

Furthermore, SSO applies for a five-year postponement (1 April 2018 to 1 April 2023) of the compliance timeframe for special arrangement 8(a)(vi) for its HOW incinerators, and requests that it be permitted to continue operating at current flue gas exit temperatures (between 300 and 400 °C).

# 9 Roadmap to Compliance for sources seeking postponement in 2017

Following the detailed sampling campaign and test runs under different operating scenarios conducted to date for the Phenosolvan Plant, the previous most promising technical solution to reduce the VOC emissions has proved unviable and unsuccessful. More time is therefore required to evaluate other potential technical solutions in Section 5. Similarly, following pre-feasibility studies conducted to date for the HOW and Biosludge Incinerators, and in particular, the new options identified through ongoing technology scans, SSO is now of the view, based on presently available information, that it may be able to feasibly comply with the new plant standards

This postponement provides for the conclusion of the feasibility studies, in order to select the optimal compliance solution, and thereafter, pending the outcome of that decision, to allow for the approval and commencement of the safe execution of the associated projects, which, if proved feasible, will eventually bring about simultaneous compliance with the existing and new plant standards. This total project timeline will extend beyond the five year extension requested in this postponement application.

Progress on advancing the project through the required governance processes will be reported to the DEA and to SSO's stakeholders in bi-annual community consultation sessions.

A summary of options under consideration are included in Table 9-1 below and more detail on the options in the Technical Appendix (Annexure E).

## Table 9-1: SSO Roadmap to compliance for Phenosolvan Plant and Incinerators

**Roadmap to sustainable air quality improvement for the Sasol Secunda complex**

| Air quality improvement actions related to 2018 postponement application | '05 | '06 | '07 | '08 | '09 | '10 | '11 | '12 | '13 | '14 | '15 | '16 | '17 | '18 | '19 | '20 | '21 | '22 | '23 | '24 | Pollutant of focus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Phenosolvan - MES sub-category 3.6*** | | | | | | | | | | | | | | | | | | | | | |
| Saturation column test run completed | | | | | | | | | | | | | | | | | | | | | VOCs |
| Design and implement alternative technology | | | | | | | | | | | | | | | | | | | | | VOCs |
| ***High Organic Waste incinerators - MES sub-category 8.1*** | | | | | | | | | | | | | | | | | | | | | |
| PM stabilisation intervention | | | | | | | | | | | | | | | | | | | | | PM10 |
| Investigate diversion of Solvents stream from incinerator | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| New incinerator option | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Installation of continuous monitoring equipment | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Retrofit / Refurbish option | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Integrated Waste Stream Solution | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Water & HOW separation within Phenosolvan *(2 week trial planned during first quarter of calendar year 2017)* | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| 3rd party inclusion into cement kilns *(separate injection point)* | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| HOW upgrade to product at U15/215 | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| ***Biosludge incinerators - MES sub-category 8.1*** | | | | | | | | | | | | | | | | | | | | | |
| Composting pilot trial | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Complete EIA for composting study. Further study has been stopped due to mass balance not closing. | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Installation of continuous monitoring equipment | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| New incinerator option | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Retrofit / Refurbish option | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Integrated Waste Stream Solution | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Anaerobic Digestion *(Info expected Feb 2017 to see if technology competes with Incineration)* | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| 3rd party bio digestion (landfill digestion). *(Trial underway)* | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |
| Composting - new initiatives | | | | | | | | | | | | | | | | | | | | | All regulated incinerator emissions |

**Legend**

- Compliance with MES (existing and new plant standards) will be achieved but further postponement will be required
- Action linked to air emission footprint improvement, but unlikely to reach limits specified by MES. Further postponements likely to be required
- Technology decision to be taken and beneficial operation date to be confirmed

# 10 Public Participation

## 10.1 Approach to Public Participation

In terms of the MES (Government Notice No. 893, 22 November 2013) a postponement application must include – "*a concluded public participation process undertaken as specified in the NEMA Environmental Impact Assessment Regulations.*"

As such the Public Participation Process (PPP), undertaken as part of Sasol's application for postponement of the compliance timeframes, was structured to meet the requirements of Chapter 6 of the EIA Regulations (Government Notice No. 733, 29 August 2014) published under the National Environmental Management Act (Act 107 of 1998) (NEMA), as specified in the MES.

A Public Participation Report, detailing the project Public Participation Process undertaken to date is attached in **Annexure C**.

The public participation process is an important component of the application process and is closely linked to the technical activities required for the preparation of the Motivation Report (Figure 10-1).

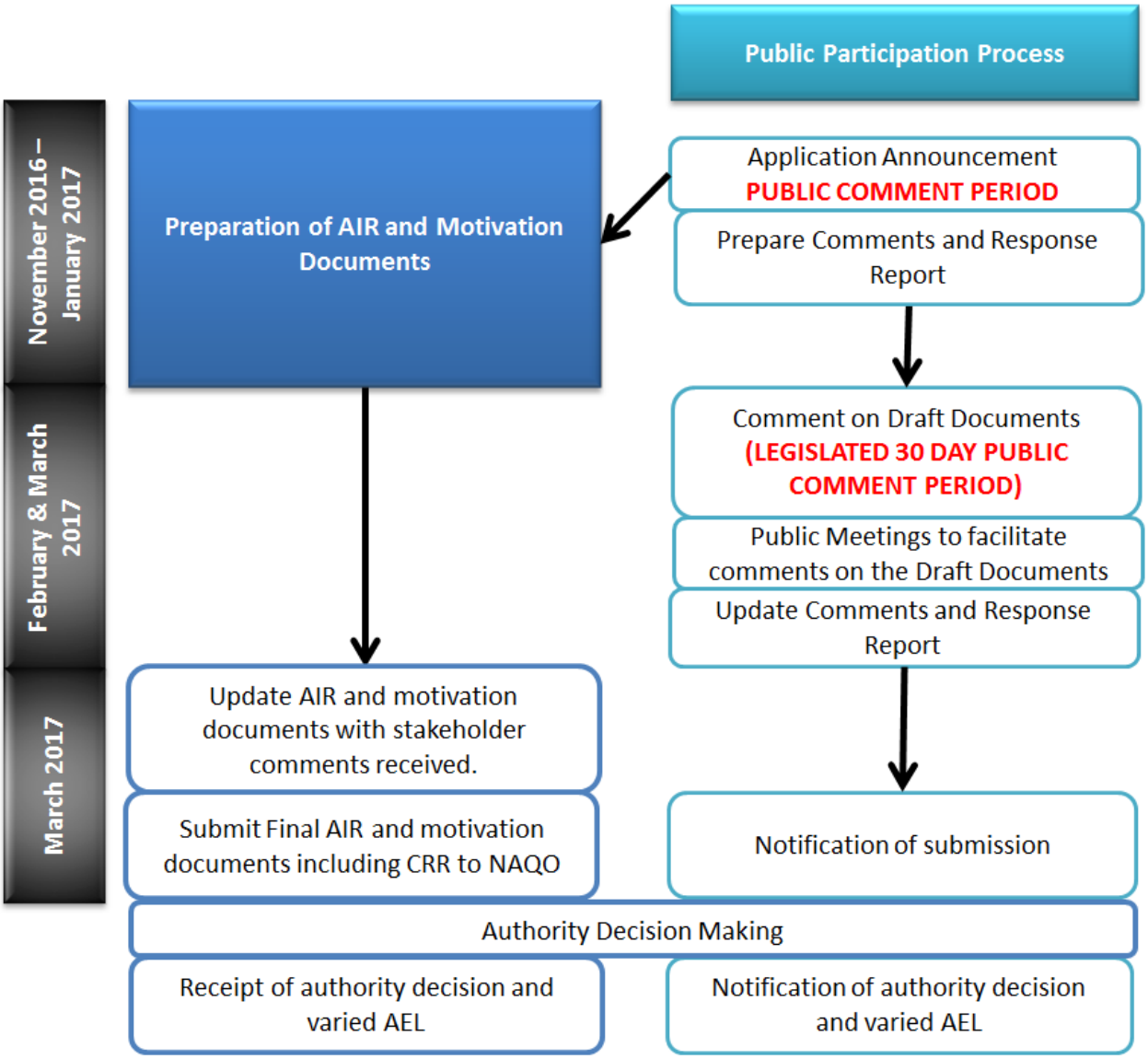


**Figure 10-1: Technical and Public Participation Process**

## 10.2 Announcement of application process

The postponement application announcement phase was conducted between **16 November 2016** and **09 December 2016**. I&APs received notification of Sasol's intention to apply for postponement, a Background Information Document (BID) and an invitation to register as an Interested and Affected Party (I&AP) in the process. I&APs were invited to participate in the process as follows:

- A letter of invitation was sent to all I&APs that have registered in previous postponement applications public participation process.
- Advertisements were placed in two local newspapers on **18 November 2016**.
- Site notices, BIDs and Comment Forms were placed, at the Secunda Public Library, Govan Mbeki Local Municipality Sasol Charlie 1 Entrance on **16 November 2016**.
- BIDs, invitation letters and comment forms were placed on SRK's website at http://www.srk.co.za/en/za-sasol2017postponement.
- Where email addresses for I&APs were not available, facsimile and SMS notification were made to I&APs to inform them of postponement application.

## 10.3 Public comment on Draft Motivation report and AIR

The Draft Motivation Report and AIR were made available for public comment for a period of 30 days from **Monday 6 February 2017** to **Wednesday 8 March 2017**.

Notification of the availability of the documents and an invitation to attend the public meetings to facilitate comment on the Draft Motivation Report and AIR was made as follows:

- Distribution by email, of notification letters, **6-8 February 2017**.
- Advertisements were placed in two local newspapers on the **10 February 2017**

Where email addresses for I&APs were not available, facsimile and SMS notifications were sent.

Electronic versions of the reports and comment sheets were made available on the SRK website, http://www.srk.co.za/en/za-sasol2017postponement. Electronic copies of the report where made available on request.

In addition, printed copies of the report and comment sheets are available at the following publicly accessible venue for I&APs to view and comment on.

**Table 10-1: Availability of printed copies of the Draft Motivation Report and AIR**

| Public Place | Locality | Contact | Telephone |
|---|---|---|---|
| Public Library | Laurens Muller Street, Secunda | Tersa Griesel | 017 620 6175 |
| Govan Mbeki Local Municipality | Horwood Street, Secunda | Reception | 017 620 6279 |
| Sasol Charlie 1 Main Entrance | Frans Du Toit Street, Secunda | Reception | 017 610 1111 |

I&AP's were able to comment and make suggestions on any aspect of the Draft Motivation Report or AIR as follows:

- Completing the registration and comment form and submitting it to the Public Participation Office at SRK.
- Written letters or additional written submission by post, email or fax.

Comments received were collated and responded to, where appropriate, in the Comments and Responses Report (CRR) (Annexure D). These comments and suggestions will be submitted together with final documents to the authority to inform the authorities' decision.

## 10.4 Public Meetings

Public meetings to facilitate comment on the Draft Motivation Report and AIR were held as follows:

**Table 10-2: Public Meeting Details**

| Date | Time | Venue |
|---|---|---|
| Thursday 23 February 2017 | 09h00 – 11h00 | The Sasol Secunda Recreation Club, Nelson Mandela Drive, Secunda |
| Thursday 23 February 2017 | 14h00 – 16h00 | The Sasol eMbalenhle Recreation Club, 2937 Ingwe Street, eMbalenhle Ext 8 |

The primary objectives of the public meetings were to:

- Foster robust engagements and build relationships with Sasol's host communities.
- Share information on Sasol, its activities and Air Quality impacts relating to the postponement application.
- Provide an opportunity for neighbouring communities to raise any issues regarding the postponement application process.
- Facilitate comments on the Motivation Report and AIR.

All comments raised at the public meetings are captured in the CRR (Annexure D).

## 10.5 Follow up with I&APs

Due to the level of attendance at the public meetings reminder emails where sent to all I&APs with email addresses. The letter guided I&APs to a copy of the public meeting presentation that was made available on the SRK website at http://www.srk.co.za/en/za-sasol2017postponement. SRK also undertook telephonic follow up with key I&APs to elicit comment.

## 10.6 Comments Received

SRK received requests for I&APs to be registered on the database as well as requests from some I&APs to be removed from the database Other than requests for registration and issues raised at the public meeting, the only comment received pertained to concerns raised around the timing for the implementation of compliance projects.

All comments received on the Draft Motivation Report or AIR either at public meetings or via post, email or fax, including responses thereto as appropriate, have been included in a CRR (Annexure D of the Motivation Report). The CRR will be submitted with the Motivation Report and AIR to the NAQO for consideration.

# 11 Conclusions and Way Forward

Sasol operates large complex industrial facilities in Sasolburg and Secunda both of which generate atmospheric emissions due to the nature of the activities. The publication in 2010 and the subsequent amendment in 2013 and 2015 of Minimum Emissions Standards (MES) has meant that Sasol is obliged to reduce many of its emissions to comply with the MES requirements.

The Sasol complex in Secunda is not a disparate grouping of various industrial processes and activities but is one integrated system. The MES apply to the SSO industrial process in a discrete way. Individual MES categories apply to different activities at SSO and require compliance for individual components of the process without recognising the complexity of the CTL process. The highly integrated nature of the industrial process both in terms of product and utility streams means that emissions abatement requires a thorough understanding of the up-stream and down-stream effects of the abatement option in question, evidenced, for example, in the results of the trial runs under different operating scenarios, for the Phenosolvan Plant.

Based on pre-feasibility studies conducted on the Incinerators, in particular, the new options identified through ongoing technology scans, SSO believes that it may feasible to comply with the new plant standards. More time is however required to confirm this position and progress towards implementation. Equally, following the detailed sampling campaign conducted to date for the Phenosolvan Plant, the previous most promising technical solution to reduce the VOC emissions was unsuccessful. More time is therefore required to evaluate other potential technical solutions.

SSO therefore seeks to operate in terms of limits that are reasonable, achievable and most importantly provide a benefit in air quality improvement which is commensurate to the costs of compliance.

SSO is hence applying for a further five-year postponement (1 April 2018 to 1 April 2023) for the Phenosolvan plant and HOW and Biosludge incinerators. As the postponement period of five years requested extends beyond 1 April 2020, the date when the new plant standards take effect, this application includes a request for postponement of both the compliance timeframes for existing plant standards for the period 1 April 2018 to 31 March 2020 and the new plant standards for the period 1 April 2020 to 1 April 2023 in order to align with the five year postponement being requested and moreover and if feasible, to bring about simultaneous compliance with the existing and new plant standards.

SSO proposes alternative emissions limits and special arrangements to be incorporated as licence conditions during the requested postponement period.

As part of this application an independent AIR has been prepared that details the implications of the proposed alternative emissions limits and alternative special arrangements for ambient air quality. For all criteria pollutants barring PM both the simulated and observed ambient concentrations are below the NAAQS. For PM while the observed ambient concentrations are above the NAAQS the simulated ambient concentrations from SSO's sources are well below the NAAQS. Even under the worst-case emissions scenario (operating at the alternative emissions scenario at all times) full compliance with the NAAQS is predicted in all circumstances for SSO's emissions. Compliance with the MES will in most (but not all) circumstances reduce ambient concentrations. In the case of PM, compliance with the MES will not achieve compliance with the NAAQS.

Compliance with the MES is a priority and SSO believes that its roadmap to sustainable air quality improvement will ensure that its emissions are responsibly managed and practicably minimised, in a manner aligned with the intent of the Constitution, the NEM:AQA and the National Framework for Air Quality Management (NAQF). Sasol is committed to supporting the relevant authorities and to collaborate with all I&APs to achieve meaningful ambient air quality improvement in the areas where its major operations are located.