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

Motivation Report Prepared by

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

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Sasol Oil (Pty) Limited

Sasol Chemical Industries (Pty) Limited, operating as Secunda Chemicals Operations, formerly Sasol Solvents, a division of Sasol Chemical Industries (Pty) Limited

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Executive Summary

This is an application for a postponement of the compliance timeframes of the Minimum Emissions Standards (MES) published in Notice No. 893 in Government Gazette 37054 of 22 November 2013 (GN 893), for certain point sources at the Sasol facility in Secunda.

For various reasons that are detailed in this report, certain point sources will not achieve compliance with the MES within the prescribed compliance timeframes. Accordingly, four Sasol operating entities in Secunda (Sasol Synfuels, Sasol Oil (Pty) Limited, Sasol Group Services and Sasol Solvents) have made applications for postponements, to make provision for time to investigate, design, obtain authorisations, approve, build and commission the necessary equipment to bring about compliance with the MES. These applications are termed within this document as the "initial postponement applications".

Following conclusion of the public participation process, this application has been updated in three respects. First, based on the stakeholder comments received during the public participation process, Sasol has updated some aspects of the applications. Secondly, Sasol is in the process of restructuring its corporate structure and so the Introduction has been updated to explain those changes. Thirdly, Sasol has updated this report's Chapter 7, now entitled "Sasol's roadmap to sustainable air quality improvement". This is done to consolidate information presented throughout this application to emphasise Sasol's actions toward sustainable air quality improvement, aligned with the intent of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) and the MES, including Sasol's commitment to the ongoing investigation of and, where feasible, implementation of sustainable compliance solutions. In respect of these initial postponements, Sasol is able to achieve compliance within a 5-10 year period.

The affected entities in Secunda propose alternative emissions limits and alternative special arrangements to be incorporated as licence conditions in place of the MES operating automatically during the period of the postponement.

The intended purpose of the alternative emissions limits and alternative special arrangements is to define the proposed licence conditions with which Sasol must comply for the duration of the postponement period. These proposed licence conditions have been established based on what is considered reasonable and achievable in the light of the assessments done by Sasol's independent consultants, and are based on the information and technologies currently available to Sasol. Sasol does not seek to increase emission levels relative to its current emissions baseline through this application. The alternative emissions limits and alternative special arrangements proposed by Sasol have been informed by independent specialist air quality studies on the basis that these limits do not affect ambient air quality beyond the National Ambient Air Quality Standards (NAAQS), which have as their overarching objective, ambient air quality that is not harmful to human health or well-being.

The application is made in terms of Regulation (11) of GN 893. Regulation (11) 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).

Regulation (12) prescribes that an application for a postponement must include –

a) An air pollution impact assessment compiled in accordance with the regulations prescribing the format of an Atmospheric Impact Report (as contemplated in section 30 of the NEM:AQA) by a person registered as a professional engineer or as a professional natural scientist in the appropriate category.
b) A detailed justification and reasons for the application.
c) A concluded public participation process undertaken as specified in the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment Regulations.

Regulation (13) limits the period for which a postponement will be granted to 5 years per postponement.

The requirements of Regulation (12) have therefore been met. An Atmospheric Impact Report (AIR) has been included as well as an independent peer review report on the modelling methodology employed in the Atmospheric Impact Report. The detailed justification and reasons are included and have been supplemented by a technical appendix outlining compliance solutions with respect to the selected point sources which are the subject of this application. The public participation process was undertaken as specified in the NEMA Environmental Impact Assessment Regulations and concluded in mid-June 2014.

Sasol respectfully requests postponements of the compliance timeframes for various existing plant standards and associated special arrangements for the affected Sasol entities in Secunda. These postponements will enable these Sasol entities to complete the necessary technical investigations to identify and implement the most appropriate solutions for these point sources, to ensure compliance with the existing plant standards and the new plant standards.

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Glossary

Definitions of terms as per GN 893 that have relevance to this application:

Existing Plant – Any plant or process that was legally authorized 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.

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

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.

Definitions of terms as per the NEM:AQA that have relevance to this application:

Priority area – means an area declared as such in terms of Section 18 of NEM:AQA.

Priority area air quality management plan – means a plan referred to in Section 19 of NEM:AQA.

Additional terms provided for the purpose of clarity in this application:

Additional postponement applications – Sasol submitted draft applications for exemption in terms of Section 59 of NEM:AQA from certain MES, along with draft applications for postponement from certain MES. These exemptions were motivated on the basis that the applicable standards were infeasible based on, amongst others, technology, brownfields, environmental and economic constraints. Since the conclusion of the public commenting process, Sasol has been directed to rather seek postponement from the compliance timeframes in the MES to address its challenges. Sasol now makes application for postponement in respect of those applications which were previously submitted, advertised and made available for public comment, as exemption applications. These are referred to herein as *additional postponement applications*.

Alternative emissions limits – The standard proposed by Sasol based on what is considered reasonable and achievable as a consequence of the assessments conducted and which Sasol 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 emission 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 minimum emissions standards. Specifically, these alternative emissions limits do not propose an increase in current average baseline emissions.

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 the

NEM:AQA. Regulations Prescribing the Format of the Atmospheric Impact Report (AIR) were published in Government Notice 747 of 2013.

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.

Ceiling emissions limit – Synonymous with "maximum emission concentrations". The administrative basis of the Minimum Emissions Standards 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 100^{th} 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 Minimum Emissions Standards specify emissions limits as ceiling emissions limits or maximum emission concentrations, Sasol has aligned its alternative emissions limits with this format, to indicate what the 100^{th} percentile emissions measurement value would be under any operational condition (excluding shut down, start up and upset conditions). It is reiterated that Sasol 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 Minimum Emissions Standards.

Criteria pollutants – Section 9 of NEM:AQA provides a mandate for 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, for example, particulate matter, nitrogen oxides and sulfur dioxide.

Initial postponement applications – Consequent upon the first round of public participation which took place in September 2013, Sasol's draft applications for postponement in terms of Regulations (11) and (12) of GN 893 were made available for public comment in April 2014. These applications are referred to in this motivation report as *initial postponement applications*, and the final versions have been submitted to the National Air Quality Officer (NAQO). Copies of these documents are also available on SRK's website.

Listed activity – In terms of Section 21 of the NEM:AQA, the Minister of Environmental Affairs has listed activities that require an atmospheric emissions licence. 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.

Maximum emission concentrations – Synonymous with "ceiling emissions limits". Refer to glossary definition 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.

Minister – The Minister of Environmental Affairs.

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. Emission parameters are set for various substances which may be emitted, including, for example, particulate matter, nitrogen oxides and sulfur dioxide.

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. In the context of Sasol's applications, these postponements are referred to as *initial postponements* and *additional postponements*, as defined in this Glossary.

GN 893 – Government Notice 893, 22 November 2013, published in terms of Section 21 of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) 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 publication in terms of Section 21, namely Government Notice 248, 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.

Sasol Synfuels – Sasol Chemical Industries (Pty) Limited operating through its Secunda Synfuels Operations, formerly Sasol Synfuels (Pty) Limited. To avoid unnecessary confusion, the name "Sasol Synfuels" has been retained in this report.

Sasol Oil – Sasol Oil (Pty) Limited.

Sasol Solvents – Sasol Chemical Industries (Pty) Limited operating through a division of its Secunda Chemicals Operations, formerly Sasol Solvents, a division of Sasol Chemical Industries (Pty) Limited. To avoid unnecessary confusion, the name "Sasol Solvents" has been retained in this report.

Sasol Group Services – Sasol Chemical Industries (Pty) Limited operating through Sasol Group Services, formerly Sasol Group Services (Pty) Limited. This particular application pertains to Logistics Operations Centre (LOC) within Sasol Group Services. To avoid unnecessary confusion, the name "LOC" has been retained in this report.

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

List of Abbreviations

AEL – Atmospheric Emissions Licence

AIR – Atmospheric Impact Report

AQMP – Air Quality Management Plan

BAT – Best Available Technique

BID – Background Information Document

CBOs – Community Based Organisations

CO – Carbon Monoxide

CTL – Coal-to-liquid

CRRs – Comment and Response Reports

ESP – Electrostatic Precipitator

FCC - Fluidised Catalytic Cracking

FGD – Flue Gas Desulfurisation

FT – Fischer-Tropsch

GHG – Green House Gas

GO – General Overhaul

HOW – High Organic Waste

HPA – Highveld Priority Area

HCl – Hydrogen Chloride

H_2S – Hydrogen Sulfide

I&APs – Interested and Affected Parties

LOC - Logistics Operations Centre

MES – Minimum Emission Standards

NAQO – National Air Quality Officer

NAQF – National Framework for Air Quality Management

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)

NGOs – Non-Government Organisations

NH_3 – Ammonia

NO_2 – Nitrogen Dioxide

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

SAS - Sasol Advanced Synthesis™

SCC - Superflex™ Catalytic Cracker

SCI - Sasol Chemical Industries (Pty) Limited

SCR – Selective Catalytic Reduction

SO_2 – Sulfur Dioxide

t/h – Tons per hour

TOC – Total Organic Compounds

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

WHO – Work Health Organisation

WSA – Wet Sulfuric Acid

US EPA – United State Environmental Protection Agency

1. Introduction

Sasol is an international integrated energy and chemical company that employs more than 34 000 people working in 37 countries. In South Africa, Sasol owns and operates facilities at Secunda in the Mpumalanga Province, Sasolburg in the Free State Province and Ekandustria in Gauteng.

The Secunda complex is made up of:

- Sasol Chemical Industries (Proprietary) Limited, operating through its Secunda Synfuels Operations (formerly Sasol Synfuels (Proprietary) Limited) and through its Secunda Chemicals Operations, including those operating divisions known as Sasol Polymers, Sasol Solvents, Sasol Nitro and the Logistics Operations Centre (LOC).
- Sasol Oil (Proprietary) Limited, which markets fuels blended at Secunda (as well as those produced at Natref in Sasolburg).
- Sasol Mining (Proprietary) Limited, which mines the gasification feedstock and utilities coal used at the Secunda complex.

Sasol is currently undergoing corporate restructuring which involves consolidating the majority of its operations into a single business, namely, Sasol Chemical Industries (Pty) Limited ("SCI"). However, in order to avoid unnecessary confusion, references to these entities have been kept in this report as previously described. This postponement application relates to Sasol Chemical Industries (Pty) Limited, operating through entities formerly known as “Sasol Synfuels”, “Sasol Solvents” and the “LOC”, and Sasol Oil (Pty) Limited (“Sasol Oil)”.

In March 2010, the Department of Environmental Affairs (DEA) published Minimum Emissions Standards (MES), in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMA:AQA). In November 2013, the Regulations within which the MES were contained, were repealed and replaced by GN 893, and this application is therefore aligned with the 2013 MES. The MES serves to define maximum allowable emissions to atmosphere for a defined range of pollutants and specific activities that can result in such emissions. In terms of GN 893, existing production facilities are required to comply with MES prescribed for existing plants by 1 April 2015 (“existing plant standards”) unless otherwise specified, as well as with MES applicable to new plants by 1 April 2020 (“new plant standards”) unless otherwise specified.

The MES apply to many of Sasol’s operating entities and divisions, including those of Sasol Synfuels, Sasol Oil, Sasol Solvents and the LOC under Sasol Group Services at the Secunda complex (the “affected Sasol entities”).

It is Sasol’s intention to comply with the DEA’s objective to improve air quality in South Africa. For various reasons that are more fully detailed in this report, however, the affected Sasol entities will not be able to comply with the MES for certain emissions from their Secunda operations within the MES timeframes or for the foreseeable future. Sasol, on behalf of the affected entities in Secunda, is therefore applying for postponement of certain requirements contained in the MES (“initial postponements”). In addition, one of these entities, Sasol Synfuels, previously applied for exemption from default application of certain requirements contained in the MES for certain point sources. Since the conclusion of the public commenting process, Sasol has been directed to rather seek postponement from the compliance timeframes in the MES to address its challenges. Consequently the exemption application will be submitted as postponement applications (“additional postponements”), as explained within the separate Sasol Synfuels motivation report.

This document serves as the motivation for the initial postponement of the compliance timeframes for the abovementioned Sasol entities, while a separate motivation has been prepared for the Sasol Synfuels additional postponement application.

The present application for postponement of the compliance timeframes for existing plant standards, incorporating applicable emission limits and associated special arrangements, includes:

- This motivation report outlining detailed reasons and a justification for the postponement application, supplemented with a technical appendix outlining technologies and project schedules with respect to the selected point sources which are the subject of this application.
- An independently compiled Atmospheric Impact Report (AIR) compiled in accordance with the Atmospheric Impact Report Regulations of October 2013, along with a further independent peer review report on the modelling methodology employed in the AIR.
- A Stakeholder Engagement Report outlining the public participation process that is being conducted in accordance with the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment Regulations. This includes a detailed overview of comments received from Interested and Affected Parties, along with Sasol's responses.

This motivation report is accordingly structured to present more detailed information on the activities of the affected Sasol entities at the Secunda complex. Thereafter, the MES are presented in general, together with the specific requirements for activities at Secunda before the reasons compelling the postponement requests are presented. In order to demonstrate the implications of the postponement requests on ambient air quality, the key findings of the stand-alone AIR are then presented, before presenting a summary of the public participation process that has been conducted in support of this application. A technical appendix providing further details on the specifics of each postponement request is a further accompanying document to this motivation report.

2. Overview of affected Sasol Entities

2.1 Sasol Synfuels

2.1.1 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 CTL plants at Secunda. The two plants, which are referred to as the East and West facilities, are for the most part, mirror images of one another, and each has some 75,000 barrels per day capacity of refinery equivalent products. 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'. By integrated value chains is meant 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.

2.1.2 The basic building blocks

The best way of understanding Sasol's activities is by considering them at atomic and molecular level. These activities are fundamentally based on carbon and hydrogen and the creation of hydrocarbons for liquid fuel and a vast array of chemical products. 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.

A key requirement for a CTL process is stripping out a range of unwanted components from the incoming raw gas stream. The incoming coal for example, contains ash and sulphur (S), which needs to be separated out from the raw gas stream. 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. In a similar vein, the incoming coal stream is a mixture of coarse coal and fine coal, where the gasification process can only operate with coarse coal. The fine coal is used to generate steam, which is a key utility required throughout the entire industrial process. If the fine coal was not used in the process, it would have to be discarded.

Importantly, the concept of integration is not just one of multiple product streams all of which are derived from the basic raw gas, but also one of positioning the various components of the industrial process in such a way as to derive the maximum utility from the incoming raw materials. Perhaps the best example is the very close proximity of all the processing units to the source of the steam so that steam is delivered at the required temperature and pressure to the various processing units. The further the steam is transported the greater the energy loss, and so the design of the plant serves to minimise the distances over which the steam needs to be transported.

Finally, the CTL process has been designed to deal with some unusual challenges that are a function of the environment in which the plant operates. Firstly, the plant is located some 1,600 m above sea level, with an associated equipment efficiency loss compared to sea level plants. The air is far less dense than at the coast, which means that dry cooling is less effective. In addition the coal available to Sasol is of poor quality and has a high ash content of some 30-34%, however, is fortunately of a low sulfur content. Such coal could not be exported economically and so must be used in relatively close proximity to where it is sourced. Finally, the plant operates in a water-stressed environment.

Sasol Synfuels 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, Sasol Synfuels 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. Sasol Synfuels operates one of the world's largest oxygen production facilities, currently consisting of 16 trains.

2.2 Sasol Solvents

Sasol Solvents operates plants at the Secunda and Sasolburg complexes, as well as in Germany. It produces and markets a diverse range of solvents (ketones and alcohols), co-monomers (hexene and octene), acrylates and associated products for customers worldwide. At the Secunda complex, Sasol Solvents obtains its raw materials for the manufacture of various solvents from Sasol Synfuels.

Among its activities, Sasol Solvents owns and operates storage tanks where its products are stored.

2.3 Sasol Oil

Sasol Oil markets fuels blended at the Secunda complex and refined through its 63.64% interest in the Natref Refinery. Products include petrol, diesel, jet fuel, illuminating paraffin, liquid petroleum gas, fuel oils, bitumen, motor and industrial lubricants and sulfur. Sasol Oil has 278 Sasol branded service stations, including six Sasol branded integrated energy centres and 132 Exel branded service stations across South Africa. Sasol Oil markets approximately one third of South Africa's inland liquid fuels requirements.

At the Secunda complex, Sasol Oil owns and operates storage tanks at the "tank farm" where liquid fuels manufactured by Sasol Synfuels are stored.

2.4 Sasol Group Services (LOC)

Sasol Group Services is the supplier of functional core and shared services to the Sasol group of companies. Among the supply chain services provided to the Secunda complex is logistics (under LOC), whereby LOC operates loading facilities for the handling and transport of products by road and rail.

2.5 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.

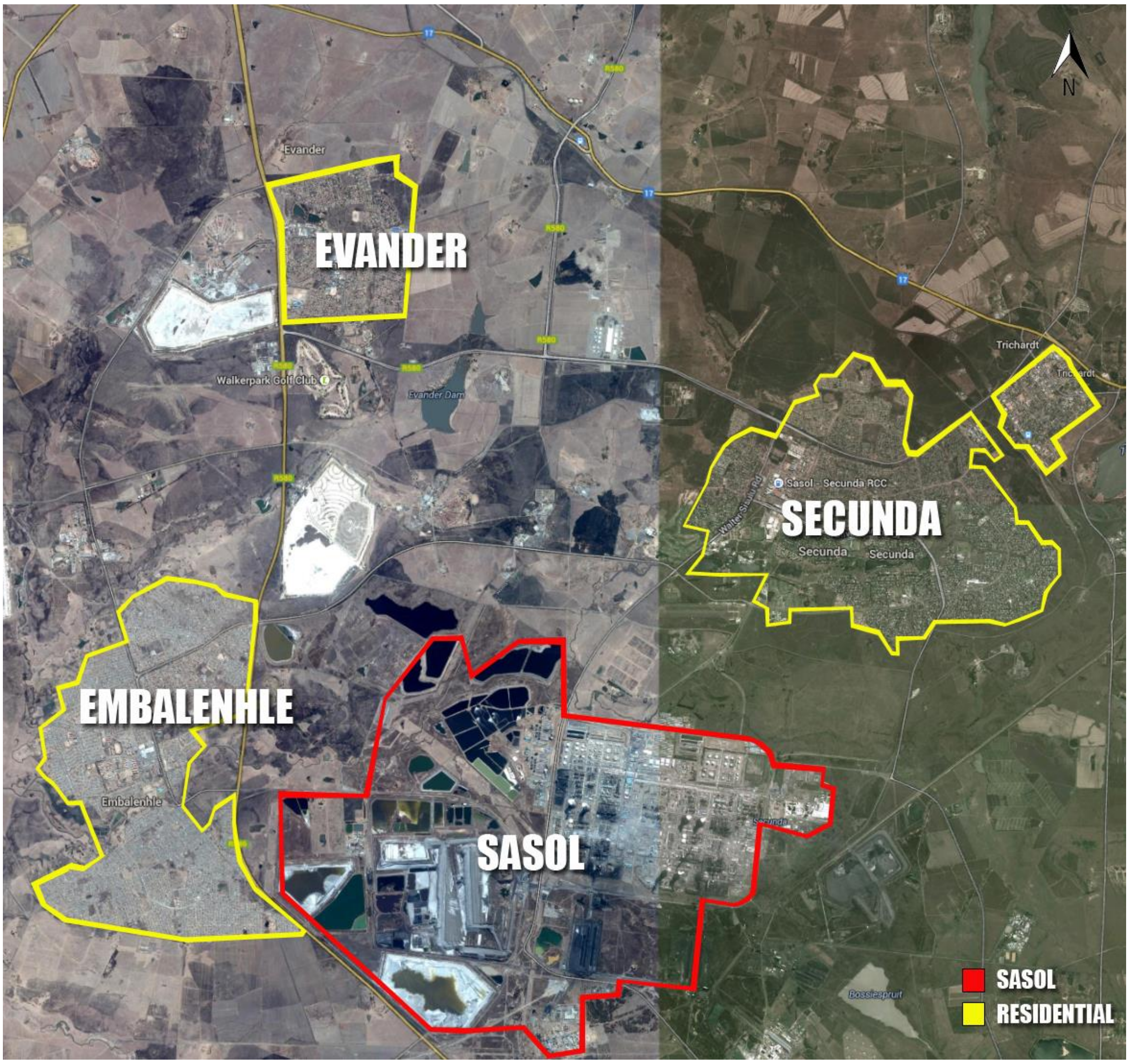

Figure 1: Map showing the position of Sasol's Secunda complex, in which the affected Sasol entities operate

2.6 Atmospheric emissions

Sasol's operations in Secunda generate a range of atmospheric emissions. The emissions are presented below as a function of the activities and facilities where they are emitted. These sources include the steam plants, the Superflex ™ Catalytic Cracker, the tar value chain, the storage tanks at the tankfarm and in other locations, the sulfur recovery process, rail loading facilities, incinerators and others. These sources are described in the following section and illustrated schematically in Figure 2.

What follows below is a summary of the processes which are the subject of the applications for postponement for the Sasol entities in Secunda.

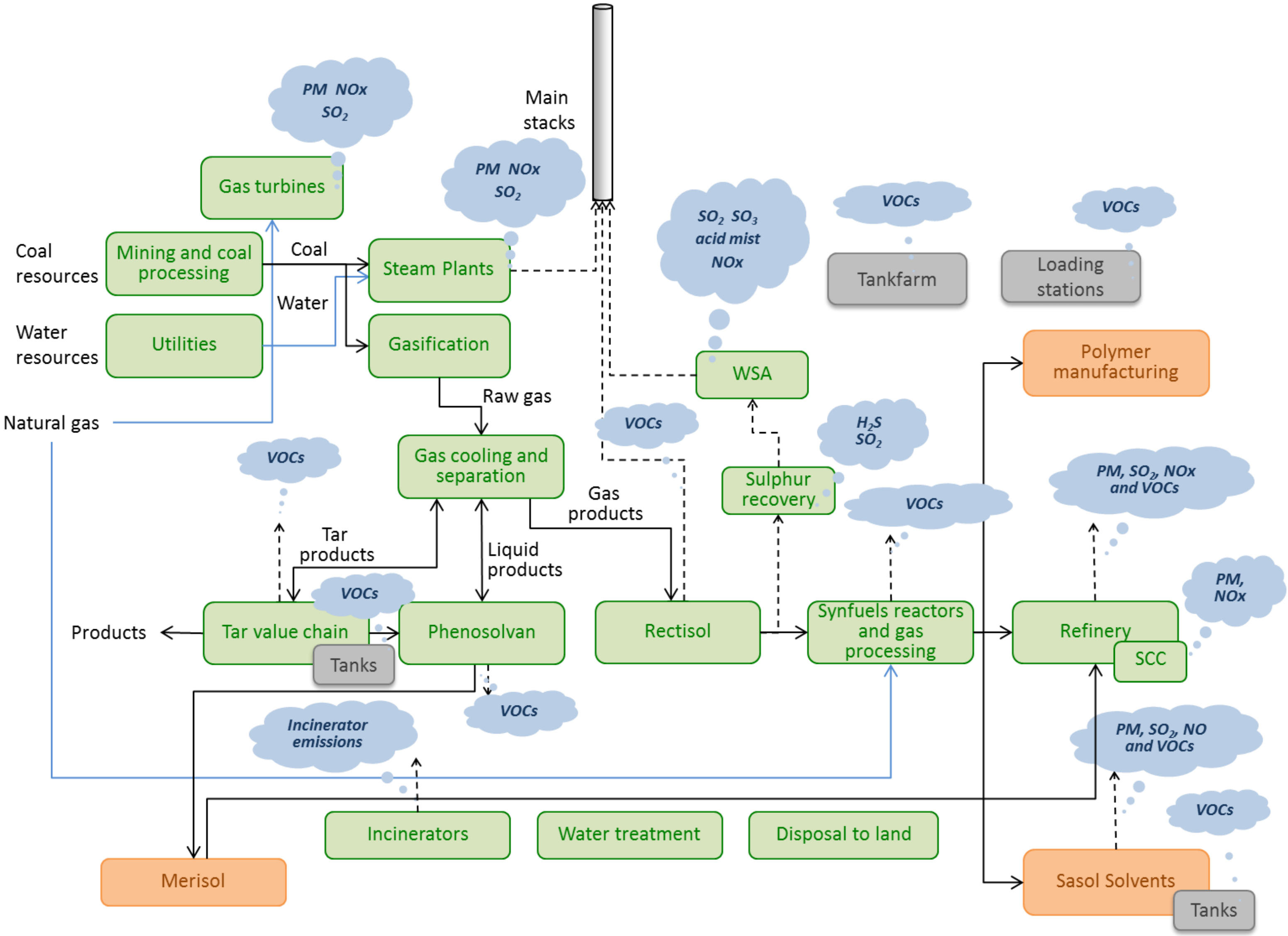

Figure 2: Schematised illustration of the industrial process at Sasol Synfuels, highlighting sources of atmospheric emissions

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

2.6.1 Steam Plants

The steam plants are owned and operated by Sasol Synfuels.

Steam is a critical industrial process requirement across the Synfuels operation. Process steam must be available at the right quality, in terms of temperature and pressure, and in the right quantity at all processes where steam is required, at all times. To meet these exacting steam requirements a large fleet of small boilers was built rather than a small fleet of large boilers. The fleet of boilers allows both planned and unplanned disruptions to steam generation to be managed without compromising the supply of steam to users across the complex.

The Sasol Synfuels East and West operations have a fleet of 17 pulverised coal fired boilers, each with a maximum production capacity of 540 tons per hour (t/h) of 40 bar superheated steam. The superheated steam is fed into common steam headers from where it is routed to the various users. The layout of the entire facility is based on minimising the distance over which the steam has to be moved with the largest steam users placed closest to the steam plants, to minimise the loss of heat from the system.

In addition to process demands, steam is supplied to generate ‘critical power’ which is needed in the event of a loss of power from the national grid. That critical power allows for safe plant shutdown without damage to the plant. Excess steam is used to generate additional electricity, which offsets some of the facility’s electricity demand from the national grid. All boiler work, including maintenance and upgrades, is driven by a strictly applied general overhaul (GO) schedule, to assure that process steam supply is not interrupted. Not only is the boiler GO schedule coordinated internally within the Secunda complex, but also with other fuel refineries to avoid inland fuel shortages, and the national electricity supplier to avoid possible regional power shortages. The GO schedule is also aligned with other statutory inspections prescribed for pressure vessels. The net effect of the GO schedule is to ensure that boilers are shut down individually in a routine, sequential manner. A single cycle of boiler shutdowns through the entire fleet of 17 boilers takes several years.

In addition the steam plants are integrated with the Rectisol and Sulfur Recovery plants. Two tall stacks (301 m on the East factory and 250 m on the West factory) serve to co-disperse emissions from the steam plant and the Sulfur Recovery plant. The high boiler outlet temperatures from the steam plants provide essential buoyancy to the much cooler off-gas stream from the Sulfur Recovery plant, significantly improving atmospheric dispersion of these emissions. That requirement for high boiler emission temperatures constrains boiler operations, such as constraining further improvements in boiler efficiencies through further heat recovery. Atmospheric emissions from the boilers include the greenhouse gas carbon dioxide (CO_2), as well as sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and particulate matter (PM).

2.6.2 The Superflex™ Catalytic Cracker (SCC)

The Superflex™ Catalytic Cracker (SCC) is owned and operated by Sasol Synfuels.

The SCC facility was commissioned in 2006 to enable compliance with the then-Department of Minerals & Energy’s Clean Fuels 1 fuel specification requirements. The SCC is a Fluidised Catalytic Cracking (FCC) process incorporating a reactor and regenerator. The SCC converts low molecular weight molecules to feedstock for petrol and olefinic gases used for manufacturing polymers and is integral to the refinery operations.

The need to introduce FCC into the unique Sasol Synfuels CTL fuels manufacturing process means that the SCC is the only commercial catalytic cracker unit in the world to use this particular technology. The cracking method of the SCC is different to the FCC of a traditional, crude oil refinery due to the significant differences in the feed to the unit. The SCC processes synthetic low-to-medium molecular weight, low-to-medium boiling point, metal-free hydrocarbons which is derived from the synthetic gas produced from coal. This contrasts with the feed to traditional FCC processes, namely processing a feedstock with high-boiling, high-molecular weight, metal-containing hydrocarbons derived from crude oil. Due to the differences in the feed material, the SCC requires a different catalyst to that normally used in a refinery FCC. The differences in composition of the catalyst and the nature of the chemical reactions mean that any abatement equipment has to be specifically designed for what is a unique application.

The SCC regenerator contains a set of five cyclones to remove catalyst particles (a form of PM emissions) from the flue gas, before it enters a stack. Further flue gas clean-up is effected via a third stage separator system consisting of a number of small cyclones, which remove more PM. This abatement equipment was installed as part of the original plant configuration when it was commissioned in 2006. Furthermore, an online opacity meter is installed to monitor PM emissions from the SCC stack.

2.6.3 Storage tanks

Storage tanks are owned and operated by Sasol Synfuels, Sasol Oil (storing petrochemical products) and Sasol Solvents (storing organic chemicals).

The Sasol complex in Secunda has various process units producing a range of different fuel and chemical intermediate and final products. The products from these units are stored in tanks, mainly at the “tank farm” area (Sasol Synfuels and Sasol Oil) or adjacent to the production plants (Sasol Solvents), according to their contents. These intermediate and final products are then either sent to downstream production units for further processing or are dispatched to customers. Product storage is conducted in an accepted manner, but fugitive emissions of Volatile Organic Compounds (VOCs) may occur (namely emissions that ‘escape’ to atmosphere rather than being deliberately released).

2.6.4 Road and rail loading facility

LOC, a Sasol Group Services entity, provides centralised logistics services to numerous Sasol business units. This includes the operation of road and rail loading facilities handling various liquid fuel and chemical products produced at the Sasol Secunda complex, for distribution to customers.

LOC’s loading facilities include large loading facilities with product throughput of more than 50,000 m^3 per year.

Fuel products are loaded at a central road loading station and a central rail loading station. A vapour recovery unit has been recently installed to recover emissions from both the road and rail loading facilities, which is undergoing certain modifications to optimise performance.

Loading is conducted in an accepted manner, but fugitive emissions of VOCs may occur.

2.6.5 Tar Value Chain

The various components of the tar value chain are owned and operated by Sasol Synfuels.

A. Tar Value Chain Phase 1

The tar value chain is located downstream of the gasification process and consists of various units that process a liquid tar-containing product stream. The liquid tar condenses out of the syngas when the syngas is cooled. The tar value chain includes various units, among them being:

i) Gas Liquor Separation

The Gas Liquor Separation unit, various gaseous, liquid and solid components are separated from the gas liquor streams. Separation is achieved by gravity separation at controlled temperatures.

ii) Coal Tar Filtration plant

In the Coal Tar Filtration plant excess solids and water are removed from the tar and oil streams before these streams are further processed in the downstream tar distillation units.

iii) Tar Distillation Units

In the Tar Distillation units, the crude tar feed (crude tar, residue oil, phenolic pitch and slop material) from the coal tar filtration plant is separated (fractionated) into different product streams using distillation processes. The product streams include light and heavy naphtha, medium and heavy creosote, residue oil and pitch.

iv) Feed Preparation Plant

The Feed Preparation plant comprises a waxy oil train and a tar train, which clean tar and waxy oil products so that these products can be recycled back to other production units where they are used as a feedstock.

Within the tar value chain, sources of fugitive VOC emissions have been identified at a number of processing units. These emission sources were identified as part of a broader Sasol initiative of reducing VOC emissions by 80% by 2020, off a 2009 baseline. In developing VOC emissions abatement strategies it is judicious to group the sources so that synergies can be realised in developing and implementing abatement solutions. The first of these groupings is referred to as Tar Value Chain Phase 1 and includes the processing units described above. The second grouping, Tar Value Chain Phase 2, is described in the following section.

B. Tar Value Chain Phase 2

As described above the tar value chain is downstream of the gasification process and consists of various units that process a liquid tar-containing product stream. The scope of the Tar Value Chain Phase 2 project is to address VOC emissions from three storage tanks within the tar value chain process, storing tarry products.

2.6.6 Phenosolvan

The Phenosolvan plant is owned and operated by Sasol Synfuels.

The Phenosolvan plant, like the tar value chain described above, is a process located downstream of the gas cooling and separation step. Whereas the tar value chain processes a liquid tar-containing product stream emanating from the gasification process, the purpose of the Phenosolvan plant is to extract valuable products from a water stream also emanating from the gasification process. At the Phenosolvan plant, 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 as that passes through the water stream. This results in VOCs exiting the column with the CO_2 gas.

2.6.7 The sulfur removal process

The first step in the CTL process involves a series of chemical reactions, collectively known as “gasification”, which converts solid coal, water (in the form of steam) and oxygen into a raw (or unpurified) synthesis gas (syngas), comprising mainly CO and hydrogen. The syngas is then transformed into various hydrocarbon streams in the patented Sasol Advanced Synthesis™ (SAS) reactor, which is based on the Fischer-Tropsch process. The hydrocarbon chains are precursors for a wide array of liquid fuel and chemical product components.

Iron oxide catalysts assist the chemical conversions that take place in the SAS™ reactors, and these catalysts only work effectively in the presence of a highly purified syngas stream. Contaminants in the gas stream such as sulfur (in the form of hydrogen sulfide, H_2S) 'poison' the catalyst and thereby reduce the efficacy of the chemical transformation. A sulfur removal process is therefore essential to purify the syngas stream prior to the SAS™ reactors, to remove both sulfur and other reaction contaminants. The necessity to exclude all sulfur from the gas stream prior to the SAS™ reactors means that Sasol Synfuels produces low-sulfur fuels.

Three key process units are involved in the sulfur removal process, as described in detail in the Sasol Synfuels exemption motivation report. For the purposes of this report, only the Sulfur Recovery plant is described below.

2.6.8 The Sulfur Recovery Plant

The Sulfur Recovery plant is owned and operated by Sasol Synfuels.

When Sasol's facilities in Sasolburg and Secunda were first constructed, there was no proven technology to extract any of the compounds from the "off-gas" that was separated from the raw syngas. As a result the off-gas was routed directly to the stack and emitted directly to atmosphere. The effect of this was to create odour episodes as far afield as Johannesburg and Pretoria because H_2S has a "rotten eggs" smell.

For more than a decade, Sasol scientists collaborated with international technology suppliers to find a way of removing sulfur from the off-gas stream. After extensive research and development, the Sulfolin process was developed, and sulfur recovery plants based on that process were built on the Sasol Synfuels East and West factories. The Sulfur Recovery plants, excluding the impact of the Wet Sulfuric Acid plant, now remove some 75% of the H_2S that was previously emitted to atmosphere. As importantly, the recovered sulfur is turned into a high purity (up to 99%), saleable product through a filtering and granulation process. The remaining H_2S in the off-gas stream is emitted from one of two main stacks in combination with emissions from the steam plant boilers as described in Section 2.6.1. As previously described the heat from the steam plant boilers enhances the buoyancy of all emissions, especially the cooler H_2S, resulting in improved dispersion in the atmosphere.

There is a possibility that some of the H_2S emitted from the sulfur recovery process naturally converts into SO_2, which would be emitted via the main stacks.

2.6.9 Sewage Solids Incinerator

The sewage solids incinerator is owned and operated by Sasol Synfuels.

Sasol Synfuels owns and operates a sewage treatment plant that treats sewage from the office buildings of the Sasol complex in Secunda as well as sewage from the town of Secunda on behalf of the Govan Mbeki municipality. On entering the treatment facility, the sewage is screened and the screenings are incinerated by the sewage solids incinerator. Once screened, the sewage proceeds to the sewage plant for treatment.

Emissions from this incinerator may include PM, SO_2, NO_x, CO, hydrogen chloride (HCl), total organic compounds (TOCs), dioxins and furans, metals, mercury (Hg), cadmium plus thallium (Cd + Tl), hydrogen fluoride (HF) and ammonia (NH_3). The incinerator fell under the 10 kg / hour threshold of the 2010 MES, prior to the November 2013 amendments, which reduced the threshold size for a listed activity, and consequently included the sewage solids incinerator. While emissions have been managed in accordance with licencing requirements, the amendments impose new measurement and emission limits compliance obligations on the incinerator. As a result of the recent regulatory changes, an emission baseline from this incinerator is currently in the process of being established.

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, Sasol makes these applications.

The Regulations identifying Listed Activities and prescribing MES for those activities were made in terms of Section 21 of the NEM:AQA, and promulgated in Government Notice 893 on 22 November 2013 (GN 893). Amongst others, Part 3 of the Regulations includes MES, which oblige existing production facilities to comply with certain emission limits and associated special arrangements by 1 April 2015 ("existing plant standards") unless otherwise specified, as well as with certain emission limits and associated special arrangements applicable to new plants by 1 April 2020 ("new plant standards") unless otherwise specified. GN 893 includes amongst others, the identification of activities which result in atmospheric emissions; establishing MES for the listed activities; prescribing compliance timeframes by which MES must be achieved; and, detailing the requirements for applications for postponement of stipulated compliance timeframes.

The 2013 Regulations of GN 893 repealed and replaced the Regulations that had been published in March 2010 under Government Notice 248. GN 893 contains substantial amendments to the previous MES, including changes to the listed activities and their associated special arrangements, additional activities subject to regulation and changes to some of the prescribed emission limits. Notwithstanding the amendments, the compliance timeframes prescribed in the 2010 Regulations remain unchanged. The net effect of GN 893 was to alter compliance requirements with less than two years in which to comply.

3.2 The MES applicable to Sasol's affected entities in Secunda

Due to the diversity and integrated nature of the Sasol operations in Secunda, there are a number of different MES listed activity categories that apply. The applicable MES are summarised in Table 1 together with an indication of whether or not Sasol will comply with the prescribed limits and associated special arrangements. Green colour coding reflects compliance with the MES, red reflects applications for additional postponements (detailed in a separate motivation report), and orange reflects applications for initial postponements (the subject of this motivation report). Blue colour coding reflects the 2020 standards for which compliance is challenging, based on the assessment of presently available technologies. Sasol is applying here for postponement of the compliance timeframes for certain MES on behalf of the affected business units MES (the initial postponement applications), where compliance will be attained in the short- to medium term, but is making a parallel application for additional postponement of other MES. In the interests of transparency both the initial and additional postponement requests are indicated in Table 1, together with the MES with which Sasol will comply within the prescribed compliance timeframes.

Table 1: Summary of compliance with the MES for Sasol's affected entities (note that this is a summarised version of the MES)

MES Category	Substance(s)	Emission limits or special arrangements*		Applicable Sasol Activities
		New plant standards	Existing plant standards	
Category 1: Sub-category 1.1	Particulate matter	50	100	Steam plant (Sasol Synfuels)
	Sulfur dioxide	500	3500	
	Oxides of nitrogen	750	1100	
Category 1: Sub-category 1.4	Particulate matter	10	10	Gas turbines (Sasol Synfuels)
	Sulfur dioxide	400	500	
	Oxides of nitrogen	50	300	
Category 2: Sub-category 2.2	Particulate matter	100	120	Superflex ™ Catalytic Cracker (Sasol Synfuels)
	Sulfur dioxide	400	550	
	Oxides of nitrogen	1 500	3 000	
Category 2: Sub-category 2.4	Total Volatile Organic Compounds	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system		Storage tanks (Sasol Synfuels)
	Total Volatile Organic Compounds	Type 1, 2 and 4 tanks comply Some type 3 storage tanks comply		Storage tanks (Sasol Synfuels)
	Total Volatile Organic Compounds	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20 m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system		Storage tanks (Sasol Oil)
	Total Volatile Organic Compounds	Type 1, 2 and 4 tanks comply Some type 3 storage tanks comply		Storage tanks (Sasol Oil)
	Total Volatile Organic Compounds	All installations with a throughput of greater than 50,000 m^3 per annum of products with a vapour pressure greater than 14 kPa, must be fitted with vapour recovery or vapour destruction units. Emission limits for vapour recovery/destruction using non-thermal treatment: Existing plant standard: 40 000 New plant standard: 40 000		Loading stations (LOC)
Category 3: Sub-category 3.6	Hydrogen sulfide	3 500	4 200	Rectisol and Sulfur Recovery Plants (Sasol Synfuels)
	Total Volatile Organic Compounds	130	250	
	Sulfur dioxide	500	3 500	
Category 3: Sub-category 3.6	Hydrogen sulfide	3 500	4 200	Phenosolvan (Sasol Synfuels)
	Total Volatile Organic Compounds	130	250	
	Sulfur dioxide	500	3 500	
Category 3: Sub-category 3.3 and Sub-category 3.6	Hydrogen sulfide	3 500	4 200	Sources in Tar Value Chain – Phase 1 (Sasol Synfuels)
	Total Volatile Organic Compounds	130	250	
	Sulfur dioxide	500	3 500	
Category 3: Sub-category 3.3	Total Volatile Organic Compounds	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20 m, or b) Fixed-roof tank with internal floating		Sources in Tar Value Chain – Phase 2 (Sasol Synfuels)

MES Category	Substance(s)	Emission limits or special arrangements*		Applicable Sasol Activities
		New plant standards	Existing plant standards	
		deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system		
Category 6	Total Volatile Organic Compounds	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20 m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system		Storage tanks (Sasol Solvents)
Category 7: Sub-category 7.2	Total fluoride	5	30	Wet Sulfuric Acid Plant (Sasol Synfuels)
	Hydrogen chloride (primary)	15	25	
	Hydrogen chloride (secondary)	30	100	
	Sulfur dioxide	350	2800	
	Sulfur trioxide	25	100	
	Oxides of nitrogen	350	2000	
Category 8: Sub-category 8.1	Particulate matter	10	20	HOW incinerators (Sasol Synfuels)
	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 200 ºC		
Category 8: Sub-category 8.1	Particulate matter	10	20	Biosludge Incinerators (Sasol Synfuels)
	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 200 ºC		

MES Category	Substance(s)	Emission limits or special arrangements*		Applicable Sasol Activities
		New plant standards	Existing plant standards	
Category 8: Sub-category 8.1	Particulate matter	10	20	Sewage solids incinerator (Sasol Synfuels)
	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 200 ºC		

**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 oxygen (O_2) reference conditions for each listed activity as specified in the MES; ng I-TEQ/Nm^3 in the case of dioxins and furans*

Colour coding:

Blue	2020 standard for which no feasible technology is presently available to attain compliance and for which Sasol continues to seek reasonable measures for longer-term certainty
Red	Additional postponements requested, on compliance timeframes for the prescribed emission limit or special arrangement
Orange	Initial postponement of compliance timeframes for the prescribed emission limit or special arrangement
Green	Will comply with the prescribed emission limit or special arrangement within the prescribed compliance timeframes
White	Compliance status to be determined (refer to Section 4.4 for an explanation)

4. Reasons for applying for Postponement

Sasol has conducted extensive assessments on the technical, operational and financial implications of strict compliance with the existing and new plant standards. Based on these assessments, for those point sources where Sasol does not already comply with the MES, Sasol has concluded in one of three different ways:

- There are point sources for which compliance can be achieved at reasonable cost for the air quality benefits achieved; in some instances this can be achieved within the prescribed compliance timeframes and hence Sasol would comply fully with the MES.
- There are point sources for which compliance can be achieved at reasonable cost for the air quality benefits achieved; however, due to lengthy project development timeframes for developing and implementing complex solutions in an existing brownfields facility, Sasol requires postponements on the compliance timeframes in order to implement and successfully commission new equipment. These point sources are the subject of this motivation report (the initial postponements).
- There are certain point sources for which strict compliance with the MES is, for a variety of reasons explained below, not reasonable or achievable with presently available technology. Following the Minister's decision communicated to Sasol in July 2014, Sasol now seeks postponement for these point source standards instead of exemptions, and specifically proposes compliance to alternative emission limits and arrangements for the duration of the postponement period. These point sources are the subject of the additional postponement application.

Legal compliance is of paramount importance to Sasol, and it is for this reason that Sasol is submitting applications as provided for in law to ensure its compliance in relation to the emission limits incorporated into its atmospheric emissions licences with which it must comply. In the second scenario described above and which applies here, Sasol commits to comply with the MES for those point sources over time, and hence it is appropriate to apply for postponement of compliance timeframes, to ensure compliance during the period required for project development and implementation. In some instances, this may take no more than the maximum allowable postponement application period of five years; in other instances, it is already known that in excess of five years of postponement will be required, and therefore multiple postponement applications will be necessary in these instances.

In the third scenario described above, Sasol is in a challenging position. A potential approach to responding to these specific, unachievable point source standards would be to apply for multiple or "rolling" postponements to the end of the facility's life, or until such time as a feasible technology is identified and implemented, whichever arises first. Sasol gave full consideration to this compliance approach and the potential repercussions, and therefore previously applied for exemptions in those cases where compliance is, based on presently available technologies, neither reasonable nor achievable. This view was premised on the fact that a postponement by its design inherently offers only short-term relief, even in the face of long-term challenges to compliance for which no appropriate mechanism to provide long-term regulatory is currently available to Sasol.

Sasol has now been advised by the Minister that she will not consider Sasol's exemption applications and that Sasol should instead apply for postponement. For this reason, and in order to ensure Sasol's compliance with the time 1 April 2015 timeframes, Sasol is now bringing an additional postponement application. Sasol continues to seek reasonable measures to secure longer-term certainty. The additional postponement application is the subject of a separate motivation report.

4.1 Overview

The reasons for applying for postponement fall into several categories that are detailed below. Before presenting each of these reasons in more detail, Sasol's overarching approach to environmental management and air quality management in particular, is presented. The reasons that underpin the applications should be read in the context of Sasol's environmental management philosophy. These reasons are specific to each listed activity, as described in the technical appendix to this motivation report, but fall into general categories, namely: the integrated nature of Sasol's activities, inadequate time to assess compliance implications due to the recent changes in regulations, due diligence obligations and the challenges inherent in modifying a brownfields operation.

4.2 Sasol's environmental management philosophy

Sasol recognises that continuous improvement in environmental management performance is an important business imperative. Introducing capital intensive environmental improvements must be balanced with the focus on socio-economic sustainability of its business. Sasol has a history of proactive environmental performance improvements and in respect of air quality management has significantly reduced atmospheric emissions from its various facilities in line with a risk-based environmental improvement approach, regardless of whether or not such emissions reductions were required in law. For that reason numerous of the emissions from Sasol's various facilities already comply with much of the MES. In addition, and in response to the outcome of the Highveld Priority Area (HPA) assessment and Air Quality Management Plan (AQMP), Sasol Synfuels voluntarily committed to certain emissions reductions for the furtherance of ambient air quality improvements.

Based on an assessment of significant capital expenditure on projects which have resulted in significant environmental improvements over the past ten years, Sasol has spent over R20 billion, averaging at R2 billion annually. The bulk of these improvements have delivered ambient air quality and greenhouse gas emission improvements (refer to Table 2). This expenditure excludes the Clean Fuels 1 programme, implemented in 2006 at a cost of R12 billion, which removed lead from petrol to improve vehicle tailpipe emissions, as well as the Clean Fuels 2 programme, which will further improve vehicle tailpipe emissions.

Table 2: Sasol's major capital expenditure over the last 10 years resulting in significant environmental improvements (only incorporating projects over R100m each)

Year	ZAR million	Project with environment related benefit	Environmental improvement in subsequent years
2003	520	Waste Recycling Facility in Secunda	Recycle waste streams and reduce waste dumping.
2004	130	Rehabilitation of Secunda waste disposal site	Improved air and water quality.
2005	12 000	Mozambique Natural Gas conversion project	Significant reductions in Sasolburg of H_2S (100%), Green House Gas (GHG) (39%), SO_2 (42%) and NO_x (37%).
	400	Hydrogen Sulfide reduction in Secunda	Reduced H_2S emissions.
2008	1 000	Wet sulfuric acid plant in Secunda*	H_2S emissions reduced when the plant is operational.
2009	300	Carbon capture and storage in Mongstad	Piloting technology for carbon capture and storage.
	100	Energy efficiency projects in Secunda	Reduced GHG emissions.
2010	2 300	280MW combined cycle gas turbines in Secunda	Reduced GHG emissions.
2011	500	Upgrade boiler 9 in Secunda*	Reduced particulate matter emissions.
	1 900	140MW Gas engines in Sasolburg	Reduced GHG emissions and improved air quality.
2012	2 000	Regenerative thermal oxidisers in Secunda	Reducing VOC emissions such as benzene.

Note: These are publicly quoted figures from previous annual reports or other official Sasol publications. Actual expenditure may have occurred over more than one year, and may have escalated beyond these publicly reported numbers. This excludes the Clean Fuels I and II projects. Numerous smaller projects – such as rehabilitation projects, water treatment plants, conversion from elevated flares to ground flares, and other emission reduction projects each individually to the value of less than R100m per annum – are also excluded.

**Projects also included in Sasol's commitments to the Highveld Priority Area Air Quality Management Plan*

Table 3: Projects included in Sasol Synfuels' Highveld Priority Area Air Quality Management Plan commitments. Note that two of these projects (indicated with *) are included in the list of projects shown in Table 2

Emission component & source	Commitment made	Status update
Fugitive VOCs arising from tar processes and product storage.	Implementation of a leak detection and repair programme to reduce fugitive emissions.	Completed
VOC emissions from fuel loading facilities.	Installation of vapour recovery unit at fuel loading facility.	Completed
Reduction of VOC emissions being vented from forced feed evaporator.	Short term unit de-bottlenecking, bypass of the forced feed evaporator at Coal Tar Filtration.	Completed
VOC emissions from various tanks.	Installation of Evapostops on various tanks on the Synfuels site.	Pilot studies to assess technology effectiveness underway.
Reduction of particulate matter from boilers.	Ammonia pressure and quality control project to reduce particulate matter.	Completed
Hydrogen sulfide emissions from the complex.	Wet Sulfuric Acid plant*.	Implemented but experiencing operational challenges.
Particulate matter (PM) from boilers exceeding normal operating parameters due to air ingress from damaged air heater (boiler 9).	Reduction of particulate matter (PM) from boilers (through air heater replacement and general overhaul of Boiler 9)*.	Completed

Sasol supports reasonable and achievable environmental performance standards being set by government, with the goal of achieving sustainable ambient air quality improvements in the most effective manner. Through its extensive technical studies and as described above, Sasol has established that for certain point sources abatement is well aligned with a risk-based approach to ambient air quality improvements. In these circumstances, meaningful ambient air quality improvements concurrent with attaining regulatory compliance can be achieved.

In these instances, Sasol will comply with the MES. However, due to lengthy technology and project development timeframes for complex solutions in a brownfields site, Sasol requires postponements on the compliance timeframes in order to implement and successfully commission new equipment. In some instances, single five-year postponements are sufficient to afford time for compliance, whereas in other instances, multiple postponements will be required, necessitating further postponement applications closer to April 2020.

For the period of postponement, Sasol has proposed alternative emissions limits or other emissions management controls as conditions to be included in its Atmospheric Emission Licences, with which it commits to comply. Sasol does not in any way seek to increase emissions relative to its current emissions baseline through its postponement applications. In the way that they have been presented, the MES compel absolute compliance with *ceiling* emission limits, or maximum emission concentrations, rather than *average* emission limits. The MES make provision for exceedance of the limits only for extraordinary events (including shut down, start up and upset conditions), and not for the variability that is inherent in day-to-day operations. These ceiling limits mean that emitters must be capable of complying with the prescribed ceiling limits, or maximum emission concentrations, under all operational circumstances, regardless of normal production variability. The alternative emissions limits that Sasol is proposing are thus not to increase emissions in any way but to simply reflect the new administrative conditions applied in the MES. After the (single or multiple) period of postponements, Sasol's ceiling emissions levels will – under all operational conditions (excluding shut down, start up and upset conditions) – comply with the MES.

4.3 Integrated nature of Sasol's activities

Sasol's fuel and chemical value chains are intimately integrated, not only among different entities within the Secunda complex (for example, Sasol Synfuels and Sasol Solvents), but also between the Secunda complex, Sasol's Sasolburg complex and even with the Natref refinery in Sasolburg. Within the Sasol Synfuels process, for example, the extensive linkages means 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. Such assessments render emissions abatement choices complex and time consuming.

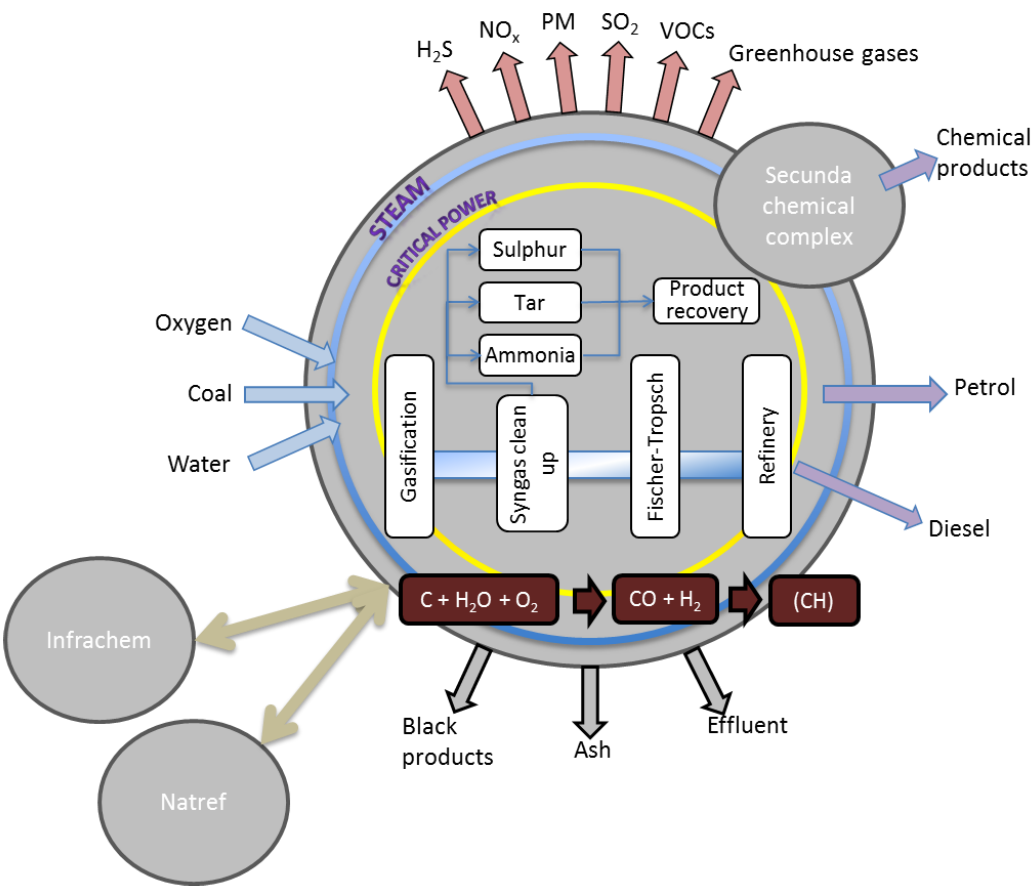

Figure 3: Schematised presentation of the industrial process at the Sasol Secunda complex to illustrate its high degree of integration

4.4 Inadequate time due to the changes in regulations

After the MES were published in the 2010 Regulations, amended MES were published in GN 893 in November 2013 without any change in the prescribed compliance timeframes.

A range of altered compliance requirements was introduced in the 2013 MES obliging emitters to assimilate the new requirements, investigate the different abatement options, decide on suitable abatement, motivate for and receive financial approval, appoint service providers to implement the abatement technology, design, construct and commission the new equipment, all within the space of some 16 months.

As an example, Category 8 of the now repealed 2010 MES included a listed activity threshold throughput of 10 kg/hour. This meant that thermal treatment activities below that threshold were not considered as listed activities. In November 2013, when the amended MES were promulgated, the threshold size for this category was reduced from 10 kg/hour to 10 kg/day, so that facilities one twentieth of the original threshold size, have very recently also been included as listed activities which need to comply in the same compliance timeframes.

The complexity and highly integrated nature of Sasol’s activities require careful consideration of upstream and downstream process impacts makes such process modifications within a relatively short period of time unattainable.

4.5 Due diligence obligations

Sasol has an established project development and governance framework to manage an extensive portfolio of capital projects, which is a “stage-gate” model.

The importance of this model to Sasol’s capital projects is two-fold:

- From a project development perspective, bringing learnings from previous project experience to bear, the model provides a framework to carefully guide the solution design process towards successful projects. Among the many important aspects guided by the model, are detailed investigations and design considerations required to address the additional complexities of interfacing new (or altered) equipment into an integrated and operational brownfields facility. For example, such considerations would include whether additional steam or power is needed for the new piece of equipment, and whether the equipment changes the throughput or capacity requirements of other process units upstream or downstream of it.
- From a governance perspective, 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. This governance process is aimed at assuring the robustness of solution development, towards implementation of successful projects that achieve their objectives and are aligned with business intent. Good project governance means that all projects need to be properly motivated, evaluated and approved in a systematic and consistent manner. The need for good governance is heightened further by the fact that Sasol is a listed company on two stock exchanges.

The duration of the various development phases (the “stages”) is typically linked to the solution’s complexity, including its number of interfaces with surrounding processes, and upstream and downstream process impacts. 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.

The Sasol stage-gate model is a sequential process, and upon successful completion of governance requirements for each stage, a project is formally approved to enter the next stage. Project schedules are driven by a number of considerations, among which key constraints include:

- Technology complexity: including managing upstream and downstream impacts, as well as key plant infrastructure interfaces that result from integrating new equipment into an existing process.
- The level of operational risk incurred by introducing new equipment to Sasol’s unique commercialised CTL fuels manufacturing process, which often requires extensive piloting time to confirm a new technology’s performance within the context of Sasol’s process, and any unintended consequences that may arise from this.
- Installing new equipment within a plant that is continuously operational requires careful planning for implementation during opportunity windows provided within the highly coordinated, complex-wide integrated GO schedule. This is particularly important to minimise impacts on production, and to carefully prioritise and plan over a fairly long-term horizon for cases where multiple different projects require implementation within the same portion of the plant.

Given these considerations, it is Sasol's experience that timeframes for implementation of capital projects on its brownfield sites very often exceed five years, and frequently also exceed ten years.

As an example of the due diligence process, a summary is presented in Table 4 of the planned project schedule for the Tar Value Chain, Phase 1 project, which entails the installation of seven Regenerative Thermal Oxidisers (RTOs) to destroy VOC emissions. It can be seen from the table that more than 11 years is required from commencement to completion for a project of this complexity, which is part of a group of ongoing investments which will realise abatement of VOCs at a cost of R7.5 billion (approved capital expenditure).

Table 4: Planned project schedule for the Tar Value Chain – Phase1, VOC emissions abatement project. The schedule is presented to illustrate a typical project execution schedule

Project stage	Purpose	Approximate stage completion time	Comments
Idea Generation	Determine the nature and scope of the Tar Value Chain Phase 1 emissions abatement project.	12 months	Completed
Prefeasibility	Identification of technology options and their applicability/feasibility, to narrow down a sub-set of prioritised solutions. In many cases piloting of technology in the CTL context is required in this phase.	24 months	Completed
Feasibility	Determine most feasible technology option following appropriately detailed technical, business and operations investigations; evaluate potential technology providers.	10 months	Completed
Engineering	Detail design of the technology; design of the interfaces with the rest of the facility; resource planning including sourcing equipment and other project resources.	54 months	Basic Engineering was completed in November 2009. This included design of technology, design of interfaces and resource planning. Detail engineering started thereafter, and is close to complete.
Construction	Execution of the project; construction of the required technology; physical integration of the new technology with existing equipment and systems.	November 2009 to April 2017 (estimate)	The timeline for this project is largely determined by the shutdown schedule for the affected plant units, which is a sequential process to allow for staggering of complex tie-in work. Construction on the first RTO started in November 2009 and is due for completion in April 2014. Construction on subsequent RTOs is due to start in April 2014, and according to the current project schedule, should be completed on all units concurrently by December 2016.
Commissioning	Commissioning of the equipment; ensure compliance with design intent; modifications if required to reach design intent.	April 2014 to April 2017 (estimate)	Commissioning of the first unit will take place in May 2014. Commissioning of the subsequent units will take place between December 2016-April 2017. Commissioning of each unit will follow its' construction, hence the schedule for commissioning is identical to the schedule for construction.
Approximate total project completion time (estimate):		Estimated total 136 months (11 ¼ years). According to the latest project schedule, the RTOs should be operational from April 2017, barring any unforeseen developments.	

The various projects required to ensure compliance with the MES are summarised in Table 5 together with an initial indication of the overall project schedule and the resultant postponement applications that will be required. It is important to note that the estimated project schedules shown below are premised on numerous assumptions including the integrated GO schedule, vendor capacity and internal resources availability. Unforeseen changes in any one of these factors could result in changes to the project schedule.

Also important to note is that there are several instances where subsequent applications for postponement will be made, since Regulation (13) of GN 893 provides for postponements not exceeding five years per application. For most of the processes listed in Table 5, it is expected that there will be one intervention that will result in compliance with both the existing and new plant standards concurrently.

Table 5: Summary listing of abatement projects to achieve compliance with the MES, including the project completion schedule and the postponement application implications of the schedules

Sasol process	Estimated project duration	Preferred technology option	Estimated date of compliance concurrently achieved with existing and new plant standards*
Steam plants (Sasol Synfuels)	11 ½ years	Upgrade of ESP internals.	Between 2020 and 2025* (existing plant standards only).
SCC (Sasol Synfuels)	8–10 years	Investigations underway.	Between 2020 and 2025*.
Tanks (Sasol Synfuels) (Sasol Oil) (Sasol Solvents)	13-15 years	Floating devices (discs).	Between 2020 and 2025*.
Rail loading facilities (LOC)	1 year	Optimisation of Vapour Recovery Unit.	By April 2016
TVC – Phase 1 (Sasol Synfuels)	8 years	Regenerative thermal oxidisers (RTO).	By April 2017
TVC – Phase 2 (Sasol Synfuels)	5-6 years	Investigations underway.	By April 2020
Phenosolvan (Sasol Synfuels)	5-6 years	Investigations underway.	Potentially by April 2020, but could be lengthier
Sewage solids incinerator (Sasol Synfuels)	Compliance status to be determined since this was only included as a listed activity in GN 893 of November 2013. Not yet investigated.		
Sulfur recovery plant and Rectisol plant – SO_2 emissions standards (Sasol Synfuels)	Compliance status to be determined since this was only included as a listed activity in GN 893 of November 2013. Not yet investigated.		

**Indicates that more than one postponement application will be required, and a further application in this regard will be made closer to 2020.*

4.6 Modifying a brownfields operation

Modifying an existing brownfields operation is 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 Sasol complex, for example, there is very little available space because the plant was specifically designed to have steam-using facilities as close as possible to the source of the steam. That 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 bringing in the kind of plant and equipment that would be required 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 did 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.

Perhaps the best example of this is implementation of PM abatement equipment at the SCC. There is no directly available technology that could be fitted readily and guarantee compliance on this unique catalytic cracking process, but even if there were, the next two available SCC plant shutdowns (April 2015 and 2017) are both likely to be fully booked for a complex series of projects and modifications required for implementation of Clean Fuels 2 fuel specifications compliance requirements. In addition the April 2019 shutdown may also be required for further optimisation of the modifications made for Clean Fuels 2. As such the soonest timeframe for implementation of emissions abatement equipment (excluding its commissioning period) would be April 2019, but more realistically only April 2021. In the interim period, explorations into the most appropriate technology to achieve compliance will be ongoing.

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.

5. Alternative Emissions Limits

5.1 Overview

Given the various reason cited above, Sasol believes that compliance with certain of the MES timeframes is not possible Sasol therefore applies for postponements of those compliance timeframes on behalf of its affected entities in Secunda, namely Sasol Synfuels, Sasol Solvents, Sasol Oil and Sasol Group Services (for the LOC).

5.2 Proposed alternative emissions limits and other emission management controls

For the period of postponement, Sasol has proposed alternative emissions limits or other emissions management controls as conditions to be included in its Atmospheric Emissions Licences, with which it commits to comply.

As described above, the alternative emissions limits have been derived from the existing baseline (average) emissions, as these will continue to prevail until such time as the emissions abatement can be implemented. It must be remembered that the change in dispensation that now requires compliance with ceiling limits, or maximum emission concentrations, means that the alternative emissions limits may appear to be an increase over baseline (average) conditions. Again, it is emphasised that these changes are no more than administrative changes and will not practically see increases in emissions over the current baseline emissions on a pollutant load basis. The alternative emissions limits are summarised in Table 6. Where applicable, these are at least aligned with current licence emission limits, and where licence conditions do not currently regulate particular emission parameters, Sasol's proposed alternative emissions limits and alternative special arrangements have furthermore been informed by independent specialist air quality studies on the basis that these limits do not affect ambient air quality beyond the National Ambient Air Quality Standard (NAAQS), which have as their overarching objective, ambient air quality that is not harmful to human health or well-being.

After the (single or multiple) period of postponements, Sasol's ceiling emissions levels will – under all operational conditions (excluding shut down, start up and upset conditions) – comply with the MES.

Table 6: Summary listing of the MES for which Sasol is applying for initial postponement of the compliance timeframes together with alternative emissions limits and other emission management controls that will prevail during the period of postponement, until full compliance with the MES is achieved

Applicable Sasol Activities	Substance(s)	MES*		Alternative emissions limits or other emission management control
		New	Existing	
Steam plant (Sasol Synfuels)	Particulate matter#	50	100	130 (until 31 March 2024)* 100 (applicable 1 April 2024)*
SCC (Sasol Synfuels)	Particulate matter#	100	120	330 (until 31 March 2021)* ^
Storage tanks (Sasol Synfuels) (Sasol Oil) (Sasol Solvents)	Total Volatile Organic Compounds#	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20 m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system		Incorporate into the site fugitive emissions monitoring plan*
Rail loading stations (LOC)	Total Volatile Organic Compounds	All installations with a throughput of greater than 50,000 m^3 per annum of products with a vapour pressure greater than 14 kPa, must be fitted with vapour recovery or vapour destruction units. Emission limits for vapour recovery/destruction using non-thermal treatment: Existing plant standard: 40 000 New plant standard: 40 000		Incorporate into the site fugitive emissions monitoring plan
Tar value chain phase 1 (Sasol Synfuels)	Total Volatile Organic Compounds	130	250	Incorporate into the site fugitive emissions monitoring plan
Tar Value Chain Phase 2 (Sasol Synfuels)	Total Volatile Organic Compounds	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20 m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system		Incorporate into the site fugitive emissions monitoring plan
Phenosolvan (Sasol Synfuels)	Total Volatile Organic Compounds	130	250	Incorporate into the site fugitive emissions monitoring plan
Sulfur recovery and Rectisol plants	Sulfur dioxide	500	3 500	Compliance status to be determined
Sewage solids incinerators	Particulate matter	10	20	Compliance status to be determined
	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,	0.5	0.5	

Applicable Sasol Activities	Substance(s)	MES*		Alternative emissions limits or other emission management control
		New	Existing	
	cobalt, copper, manganese, nickel, vanadium			
	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	

**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; ng I-TEQ/N m^3 in the case of dioxins and furans*

 # indicates that further postponement applications would be required to facilitate compliance, since GN 893 limits the granting of postponements to a maximum period of five years per application

^ This point source is part of a separate variation to licence application in terms of Section 46 of NEM:AQA

6. The Atmospheric Impact Report

6.1 Overview

The AIR is a regulatory requirement and has to be compiled and submitted as part of an application for postponements. The purpose of the AIR is to provide an assessment of the implications for ambient air quality and associated potential impacts, of the emissions that will occur if the postponements are granted and proposed alternative emissions limits were accepted. The AIR was completed by independent consultants and not Sasol itself. Airshed Planning Professionals (Airshed) was appointed to this end. 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.

6.2 Study approach and method

6.2.1 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” (Government Gazette 533, published 11 July 2014) were used to guide dispersion model selection. The CALPUFF model was selected mainly because it can simulate pollution dispersion in low wind (still) conditions, which occur frequently in the area where Sasol Synfuels operates. In addition CALPUFF can be used to model chemical transformations in the atmosphere, specifically in relation to the conversion of NO to NO_2 and the secondary formation of particulates.

6.2.2 Peer review of dispersion modelling methodology

The dispersion modelling methodology was 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. One of E^{x}ponent’s directors played a significant role in the development of the CALPUFF modelling system. The peer reviewer was provided with a plan of study and a draft AIR, which was prepared by Airshed in accordance with the Dispersion Modelling regulations, as referenced by the AIR Regulations of October 2013.

The peer reviewer's findings were assessed in terms of their potential impact on air quality. For cases where the peer review findings were identified as having a potentially significant impact on ambient air quality, the dispersion model inputs and/or settings were revised and the model was re-run taking into account the recommendations. Conversely where the findings were expected to have very marginal effects on the results, the findings were noted. Airshed's plan of study, the peer reviewer's report and Airshed's comments on each of the findings are included as Annexure B.

Two key comments were considered material for the purposes of the study, and actions were taken to address the findings.

The first relates to the use of the Probability Density Function (PDF) for dispersion from tall stacks under convective conditions, typical of the Highveld. This is of significance for tall stacks in convective conditions since it better considers short-term elevated concentrations that typically occur during down draught conditions. This finding was deemed to be significant for other regions included in the peer reviewer's assessment, but not the Sasolburg area, since this area is not known for convective conditions.

The second relates to the peer reviewer's aim of replicating Airshed's results independently. Errors in the initial input files sent to the peer reviewer meant that Airshed's updated modelled results could not be replicated. Since it was important for the peer reviewer's assessment to independently model and obtain similar results to Airshed, updated input files were sent to E^xponent for a re-run until the results were satisfactory.

The remainder of findings and comments on these are detailed in Annexure B. They relate to, among others, land use category data, wet and dry deposition of emissions and chemical transformation of NO_x.

6.2.3 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. Sasol operates three ambient air quality monitoring stations in and around Secunda, namely at Secunda Club, Langverwacht and Bosjesspruit, specifically sited to monitor Sasol's impacts on ambient air quality. Data for 2010, 2011 and 2012 from all three stations were included in the AIR investigation. The monitoring stations are accredited (ISO/IEC17025) to ensure data quality and availability, with 90% data availability for the three years.

6.2.4 Emissions scenarios

In order to assess the impact of each of the additional postponements for which Sasol has applied, four emissions scenarios were modelled, with the results throughout the AIR presented as illustration in Figure 4.

1. **Current baseline emissions**, reflective of the impacts of present operations, which are modelled as *averages* of measurements taken from continuous emission monitoring (where available) or periodic emission monitoring. This scenario is the represented by the first column in the presentation of all AIR graphs (shown in blue in Figure 4). Baseline emissions were derived from accredited (ISO/IEC17025) third parties and laboratories. Emissions measurements follow the requirements prescribed in Schedule A of GN 893. The reason baseline emissions were modelled as averages of measured point source emissions was to

obtain a picture of long-term average impacts of Synfuels'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.

The following three scenarios are modelled to reflect the administrative basis of the MES, being ceiling emission levels. These scenarios are therefore theoretical cases where the point source is constantly emitting at the highest expected emission level possible under normal operating conditions, for the given scenario (i.e. the maximum emission concentration).

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 the represented by the second column in the presentation of all AIR graphs (shown in red in Figure 4 for example, this considers the renewal of electrostatic precipitator (ESPs) and the implementation of some technology to achieve compliance with existing plant standards for PM emissions from the SCC.
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 the represented by the third column in the presentation of all AIR graphs (shown in green in Figure 4). For example, this considers the implementation of bagfilters at the Steam plant's boilers, which would result in lowered flue gas temperatures from the boilers with a resulting detrimental effect on the co-dispersion of other pollutants including PM.
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). This scenario is the represented by the fourth column in the presentation of all AIR graphs (shown in purple in Figure 4). It is re-emphasised that Sasol Synfuels will not physically increase its current baseline emissions (expressed as an average). In some instances the scenario appears higher than the baseline, only because it portrays the worst case outcome where the maximum emission concentration occurs under the 99^{th} percentile worst meteorological conditions – and this is modelled assuming these conditions prevail for the entire duration of the modelling period. Sasol seeks alternative emissions limits which are aligned with the manner in which the MES are stated and which accommodate the natural variability inherent in emissions under different operating conditions, and hence must request a ceiling emissions limit rather than an average emissions limit. Hence t alternative emission limit is simply a different way of expressing current baseline emissions (in cases where further abatement is not possible), or may even reflect a reduction in average baseline emissions (in cases where further abatement is possible, but not to a level which achieves compliance with the MES ceiling emissions limits). After the (single or multiple) postponement period(s) is concluded, the point sources would conform to the new plant standards.

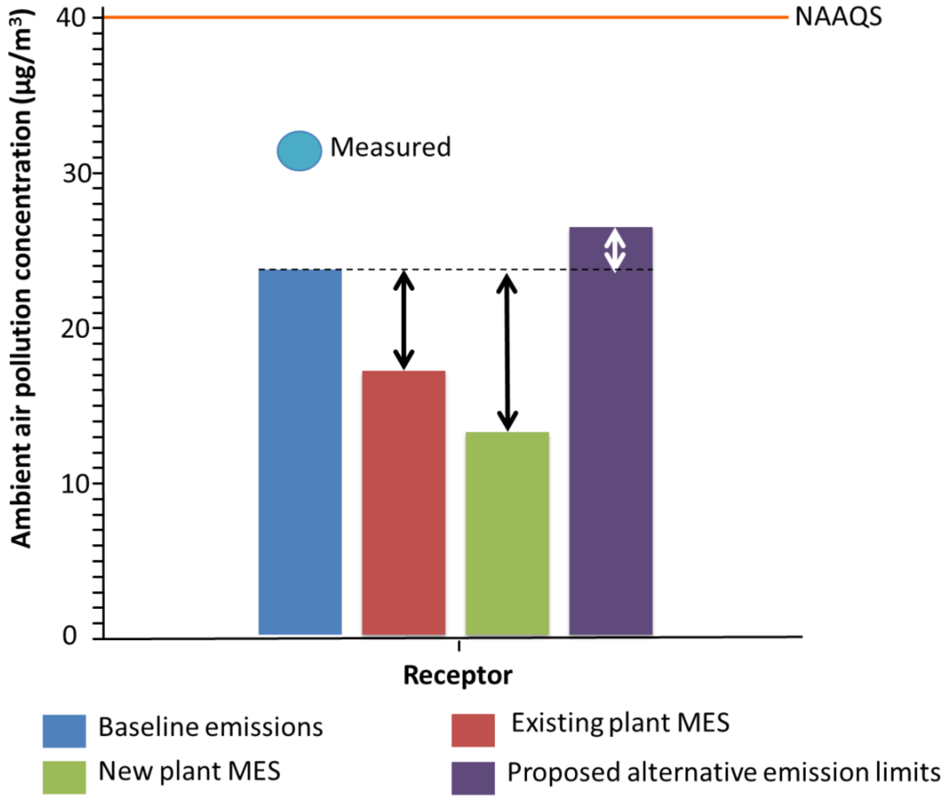

Figure 4: Schematic displaying how the dispersion modelling scenarios are presented in the AIR, for each receptor point in the modelling domain

In Figure 4, the black arrows above the red and green bars reflect the predicted delta (i.e. change) in ambient impacts of Sasol's baseline emissions versus the given compliance scenario. At a practical level, the white arrow on the purple bar represents the theoretical delta increase in short-term ambient impacts, where maximum emission concentrations occur, compared with the predicted impact of average current baseline emissions.

The blue dot in Figure 4 represents physically measured ambient air quality, reflective of the total impact of all sources in the vicinity, as the 99th percentile recorded value over the total modelling period. On a given day, there is a 99% chance that the actual measured ambient air quality would be lower than this value, but this value is reflected for the purpose of aligning with modelling requirements.

The orange line represents the applicable NAAQS or, where not available, relevant international benchmark, used for interpretation of the dispersion modelling results, as described in Section 6.2.5.

6.2.5 National Ambient Air Quality Standards

Once ambient concentrations have been predicted using the dispersion model, or direct physical measurements sourced, 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 level of health risk and the assessment has accordingly been based on a comparison between the predicted concentrations and the NAAQS. The measured concentrations have been used to ascertain the representativeness of the modelling and to assess compliance with the NAAQS as a function of all sources of emissions.

For non-criteria pollutants where NAAQS have not been set health-effect screening levels that could be used for assessing the non-criteria pollutants emitted by Sasol have been identified from literature reviews and internationally recognised databases. These non-criteria pollutants for which screening levels were identified, include H_2S, SO_3 and various emissions from incinerators, namely lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel and vanadium. The benchmarks used are listed in Table 7.

Table 7: Most stringent health-effect screening level identified for all non-criteria pollutants assessed

Compound	Acute exposure[(a)] [units: µg/m³]	Chronic exposure[(b)] [units: µg/m³]
Lead (Pb)	(c)	(d)
Arsenic (As)	0.2 (g)	0.015 (g)
Antimony (Sb)	(c)	(d)
Chromium (Cr)	(c)	0.1 (e)
Cobalt (Co)	(c)	0.1 (f)
Copper (Cu)	100 (g)	(d)
Manganese (Mn)	(c)	0.05 (e)
Nickel (Ni)	0.2 (g)	0.014 (g)
Vanadium (V)	0.8 (f)	0.1 (f)
Hydrogen sulfide (H_2S)	135 (h)	(d)
Sulfur trioxide (SO_3)	22.5 (f)	(d)

(a) Hourly concentrations compared with short-term / acute exposure health effect screening level
(b) Annual concentrations compared with long-term / chronic exposure health effect screening level
(c) No hourly health screening level
(d) No annual health screening level
(e) US-EPA IRIS Inhalation Reference Concentrations (µg/m³) – chronic
(f) US ATSDR Maximum Risk Levels (MRLs) (µg/m³) - acute
(g) Californian OEHHA (µg/m³) – acute
(h) Haahtele *et al*., 1992 – acute (4-hour average)

6.2.6 Sensitive receptors

Fifteen sensitive receptors were defined in and around the Secunda complex and at various distances from the sources within the 50 km-by-50 km modelling domain. The fifteen receptors include residential areas, ambient air quality monitoring stations and points of maximum predicted pollutant concentrations, and are illustrated in Figure 5. The predicted ambient concentrations for each of the four emissions scenarios have been presented as bar charts relative to the NAAQS (where these exist) and to measured ambient concentrations (also where these exist) for each sensitive receptor. The sensitive receptors are listed in Table 8.

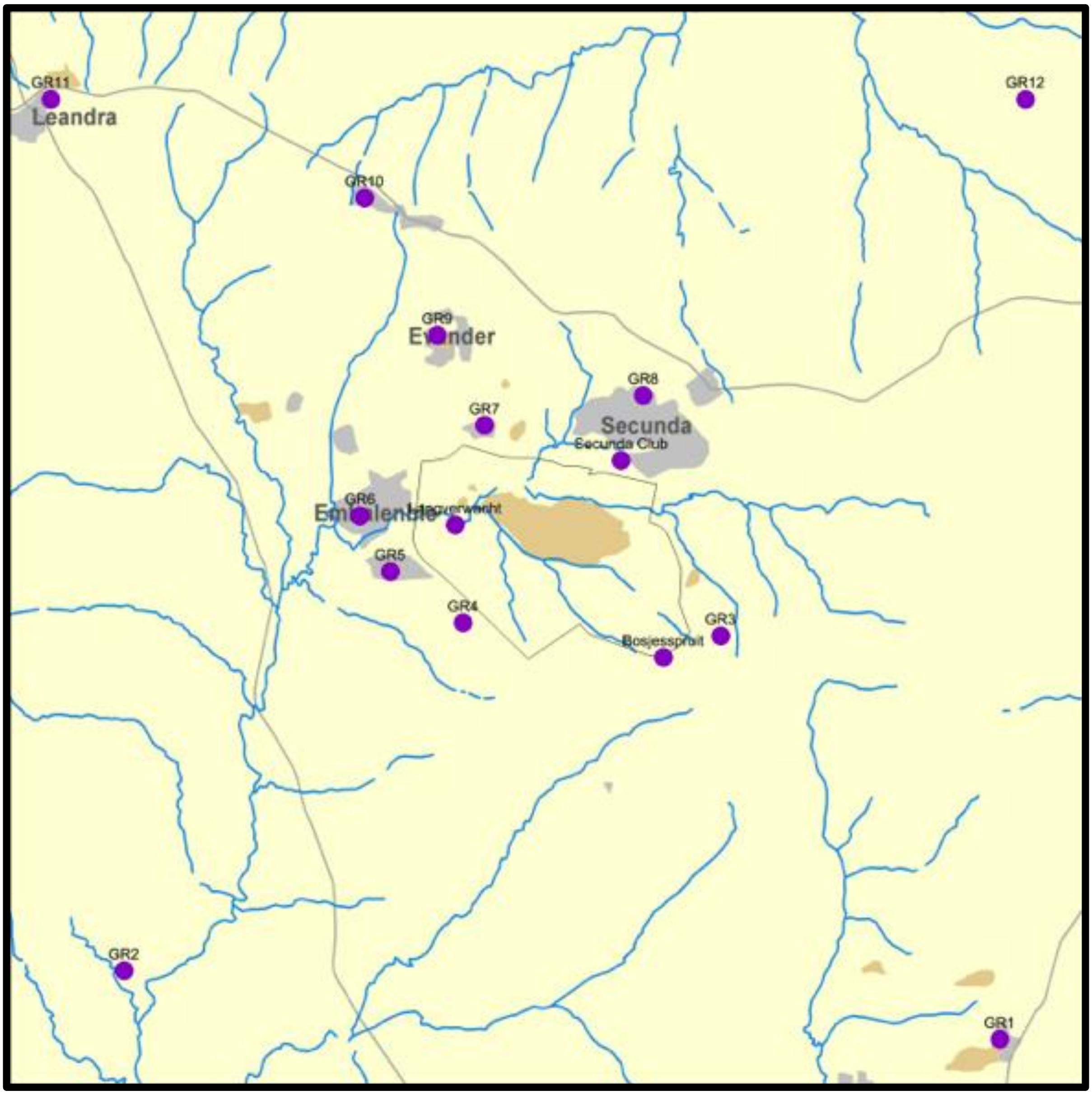

Figure 5: Map showing the positions of the fifteen sensitive receptors identified for presenting the predicted ambient air quality for the different pollutants referenced in this application and for each emissions scenario

Table 8: Summary listing of the sensitive receptors illustrated in Figure 5

Receptor code name	Receptor details	Distance from source (metres)
Langverwacht	SASOL Langverwacht monitoring station	4 718
Secunda Club	SASOL Secunda Club monitoring station	4 971
GR4	Edge of plume (ash disposal facility)	5 648
GR7	Winkelhaak Mines	6 394
Bosjessspruit	SASOL Bosjesspruit monitoring station	7 324
GR5	Embalenhle – point of maximum predicted concentrations	7 775
GR8	Northern boundary of Secunda (residential area)	8 042
GR3	Point of maximum near Bosjesspruit	8 851
GR6	Embalenhle (residential area)	9 158
GR9	Evander (residential area)	11 131
GR10	Kinross (residential area)	18 376
GR2	SW (Edge of domain)	28 262
GR12	NE (Edge of domain)	30 158
GR1	SE (Edge of domain)	31 043
GR11	NW (Edge of domain); Leandra (residential area)	31 289

6.2.7 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.

The emphasis in this assessment has been on the 'delta', being the difference in predicted ambient concentrations under the four emissions scenarios modelled. The model uncertainty is therefore a constant factor among the scenarios, and the delta can be considered, with a reasonable degree of confidence, as representative of the differences in ambient concentrations that would materialise under different emissions scenarios. The intention behind the atmospheric impact modelling for this motivation has therefore been to show the contribution of each source applying for exemption or postponement to ground level concentrations of applicable criteria pollutants in the vicinity of the Sasol facility. The delta approach is strongly consistent the risk based approach that underpins Sasol environmental management philosophy. The modelled contribution of the baseline scenario is compared with the modelled contributions of the scenarios depicting compliance with existing and new plant standards, to determine the difference that compliance with the MES will make to ambient concentrations of these pollutants in relation to the NAAQS. Since the aim of the dispersion modelling was to illustrate the change in ground level concentrations from the current levels (the baseline emission scenario) to those levels resulting from compliance with the prescribed emission limits (the existing and new plant standards), the intention was not comprehensively to include all air emissions from the Sasol Secunda complex or those associated with activities other than Sasol. Unaccounted emissions include those from unintended emissions within the plant (fugitive emissions) and small vents, as well as air emissions from other industries, emissions from activities occurring within the communities and domestic fuel burning (especially during the winter season), as well as long-range transport of pollutants into the local air shed.

Since model inputs are only estimates, even the most sophisticated models will have inherent uncertainties and will have the potential to underestimate or overestimate actual concentrations. Model performance was assessed by using the fractional bias method, as recommended by the US Environmental Protection Agency, which concluded that model predictions lay well within a factor of two when compared with the measured data, and hence was considered reasonably representative. Further detail on this analysis is included in the AIR.

6.2.8 Compliance with AIR Regulations

As far as practically possible and as summarised in Appendix B-1 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). Due to the nature of this application process, the procedure prescribed by these regulations was adapted to reflect the purpose of the assessment, through evaluation of different compliance scenarios, as described above, and thus represents a "fit for purpose" assessment. This notwithstanding, as also explained in the preface to the AIR, further detail on our point sources which do not form part of the postponements have been incorporated into the AIR in light of stakeholder comments received. This information does not alter the conclusions arising from the initial air quality assessment.

A. Baseline Modelling

The dispersion modelling was conducted using baseline emissions representative of normal operating conditions for affected point sources. The MES regulates normal operating conditions; therefore only normal operating conditions were included in the assessment. Maximum emissions and emissions during start-up, shut-down, maintenance or upset conditions are in many cases not available as measurements are not conducted during these upset conditions. Due to safety concerns and practical considerations, emissions are measured during operations representative of normal operating conditions during planned, scheduled measurement campaigns.

B. Fugitive Emissions

Sasol manages fugitive emissions from its facilities, which includes fugitive volatile organic compounds (VOCs) and fallout dust. These fugitive emissions are managed in accordance with a leak detection and repair (LDAR) programme in the case of VOCs which has been in implementation since 2006, and dust fallout management, as described further in the AIR.

C. VOC Emissions

VOC dispersion modelling of low-elevation sources was not conducted, since many of the VOC sources included in this application are fugitive sources that will be addressed along with the point sources. These sources cannot be quantified sufficiently for dispersion modelling as the VOC emissions vary significantly with changes in temperature and operating conditions, making dispersion modelling impractical in assessing the impact of these sources on cumulative ambient VOC concentrations.

On site, VOC emissions are managed in accordance with the requirements of the Occupational Health and Safety Act. Ambient concentrations of VOCs are recorded by the monitoring stations. The monitored VOCs would therefore reflect the ambient impact of all of Sasol's sources, including compliant point sources and fugitive sources, along with VOCs from any third party sources. The measurements therefore provide a comprehensive view of ambient VOC levels, and the assumption that these are all Sasol's impacts, can therefore be considered as the most conservative means in assessing the ambient VOC impact from the facility.

Sasol Synfuels operates two monitoring stations close to the factory boundary which can be used to assess the VOC impact from the facility – the Sasol Club Monitoring Station close to the town of

Secunda and the Langverwacht station close to the eMbalenhle town. The NAAQS for benzene is 10 µg/m^3 (3.2 parts per billion) until 31 December 2014, whereafter it is reduced to 5 µg/m^3 (1.6 ppb). The 2015 NAAQS of 1.6 ppb was used to assess the monitored benzene values.

Dispersion modelling for VOC emissions from the main stacks (a high-elevation source) has been conducted.

6.3 Key findings

In presenting these findings it is necessary to briefly describe the use of the 99^{th} percentile to show predicted and measured ambient air pollution concentrations. As a simulation (and simplification) of reality, dispersion models will always contain some degree of error. Model validation studies elsewhere have indicated that typically the highest predicted concentrations are overestimated as a result of the way that meteorological processes are parameterised in the model.

At the same time the NAAQS include both a limit value and the requirement that the limit value be met for at least 99% of the time. For hourly average values (such as the ambient SO_2 and NO_2 standards) that implies that up to the highest 88 hourly average values can be discarded and for daily averages (such as the ambient PM_{10} standard) up to 4 days can be discarded. For annual averages the limit value is the standard with no exceedances being allowed. All the predicted and measured values shown in this report are based accordingly on the 99^{th} percentile values except for annual averages.

6.3.1 Particulate Matter

The PM sources included in the AIR cumulatively account for more than 98% of the Secunda complex's total point source PM emissions.

As described in further detail in Section 5.1.4.4 of the AIR, the CALPUFF modelling suite enabled inclusion of the impact of the chemical conversion of sulfur dioxide and nitrogen oxides to secondary particulates within the dispersion model results. Thus, the predicted PM_{10} concentrations reflected in the AIR dispersion modelling results include direct emissions of PM_{10} plus secondary particulates formed from Sasol's emissions. Predicted daily average PM_{10} concentrations resulting from PM emissions from all modelled PM sources at Sasol are shown in Figure 6. It can be seen from the figure that the PM emissions result in predicted concentrations that are well less than the NAAQS (<10%), and significantly less than the measured ambient concentrations at each of the monitoring stations. The modelled predictions imply that full compliance with even the new plant standards at the steam plants will result in only a small reduction in ambient PM_{10} concentrations. Not unexpectedly the alternative emission limits result in the highest predicted ambient PM_{10} concentrations. It must be remembered that the alternative limits are expressed as ceiling limits or maximum emission concentrations, and so the emissions scenario was run as if those emissions will be maintained at all times, which they will not.

At the same time, measured PM_{10} concentrations are seen not to comply with the NAAQS, with frequent exceedances recorded. The measured concentrations obviously reflect all the sources in the airshed and these sources would include other industries, community sources such as domestic fuel burning (especially during the winter season) and veld fires. Given the negligible change in ambient PM_{10} concentrations predicted for full compliance with the MES, MES compliance by Sasol Synfuels at the steam plants and the SCC plant would be immaterial to compliance with the PM_{10} NAAQS, given the significant and largely uncontrolled contributions from other sources.

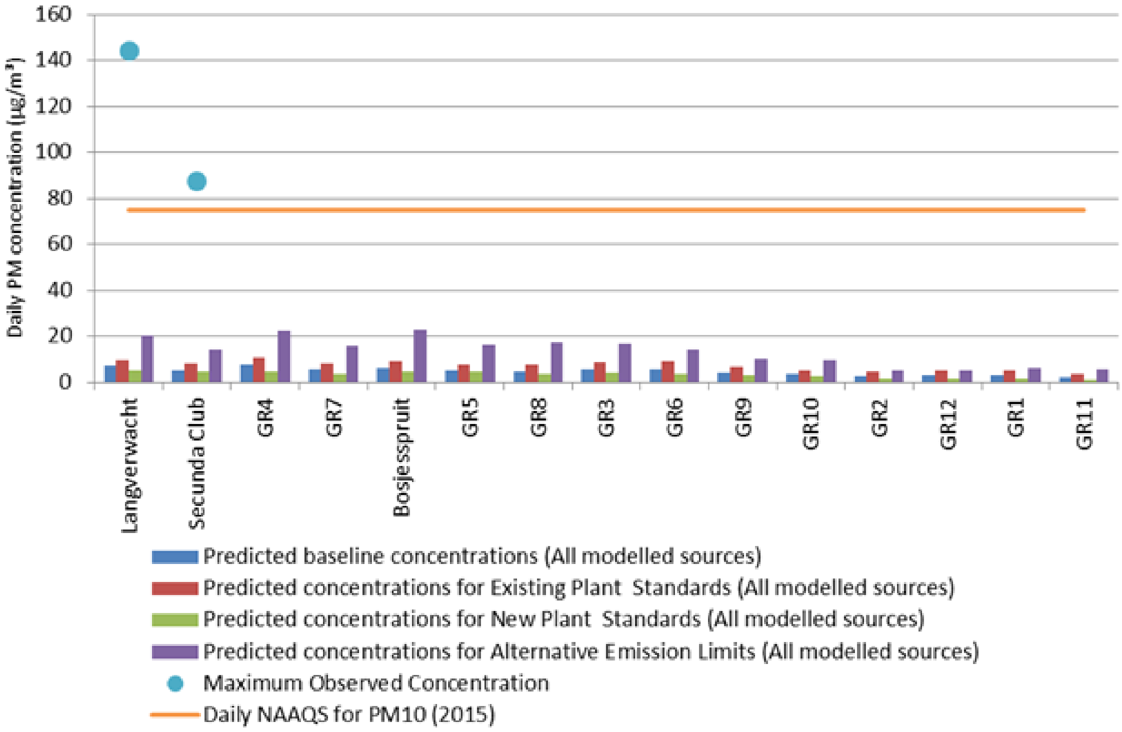

Figure 6: Measured and predicted daily average ambient concentrations of PM_{10} for combined sources at the fifteen sensitive receptors, for each of the four emissions scenarios modelled

6.3.2 Sulfur dioxide

The SO_2 sources included in the AIR cumulatively account for more than 99% of the Secunda complex's total SO_2 emissions.

This includes all SO_2 emissions from the main stacks, which are assumed to originate from the steam plants, but would include any H_2S emissions which potentially converts to SO_2 in the stack, since these listed activity processes co-disperse their emissions from the main stacks. As such, SO_2 emissions from the sulfur recovery process, while not quantifiable at this stage (due to unforeseen regulatory changes in the 2013 MES), if they occur, are already accounted for in the dispersion model.

Predicted ambient hourly average SO_2 concentrations resulting from emissions from the Sasol plant are shown in Figure 7. It can be seen from the figure that the highest predicted ambient concentrations are predicted to occur under the existing plant MES emissions, with progressively lower concentrations for the alternative emissions limits, baseline emissions and then the new plant MES, respectively. The predicted ambient concentrations from the baseline (namely current emissions) are less than what they would be under the existing plant standards scenario, because the Sasol Synfuels boilers already emit at concentrations below the standard. This highlights how critically important it is to differentiate between load and concentration where it is the former that determines the ambient concentrations, but the MES is expressed as the latter.

Reductions of Sasol's total impacts on ambient SO_2 concentrations (for hourly concentrations, at the 99^{th} percentile) of up to 75 µg/Nm^3 are predicted between the baseline and the new plant MES at

Bosjesspruit and GR3, which represents ~20% of the NAAQS. Even the highest predicted ambient concentrations under the worst-case alternative emissions limit scenario are seen to be no more than 49% of the NAAQS[1].

Measured ambient SO_2 concentrations are seen to comply with the SO_2 NAAQS. At the same time it can be seen that Sasol is a significant contributor to the measured ambient concentrations but this is expected given that the monitoring stations (Langverwacht, Secunda Club and Bosjesspruit) were specifically located to record the Sasol specific contributions to ambient air quality. Thus even with a relatively high contribution of SO_2 from the Secunda complex to ambient concentrations, there is still absolute compliance with the NAAQS. The difference between the measured and the predicted concentrations can be attributed to sources other than Sasol. These sources were not directly modelled but are considered to be "background" concentrations with a key source likely being power generation. The reality of what will transpire should the authorities grant the alternative emissions limits, is ambient concentrations that fall within the range between the predicted concentrations under baseline emissions and those predicted under the alternative emissions limits, which will be well less than the SO_2 NAAQS.

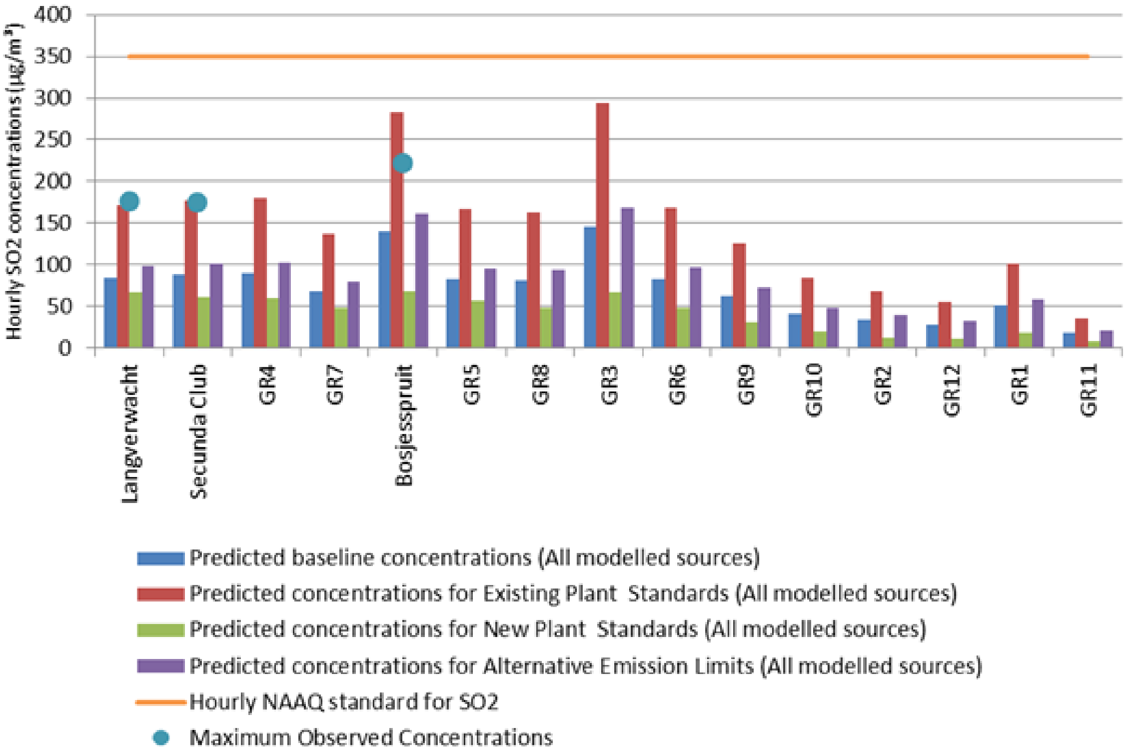

Figure 7: Measured and predicted hourly average ambient concentrations of SO_2 for combined sources at the fifteen sensitive receptors, for each of the four emissions scenarios modelled

[1] This excludes the scenario for compliance with the existing plant standards since these become redundant in the light of the lower emissions that occur already.

6.3.3 Total volatile organic compounds

As explained above, VOC emissions from low-elevation point sources in the Sasol Secunda complex such as storage tanks, loading stations and others are best reflected through direct fence line benzene measurements (as a proxy for VOCs) from the monitoring stations surrounding the Sasol Secunda complex. These measurements reflect the total, combined effect of VOC emissions from across the entire Sasol Secunda operation, and conservatively assume all ambient VOCs are attributable to the Sasol Secunda complex. On site, VOC emissions are assessed by a comprehensive occupational hygiene monitoring system aligned with the requirements of the Occupational Health and Safety Act (Act No. 85 of 1993). Fugitive emissions are managed by a fugitive emissions management plan, in the form of a LDAR programme.

Sasol Synfuels operates two monitoring stations close to the factory boundary, which have been used to assess the VOC impact from the facility – the Sasol Club Monitoring Station close to the town of Secunda and the Langverwacht station close to the eMbalenhle town. Measured benzene concentrations at the two monitoring stations are shown in Figure 8 where it can be seen that the measured concentrations are well below the NAAQS for benzene (5 µg/m^3 or 1.6 ppb).

The NAAQS for benzene is 10 µg/m^3 until 31 December 2014, where after it is reduced to 5 µg/m^3. The 2015 NAAQS of 5 µg/m^3 was used to assess the monitored benzene values. The blue dots in Figure 8 illustrate the observed ambient benzene concentrations, which lie within 30% of the 2015 NAAQS.

The dispersion modelling scenarios for VOC emissions from the Rectisol plant that are depicted in Figure 8 are referred to in the Sasol Synfuels motivation report for additional postponements, and hence are not discussed further here.

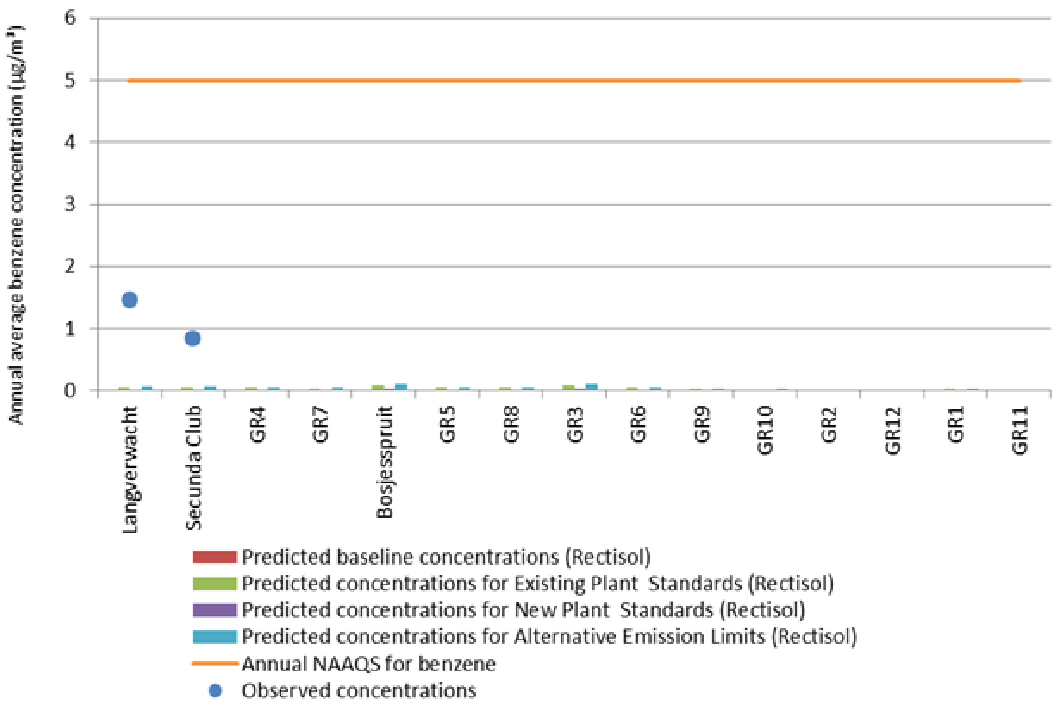

Figure 8: Observed annual average benzene concentrations at Langverwacht and Secunda Club (µg/m^3) compared with NAAQS

6.3.4 Incinerator emissions

A detailed assessment has been conducted on the larger high organic waste (HOW) and Biosludge incinerators as part of the additional postponement applications. As part of the assessment it was shown that emissions of the criteria pollutants SO_2, PM_{10} and $NO_{x,}$ arising from those larger incinerators contributes negligibly to the combined emissions from Sasol. Predicted ambient pollutant concentrations deriving from combined emissions from the HOW and Biosludge incinerators are shown in Table 9 relative to the strictest health screening effect levels (listed in Table 7). It can be seen from Table 9 that the maximum predicted concentrations are significantly lower than the health screening limits with the highest relative ambient concentration for baseline emissions being Mn at some 4.2% of the screening level, and at most 50% of the screening level for the Mn alternative emissions limit (or maximum emission concentration) scenario. The remaining predicted concentrations are at least an order of magnitude below the commensurate health screening level.

The sewage solids incinerator is significantly smaller than these two incinerators, and has only recently been included as a listed activity due to the reduction in threshold listed activity size to 10 kg/day in the November 2013 amendments. As such it can be stated with a reasonable degree of confidence that the impact of emissions from the sewage solids incinerator on ambient pollutant concentrations would be negligible at most.

Table 9: Summary listing of the maximum predicted concentrations of selected non-criteria pollutants compared to the strictest health effect screening levels (see Table 7). The predicted concentrations derive from combined emissions from the HOW and Biosludge incinerators

Compound	Maximum concentration[(a)]	Screening level
Baseline operations		
Mn	0.0021	0.05 [(b)]
NH_3	0.0031	1184 [(c)]
HCl	0.0276	2100 [(c)]
HF	0.0205	240 [(c)]
Existing and new plant standards		
Mn	0.0002	0.05 [(b)]
NH_3	0.1353	1184 [(c)]
HCl	0.1353	2100 [(c)]
HF	0.0137	240 [(c)]
Alternative emissions limit scenario		
Mn	0.0251	0.05 [(b)]
NH_3	9.0631	1184 [(c)]
HCl	5.3992	2100 [(c)]
HF	5.3992	240 [(c)]
(a) Maximum predicted concentration across the 12 receptors (b) Chronic exposure level (c) Acute exposure level		

6.4 Overall findings of the AIR

6.4.1 Compliance with the NAAQS

The purpose of the MES is to achieve the intent of the NEM:AQA which means ensuring that ambient air quality is achieved that does not threaten the health or well-being of people and the environment. To all intents and purposes that means ambient air quality that complies with the NAAQS. Thus in assessing the request for postponements from compliance timeframes for the certain of the listed activities associated with the Sasol complex in Secunda, the effect of granting such a request has to be assessed in terms of the implication for ambient air quality.

Regarding compliance with NAAQS, measured ambient air quality from the three Sasol monitoring stations is seen to comply with the NAAQS and other health risk screening limits, the exception being for PM_{10}. The compliance in respect of the NAAQS suggests that current emissions from Sasol and other emitters in the airshed are broadly acceptable in regulatory terms. In respect of PM_{10} it is known that there are multiple sources of PM including other industries, vegetation burning, dust, discard coal combustion and domestic fuel use.

Given the high background loading of PM_{10}, Sasol maintains control of PM emissions from the Secunda complex. Modelling of PM emissions from the Secunda complex reveals low resultant concentrations of ambient PM_{10}, even when the chemical transformation of SO_2 and NO_x into particulates is considered. Predicted ambient PM_{10} concentrations are seen to be less than 10% of the NAAQS and an even smaller fraction of the measured concentrations. This implies that reducing PM_{10} emissions from Sasol Synfuels activities will not reduce ambient concentrations of PM_{10} significantly, and will not result in compliance with the NAAQS given other dominant sources of PM.

In respect of the other emissions for which Sasol is applying for postponement on behalf of its affected entities, direct physical measurements of benzene (as a proxy for VOCs) reveal full compliance with the NAAQS and concentrations that are well below the NAAQS limit value.

Incinerator emissions generally have small loads regardless of the point source emission concentrations. A parallel assessment of the HOW and Biosludge incinerators, which are larger activities than the sewage solids incinerator, indicate very low resultant ambient concentrations of the pollutants in question. On the back of those findings it is concluded here that the contribution of the sewage solids incinerator to ambient concentrations would be negligible at most.

Thus at the level of principle, reducing emissions of these pollutants will serve to further reduce ambient concentrations that already comply with the NAAQS. The same holds true for the non-criteria pollutants where health risk screening limits are not exceeded by measured pollutant concentrations.

6.4.2 The effect of the alternative emissions limits

The alternative emissions limits proposed by Sasol to apply during the period of postponement, are in some instances significantly higher than the MES. It has to be remembered that the administrative basis of the MES is to comply under all operational circumstances, with emissions exceeding the MES only being tolerated for shut down, start up and upset conditions. That administrative requirement means that Sasol 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 full compliance with the NAAQS is predicted in all circumstances. In the case of the non-criteria pollutant emissions, resultant ambient concentrations are a fraction of the respective limits.

6.4.3 Health effects

The AIR Regulations prescribe an assessment of the health effects of the emissions for which relief is sought from the MES based on the degree to which there is compliance with the NAAQS. It cannot be argued that compliance with the NAAQS means no health risk. Indeed the World Health Organisation indicates that there is no safe limit in respect of exposure to PM. The NAAQS prescribe, however, a permissible or tolerable level of health risk. The overall findings of the AIR are that the alternative emissions limits and alternative emissions controls requested by the affected Sasol entities to apply during the period of postponement will result in permissible health risks.

6.4.4 Ecological effects

An assessment of air pollution impacts on soil, water and receptors other than human was not formally included in the AIR. Nonetheless, the AIR includes a brief literature review of available studies on deposition of atmospheric sulfur and nitrogen on South African ecosystems.

Sasol has furthermore conducted its own literature study of the ecological impacts of atmospheric emissions in the Mpumalanga Highveld airshed, which is hereunder summarised.

Anthropogenic emissions of sulfur and nitrogen are a relatively new phenomenon in South Africa which became prominent once large scale coal fired power plants were introduced during the 1960s. Sasol estimates that it contributes about 15% of the total sulfur and nitrogen emissions into the Mpumalanga Highveld air shed. It is, however, currently not considered possible to isolate any single point source contribution from the deposition impacts from the other sources, either anthropogenic or natural. Due to this contribution to the total sulfur and nitrogen emission load in the Mpumalanga Highveld, Sasol has for many years actively supported research efforts to quantify the ecological impact of these atmospheric pollutants in South Africa where there are large differences between the European situation where most of this type of research has taken place.

The research work to date has focused on: (1) better understanding the transport and fate of atmospheric pollutants in order to determine the spatial deposition rates; and (2) measuring directly deposition impacts to water, soil and ecosystems. The critical load mapping approach developed for the European situation has been extensively used as a proxy for assessing risk. Recent critical load mapping has identified some areas in the inland region of South Africa where critical threshold limits have been exceeded although for the majority of the sites pollutant concentrations have been found to be well below the critical thresholds considered necessary for environmental damage to occur.

While sulfur emissions are the dominant acidification inputs, nitrogen emissions are responsible for the formation of low level ozone through the reaction between NO_x and VOC – both from human and natural sources – in the presence of sunlight. Ozone is known to cause damage to vegetation and be harmful to materials. Despite the ozone concentrations in South Africa being above the European critical levels for crop damages, no vegetation damages have to date been reported. Reasons suggested for this are varied including the view that impacts have either not been identified due to a lack of local research attention on this topic; or vegetation, as in some known species to have adapted to the high ozone levels.

The observed evidence to date is that there have been no widespread ecological impacts which can directly be attributed to atmospheric deposition. The majority of soils in the inland region of South Africa have a sufficiently large capacity to buffer the additional acidifying inputs but less so the additional sulfate making salt build and flux a more important criterion. The salt loads need to be assessed against the other water quality drivers of the catchment. According to the work reviewed there have at most been some limited changes to soil and water quality which can be linked to atmospheric deposition of sulfate and nitrate species.

While the evidence tends to suggest that the South African situation is not at a tipping point the understanding of the linkage between atmospheric emission concentrations and ecological impacts remains an important area of research. Sasol continues to actively support joint research on this issue. In addition to continued assessments of atmospheric dry and wet deposition of sulfur and nitrogen species, further studies on the effects of ozone, a secondary pollutant, on local forests and agriculture in South Africa are thought to be necessary to better quantify ozone impacts on ecosystems. The current knowledge base needs to be expanded to permit reliable quantification of air pollution impacts on people, crops and natural systems and to enable accurate assessment of industrial activity impacts in order for a rational basis for cost effective strategies on reducing air pollutants to be implemented.

7. Sasol's roadmap to sustainable air quality improvement

Sasol follows a Group-wide risk-based approach to identifying and managing its priority environmental risks. Sasol's environmental policies, targets, standards and guidelines are all then driven as a function of the identified risks in a systematic focus on continuous environmental improvement.

This Chapter outlines the holistic approach to sustainable air quality improvement, while the specifics of how and when compliance will be attained for the sources described in this postponement application, is summarised in Figure 9.

7.1 Commitment to continued implementation of Sasol's risk-based approach

Sasol prioritises emission reductions as a function of addressing risk and identifies emissions abatement opportunities which will realise the greatest improvements in onsite or ambient air quality. Often these interventions are win-win outcomes, with other benefits such as improving production efficiencies, reducing waste and demand for raw materials and generating new products from streams that would otherwise have been wastes.

Over the past decade, Sasol has spent in excess of R20 billion, or R2 billion per year, on various environmental improvements, as detailed in this report. This expenditure excludes very significant investments in the Department of Energy's Clean Fuels 1 programme (and imminent Clean Fuels 2 programme), which has resulted in, and will further result in reduced motor vehicle emissions. Reduced motor vehicle emissions have obvious benefits for ambient air quality in especially those areas with high traffic density. The environmental improvement projects were driven by Sasol's business objectives of delivering sustainable returns to shareholders in a socially and environmentally responsible manner.

As an example of its ongoing air emissions improvements, Sasol continues to work towards its internal target of reducing VOC emissions by 80% by 2020, off a 2009 baseline, which is not driven by legal requirements.

7.2 Upholding Highveld Priority Area Plan commitments

Sasol Synfuels 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, as outlined in Table 10. Sasol Synfuels has made major efforts and will continue with those efforts to improve the Wet Sulfuric Acid plant's performance.

Table 10: Sasol Synfuels commitments to the Highveld Priority Area Air Quality Management Plan

Emission component & source	Commitment made	Status
Fugitive VOCs arising from tar processes and product storage.	Implementation of a leak detection and repair programme to reduce fugitive emissions.	Completed
VOC emissions from fuel loading facilities.	Installation of vapour recovery unit at fuel loading facility.	Completed
Reduction of VOC emissions being vented from forced feed evaporator.	Short term unit de-bottlenecking, bypass of the forced feed evaporator at Coal Tar Filtration.	Completed
VOC emissions from various tanks.	Installation of Evapostops on various tanks on the Synfuels site.	Pilot studies to assess technology effectiveness underway.
Hydrogen sulfide emissions from the complex.	Wet Sulfuric Acid plant.	Installed, but experiencing operational challenges.
PM from boilers exceeding normal operating parameters due to air ingress from damaged air heater (boiler 9).	Reduction of PM from boilers (through air heater replacement and general overhaul of Boiler 9).	Completed
Reduction of particulate matter from boilers.	Ammonia pressure and quality control project to reduce particulate matter.	Completed

7.3 Commitment to compliance with reasonable and achievable standards which achieve sustainable ambient air quality improvements

Sasol is committed to comply with all applicable environmental laws, including air quality laws such as the MES.

Sasol's roadmap for compliance with air quality law involves a multi-faceted approach, aligned with a risk-based philosophy:

7.3.1 Compliance with point source standards along achievable timelines

For some point sources, through Sasol's proactive environmental improvement approach, Sasol will comply with the point source standards within the prescribed timeframes for existing plant standards and new plant standards.

For certain other point sources, as detailed in this motivation report, Sasol's technology investigations have identified that compliance is achievable within the short to medium term, but the implementation of compliance solutions has a schedule that extends beyond the compliance timeframes. In these cases, Sasol has applied for these initial postponements. With the passage of time, all these point sources will attain full compliance with the MES, as summarised in Table 5.

7.3.2 Approach to compliance in respect of additional postponement applications

Sasol had previously applied for exemption from default application of the MES in cases where compliance cannot feasibly be achieved with presently available technologies, and will not materially improve ambient air quality. However, Sasol has been directed to make an application for additional postponements, as described in a separate report. While Sasol's concerns with the MES remain, Sasol proposes three commitments to assure its stakeholders that sustainable environmental improvements will continue to be implemented and that, where reasonably feasible and achievable in the longer term, it will comply.

A. Commitment to compliance with alternative emissions limits

Sasol does not propose that for the duration of its additional postponement period its atmospheric emissions licences contain no emissions limits. Instead, for this period Sasol seeks alignment of the NEM:AQA's future emission limits prescribed in its atmospheric emission licences with alternative emissions limits (specified as maximum emission concentrations) that have been informed by integrated environmental management principles. Sasol Synfuels asserts that the alternative emission limits requested in this additional postponement application are the best that can feasibly be achieved on its facility, with presently available technology. Sasol furthermore intends that all the legal obligations associated with licence conditions, be attached to these alternative emissions limits, if incorporated in its licences. As described in the AIR, these alternative emissions limits will not cause exceedances of the NAAQS.

B. Commitment to periodic technology scans for sustainable compliance solutions

Despite not being able to comply using currently available technologies in the short to medium term, Sasol commits that, throughout the postponement period, it will conduct continued technology scans to investigate any future solutions that emerge which may enable it to comply over the longer term. Where promising new technologies are identified, Sasol commits to embarking on more detailed technical investigations, in accordance with Sasol's project governance framework. In this manner, it may be possible that in future, feasible solutions are identified, and that compliance is eventually achieved with the standards, albeit in the longer term. In order to ensure that the National Air Quality Officer (NAQO) is kept abreast of developments, Sasol proposes providing annual feedback to the NAQO as well as a comprehensive status report on its investigations and conclusions at the end of the postponement period.

C. Commitment to engage with the DEA to advance the regulatory implementation of alternative compliance mechanisms

Sasol is supportive of appropriate alternative compliance mechanisms to achieve the objectives of the Constitution, the NAQF and the NEM:AQA. Evident from the AIR prepared for this application, as well as other air quality assessments, is the significant air quality challenge on the Highveld arising from ground-level emissions of PM from domestic fuel use and the exposure of communities to the same.

Sasol believes that air quality offsets could provide significant air quality improvements with associated community health and socio-economic benefits, particularly in priority areas. Sasol will conclude a detailed assessment of the potential ambient air quality improvements that can be attained through a pilot offset study by the end of 2014. It is hoped that the pilot may demonstrate more holistically sustainable improvements in ambient air quality, and in particular, make a contribution towards the PM_{10} challenges in the HPA where Sasol's Secunda facility is located and in which respect there are exceedances of the NAAQS which are not, on the basis of the AIR, attributable to Sasol's activities. Sasol will grow its knowledge of how off-site projects might work from this pilot investigation. Offsets, if clearly defined in scope and properly supported by regulations providing appropriate incentives for investment, may provide a significant lever to improve ambient air quality. To this end, Sasol commits to engage with the Department to advance the regulatory implementation of offsets as an alternative compliance mechanism.

7.4 Summary of roadmap to sustainable air quality improvement

In summarising this chapter, Sasol follows a Group-wide risk-based approach to identifying and managing its priority environmental risks. Sasol's environmental policies, targets, standards and guidelines are all then driven as a function of the identified risks with a systematic focus on continuous environmental improvement.

Figure 9 presents a summary of the information contained within the Secunda motivation reports and associated technical appendices, demonstrating the Secunda roadmap to air quality improvement, described by emission source.

A short description is provided for the seven types of air quality improvement actions depicted in Figure 9, which Sasol has adopted in past years, and which Sasol will continue to act on. The labelling below corresponds to the labels included in the figure's legend. These actions include:

a) Proactive investments informed by a risk-based approach and aligned with voluntary internal targets. For example:
   - Investments on the VOC roadmap, to reduce emissions of VOCs by 80% by 2020, off a 2009 baseline

b) The implementation of commitments to the Highveld Priority Area air quality management plan. For example:
   - The construction of a wet sulfuric acid plant on Sasol Secunda's eastern factory

c) Implementation of solutions to reach compliance with existing or new plant standards, where feasible solutions for compliance have been identified, and where the initial postponement applications were made, to allow for the successful implementation of projects. For example:
   - The construction of 7 regenerative thermal oxidisers to treat VOC emissions from various point and fugitive emission sources
   - Renewal of steam plant electrostatic precipitators to reach existing plant PM standards under all normal operating conditions

d) Implementation of solutions driven by MES compliance, which are aligned with NEMA sustainable development principles and which result in point source emission improvements, but which are unlikely to reach the prescribed emission limits set by the MES. For example:
   - Solutions informed by the waste hierarchy either to avoid waste incineration or divert portions of waste streams from incinerators for beneficiation

e) Technical investigations driven by MES compliance. For example:
   - Investigations initiated recently due to November 2013 amendments to the MES, for Rectisol SO_2 emissions and the sewage solids incinerator

f) Implementation of measures which, while not materially reducing mean emission concentrations, serve to manage emission peaks by improving availability. This includes the renewal of the sulfur recovery plant, as part of the renewal roadmap for the Sasol Secunda facility

g) Compliance with other government policies which either directly or indirectly result in ambient air quality improvements. For example:

- The Department of Energy's Clean Fuels programme

h) Studies implemented to investigate the feasibility and potential for air quality offsets to deliver sustainable ambient air quality improvements. For example:

- Sasol's current air quality offset pilot study, investigating the feasibility of RDP house insulation to reduce winter domestic coal burning

Through these actions, Sasol will in most cases comply with the MES, as identified technical solutions are implemented. For a limited number of point sources, while sustainable emission reduction interventions have and will continue to be implemented along the lines summarised above and illustrated in Figure 9, feasible compliance with the new plant standards is not foreseen with presently available technologies. For these limited cases, Sasol's approach will be to responsibly manage its emissions while striving towards the desired environmental outcome of ambient air quality improvement, by upholding its commitments outlined in Section 7.3.2 (A)-(C).

	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	
											First postponement period						Second postponement period*										
Air quality improvement actions	**'05**	**'06**	**'07**	**'08**	**'09**	**'10**	**'11**	**'12**	**'13**	**'14**	**'15**	**'16**	**'17**	**'18**	**'19**	**'20**	**'21**	**'22**	**'23**	**'24**	**'25**	**'26**	**'27**	**'28**	**'29**	**'30**	**Ambient pollutant of focus**
Steam plant - MES sub-category 1.1																											
Ammonia dosing implemented to improve PM10 collection efficiency	a	a																									PM10
Grow power generation \on natural gas, to back out of coal-based electricity imports			a	a	a	a	a																				PM10, SO2, NOx (including additional benefit of greenhouse gases)
Upgrade boiler 9 to stabilise boiler performance							b	b	b																		PM10
Upgrade & replace ESPs											c	c	c	c	c	c	c	c	c								PM10
ESP optimisation study											d	d	d	d	d	d	d	d	d								PM10
Superflex ™ Catalytic Cracker - MES sub-category 2.2																											
SCC installed to comply with Department of Energy's Clean Fuels 1 programme		g																									Ambient lead
Replace existing PM abatement technology with new technology															c	c	c	c	c	c							PM10
VOC roadmap - internal target of 80% absolute reduction against 2009 baseline by 2020																											
Short-term unit debottlenecking project (STUD)	b																										VOCs
VOC reduction at U13/213 drains								a	a	a	a																VOCs
Leak detection and repair					b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	VOCs
VOC reduction at sampling points				a	a	a	a	a	a	a	a																VOCs
Storage tanks: tank farm & Solvents - MES sub-categories 2.4 and 6																											
Investigate Evapostop discs as a possible abatement technology						b	b	b	b	b																	VOCs
Install identified compliance technology (floating discs)											c	c	c	c	c	c	c	c	c	c							VOCs
Loading stations - MES sub-category 2.4																											
Install vapour recovery unit at rail loading station	b																										VOCs
Complete modifications to vapour recovery unit											c	c															VOCs
Phenosolvan - MES sub-category 3.6																											
Conclude saturation column test run; identify and implement preferred technology											c	c	c	c	c	c											VOCs
Tar value chain phase 1 - MES sub-category 3.3 & 3.6																											
Installation of 7 regenerative thermal oxidisers						c	c	c	c	c	c	c	c														VOCs
Tar value chain phase 2 - MES sub-category 3.6																											
Identify and implement preferred technology on tar tanks											c	c	c	c	c	c											VOCs
Sulphur recovery & Rectisol, and Wet sulphuric acid plant - MES sub-categories 3.6 & 7.2																											
Hydrogen sulphide reduction project	a																										H2S
Construction of a wet sulphuric acid plant on Eastern factory	b	b	b	b	b	b																					H2S, VOCs
WSA plant stabilisation project, to bring plant to design intent							b	b	b	b																	H2S, SO2, SO3, VOCs
Salt management to improve availability of Suphur recovery units										d	d	d	d														H2S
Sulphur recovery sludge management plan										d	d	d	d	d	d												H2S
Decanter renewal							b	b																			H2S
Renewal of sulphur recovery units											f	f	f	f													H2S
Rectisol drip tray replacement									d	d																	VOCs
Investigation to confirm Rectisol SO2 emissions and investigate compliance solutions											e	e	e	e	e	e											SO2
High Organic Waste incinerators - MES sub-category 8.1																											
PM stabilisation								d	d																		PM10
Diversion of Solvents stream from incinerator (10% of total waste volume)											d	d	d														All regulated incinerator emissions
Biosludge incinerators - MES sub-category 8.1																											
Composting pilot trial								e	e																		All regulated incinerator emissions
Complete EIA for composting study, which if successful, could result in diversion of a significant volume towards composting, reducing incinerator emissions										d	d	d															All regulated incinerator emissions
Sewage solids incinerator - MES sub-category 8.1																											
Establish compliance with MES, and investigate compliance solutions, if necessary											e	e	e	e	e	e											All regulated incinerator emissions
Off-site solutions for ambient air quality improvement																											
Sponsorship of study leading to development of Basa Magogo clean cooking method	a	a																									Ambient & indoor PM10, SO2, CO (and benefit of greenhouse gases)
Triple bottom line economic modelling of potential offset opportunities								a																			Ambient & indoor PM10, SO2, CO (and benefit of greenhouse gases)
Social, indoor and ambient baseline air quality study									a																		Ambient & indoor PM10, SO2, CO (and benefit of greenhouse gases)
Implementation of insulation in pilot study; post-implementation baseline measurement										a	a																Ambient & indoor PM10, SO2, CO (and benefit of greenhouse gases)
Possible implementation of offsets, subject to approval of regulations for offsets as an alternative compliance mechanism															←	—	—	—	—	—	—	—	—	—	—	→	Ambient & indoor PM10, SO2, CO (and benefit of greenhouse gases)

Legend

- (a) Action linked to voluntary emission reduction and / or internal targets (described under (a) of Section 7)
- (b) Action linked to Highveld Priority Area air quality management plan commitment (described under (b) of Section 7)
- (c) Action linked to MES compliance project, where existing and/or new plant standard will be achieved (described under (c) of Section 7)
- (d) Action linked to MES air quality footprint improvement, but unlikely to reach limits specified by MES (described under (d) of Section 7)
- (e) Technical investigation to explore environmental improvement options linked to MES point sources (described under (e) of Section 7)
- (f) Actions to sustain current emission levels, through availability improvements (described under (f) of Section 7)
- (g) Other non-DEA policy driver, leading to ambient air quality improvements (described under (g) of Section 7)
- (h) Investigations to off-site investments as means to contribute to NEM:AQA ambient air quality improvement objectives (described under (h) of Section 7)

* Compliance projects with project schedules exceeding April 2020 will require a further postponement of compliance timeframes, for which application will be made closer to 2020

Figure 9: Roadmap to sustainable air quality improvement for the Sasol Secunda complex

8. Stakeholder engagement

Sasol has structured its public participation process in support of postponement applications along the Environmental Impact Assessment (EIA) regulations published under the National Environmental Management Act (Act 107 of 1998) (NEMA), as specified in the November 2013 Minimum Emissions Standards (MES) regulations.

The stakeholder engagement process is an important component of the application process and is closely linked to the technical steps and activities required in the preparation of Motivation Reports (Figure 10).

The initial stakeholder engagement process comprised two rounds of engagement; public meetings that took place during the announcement phase and a second round of public meetings and focus group meetings that took place when the Draft Motivation Reports in support of postponement applications were made available for public comment.

Since the conclusion of the initial stakeholder engagement process in June 2014, the Minister of Environmental Affairs has formally notified Sasol that she will not consider its exemption applications, and has advised that postponement applications should be made instead. Sasol will therefore submit its previous exemption applications as additional postponement applications. While the additional applications contain materially the same content as the original exemption applications, a further opportunity will be provided to stakeholders to comment on these as additional postponement applications.

The final postponement applications that have not been affected by the Minister's notification were submitted to the National Air Quality Officer (NAQO) for decision-making in September 2014. Stakeholders were notified that their comments on final postponement applications could be submitted directly to the NAQO.

A copy of the Stakeholder Engagement Report is attached in Annexure C.

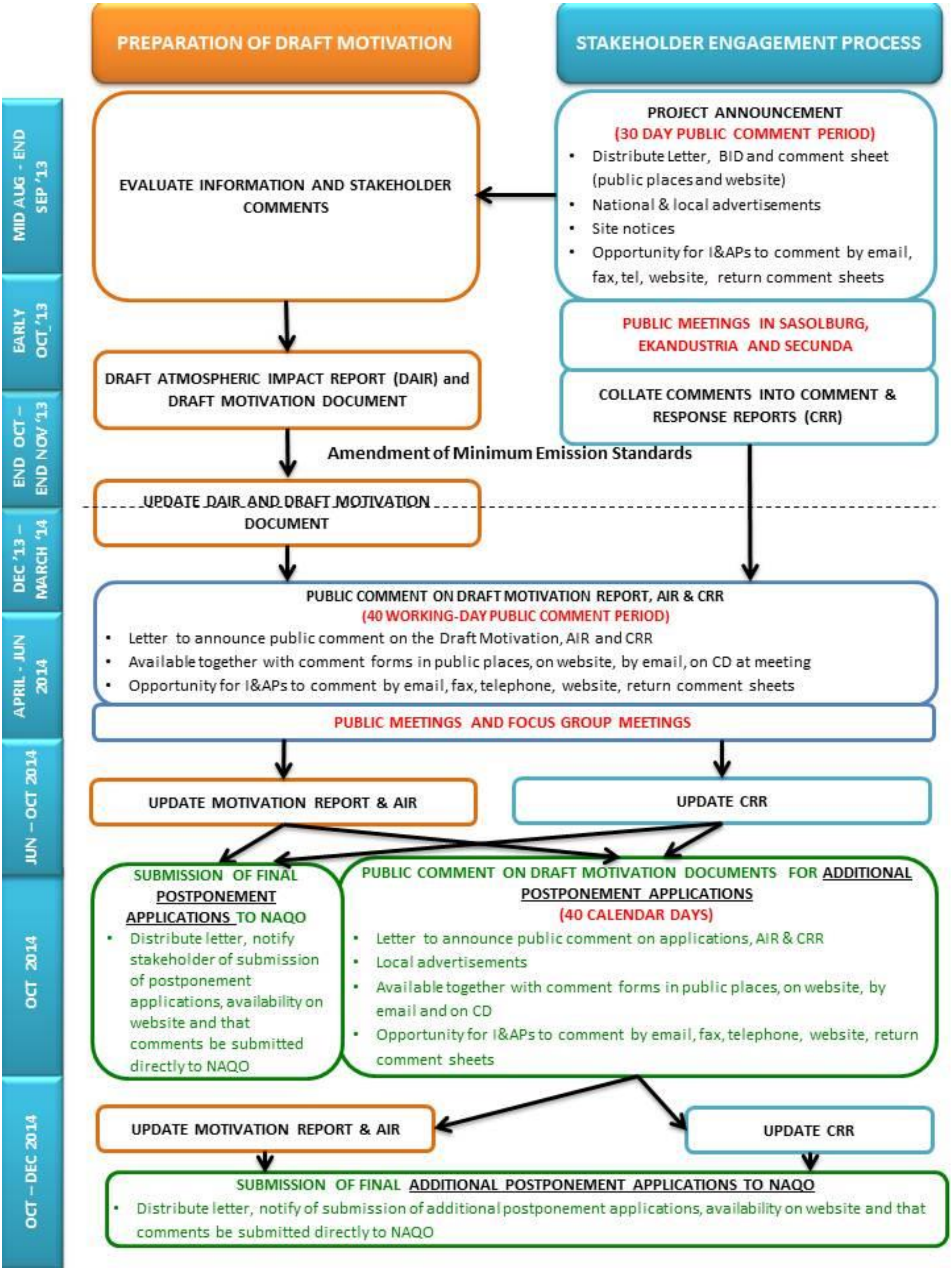

Figure 10: Technical and Stakeholder Engagement Process

8.1 Project announcement

Sasol's application process was announced between **15 September 2013 and 15 October 2013.** Stakeholders were invited to separate public meetings which were held from 7 – 10 October 2013 for the different Sasol operations. The public meeting for the Secunda operation took place on Thursday, 10 October 2013, 13:00 – 15:00, at the eMbhalenhle Community Hall in Secunda. Stakeholders received notification of public meetings and were invited to participate in the process as follows:

- A letter of invitation was sent to stakeholders to invite them to the public meetings and register as stakeholders.
- The invitation letter was accompanied by a Background Information Document (BID), providing more information on Sasol's operations and a Comment Form for stakeholders to submit their comments.
- Advertisements were placed in national and local newspapers to announce Sasol's application process.
- The BID, invitation letter and comment forms were made available in public places and on the SRK website www.srk.co.za.
- Telephonic and sms notification were made to stakeholders to inform and remind them of public meetings and opportunities to comment.

Key issues and comments raised by stakeholders

The key comments, concerns and suggestions raised by stakeholders during announcement are summarised as follows. For a comprehensive record of stakeholder comments, please refer to Annexure D.

- **Comments relating to Sasol's application process** - Stakeholders' comments focused on Sasol's reasons for applying for postponements, legal requirements, timeframe for compliance and requests for details regarding which plants and processes require exemption.
- **Stakeholder engagement** - It was noted that the Background Information Document (BID) did not provide sufficient information for meaningful stakeholder comment. Stakeholders commented on the poor attendance of stakeholders at the public meetings and suggestions were made for more convenient venues and times for public meetings, as well as an extended stakeholder comment period.
- **Environmental concerns** - Stakeholders expressed concern regarding Sasol's air quality emissions and its actual contribution to air pollution in the area. Other environmental concerns raised were the impact of Sasol's emissions on water quality, health and socio-economic factors such as Sasol's obligation to re-invest in communities in their area of operation and to empower communities to care for the environment.
- Stakeholders asked how compliance to the MES will impact acid rain in the area, bee farming and dust generation on cattle grazing and cattle health. Information was requested on how these impacts will be mitigated.

8.2 Public comment on the Draft Motivation Report

Due to the fact that the public meetings held during the first round of stakeholder engagement was poorly attended, despite reasonable efforts, it was proposed to hold focus group meetings with key stakeholders, in addition to public meetings during the second round of engagement to encourage greater stakeholder participation in Sasol's application process.

The public meeting for the Secunda operation took place on Thursday, 22 May 2014, 13:00 – 15:00, at the Kruik Conference Centre in Secunda. Stakeholders received notification of public meetings and were invited to comment on the Draft Motivation Report during the comment period from **15 April to 13 June 2014**, as follows:

- Distribution by email and mail, of an invitation letter to attend public meetings, accompanied by a Comment Form in English. These documents were available in, Afrikaans and isiZulu upon request.
- Posting the letter, Comment Form and Draft Motivation Reports on the SRK website (www.srk.co.za).
- Placing the letter, Comment Form and the Draft Motivation Reports in publicly accessible venues close to the Secunda operation, as during the announcement phase.
- Advertisements in two national newspapers to announce the availability of the Draft Motivation Report for public comment:
  - Sunday Times (English), Sunday 30 March 2014;
  - Beeld (Afrikaans), Tuesday 1 April 2014.
- Advertisements in local newspapers;
  - Ridge Times (English and Afrikaans), Wednesday 2 April 2014;
  - Ekasi (Zulu), Friday 15 April 2014.
- Telephonic and SMS notifications were sent to stakeholders to notify them of opportunities to comment.

Focus group meeting with the South African Communist Party

A follow-up focus group meeting was held with the South African Communist Party on their request. This meeting took place on 21 May 2014 at the Sasol Fundu Park Conference Room in Secunda. Comments made at this meeting are included in the CRR for the Secunda operation.

Focus group meeting with key stakeholders

A focus group meeting was held with key stakeholders, such as NGOs, environmental and conservation groups and organised sectors of society (business and labour, organised civil society groups and community based organisations) on 23 May 2014, at the Hacklebrooke Conference Centre in Johannesburg. All comments made at this meeting have been included in the CRRs of all Sasol operations.

Key issues and comments raised by stakeholders

The key issues, comments and concerns raised by stakeholders during the comment period on the draft Motivation Reports are summarised below. For a comprehensive record of stakeholder comments, please refer to Annexure D.

- **Application process** - Stakeholders questioned the legal basis of Sasol's applications since the Highveld priority area in which Sasol operates is located is in non-compliance with ambient air quality standards. Stakeholders questioned why Sasol has not investigated solutions to compliance timeously and were of the opinion that Sasol had sufficient time since 2010 to find solutions for compliance to the MES, so as not to ask for postponements or exemptions.
- **Environmental concerns** – Questions were raised regarding the meaning of technical terms used in the presentation such as ceiling limits and average emissions. Concern was also expressed regarding PM_{10} emissions that remain high in the area of Sasol's operation even when domestic coal burning emissions have reduced after winter. Stakeholders felt that Sasol was shifting the blame for non-compliance with ambient air quality standards to communities.

  It was noted that Sasol should give priority to environmental health before profits. Stakeholders stressed that residents in Secunda, especially children, suffer from respiratory diseases as a result of Sasol's operations. Some stakeholders were of the opinion that if ceiling limits are raised, it negatively affects resident's health.

Some stakeholders were of the opinion that postponements from the MES should not be granted for Sasol operations as there was no legal basis for their application. In addition that Sasol has not addressed the adverse health impacts of their operations, or cumulative impacts. Applications have not been submitted within the appropriate time of compliance date and no postponement should be allowed for hazardous air pollutants, such as PM and other hazardous emissions.

- **Stakeholder engagement** – Stakeholders noted that the information given in the presentations was too technical for the general public to understand fully and said that more effort should have been put in to explain complex terms to stakeholders in general and to surrounding communities through capacity building initiatives. In addition, that the 40 day comment period was not sufficient to comment on reports and consult with specialists.

  Questions were raised as to how stakeholders were to provide comment on reports when it is stated in the draft motivation reports that it was a criminal offence to publish any part of the document without written consent of the author.

8.3 Way forward on application process

Stakeholders were informed in writing (email, fax, post) that the Minister of Environmental Affairs formally notified Sasol that she would not consider its exemption applications, and advised that postponement applications should be made instead. In line with the Minister's notification, Sasol will submit the following to the NAQA for decision-making:

- final postponement applications that have not been affected by the Ministers' notification; and
- previous exemption applications as additional postponement applications.

8.4 Notification of submission of final postponement applications

Stakeholders were advised in writing (mail, email and fax) that final postponement applications were submitted to the NAQO for decision-making and that comments on the reports can be submitted directly to the NAQO within 21 days. Final Motivation Reports were available electronically for stakeholder's information, on the SRK website (www.srk.co.za), or on request from the stakeholder engagement office.

8.5 Comment and Response Report

All comments, concerns, questions and suggestions raised for the Secunda operation during the stakeholder engagement process, including comments during public meetings and written comments received from stakeholders have been recorded in the Comment and Response Report (CRR). The CRR provides a consolidated record of stakeholder comments, as well as responses from the SRK, Airshed and the Sasol project team members. The CRR is attached as **Annexure D.**

9. Conclusions

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 of MES has meant that Sasol is obliged to reduce many of its emissions to comply with the MES requirements. The Sasol plant at Secunda in Mpumalanga, is complex. The plant converts coal into liquid fuels and chemicals in a process known as coal to liquids or CTL. The CTL process requires that the coal be gasified, where after the carbon in the gas stream is combined with hydrogen to form the hydrocarbon chains that are the basic building blocks of the liquid fuels and the chemical products produced. The FT process which is employed uses a catalyst that is easily poisoned by impurities in the gas stream, most notably sulfur. It is essential that the sulfur be removed from the raw gas stream prior to the gas entering the FT reactor. Sasol has over the years developed ways of turning these process impurities into commercial products that can be sold on to a variety of customers.

The net effect is an industrial process that has multiple product streams all of which are highly dependent on one another, with similarly highly integrated utilities, most especially heat and steam. 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. Exacting due diligence obligations derive from among others, the size of the company, its listing on two stock exchanges, and technology and project development governance processes. For a number of point sources described in this report, Sasol will comply with the MES but over an extended period of time, since project life spans are typically about ten years for complex brownfields sites. In addition the publication of revised MES in November 2013 means that there has not been enough time to consider properly the implications for current activities and emissions. As a result Sasol will not be able to meet some of the prescribed compliance timeframes and has accordingly applied for postponement for the affected listed activities. Sasol has also proposed alternative emissions limits or emissions management controls that would prevail in the intervening period.

Sasol has assessed the ambient air quality implications of the alternative emissions limits or other emissions management controls that it has proposed, necessarily on the basis on ceiling or maximum emissions concentrations, conducted by an independent third party and published as an AIR.

Key findings of the AIR include that there is compliance with the NAAQS standards at all of the ambient air quality monitoring stations operated by Sasol, except in the case of PM_{10} where non-compliance is evident. Work done elsewhere indicates that non-compliance with the PM_{10} NAAQS, is largely a function of low level emissions from multiple sources across the Highveld, most notably domestic fuel use, rather than industrial emissions. Predicted ambient concentrations from the different emission scenarios (including current emissions, compliance with the MES and the requested interim limits), are all in compliance with the NAAQS, as shown in Table 11. In many instances the reductions in ambient concentrations brought about by moving from current emissions to the MES are so small as to be negligible. In the case of the incinerator emissions where there are low loads (but concentrations that exceed the defined MES) the resultant predicted concentrations are negligible.

Sasol intends to comply with the MES to the extent that it is feasible to do so, but the long term nature of implementing the emissions abatement requirement for compliance, means that the projects cannot be completed within the prescribed compliance timeframes defined in the MES. Sasol is therefore applying for postponements of the compliance timeframes for the listed activities described in this report, on behalf of the affected entities, being Sasol Synfuels, Sasol Oil, Sasol Solvents and Sasol Group Services (for the LOC).

Table 11: Concluding summary of Sasol Synfuels' compliance with the MES and compliance in the vicinity of the Sasol Secunda complex with the NAAQS

MES Category	Substance(s)	Emission limits or special arrangements*		Compliance with NAAQS** or international health screening levels	Applicable Sasol Synfuels Activities
		New plant standards	Existing plant standards		
Category 1: Sub-category 1.1	PM	50	100	Hourly standards exceeded	Steam plant
	SO_2	500	3500		
	NO_x	750	1100		
Category 1: Sub-category 1.4	PM	10	10	Hourly standards exceeded	Gas turbines
	SO_2	400	500		
	NO_x	50	300		
Category 2: Sub-category 2.2	PM	100	120	Hourly standards exceeded	Superflex Catalytic Cracker ™
	SO_2	400	550		
	NO_x	1 500	3 000		
Category 2: Sub-category 2.4	TVOC	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system			Tank farm
	TVOC	All installations with a throughput of greater than 50,000m^3 per annum of products with a vapour pressure greater than 14 kPa, must be fitted with vapour recovery or vapour destruction units. Emission limits for vapour recovery/destruction using non-thermal treatment: Existing plant standard: 40 000 New plant standard: 40 000			Loading stations
Category 3: Sub-category 3.6	H_2S	3 500	4 200		Rectisol and Sulfur Recovery Plants
	TVOC	130	250		
	SO_2	500	3 500		
Category 3: Sub-category 3.6	H_2S	3 500	4 200		Pheno-solvan
	TVOC	130	250		
	SO_2	500	3 500		
Category 3: Sub-category 3.3 Sub-category 3.6	H_2S	3 500	4 200		Sources in Tar Value Chain – Phase 1
	TVOC	130	250		
	SO_2	500	3 500		

MES Category	Substance(s)	Emission limits or special arrangements*		Compliance with NAAQS** or international health screening levels	Applicable Sasol Synfuels Activities
		New plant standards	Existing plant standards		
Category 3: Sub-category 3.3	H_2S	3 500	4 200		Sources in Tar Value Chain – Phase 2
	TVOC	130	250		
	SO_2	500	3 500		
Category 6	TVOC	Type 3 storage vessels shall be of the following type: a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system			Storage tanks (Sasol Solvents)
Category 7: Sub-category 7.2	Total Fluoride	5	30		Wet Sulfuric Acid Plant
	HCl (primary)	15	25		
	HCl (secondary)	30	100		
	SO_2	350	2800		
	SO_3	25	100		
	NO_x	350	2000		
Category 8: Sub-category 8.1	PM	10	20	Hourly standards exceeded	HOW incinerators
	CO	50	75		
	SO_2	50	50		
	NO_x	200	200		
	HCl	10	10		
	HF	1	1		
	Sum of Lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	0.5		
	Mercury	0.05	0.05		
	Cd + Tl	0.05	0.05		
	TOC	10	10		
	Ammonia	10	10		
	Dioxins and furans	0.1	0.1		
	N/A	Exit gas temperatures must be maintained below 200 ºC		N/A	

MES Category	Substance(s)	Emission limits or special arrangements*		Compliance with NAAQS** or international health screening levels	Applicable Sasol Synfuels Activities
		New plant standards	Existing plant standards		
Category 8: Sub-category 8.1	PM	10	20	Hourly standards exceeded	Biosludge Incinerators
	CO	50	75		
	SO_2	50	50		
	NO_x	200	200		
	HCl	10	10		
	HF	1	1		
	Sum of Lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	0.5		
	Mercury	0.05	0.05		
	Cd + Tl	0.05	0.05		
	TOC	10	10		
	Ammonia	10	10		
	Dioxins and furans	0.1	0.1		
Category 8: Sub-category 8.1	PM	10	20	Hourly standards exceeded	Sewage solids incinerator
	CO	50	75		
	SO_2	50	50		
	NO_x	200	200		
	HCl	10	10		
	HF	1	1		
	Sum of Lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	0.5		
	Mercury	0.05	0.05		
	Cd + Tl	0.05	0.05		
	TOC	10	10		
	Ammonia	10	10		
	Dioxins and furans	0.1	0.1		

MES Category	Substance(s)	Emission limits or special arrangements*		Compliance with NAAQS** or international health screening levels	Applicable Sasol Synfuels Activities
		New plant standards	Existing plant standards		
	N/A	Exit gas temperatures must be maintained below 200 ºC		N/A	

**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; ng I-TEQ/Nm^3 in the case of dioxins and furans*

***Reflects compliance of ambient air quality with the NAAQS (for hourly, daily and annual standards as applicable for each given pollutant), or predicted model compliance with health benchmarks, where no NAAQS are specified*

Colour coding:

(blue)	2020 standard for which no feasible technology is presently available to attain compliance and for which Sasol continues to seek reasonable measures for longer-term certainty
(red)	Additional postponements requested, on compliance timeframes for the prescribed emission limit or special arrangement
(orange)	Initial postponement of compliance timeframes for the prescribed emission limit or special arrangement
(green)	Will comply with the prescribed emission limit or special arrangement within the prescribed compliance timeframes
(white)	Compliance status to be determined (refer to Section 4.4 for an explanation)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Annexures

Annexure A: Atmospheric Impact Report

Annexure B: Peer Review Report on the approach to the Atmospheric Impact Report

Annexure C: Volume 1 - Stakeholder Engagement Report

Annexure D: Volume 2 - Comments and Response Report

Annexure E: Further Technical Information in support of the postponement application