



## **Draft Motivation Report for Sasol South Africa Limited operating through its Secunda Operations**

DRAFT MOTIVATION REPORT FOR AN APPLICATION FOR A LOAD-BASED EMISSION LIMIT FOR SULPHUR DIOXIDE (SO<sub>2</sub>) IN TERMS OF CLAUSE 12A OF THE MINIMUM EMISSION STANDARDS (MES) OF 22 NOVEMBER 2013 AS AMENDED, PUBLISHED IN TERMS OF SECTION 21 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT 39 OF 2004

## Executive summary

The Secunda Operations had been granted postponement from meeting the new plant standard for SO<sub>2</sub> for its boilers at the steam plants until 31 March 2025. Secunda Operations deems the applicable SO<sub>2</sub> limit of 1 000 mg/Nm<sup>3</sup>, promulgated in March 2020, a reasonable standard which it can comply with, albeit through significant effort. The Secunda Operations, however, publicly communicated that the implementation of any feasible solution will extend beyond 1 April 2025 due to the magnitude and complexity of the scope.

Sasol remains relentless in its commitment to legal compliance and ambient air quality improvement regardless. This commitment stands along Sasol's long-term ambition to transform its operations to lower carbon options, meet its GHG reduction targets towards net zero by 2050 (communicated in 2021 at its Capital Market's Day) and to reduce its overall environmental footprint.

Against this backdrop, the Secunda Operations aims to exploit synergies in developing GHG and boiler SO<sub>2</sub> reduction roadmaps in an integrated manner. This integrated air quality and GHG reduction roadmap involves the turning down of boilers, not only to reduce SO<sub>2</sub> emissions with benefits anticipated to be realised already from 2025 onwards, but to also have a favorable impact on the reduction of GHGs and other pollutants emitted from the boilers.

This approach would see the overall mass of SO<sub>2</sub> (and other pollutants) emitted, per day and per unit of final product, reduced. Through this integrated reduction roadmap, the Secunda Operations aims to achieve a 30% total load reduction in SO<sub>2</sub> emissions by 2030, which is significantly more than what would be achieved (15%) under the current concentration limits in the MES.

Through the implementation of this integrated reduction roadmap, the mass of SO<sub>2</sub> emitted from the boilers at the steam plants is expected to already yield a 4% reduction prior to April 2025. The 4% reduction in SO<sub>2</sub> emissions will further be augmented by existing initiatives such as emission offsetting that have and, leading up to 1 April 2025, will continue to reduce emissions from other anthropogenic sources as per applicable AEL requirements. To this end the Secunda Operations can already demonstrate and anticipate further reductions in the SO<sub>2</sub> and PM emissions from anthropogenic sources in advancing ambient air quality improvements prior to the requested load-based limits taking effect.

To enable the abovementioned transition, the Secunda Operations will require to be regulated by load-based emission limits (the mass and the rate of the pollutant emissions) instead of a concentration limit (the mass of pollutant per cubic meter of air emitted) as provided for in the MES.

Clause 12A of the MES provides for an existing plant, such as the Secunda Operations, to apply to the NAQO for an emission load limit to be granted in instances where a new plant standard cannot be met for a particular pollutant, such as SO<sub>2</sub>, if certain criteria are met. The Secunda Operations therefore intends to apply to the NAQO by latest 19 July 2022, in accordance with the provisions of the associated condonation granted by the Minister of Forestry, Fisheries and the Environment, for load-based limits and associated timelines explained in table I below.

This motivation report explains the Secunda Operations’ motivation for requesting load-based emission limits for SO<sub>2</sub> and how the specified criteria for the application are met. This report, together with the AIR and Public Participation Report, will be submitted to the NAQO in support of the application for consideration in concurrence with the Gert Sibande District Municipality Licensing Authority.

The AIR confirms that the Secunda airshed (as defined in the AIR) within which the activities relevant to this application are undertaken, is in material compliance with the NAAQS for SO<sub>2</sub>. This airshed is hence not regarded as a SO<sub>2</sub> “hot-spot” within the greater HPA. Given that the integrated reduction roadmap will not only aim to reduce ambient concentrations of SO<sub>2</sub> but also that of particulate matter (PM) and nitrogen oxides (NO<sub>x</sub>), it is deemed to result in an overall improvement of ambient air quality within the region. Figure I, below, indicates the SO<sub>2</sub> spatial improvement of ambient air quality from the current baseline against the improvements expected by 2025 and 2030 based on the implementation of the integrated reduction roadmap.

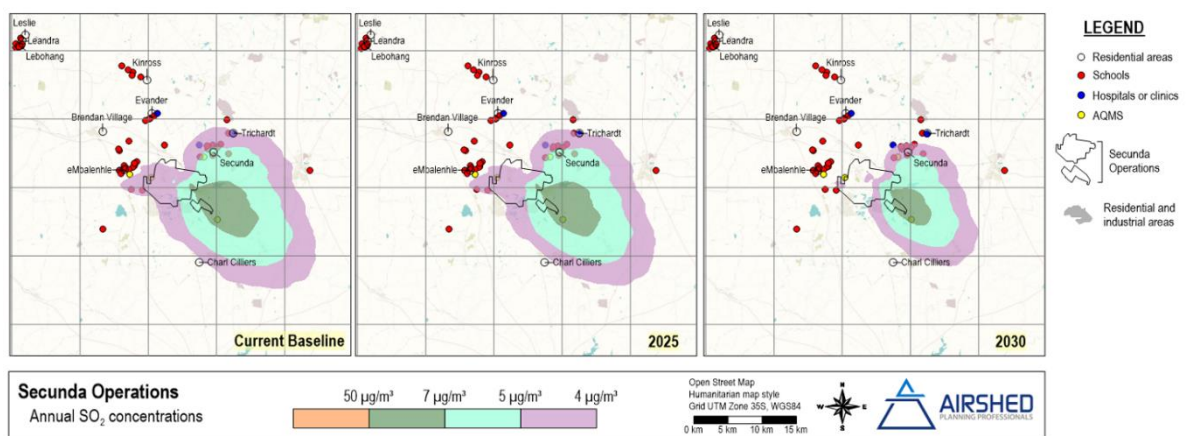


Figure i: Annual SO<sub>2</sub> spatial concentration improvement for the load-based emission limits by 2025 and 2030

A favorable decision will enable the Secunda Operations to deliver on the expected 30% load reduction in SO<sub>2</sub> emissions compared to the 15% that would otherwise be achieved through by the MES concentration limit. The benefits of the integrated reduction roadmap is anticipated to extend beyond demonstrable improvements in ambient air quality, to also include reductions in Sasol’s water intensity and the amount of solid waste generated.

Table i: Emission load limits requested for the Secunda Operations steam plants’ boilers

Source	Emission	Emission load-based limit requested (maximum limit)	Averaging Period	Period
Secunda Operations boilers at the steam plants	SO <sub>2</sub>	503 t/d	Monthly	1 April 2025 to 31 March 2030
		365 t/d		1 April 2030 onwards

## Glossary

Definitions in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) and definitions of terms as per GN 893 and GN 687 which have relevance to the Clause 12A Application:

**Clause 12A** of the MES (GN 687 in Government Gazette 42472 of 22 May 2019) - allows for an existing plant to apply to the NAQO for an alternative plant standard where a new plant standard cannot be met for a particular pollutant and provides for an alternative emission load limit to be granted as a compliance standard.

**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 1998 (Act No.107 of 1998), was made before 1 April 2010

**Licensing authority** – refers to an authority responsible for implementing the licensing system

**Listed activity** – In terms of Section 21 of the NEM:AQA, the Minister of Environment, Forestry and Fisheries (formerly Environmental Affairs) has listed activities that require an AEL. Listed activities must comply with prescribed emission standards. The standards are predominantly based on ‘point sources’, which are single identifiable sources of emissions, with fixed location, including industrial emission stacks, called a “point of compliance”.

**New Plant** - Any plant or process where the application for authorisation in terms of the National Environmental Management Act 1998 (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 smokestacks.

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

Additional definitions provided for clarity:

**The application** -Secunda Operations intends to apply to the National Air Quality Officer for load-based emission limits for SO<sub>2</sub> in terms of Clause 12A of the MES, to enable continued lawful operations pending the completion of the implementation of the integrated reduction roadmap post 1 April 2025 and subsequent sustained compliance (the application)

**Criteria pollutants** – Section 9 of NEM:AQA provides a mandate to the Minister to identify a national list of pollutants in the ambient environment which present a risk 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. In this document, any pollutant not specified in the National Ambient Air Quality Standards (NAAQS) is called a “non-criteria pollutant”.

**GN 687**- Government Notice 687, in Government Gazette 42472 of 22 May 2019, published in terms of Section 21 of the NEM:AQA and entitled Amendments to the Listed Activities and Associated Minimum Emission Standards Identified in Terms of Section 21 of the National Environment Management: Air Quality Act, 2004 (Act No.39 of 2004). GN 687 amends category 1: Combustion installations by the addition to subparagraph(a) of paragraph (1) Subcategory 1.1: Solid Fuel Combustion Installations of the following item: (iv) Existing plants shall comply with a new plant emission limit of 1000 mg/Nm<sup>3</sup> for sulphur dioxide (SO<sub>2</sub>)

**GN 893** – Government Notice 893, Gazette No. 37054 dated 22 November 2013, published in terms of Section 21 of the NEM:AQA and entitled ‘List of Activities which Result in Atmospheric Emissions which have or may have a Significant Detrimental Effect on the Environment, Including Health and Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage’. GN 893 repeals the prior List of Activities published in terms of Section 21, namely GN 248, Gazette No. 33064 dated. 31 March 2010. GN 893 deal with aspects including: the identification of activities which result in atmospheric emissions; establishing minimum emissions standards for listed activities; prescribing compliance timeframes by which minimum emissions standards must be achieved; and detailing the requirements for applications for postponement of stipulated compliance timeframes. Amendments to GN 893 have been made in 2015 (GN 551) and in 2018 (GN1207).

**GN 1207** - Government Notice 2017, Gazette No. 42013 dated 31 October 2018, published in terms of Section 21 of the NEM:AQA and entitled ‘Amendments to the Listed Activities and Associated Minimum Emission Standards Identified in Terms of Section 21 of the National Environment Management: Air Quality Act, 2004 (Act No.39 of 2004).

**Minimum Emissions Standards (MES)** – Prescribed maximum emission limits and the manner in which they must be measured, for specified pollutants. These standards are published in Part 3 of GN 893, as amended by GN551 and GN1207. These standards are referred to herein as MES



## List of abbreviations

AIR	Atmospheric Impact Report
AQMS	Ambient Air Quality Monitoring Station
ARM	Air Resource Management
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CTL	Coal-to-liquid
DFFE	Department of Forestry, Fisheries and Environment (also Department of Environmental Affairs, and, Department of Environmental Affairs and Tourism)
EIA	National Environmental Management Act and the Environmental Impact Assessment
GHG	Greenhouse gas emissions
GNR	Gazette Notice
HPA	Highveld Priority Area
MES	Minimum Emission Standard
NAAQS	National Ambient Air Quality Standards (as a combination of the NAAQ Limit and the allowable frequency of exceedance)
NAQO	National Air Quality Officer
NEMAQA	National Environmental Management: Air Quality Act
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Oxides of Nitrogen
O <sub>2</sub>	Oxygen
PM	Particular matter
PM <sub>2.5</sub>	Particular matter with diameter of less than 2.5µm
PM <sub>10</sub>	Particular matter with diameter of less than 10µm
PPCEA	Parliamentary Portfolio Committee on Environmental Affairs
SO <sub>2</sub>	Sulfur dioxide
t/h	Tons per hour
VOC	Volatile organic compounds

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# 1. Introduction

## 1.1 Overview

Sasol is a global chemicals and energy company that owns and operates a petrochemical and chemical manufacturing facility in Secunda, Mpumalanga. Sasol’s Secunda Operations converts coal into liquid fuels and a range of chemical products. The Secunda Operations has various atmospheric emissions across its operations and undertakes these activities in accordance with an Atmospheric Emissions License (AEL) which authorises these emissions subject to certain emission limits and other associated conditions.

In terms of the National Environmental Management: Air Quality Act, 39 of 2004 as amended (NEMAQA), the Secunda Operations is required to comply with its AEL which incorporates provisions of the Minimum Emission Standards (MES - Government Gazette No. R. 893 of 13 November 2013). Accordingly, the Secunda Operations had to meet the limits specified in the MES for existing plants by 1 April 2015 and for new plants by 1 April 2020.

Whilst many of the Secunda Operations’ processes could comply with the MES limits from the outset, there were selected activities for which the Secunda Operations was unable to timeously comply. For these specific cases the Secunda Operations applied for and was granted postponement of the compliance timeframes to implement the necessary abatement along extended timeframes to enable compliance. The Secunda Operations is currently on track with its air quality compliance roadmaps to achieve compliance with the new plant standards by 1 April 2025 in accordance with its AEL conditions that incorporate the abovementioned postponement decisions (**Error! Reference source not found.**).

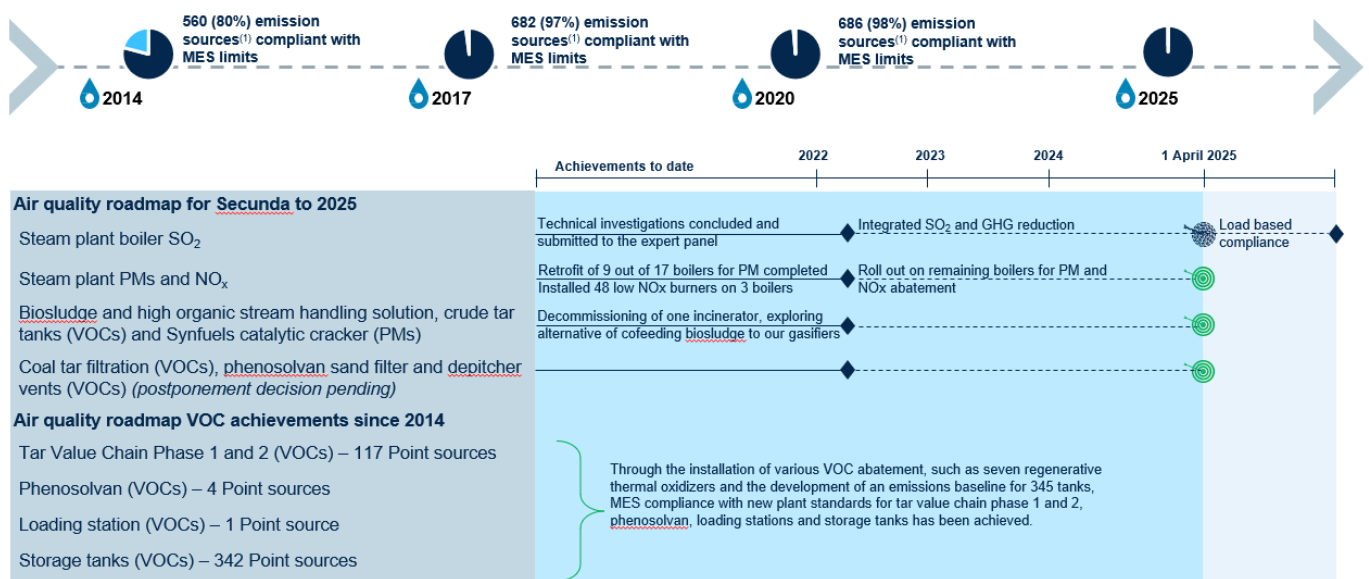


Figure 1: Summary of the air quality compliance roadmap status and compliance goals at the Secunda Operations

The Secunda Operations had also been granted postponement from meeting the new plant standard for sulphur dioxide (SO<sub>2</sub>) for its boilers at the steam plants, governed in terms of subcategory 1.1 of the MES, until 31 March 2025. The Secunda Operations deems the applicable SO<sub>2</sub> limit of 1 000 mg/Nm<sup>3</sup>, finally promulgated in March 2020, a reasonable standard which it can comply with, albeit through significant effort, and previously publicly communicated that the implementation of any feasible solution will extend beyond 1 April 2025 due to the magnitude and complexity of the scope.

Throughout the development of the MES and the various amendments thereto, the Secunda Operations has communicated publicly the unique challenges which its aging boiler fleet at the steam plants face in achieving compliance. This is technically extremely challenging due to the integrated nature of the Sasol process as well as physical constraints imposed by the congested nature of the facility.

The Secunda Operations has conducted detailed technology scans and investigated various air quality abatement technologies for SO<sub>2</sub>. As such, coal beneficiation, which considers removing sulphur containing minerals from the coal before burning the coal in the boilers using a process known as coal washing, was initially considered as an abatement option. The Secunda Operations also collaborated with and provided submissions to the panel of experts appointed by the Minister of Forestry, Fisheries and the Environment (DFFE) in October 2019 to guide on an independent and sustainable approach for the management of SO<sub>2</sub> emissions from existing plants. The submissions included a detailed technical report on abatement solutions evaluated by Sasol to manage sulphur dioxide (SO<sub>2</sub>) emissions from existing plants regulated in terms of category 1.1 of the MES, additional information in January 2020 which included cost estimates with regards to the implementation of the various technology abatement solutions for various scenarios as requested by the Panel and feedback on calcification of Sasol's emissions in December 2020. The submissions were also provided to the National Air Quality Officer "(NAQO)" on 5 November 2019 and 31 January 2020.

Following these exhaustive technology scans and detailed engineering reviews of technologies that had the potential to work were determined to be unfeasible. Coal beneficiation, for the reasons explained below, was determined to be unsustainable.

While Sasol remains committed to legal compliance, its long-term ambition is to transform its operations to lower carbon options, meet its GHG reduction targets (communicated in 2021) towards net zero by 2050 and to reduce its overall environmental footprint. It is in this context that, during work done in responding to Sasol's greenhouse gas (GHG) reduction ambitions, it has become increasingly clear that there are potential synergies when developing GHG and boiler SO<sub>2</sub> reduction roadmaps in an integrated manner. This integrated air quality and GHG reduction roadmap involves the turning down of boilers not only to reduce SO<sub>2</sub> emissions with benefits to be realised already from 2025 onwards, but to also have a favourable impact on the reduction of GHGs and other pollutants emitted from the boilers. This approach would see the overall mass of SO<sub>2</sub> (and other pollutants) emitted, per day and per unit of final product, reduced. The optimal solution for the Secunda Operations to reduce its SO<sub>2</sub> emissions aligned with the applicable MES provisions, is therefore to reduce the load of its atmospheric emissions. Through this integrated reduction roadmap, Sasol expects to achieve a 30% load reduction in SO<sub>2</sub> emissions by 2030, which is significantly more than what would be achieved under the current concentration limits in the MES (15%).

The Secunda Operations recognises that the ambient concentration of a regulated pollutant is an indirect function of emission concentrations but a direct function of emission rates (mass emitted per day). Dispersion models, as the key tool for predicting ambient air quality, require the emissions to be entered as the mass of the pollutant, per unit time (emission rate), which collectively is referred to as the “load”. It is therefore the emission load and not the concentration that determines the impact on ambient air quality.

To enable the transition through the integrated reduction roadmap, Sasol intends to apply to the National Air Quality Officer (NAQO) to be regulated by load-based emission limits (the mass and the rate of the pollutant emissions) instead of a concentration limit (the mass of pollutant per cubic meter of air emitted) as provided for in the MES. Simply put, the Secunda Operations will apply to reduce the mass of SO<sub>2</sub> emitted during a day rather than the amount of SO<sub>2</sub> emitted per normal cubic meter of air. The application will be submitted by latest 19 July 2022, in accordance with the provisions of the associated condonation granted by the Minister DFFE.

This document articulates the Secunda Operations’ motivation for load-based emission limits for SO<sub>2</sub> in terms of Clause 12A of the MES. This document, once finalised following the public participation process, will be submitted to the NAQO for consideration in concurrence with the Gert Sibande District Municipality Licensing Authority.

## 1.2 Purpose of this motivation report

This motivation report provides an overview of:

- the Secunda Operations, highlighting the integrated and complex nature of the facility, the steam plants’ process description and the applicable MES concentration limits;
- the Secunda Operations’ air quality compliance roadmap to enable compliance with other applicable emission standards for MES Subcategory 1.1: Solid Fuel Combustion Installations for Secunda Operations steam plants as per its AEL;
- the challenges faced by the Secunda Operations steam plants’ boilers in meeting the MES SO<sub>2</sub> concentration limit for MES Subcategory 1.1 and the various studies concluded to date by Sasol in trying to achieve the SO<sub>2</sub> concentration limit;
- reductions in emissions of SO<sub>2</sub> achieved to date and to be achieved by 1 April 2025, including measures and direct investments implemented towards compliance with the SO<sub>2</sub> concentration limit;
- material compliance by the Secunda Operations with the National Ambient Air Quality Standards (NAAQS) in the area (as defined in the AIR);
- the Secunda Operations’ request for load-based emission limits;
- the AIR findings that demonstrate a predicted improvement in ambient air quality based on the requested load-based SO<sub>2</sub> emission limits; and
- the public participation process and outcomes related to this application.



## 2. Secunda Operations

### 2.1 Overview

Sasol South Africa Limited (Sasol) owns and operates, through its Secunda Operations (Figure 2), a petrochemical facility in the Sasol Secunda complex south of Secunda, Mpumalanga (Sasol, 2021a). The Secunda Operations consists of two coal-to-liquids (CTL) plants, which are referred to as the east and west facilities having ~75 000 barrels per day capacity of refinery equivalent products



Figure 2: Location of Secunda Operations Facility (plant boundary outlined in blue)

#### 2.1.1 Process description

At the Secunda Operations, coal is converted into a synthetic gas (essentially carbon monoxide (CO)), and hydrogen (H<sub>2</sub>) in a gasification process, a process that requires steam. The gasification product is cooled and separated into gaseous, liquid and tar product streams. Each stream is then processed further to produce a variety of products as shown in Figure 3. The synthetic stream is reacted in the Fischer-Tropsch process to form hydrocarbon chains. The hydrocarbon chains are then used principally to manufacture liquid fuels and chemicals. Many of these processes require steam to convert the feed into products. Steam is also used in the production of electricity on the site. That steam is produced at the Secunda Operations by the steam plants.



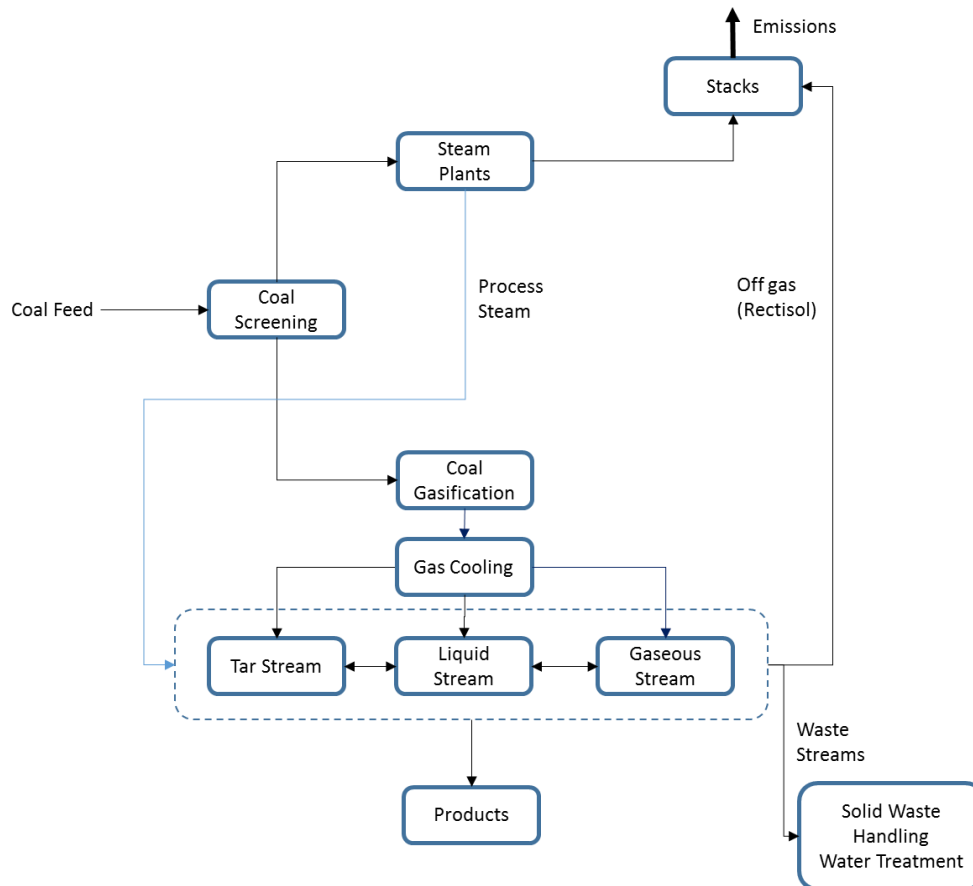


Figure 3: Overview of the various industrial activities at the Secunda Operations

### 2.1.2 Steam plants

For the Secunda Operations, it is critical that process steam is continuously available at the right quality and quantity at all processes where steam is required. A fleet of boilers was built to meet the Secunda Operations' steam requirements. The fleet includes 17 pulverised coal fired boilers, each with a nominal production capacity of 540 tons per hour (t/h) of 40 bar superheated steam. The superheated steam is fed into a common steam pipeline from where it is routed to the various users.

In addition to process demands, steam is supplied to generate 'critical power' needed in the event of power loss (electricity) from the national grid. That critical power allows for safe 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 (Sasol, 2014).

The layout of the entire facility is based on minimising the distance over which the steam must be moved with the largest steam users placed closest to the steam plants, to minimise the loss of heat from the system. Atmospheric emissions from the steam plants' boilers include: SO<sub>2</sub>, oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM) and greenhouse gas carbon dioxide (CO<sub>2</sub>).

### 2.1.3 Steam plants: applicable MES standards

The activities conducted at the steam plants are listed activities, governed in terms of MES Category 1: Combustion Installations, (*Subcategory 1.1: Solid Fuel Combustion Installations*), which the Secunda Operations are authorised to conduct in terms of section 7.2 of its AEL: License number 0016/2019/F03 (Table 1) (Sasol, 2021b).

The Secunda Operations had also been granted postponement from meeting the new plant standard for sulphur dioxide (SO<sub>2</sub>) for its boilers at the steam plants, governed under subcategory 1.1 of the MES, until 31 March 2025. The Secunda Operations deems the applicable SO<sub>2</sub> limit of 1 000 mg/Nm<sup>3</sup>, finally promulgated in March 2020, a reasonable standard which it can comply with, albeit through significant effort, and previously publicly communicated that the implementation of any feasible solution will extend beyond 1 April 2025 due to the magnitude and complexity of the scope.

Table 1: Secunda Operations' AEL License number 0016/2019/F03 Section 7.2 indicating the point source- maximum emission rates (under normal working conditions) for the steam plants

Point source code	Pollutant name	Maximum Release Rate		Average Period	Duration of Emissions
		mg/Nm <sup>3</sup> under normal conditions of 10% O <sub>2</sub> , 273 Kelvin and 101,3 kPa	Compliance Timeframe		
B1 (West Stack)	Particular matter (PM)	120	1 April 2015 to 31 March 2020	Daily	Continuous
		100	1 April 2020 to 31 March 2025		
	SO <sub>2</sub>	3500	1 April 2015 to 31 March 2020	Daily	Continuous
		2000	1 April 2020 to 31 March 2025		
NOx	1100	1 April 2015 to 31 March 2020	Daily	Continuous	

Point source code	Pollutant name	Maximum Release Rate		Average Period	Duration of Emissions
		mg/Nm <sup>3</sup> under normal conditions of 10% O <sub>2</sub> , 273 Kelvin and 101,3 kPa	Compliance Timeframe		
B2 (East Stack)	Particular matter (PM)	120	1 April 2015 to 31 March 2020	Daily	Continuous
		100	1 April 2020 to 31 March 2025		
	SO <sub>2</sub>	3500	1 April 2015 to 31 March 2020	Daily	Continuous
		2000	1 April 2020 to 31 March 2025		
	NO <sub>x</sub>	1100	1 April 2015 to 31 March 2020	Daily	Continuous
		1000	1 April 2020 to 31 March 2025		

Table 2: MES Subcategory 1.1: Solid Fuel Combustion Installations

Pollutant	New Plant Standard MES limits	
	mg/Nm <sup>3</sup> under normal conditions of 10% O <sub>2</sub> , 273 Kelvin and 101.3kPa.	
Particulate matter		50
Sulphur dioxide		1000 <sup>1</sup>
Oxides of Nitrogen		750

<sup>1</sup> As per special arrangement (a)(iv) under section (2) of Subcategory 1.2: Liquid Fuel Combustion installations in the MES.

### 3. The clause 12A application - the request and meeting of criteria

Clause 12A of the MES provides for an existing plant, such as the Secunda Operations, to apply to the NAQO for an emission load to be granted in instances where a new plant standard cannot be met for a particular pollutant, such as SO<sub>2</sub>, if certain criteria are met. The criteria are explained in the extract from clause 12A of the MES, below:

(12A)...

- a) *An existing plant may submit an application regarding a new plant standard to the NAQO for consideration if the plant is in compliance with other emission standards but cannot comply with a particular pollutant or pollutants.*
- b) *An application must demonstrate previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards.*
- c) *The NAQO, after consultation with the Licensing Authority, may grant an alternative emission limit **or** emission load if:*
  - i) *there is material compliance with the NAAQS in the area for the pollutant or pollutants applied for; **or** the Atmospheric Impact Report does not show a material increased health risk where there is no ambient air quality standard.*

To contextualise the above provisions for the intended Secunda Operations' application, it should be noted that the plant in question is the steam plants at the Secunda Operations which operates in the Secunda area/airshed (as defined in the AIR), and the relevant pollutant is SO<sub>2</sub> from the boilers at the steam plants. The associated new plant standard for SO<sub>2</sub> is 1 000 mg/Nm<sup>3</sup>. The compliance challenge in question is by and large associated with the infeasibility and unsustainability of the identified technologies, excluding the integrated reduction roadmap which is the subject of the intended application. The intended application is premised on the implementation of the aforementioned roadmap, which in turn is reliant on load-based limits to apply for SO<sub>2</sub>. The application is further premised on clause 12(c)(i), given that there are AAQS for SO<sub>2</sub> and therefore substantiated by the AIR to confirm material compliance.

Clause 12A is not specific on the procedural requirements for the application. However, clause 12 explains the specific procedural requirements for applications in terms of clause 11A and 11B including (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 Act), 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 (motivation report) and (c) a concluded public participation process undertaken as specified in the National Environmental Management Act 107 of 1998 and the Environmental Impact Assessment Regulations. The Secunda Operations opted to align its clause 12A application with the abovementioned requirements.

Section 3.1 to 3.3 below demonstrate how each of the three clause 12A requirements have been met by the Secunda Operations' steam plant boilers to motivate and support the application for SO<sub>2</sub> load-based emission limits.

### 3.1 Clause 12A (a): The plant is in compliance with other emission standards but cannot comply with a particular pollutant or pollutants.

#### 3.1.1 Compliance with other emission standards for MES Subcategory 1.1: Solid Fuel Combustion Installations

Through a variety of projects and significant investments to date, the Secunda Operations is able to meet the applicable MES (as per its AEL) for 98% of all its emission sources. For more detail, refer to Sasol’s 2021 Sustainability report on [www.sasol.com](http://www.sasol.com) from page 44 – 46.

The Secunda Operations’ boilers at their steam plants must comply with the MES Category 1: Combustion Installations, (*Subcategory 1.1: Solid Fuel Combustion Installations*) for SO<sub>2</sub>, NO<sub>x</sub> and PM (Table 2) as specified in its AEL by 1 April 2025.

In this regard, following comprehensive piloting of the available technologies, the Secunda Operations has already retrofitted nine out of the 17 electrostatic precipitators (ESPs) on the steam plants’ boilers and is on target to complete the remaining eight retrofits by 1 April 2025. For NO<sub>x</sub> abatement, 48 low NO<sub>x</sub> burners have been installed on three boilers within the steam plants and project completion is on target to enable compliance by 1 April 2025.

The Secunda Operations is on track to enable compliance with NO<sub>x</sub> and PM MES limits (Table 3) by 1 April 2025 in accordance with the applicable conditions of its AEL (**Error! Reference source not found.**).

Table 3: Secunda Operations compliance with 2025 MES for boilers at the steam plants

Pollutant	Applicable emission limit (ug/m <sup>3</sup> )	2025 MES Compliance
Particulate matter	50	Yes
Nitrogen oxides	750	Yes

#### 3.1.2 Secunda Operations’ steam plants MES SO<sub>2</sub> concentration compliance challenge

Since 2006, Secunda Operations has conducted numerous abatement studies on how to achieve the steam plants’ boiler SO<sub>2</sub> MES limit (Sasol, 2021a). These studies are summarised in Figure 2

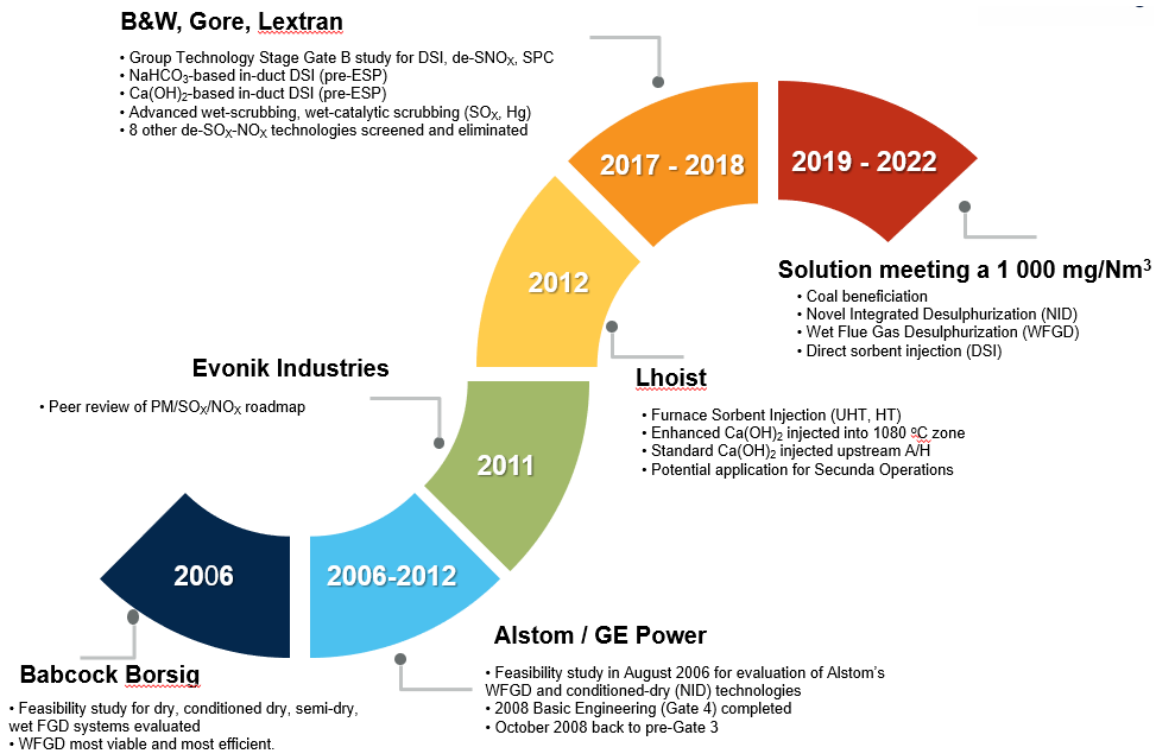


Figure 2: SO<sub>2</sub> Air Quality Abatement Technology Journey for the Secunda Operations' steam plants

The principle of Best Practical Environmental Option as described in the National Framework for Air Quality Management (DFFE, 2018), requires a holistic assessment of the consequences of compliance for other environmental aspects (such as coal use, waste water and waste). Certain identified technologies were immediately recognised as technically infeasible and not considered for further evaluation. Promising technology options were further investigated and assessed, considering the efficiency to achieve the desired emission reduction but also site and process integration, ease of implementation, safety, constructability and cross-media impacts (i.e., other environmental aspects being negatively affected). The assessments highlighted that commercially available technologies for boiler SO<sub>2</sub> abatement are technically complex with many unintended consequences, especially invoking cross-media impacts on the water and waste environments as well as increased GHGs emissions. The Secunda Operations has spent R75 million on investigating SO<sub>2</sub> abatement options from 2006 to date. Of that amount R45 million was spent investigating implementation of wet and dry flue gas desulphurization abatement.

The Secunda Operations raised the challenges in meeting the new plant SO<sub>2</sub> compliance limit with the relevant authorities and the Parliamentary Portfolio Committee on Environmental Affairs (PPCEA). Additionally, the Secunda Operations also collaborated with and provided submissions to the panel of experts appointed by the Minister of DFFE in October 2019 to guide on an independent and sustainable approach for the management of SO<sub>2</sub> emissions from existing plants. The submissions included a detailed technical report on abatement solutions evaluated by Sasol to manage SO<sub>2</sub> emissions



from existing plants, additional information in January 2020 which included cost estimates with regards to the implementation of the various technology abatement solutions for various scenarios as requested by the Panel and feedback on calcification of Sasol's emissions in December 2020. The submissions were also provided to the National Air Quality Officer (NAQO) on 5 November 2019 and 31 January 2020.

Plausible technologies included in the abovementioned submissions also considered cost and the associated environmental cross media impacts. These technologies included coal beneficiation, novel integrated desulphurisation (NID) and dry sorbent injection (DSI) at Secunda Operations

Both NID and DSI were shown to be incapable of achieving the 1 000 mg/Nm<sup>3</sup> concentration-based emission standard. Only coal beneficiation, prior to combustion, has the potential to reduce the concentration of SO<sub>2</sub> emissions to achieve this limit. Coal beneficiation, which considers removing sulphur containing minerals from the coal before burning the coal in the boilers using a process known as coal washing, was initially considered as an abatement option but however has significant negative 'cross media' environmental impacts including:

- Increased water consumption;
- Increased electricity requirement;
- Increased greenhouse gas emissions; and

A significant coal discard/waste stream of approximately 4 200 000 tons per annum requiring safe disposal at a landfill site would also be required.

Given the abovementioned unsustainable and detrimental environmental impacts and that the abovementioned option will prolong Sasol's dependency on coal, coal beneficiation is disregarded as an unsustainable option. It is not aligned with Sasol's sustainability objectives of transitioning to lower carbon options to reduce its GHG footprint towards a 30% reduction in 2030 and net zero in 2050.

Accordingly, the Secunda Operations submits that the optimal SO<sub>2</sub> reduction solution is therefore to reduce its atmospheric emissions by reducing boiler operations based on compliance with load-based limits. Reducing boiler operations would mean reduced coal use together with reductions in all associated coal use environmental aspects, including SO<sub>2</sub> and GHG emissions. It should further be noted that the proposed integrated reduction roadmap does not have negative cross media environmental impacts.

### **3.2 Clause 12A (b): Demonstrate previous reduction in emissions of the said pollutant or pollutants, measures and direct investments implemented towards compliance with the relevant new plant standards.**

#### **3.2.1 Previous reductions in emissions of the said pollutant**

The Secunda Operations has incorporated air quality offsetting (as per the requirements of its AEL read with the relevant postponement decisions) as part of its ambient air quality

improvement plans to reduce PM and SO<sub>2</sub> emissions from domestic fuel use in low-income dense settlements. These initiatives included, amongst others, the insulation of over 5 500 reconstruction and development program (RDP) houses and replacing coal stoves with liquified petroleum gas stoves and heaters, as well as education and awareness programs that reached 7 700 households and 26 000 learners.

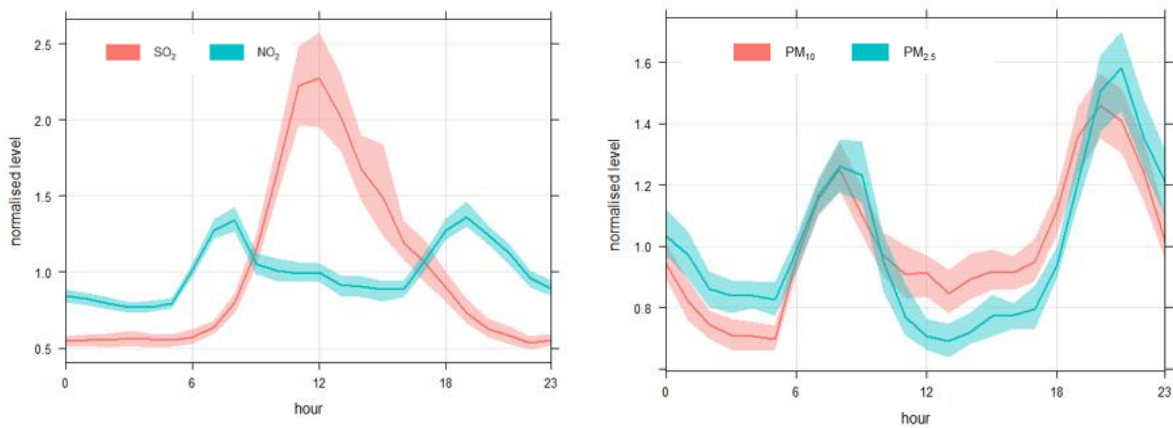
PM is a priority pollutant in the Highveld Priority Area (HPA) and also prevalent from non-industrial sources of pollution negatively impacting the ambient air quality in the HPA. Therefore the Secunda Operations included, as part of its offset programme, a focus on PM reduction from non-industrial sources to augment its on-site compliance roadmap to enable ambient air quality improvement on PM in the airshed comprehensively. The bi-modal ambient PM concentration peaks shown in Figure 3 is typical for residential fuel burning in the HPA. A morning and evening PM peak occur when domestic fuel burning is at its maximum. The morning PM peaks flatten (reduce) towards midday as atmospheric mixing is induced by heating of the earth's surface by the sun.

What the graph illustrates is that there are two distinct sources of atmospheric emissions in the HPA namely ground-level emissions (such as domestic fuel use – non-industrial emission source) and elevated emissions (from tall stack sources – industrial emission source). The stable atmosphere prevents emissions from the tall stacks coming to ground but traps ground-level emissions at the ground and prevents dispersion. When the atmosphere is destabilised by turbulence and convective conditions during the day then emissions from the tall stacks come to ground and emissions from ground level sources are ventilated. The Secunda Operations believes that air quality offsetting is therefore an impactful way of improving ambient air quality associated with sources from low-income, dense settlements towards holistic ambient air quality improvement .

To date, the Secunda Operations' offset programme mitigated emissions of more than 207 tons of PM<sub>10</sub>, 194 tons of PM<sub>2,5</sub> and 80 tons of SO<sub>2</sub> in the surrounding airshed (Sasol, 2021). The emission offsetting initiatives will continue as part of Sasol's required offset programme till 1 April 2025, anticipated to further reducing the SO<sub>2</sub> and PM emissions from anthropogenic sources in advancing ambient air quality improvements.

Further, implementation of the integrated air quality and GHG reduction roadmap is aimed at enabling that SO<sub>2</sub> emissions are reduced by 23 tons per day prior to 1 April 2025. This would amount to a 4% load reduction on SO<sub>2</sub> to already be achieved by 1 April 2025, with the bulk intended to be achieved by 2030 (30% in total).

a)



b)

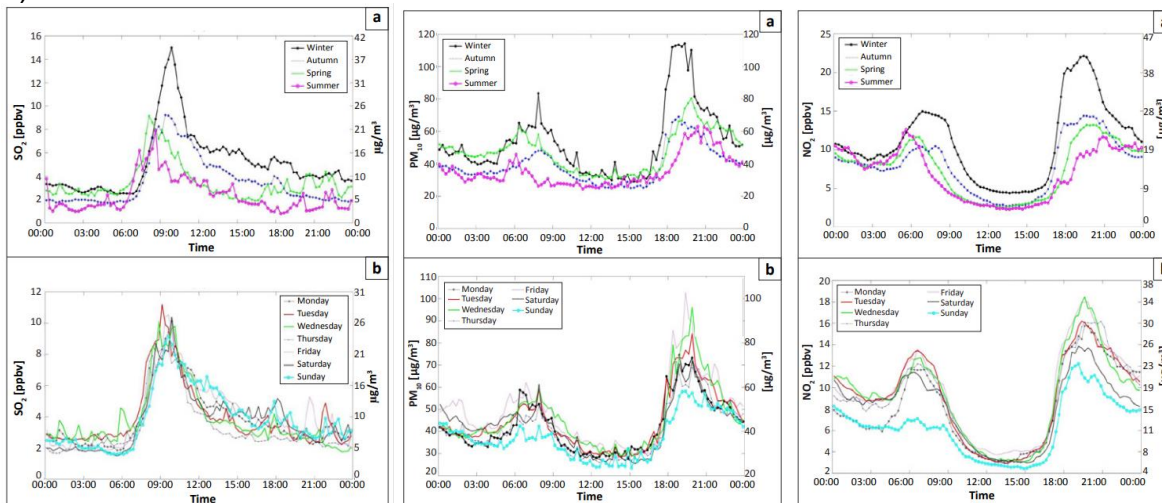


Figure 3: a) Diurnal normalized hourly average concentrations of SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> at the local air quality monitoring stations as per the air impact report (the applicable airshed). The graph illustrates that there are two separate emissions sources namely ground-level and elevated emissions (from tall stacks) b) same trends are observed in the industrialised western Bushveld Igneous Complex (Venter et al., 2012, Belelie et al, 2019)

### 3.2.2 Measures and direct investments implemented towards compliance with the new plant standards by the 1 April 2025 compliance date

To comply with the new plant standards by 1 April 2025 (as provided for in its AEL which incorporates the relevant postponement decision), the Secunda Operations has already installed additional PM and NO<sub>x</sub> abatement on the steam plants' boilers. To reduce PM emissions, nine out of 17 boiler electrostatic precipitators (ESPs) have already been retrofitted with better functioning transformers, and the remainder of the boiler fleet is on track to be retrofitted before 1 April 2025. For NO<sub>x</sub> abatement, three boilers have already been retrofitted with a total of 48 low NO<sub>x</sub> burners with completion on target to enable compliance by 1 April 2025. The steam plants' boilers is therefore on track to be fully compliant with the PM and NO<sub>x</sub> MES limits by 1 April 2025.

Implementation of the integrated air quality and GHG reduction roadmap will also require significant additional capital spend and investment in various projects up until 2030 to manage the reductions in steam load.

### **3.3 Clause 12A (c): There is material compliance with the NAAQS in the area for the pollutant applied for.**

Material compliance with the NAAQS, in the area in which the applicant will conduct its operations on a load-based emission limit, must be demonstrated for consideration of the clause 12A application. The area in question (airshed within which the Secunda Operations operates the steam plants) is defined in the AIR (Airshed, 2022). Accordingly, for purposes of demonstrating material compliance, measured SO<sub>2</sub> concentrations at the ambient air quality monitoring stations in the area are compared to the NAAQS. The location of these monitoring stations is included in the AIR Figure 5.3 page 57.

The NAAQS includes both a “limit value” and a “frequency of exceedance”. The “limit value” refers to a concentration based on scientific knowledge, with the aim of minimising harmful effects on human health. The “frequency of exceedance” refers to the tolerated number of times a limit value can be exceeded in one calendar year. Thus, if the exceedances of a limit value are within the tolerances, it is argued that there is material compliance with the NAAQS. This is used as the basis to confirm material compliance to the NAAQS in the applicable area.

#### **3.3.1 Secunda Operations ambient air quality monitoring network**

The Secunda Operations has a network of accredited (ISO/IEC17025) ambient air quality monitoring stations in the vicinity of Secunda covering the applicable area (airshed). These stations are Secunda Club, eMbalenhle and Bosjesspruit. Ambient air quality data for the period 2007 to 2021 was analysed for SO<sub>2</sub> NAAQS compliance in the Secunda area by Sasol. The measured ambient SO<sub>2</sub> concentrations are shown for hourly, daily, and annual, averaging periods in Figure 4 to Figure 6. There are no exceedances of the NAAQS limit values above the allowable number for any of the averaging periods. Therefore, it is argued that the NAAQS in this area, on average, is not exceeded and consequently constitutes material compliance with the SO<sub>2</sub> NAAQS. This is demonstrated in the Figures below.

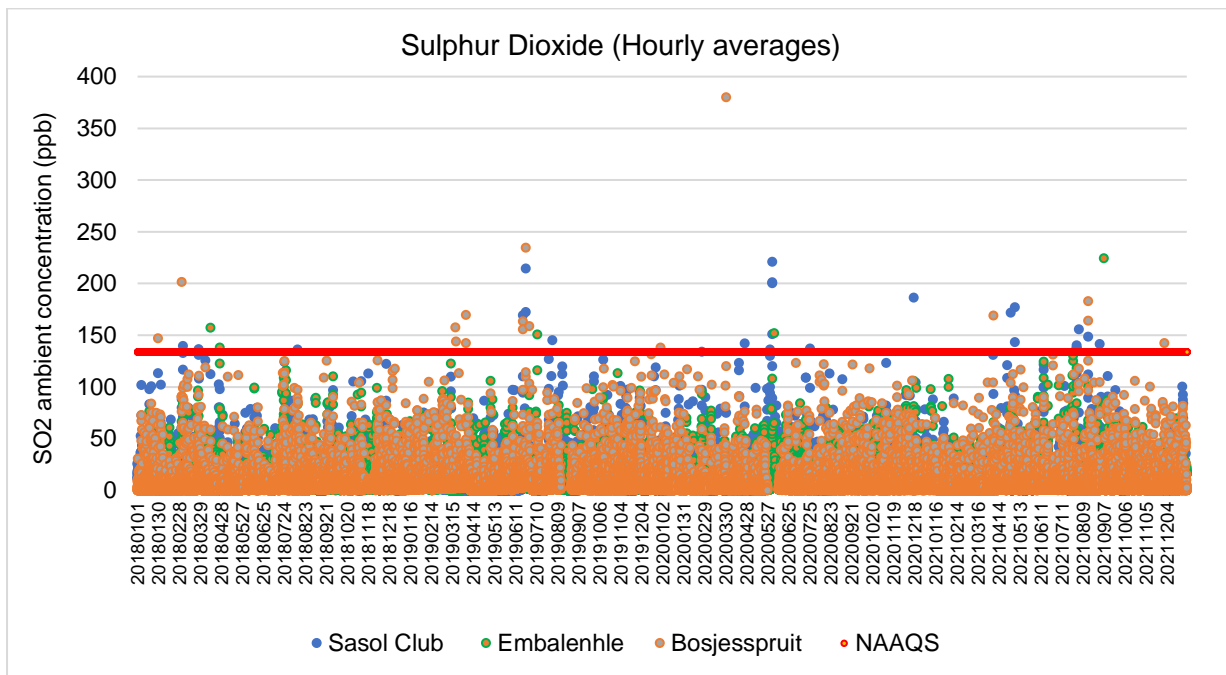


Figure 4: Measured SO<sub>2</sub> hourly average ambient air quality concentrations for the period 2018 – 2021 for the Secunda ambient air quality monitoring network

Table 4: Measured SO<sub>2</sub> hourly average ambient air quality concentrations for the period 2018 – 2021 for the Secunda ambient air quality monitoring network

Hourly averaging	2018	2019	2020	2021
Number of allowable exceedances	88	88	88	88
Number of exceedances	7	14	8	11

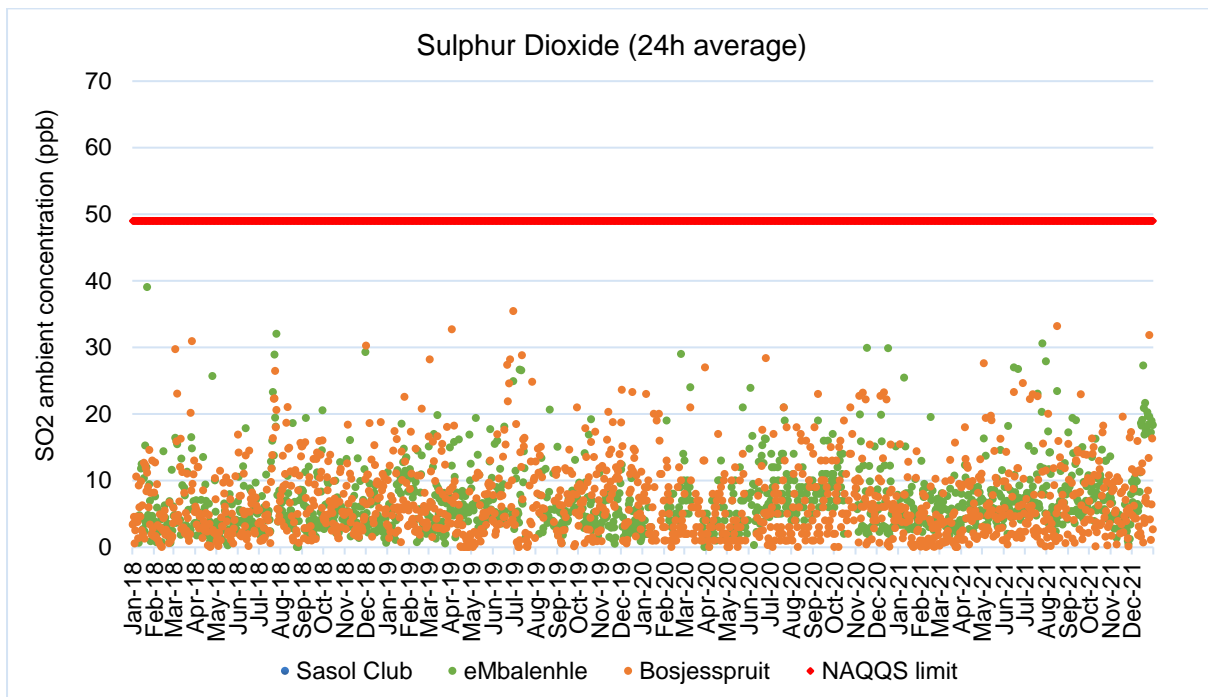


Figure 5: Measured SO<sub>2</sub> daily average ambient air quality concentrations for the period 2018 – 2021 for the Secunda ambient air quality monitoring network

Table 5: Measured SO<sub>2</sub> daily average ambient air quality concentrations for the period 2018 – 2021 for the Secunda ambient air quality monitoring network

Daily averaging	2018	2019	2020	2021
Number of allowable exceedances	4	4	4	4
Number of Exceedances	0	1	1	0



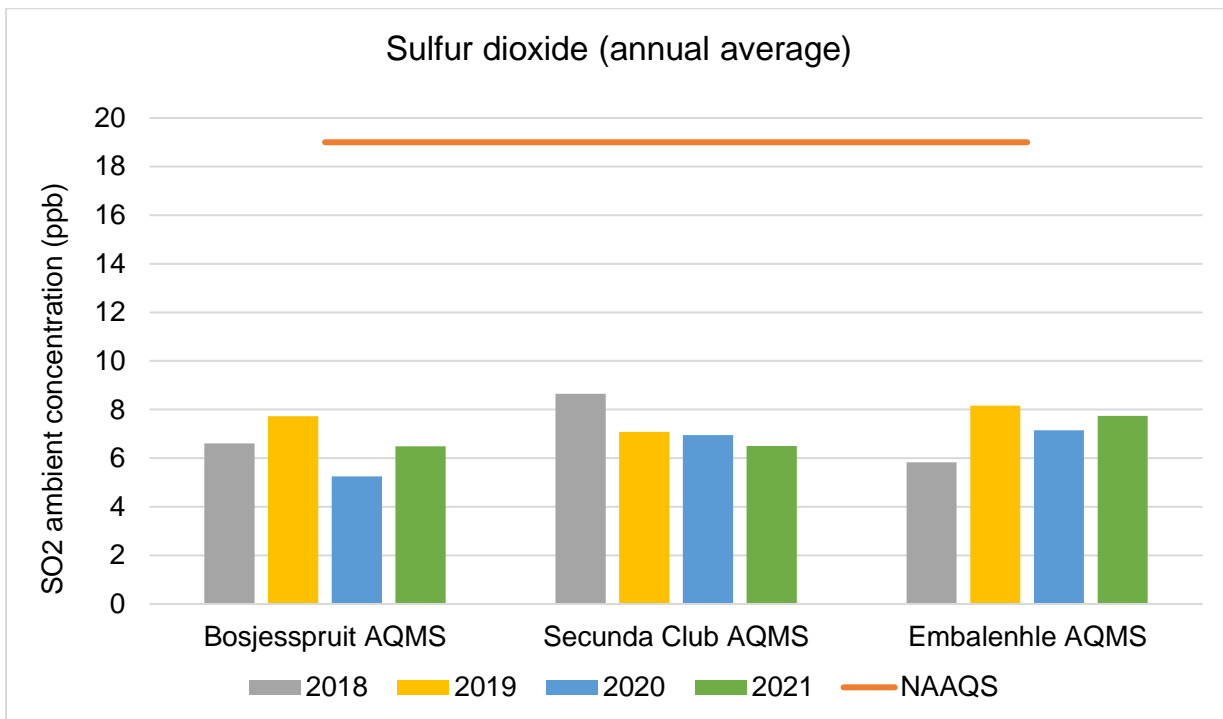


Figure 6: Measured SO<sub>2</sub> annual average ambient air quality concentrations for the period 2018 – 2021 for the Secunda ambient air quality monitoring network

### 3.3.2 State of The Air Report (DFFE, 2020)

The 2019 State of The Air Report and National Air Quality Indicator (DFFE, 2020), evaluated NAAQS compliance for annual averages of SO<sub>2</sub> at ambient air quality monitoring stations for South Africa. This was conducted for the period 2007 to 2019. Only ambient air quality monitoring stations that met the minimum requirements (DFFE, 2020) for data recovery were included in the assessment. The ambient air quality monitoring networks incorporated as part of the assessment included the HPA as well as the Mpumalanga Provincial network.

- HPA ambient air quality monitoring network measured SO<sub>2</sub> annual averages

A comparison of the measured SO<sub>2</sub> concentrations at the HPA ambient air quality monitoring networks to the NAAQS for SO<sub>2</sub>, clearly indicates that there is material compliance with SO<sub>2</sub> for the HPA including Secunda.

The graph in Figure 7 below clearly indicates there are no SO<sub>2</sub> exceedances in the Secunda airshed therefore it should not be regarded as SO<sub>2</sub> hotspot in the HPA

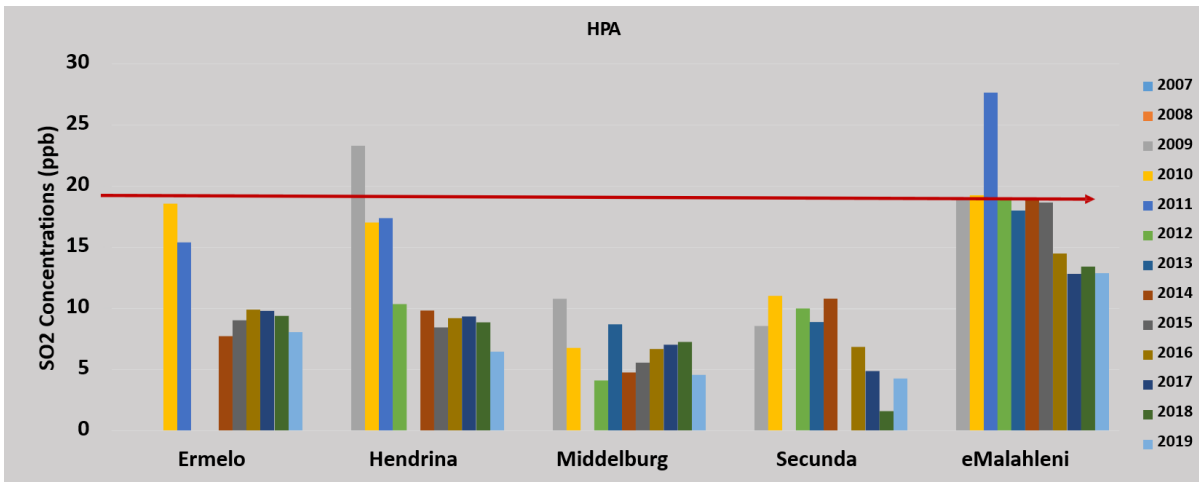


Figure 7: Measured SO<sub>2</sub> annual average ambient air quality concentrations for the period 2007-2019 for the HPA ambient air quality monitoring network (DFFE, 2020)

- Mpumalanga Provincial ambient air quality monitoring network measured SO<sub>2</sub> annual averages

A comparison of the measured SO<sub>2</sub> concentrations at the Mpumalanga Provincial ambient air quality monitoring networks to the NAAQS for SO<sub>2</sub>, confirms there are no SO<sub>2</sub> exceedances in the Secunda airshed and therefore it should not be regarded as SO<sub>2</sub> hotspot in the Mpumalanga province as indicated in Figure 8 below

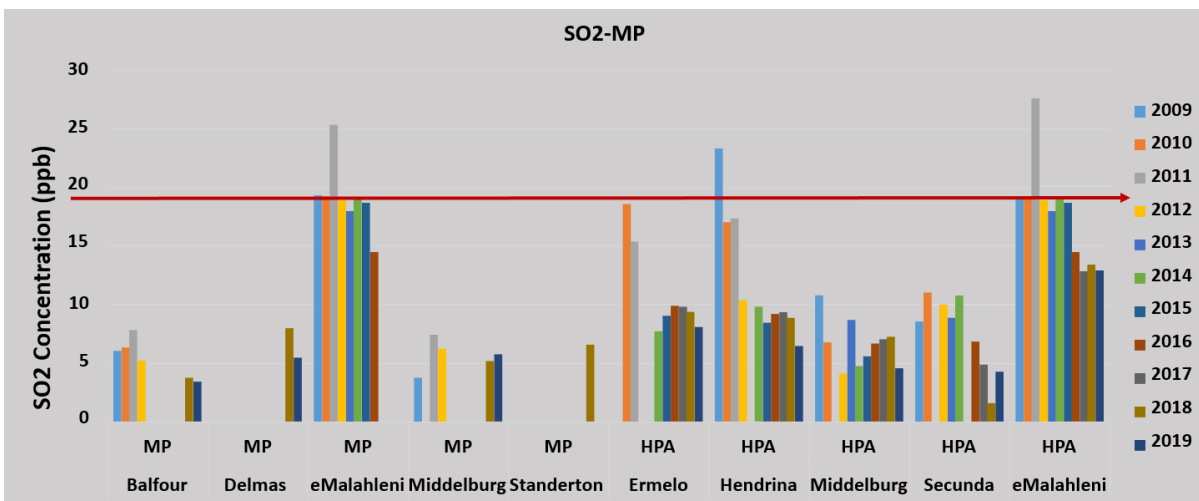


Figure 8: Measured SO<sub>2</sub> annual average ambient air quality concentrations for the period 2007-2019 for the HPA ambient air quality monitoring network (DFFE, 2020)

### 3.4 Summary

The Secunda Operations remains committed to legal compliance and ambient air quality improvement.

This is aligned with Sasol's ambition to transform its operations to lower carbon options, meet its GHG reduction targets communicated in 2021 and to reduce its overall environmental footprint. Therefore, the Secunda Operations is of the view that the implementation of the integrated air quality and GHG reduction roadmap, involving the turning down of boilers not only to reduce SO<sub>2</sub> emissions with benefits intended to be realised already from 2025 onwards, is the best approach towards ambient air quality improvement as envisaged by the MES. This approach would see the overall mass of SO<sub>2</sub> and other pollutants emitted from the boilers, per day and per unit of final product, reduced. This will significantly increase the Secunda Operations' contribution to ambient air quality improvement.

The reasons informing the clause 12A application to enable this transition as well as how the applicable criteria specified for the application are met, is explained in this report.

Should the Clause 12A application be approved,

- a) The Secunda Operations' steam plants will be able to operate lawfully on load-based limits from 1 April 2025 whilst implementing the integrated GHG and SO<sub>2</sub> reduction roadmap;
- b) The aim of enabling a 4% load reduction in SO<sub>2</sub> before April 2025 will be enabled with the bulk of the intended reduction to be realised in 2030 (total of 30%), which is more significant than the 15% reduction to be realised via a concentration-based limit;
- c) Load reductions in other pollutants will also be enabled, significantly increasing the Secunda operations' contribution to ambient air quality improvement.

## 4. Load-based approach

To enable ambient air quality improvement on SO<sub>2</sub> through the implementation of the integrated reduction roadmap (see overview in section 1.1 for more detail), Sasol intends to apply to the National Air Quality Officer to be regulated on load-based emission limits (the mass and the rate of the pollutant emissions) instead of a concentration limit (the mass of pollutant per cubic meter of air emitted) as provided for in the MES. Error! Reference source not found. in section 4.2 below explains the emission loads (and associated time periods within which these will apply) that will be applied for in terms of clause 12A of the MES.

## 4.1 Boiler load reduction

The Secunda Operations contends that only a load-based emission limit broadly equivalent to the 1 000 mg/Nm<sup>3</sup> concentration-based limit is a feasible form of compliance. Stated differently, the Secunda Operations intends to reduce emissions from the steam plants by reducing steam produced from its coal fired boilers, utilising less coal and thereby reducing the mass of SO<sub>2</sub> emissions (load). The effect of the reduction in load on ambient air quality would be similar or better to running the boilers at full capacity at an emissions concentration limit of 1 000 mg/Nm<sup>3</sup>.

In addition to the reduction in SO<sub>2</sub> emission load, there would be a proportional reduction in the loads of all other atmospheric emissions from the steam plants including PM, NO<sub>x</sub> and CO<sub>2</sub> (GHG's), which would not be realised by simply reducing the SO<sub>2</sub> emissions concentration to comply with the concentration based MES limit. The added benefits include associated reductions in the criteria pollutants namely PMs and NO<sub>x</sub> to be realised over and above compliance to the MES limits through the completion of the air quality compliance roadmaps.

In contrast to the concentration-based solution, the load-based solution does not have associated, negative, environmental impacts like additional water use, waste water generation and solid waste disposal.

To enable the load reduction through the integrated reduction roadmap, multiple projects such as renewable electricity, energy efficiency and infrastructure developments are required to supply the Secunda Operations with the electricity and steam that would be lost through reducing boiler operations. As the steam plants boilers utilise fine coal as a feedstock, reduced boiler operations would mean less fine coal burnt resulting in a fine coal excess. A project to address the expected fine coal excess must also be in place to enable the integrated reduction roadmap. Due to the magnitude and complexity of the roadmap and the associated projects it will not be possible to complete this by 1 April 2025<sup>2</sup>. An initial reduction of 23 tons of SO<sub>2</sub> per day (4%) is envisaged by before April 2025, with the bulk of the reduction of 161 t/d (30%) intended to be realised by 2030.

## 4.2 Requested load-based limits

This application is made in accordance with the requirements of Clause 12A of the MES (Government Notice No. 687 in Government Gazette No. 42472 of 22 May 2019) for SO<sub>2</sub> load-based emission limits for the Secunda Operations steam plants' boilers applicable from 1 April 2025 and onwards.

The MES require compliance with the prescribed emission limits under normal operating conditions, excluding shut down, start up and upset conditions. The regulated facility is required to ensure that emissions are consistently below the concentration-based limit specified in the MES. The limit represents a maximum concentration. The average emissions, where the facility will be operating at most of the time, will generally be substantially lower than the specified limit.

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<sup>2</sup> It should be noted that coal beneficiation, were it to have been implemented, could also not be implemented by 1 April 2025.

Since the MES specifies emissions limits as maximum emission concentrations, the Secunda Operations has structured the load-based emissions limits to be applied for in the same way. The Secunda Operations will be applying to be regulated on a specified maximum SO<sub>2</sub> emission load (Table 6) rather than the maximum concentration (1000 mg/Nm<sup>3</sup>). The requested SO<sub>2</sub> load-based emission limits are presented in Table 6 below.

Table 6: Requested emission load-based limits for the Clause 12A period from 1 April 2025 until 31 March 2030

Source	Emission	Emission load-based limit requested (maximum limit)	Averaging Period	Period
Secunda Operations Steam Stations boiler plant	SO <sub>2</sub>	503 t/d	Monthly	1 April 2025 to 31 March 2030
		365 t/d		1 April 2030 onwards

## 5. Atmospheric impact report

The motivation for and application is substantiated through and AIR. The AIR evaluates the ambient air quality impact of the load-based emission limit on the receiving environment. Sasol appointed an independent specialist firm (Airshed Planning Professionals) to conduct the AIR. The following section presents a summary of the AIR with the full report contained in Annexure 1.

### 5.1 Methodology

For this assessment Airshed Planning Professionals has ensured that the dispersion modelling methodology for the AIR confirms with the requirements of the Regulations Regarding Air Dispersion Modelling” (Government Gazette 533, published 11 July 2014). The US-EPA approved CALPUFF dispersion modelling system was utilised in this AIR. The modelled predicted concentrations were assessed against the NAAQS.

In order to assess the impact of the load-based emission limits for which the Secunda Operations will be applying, five emissions scenarios were modelled as indicated in Table 7.

Table 7: Emission Scenarios Modelled

Scenario Name	Scenario	Description	Purpose	Tons / day
Baseline	Baseline SO <sub>2</sub>	Baseline assessment based on the 95 <sup>th</sup> percentile mass emission rate	Represents the expected higher emission load during normal operations. Normal operating conditions will be below this limit 95% of the time. The scenario is only to illustrate the ambient impact if sources are modelled as continuous emission rate, however the plant is not operating continuously at this level.	526
	Baseline (Average):	Baseline assessment based on the average normal plant operation for pollutants (NO <sub>x</sub> , PM).	This scenario is used as the point of comparison of current impacts to the assessed scenarios for NO <sub>x</sub> and PM emissions only.	Not applicable



Scenario Name	Scenario	Description	Purpose	Tons / day
2025 Scenario	Scenario 1	95 <sup>th</sup> Percentile SO <sub>2</sub> with an interim 4% emission load reduction	This scenario will reflect the expected maximum emission load of SO <sub>2</sub> with an equivalent load reduction of 4%. Indicative of impact 2025 - 2030.	502
MES Compliance	Scenario 2	SO <sub>2</sub> MES limit of 1 000 mg/Nm <sup>3</sup> with a 15% emission load reduction	This reflects a hypothetical scenario where SO <sub>2</sub> emissions conform to the standard of 1 000 mg/Nm <sup>3</sup> and to continuously operate at the standard. This scenario will be representative of the maximum emission load for SO <sub>2</sub> with a 15% reduction from SO <sub>2</sub> baseline	449
2030 Scenario	Scenario 3	95 <sup>th</sup> Percentile SO <sub>2</sub> with a 30% reduction of emission load at the end state	This scenario will reflect the expected maximum emission load of SO <sub>2</sub> with a 30% load reduction which is similar in impact to scenario 2. Indicative of impact after 2030.	365

## 5.2 Key AIR findings

The modelled predicted concentrations were assessed against the NAAQS. It must be noted that the NAAQS includes both a “limit value” and a “frequency of exceedance”. The “limit value” refers to a concentration based on scientific knowledge, with the aim of minimising harmful effects on human health. The “frequency of exceedance” refers to the tolerated number of times a limit value can be exceeded in one calendar year.

Thus, if the exceedances of a limit value are within the tolerances, it is argued that there is material compliance with the NAAQS. For hourly average values (eg. hourly SO<sub>2</sub> and NO<sub>2</sub> NAAQS) the permissible frequency for exceeding the 1-hour air quality standard is 88 exceedances per year. For daily average values (eg. daily SO<sub>2</sub> and PM NAAQS) the permissible frequency for exceeding the daily air quality standard is four exceedances per year.

### 5.2.1 SO<sub>2</sub> model results

- The model predicted hourly (Figure 9), daily (Figure 10) and annual (Figure 11) SO<sub>2</sub> ambient concentrations as a result of the Secunda baseline operations for all scenarios (section 5.1.2) are well below the NAAQS limit values for the entire 3 year simulated period (2018-2020).
- If the Secunda Operations were theoretically able to comply with either the concentration-based plant standards or the load-based emission limit for its steam plants boilers, in general ambient SO<sub>2</sub> concentrations would decrease and would result in similar improved air quality, for longer duration as well as spatially further away from the source.
- The SO<sub>2</sub> area of impact based on concentration levels in the isopleths for Scenarios 2 (Compliance with MES) and 3 (End State Load Scenario) are similar for all averaging periods.
- Simulated hourly SO<sub>2</sub> concentrations for Scenario 1 (Interim Load Scenario) increased relative to the baseline at 2 AQMS and 1 receptor by between 0.3% and 2.2%. Improvements were simulated at the remaining 4 AQMS and 19 closest receptors in the range of 0.8 to 4.9%. Daily SO<sub>2</sub> concentrations were simulated to improve at all AQMS and the 20 closest receptors in the range between 0.5% and 11%. Annual SO<sub>2</sub> concentrations were simulated to improve at all AQMS and the 20 closest receptors in the range 0.6% and 6%.
- Simulated hourly SO<sub>2</sub> concentrations for Scenario 2 (Compliance with MES) improved relative to the baseline at all AQMS and the 20 closest receptors by between 13% and 19%. Daily SO<sub>2</sub> concentrations were simulated to improve at all AQMS and the 20 closest receptors by between 11% and 22%. Annual SO<sub>2</sub> concentrations were simulated to improve at all AQMS and the 20 closest receptors in the range 16% and 19%.
- Simulated hourly SO<sub>2</sub> concentration for Scenario 3 (End State Load Scenario) improved relative to the baseline at 1 AQMS and 3 receptors by between 0.5% and 7%. Increased hourly SO<sub>2</sub> concentrations were simulated at the remaining 5 AQMS and 16 closest receptors in the range 1% to 20%. Daily SO<sub>2</sub> concentrations were simulated to improve at all AQMS and the 20 closest receptors in the range between 10% and 33%. Annual SO<sub>2</sub> concentrations were simulated to improve at all AQMS and the 20 closest receptors in the range 8% and 30%.
- The lowest frequency of exceedance of the hourly NAAQ limit concentration for SO<sub>2</sub> - all within the allowable 88 hours per year - was dependent on the AQMS location, however, the number of hourly exceedances were similar for Scenarios 2 (Compliance with MES) and Scenario 3 (End State Load Scenario), with fewer exceedances for all scenarios relative to the baseline.

Figures 9 to 11 illustrates a difference between the “Observed” SO<sub>2</sub> concentrations at the ambient monitoring stations, and modelled results on the bar charts. The difference between the measured and modelled values is explained by other non-Sasol sources of SO<sub>2</sub> emissions contributing to the cumulative ambient levels as measured by the

monitoring stations. Nevertheless, the ambient measurements remain well within the NAAQS for all scenarios.

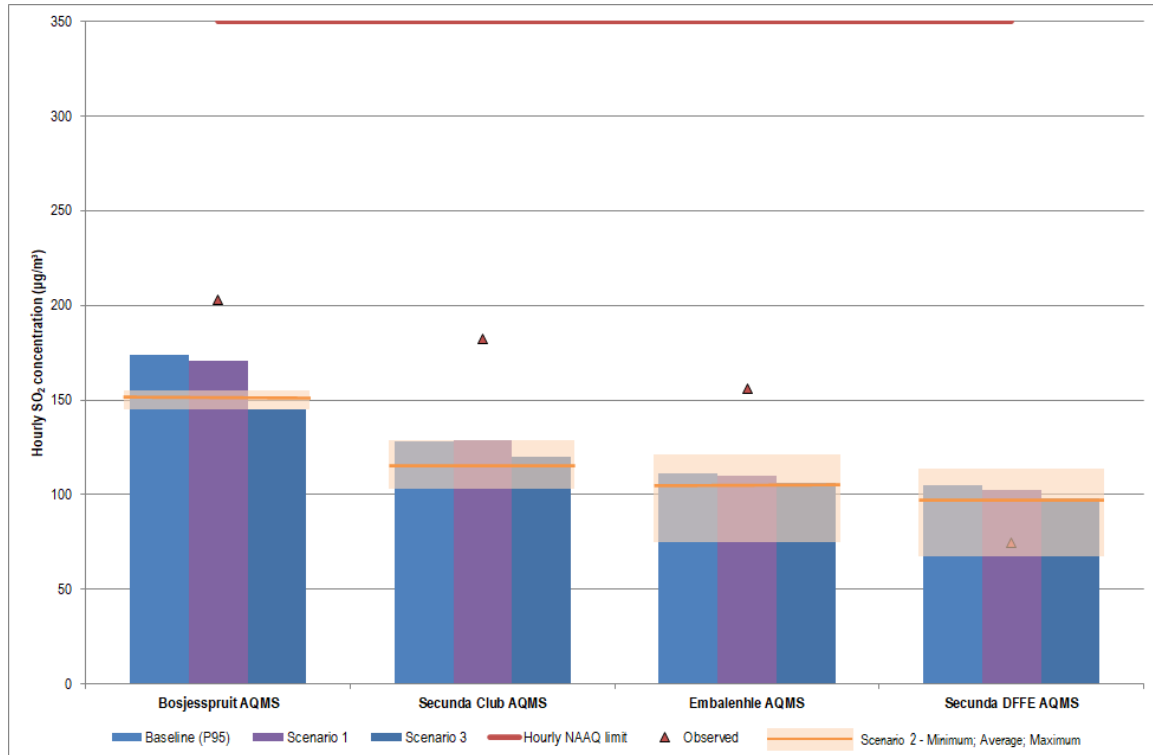


Figure 9: Simulated hourly SO<sub>2</sub> concentrations (average 99<sup>th</sup> percentile over 3 years) at AQMS for the Secunda Operations

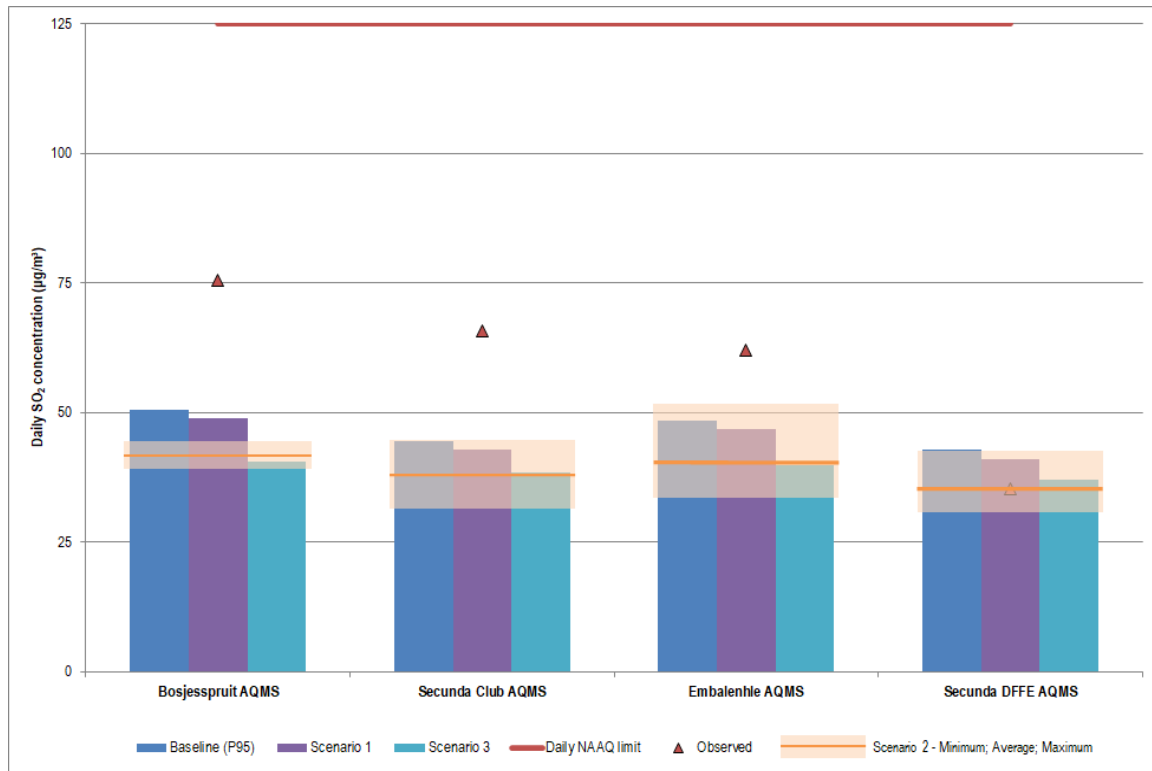


Figure 10: Simulated daily SO<sub>2</sub> concentrations (average 99<sup>th</sup> percentile over 3 years) at AQMS for the Secunda Operations

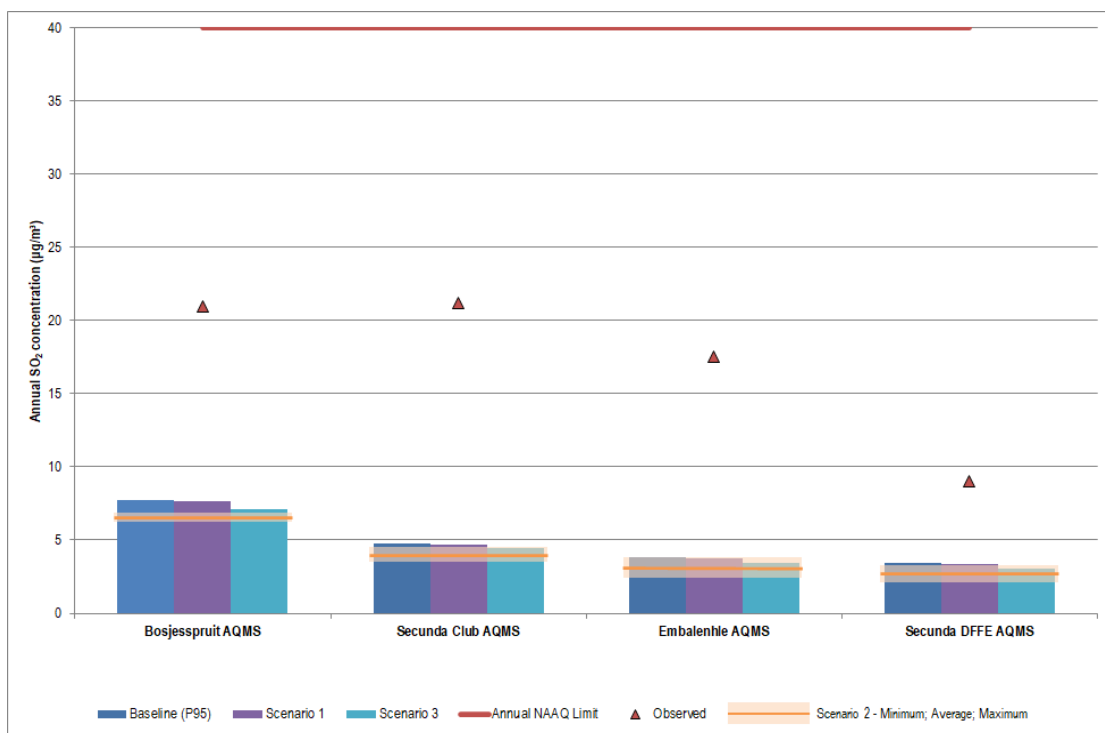


Figure 11: Simulated annual SO<sub>2</sub> concentrations at AQMS for the Secunda Operations (average over 3 years)

### 5.2.2 NO<sub>2</sub> model results

- The model simulated hourly (Figure 12 and Figure 13) NO<sub>2</sub> ambient concentrations as a result of the Secunda Operations for all scenarios (section 5.1.2) fall well below the NAAQS.
- The Secunda Operations is committed to comply with the new plant standards for NO<sub>x</sub> (Scenario 2) by 2025, the load-based emission limit will result in further reduction in ambient concentrations (Scenario 3) resulting in improved air quality.
- The NO<sub>2</sub> smallest impact footprint was simulated for Scenario 3 (End State Load Scenario) with reduced ambient NO<sub>2</sub> concentrations relative to the baseline.
- Simulated NO<sub>2</sub> concentration improvements for Scenario 1 relative to the baseline range between 5.5% and 9.3% at the AQMS and 20 closest receptors.
- Simulated NO<sub>2</sub> concentration improvements for Scenario 2 (Compliance with MES relative to the baseline range between 3.4% and 6.2% at the AQMS and 20 closest receptors.
- Simulated NO<sub>2</sub> concentration improvements for Scenario 3 (End State Load Scenario) relative to the baseline range between 15% and 29% at the AQMS and 20 closest receptors.
- The lowest frequency of exceedance of the hourly NAAQ limit concentration for NO<sub>2</sub> – all within the allowable 88 hours per year – was simulated for Scenario 3 (End State Load Scenario) followed by Scenario 2 (Compliance with MES).

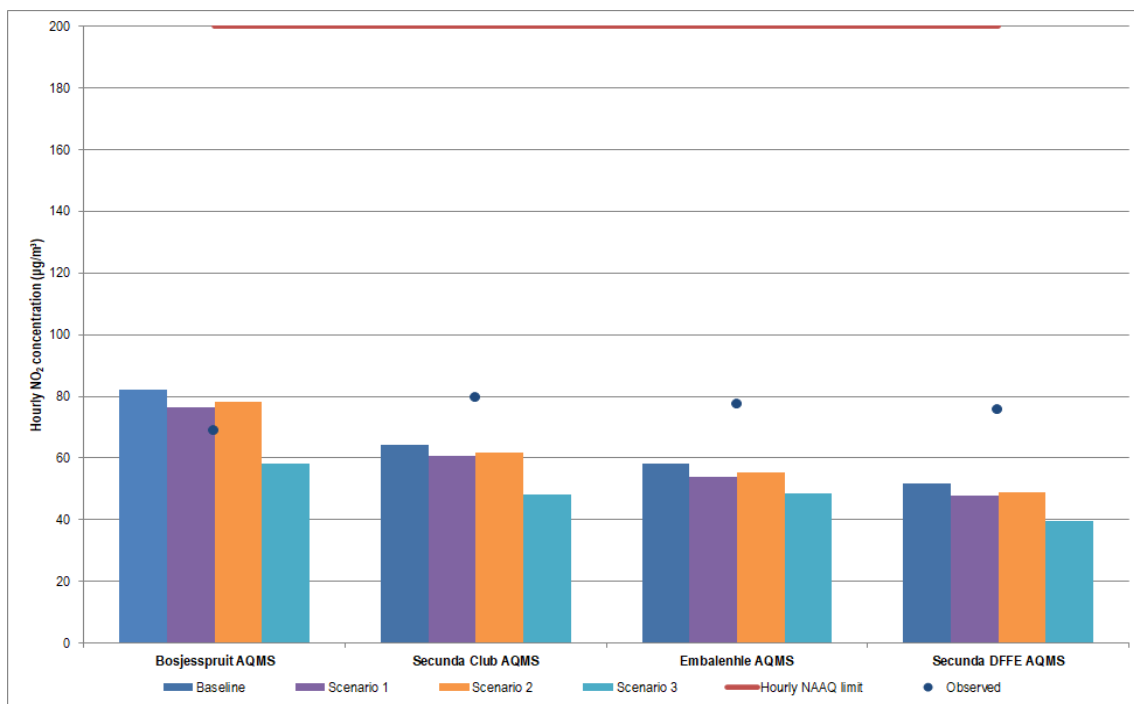


Figure 12: Simulated hourly NO<sub>2</sub> concentrations (99<sup>th</sup> percentile maximum over 3 years) at AQMS for the Secunda Operations

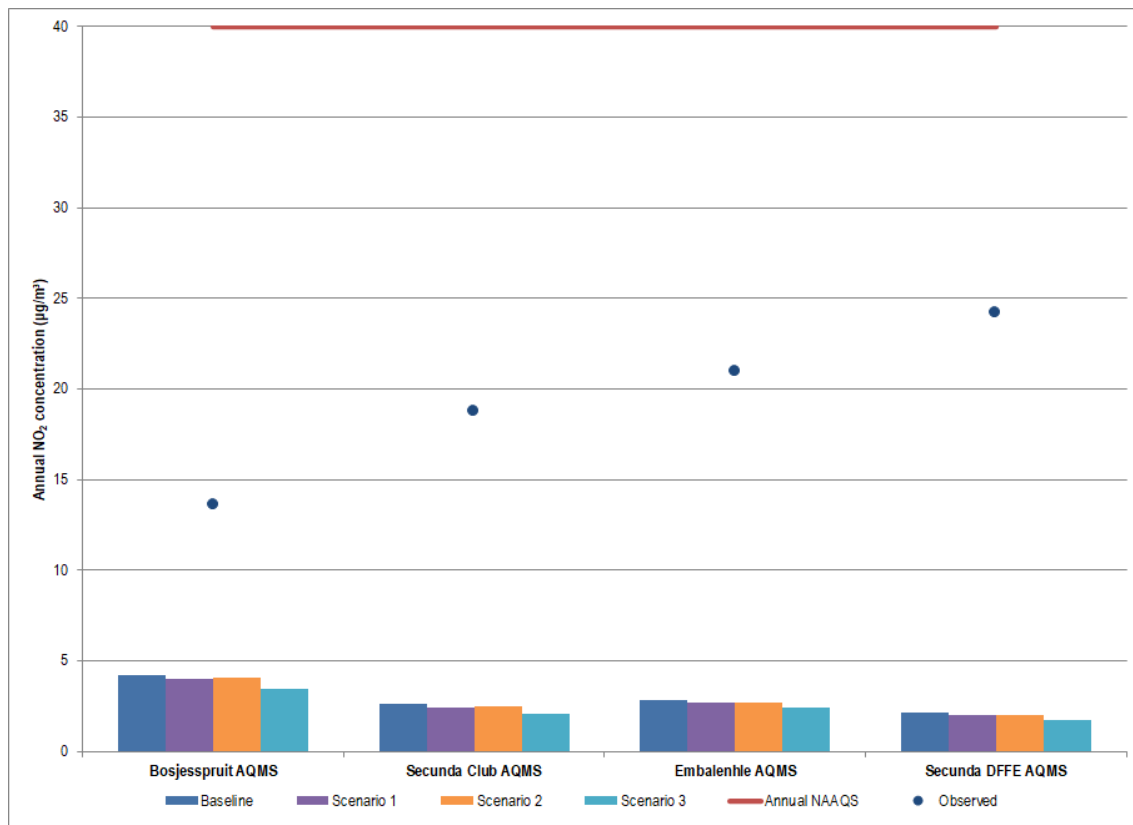


Figure 13: Simulated annual NO<sub>2</sub> concentrations at AQMS for the Secunda Operations (maximum over 3 years)

### 5.2.3 PM<sub>10</sub> model results

- The model simulated daily (Figure 14) and annual (Figure 15) PM<sub>10</sub> ambient concentrations as a result of Secunda baseline operations for all scenarios (section 5.1.2) fall well below the NAAQS. Measured PM<sub>10</sub> concentrations exceed the NAAQS at the stations. Non-compliance with the PM NAAQS is highly likely due to domestic fuel use in low-income, dense settlements (see Figure 3).
- The Secunda Operations is committed to comply with with the new plant standards for PM<sub>10</sub> (Scenario 2) by 2025, the load-based emission limit will result in further reduction in ambient concentrations (Scenario 3) resulting in improved air quality
- The smallest PM impact footprint was simulated for Scenario 3 (End State Load Scenario) followed by Scenario 2.
- Ambient PM concentration improvements for Scenario 1 relative to the baseline range between 0.7% and 12% at the AQMS and 20 closest receptors.
- Ambient PM concentration improvements for Scenario 2 (compliance with MES) relative to the baseline range between 3% and 10% at the AQMS and 20 closest receptors.



- Ambient PM concentration improvements for Scenario 3 (End State Load Scenario) relative to the baseline range between 8% and 29% at the AQMS and 20 closest receptors.

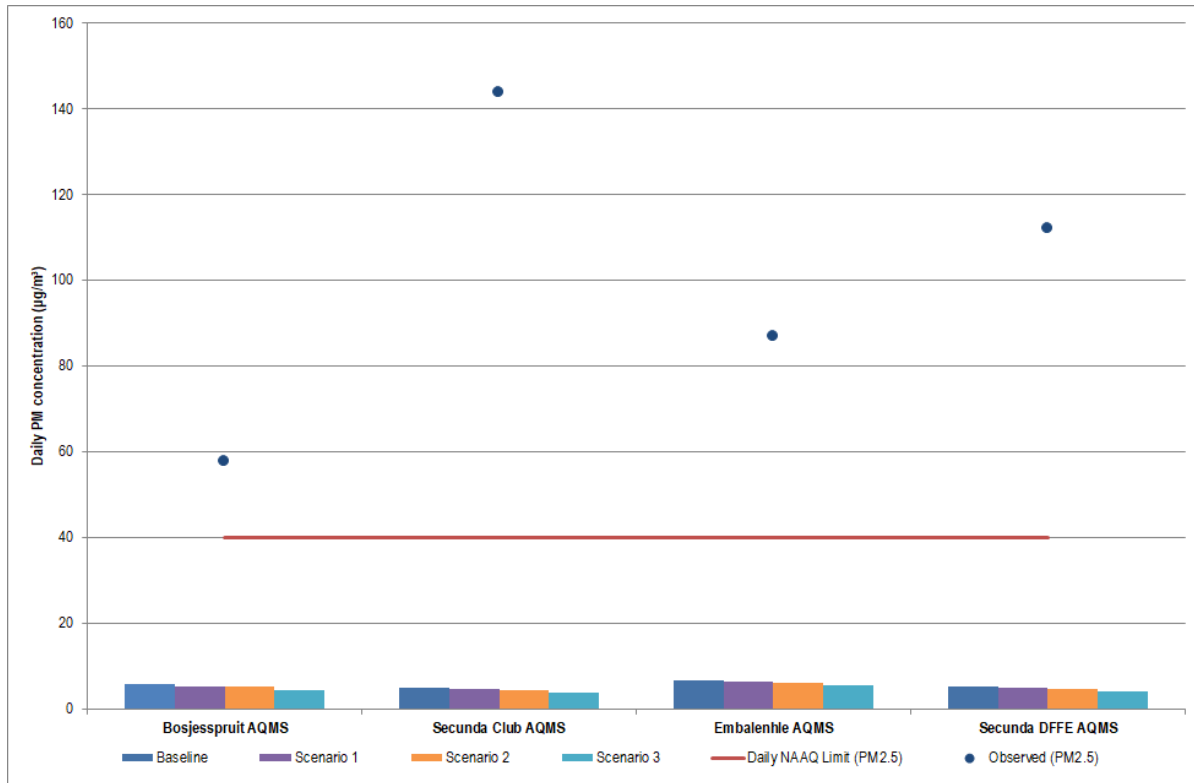


Figure 14: Simulated daily PM concentrations (99<sup>th</sup> percentile maximum over 3 years) at AQMS for the Secunda Operations

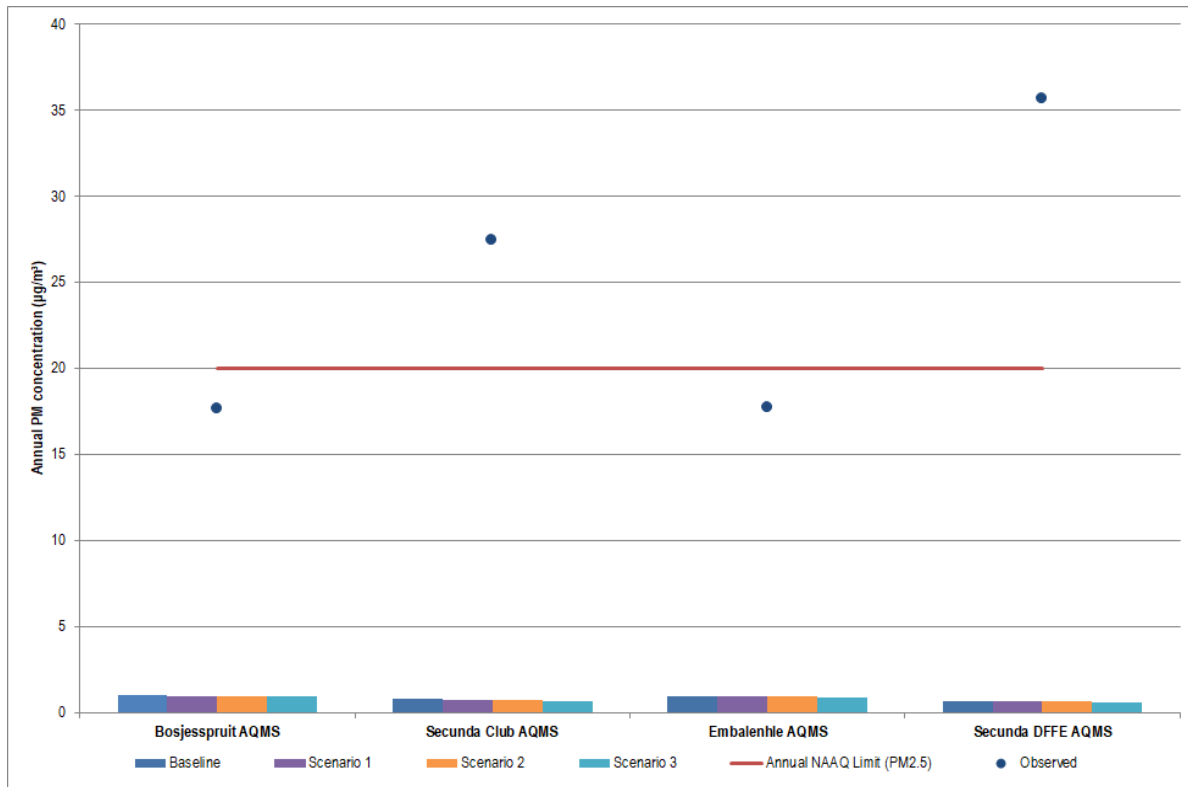


Figure 15: Simulated annual PM concentrations at AQMS for the Secunda Operations (maximum over 3 years)

### 5.3 Overview of the AIR Results

#### 5.3.1 The ambient air quality impact of the load-based SO<sub>2</sub> emission limit

The proposed SO<sub>2</sub> load-based emission limits proposed by the Secunda Operations generally results in an improvement in ambient SO<sub>2</sub> concentrations for the airshed. The Secunda Operations' interim load scenario (4% SO<sub>2</sub> emission load reduction) generally results in a progressive improvement (Figure 16) in ambient air quality. Whereas the proposed Secunda Operations' end state load scenario (30% SO<sub>2</sub> emission load reduction) results in a considerable improvement (up to 30% in ambient SO<sub>2</sub> concentrations (Figure 17)). A comparison of Scenario 2 and 3 demonstrates that compliance with the new plant SO<sub>2</sub> MES limit results in greater hourly ambient SO<sub>2</sub> concentration improvements compared to baseline. However, the envisaged 30% SO<sub>2</sub> emission load reduction results in greater ambient SO<sub>2</sub> concentration improvements for both daily and annual averaging periods.

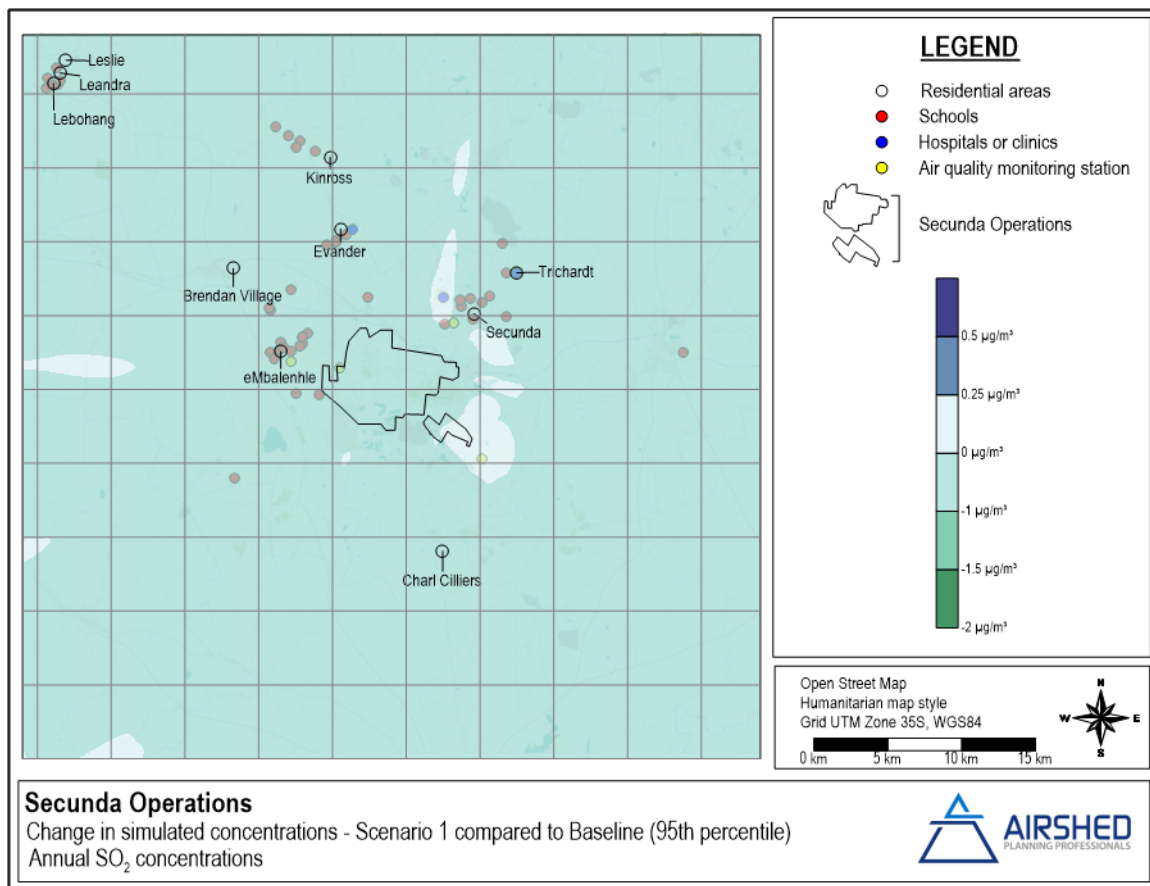


Figure 16: Change in simulated annual SO<sub>2</sub> concentrations from Scenario 1 compared to Baseline (95<sup>th</sup> percentile)

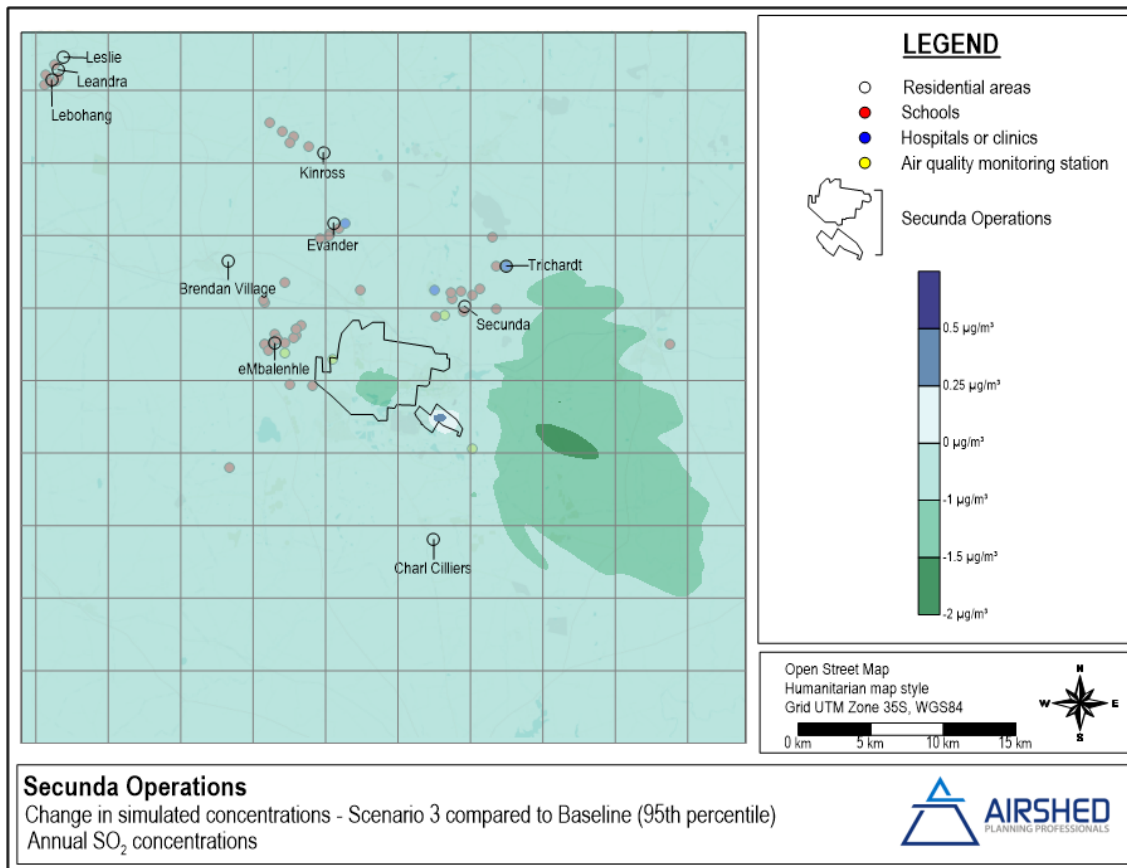


Figure 17: Change in simulated annual SO<sub>2</sub> concentrations from Scenario 3 compared to Baseline (95<sup>th</sup> percentile)

### 5.3.2 Additional NO<sub>2</sub> and PM ambient air quality benefits due the emission load reduction

The Secunda Operations is on target to retrofit all the boilers within the steam plants with both NO<sub>x</sub> and PM abatement by 1 April 2025 to meet the relevant AEL requirements informed by the MES new plant standards (Table 2). Based on the Secunda Operations' envisaged additional emission load reductions to be achieved in 2025 (Scenario 1) and 2030 (Scenario 3) (Table 6), the emission load reductions will result in additional air quality improvements in both ambient NO<sub>2</sub> and PM concentrations (Section 5.2.2 and 5.2.3).

### 5.3.3 Evaluation of Model Predicted Results to NAAQS

The frequency of exceedances for the model predicted SO<sub>2</sub>, NO<sub>2</sub> and PM ground level concentrations were compared to the NAAQS at the ambient air quality monitoring stations. No daily exceedances were simulated. Although, the model simulated exceedances for hourly SO<sub>2</sub> and NO<sub>2</sub> the number of exceedances was well within the permissible tolerances, thus demonstrating material compliance with the NAAQS.

#### 5.3.4 Health effects

The development of NAAQS for South Africa was informed by the World Health Organisation Air Quality Guidelines. The NAAQS were published after an extensive engagement process including all stakeholders (DFFE, Industry, NGO's & academia). The NAAQS prescribe a permissible or tolerable health risk. The AIR results demonstrate that the load-based emissions limits result in improved ambient SO<sub>2</sub>, NO<sub>2</sub> and PM concentrations thereby not only complying with the NAAQS but thereby contributing towards a reduction in associated risks.

#### 5.3.5 Ecological effects

The key finding from the AIR is that the proposed SO<sub>2</sub> emission load-based limits to be applied for does not result in any in significant environmental impacts. The critical environmental levels for vegetation, dustfall, ambient corrosion and atmospheric deposition are not exceeded.

## 6. Public participation process

The process followed for this application allows potential interested and affected parties (I&APs) an opportunity to comment on, or raise issues relevant to the intended application. For purposes of this application, in conducting the PPP, we aim to engage with the I&APs in a manner that allows them to participate meaningfully. The principles on public participation as explained in NEMA and the EIA regulations informed the process.

The three phases of our PPP are illustrated in the Figure 18

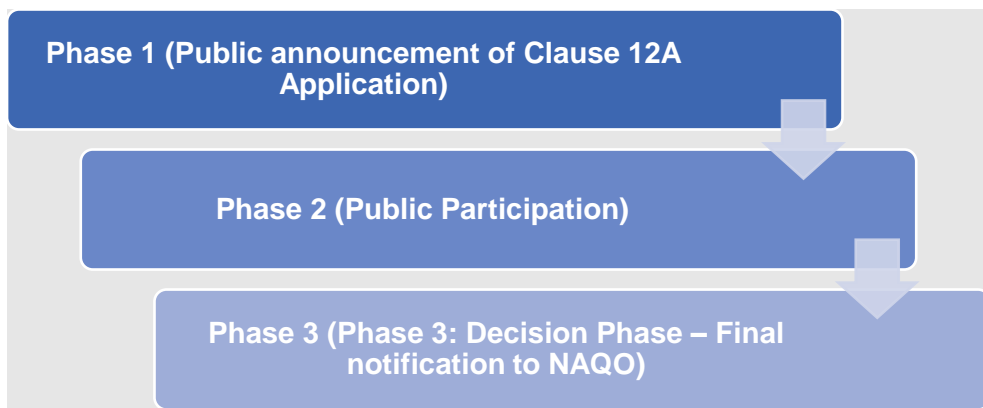


Figure 18: Three phases of our PPP

Our PPP approach has been simplified in Figure 19 below and indicates where the public open day will be held, including the local and national newspapers selected to announce the project and where site notices along with copies of the Draft Motivation Report will be placed.



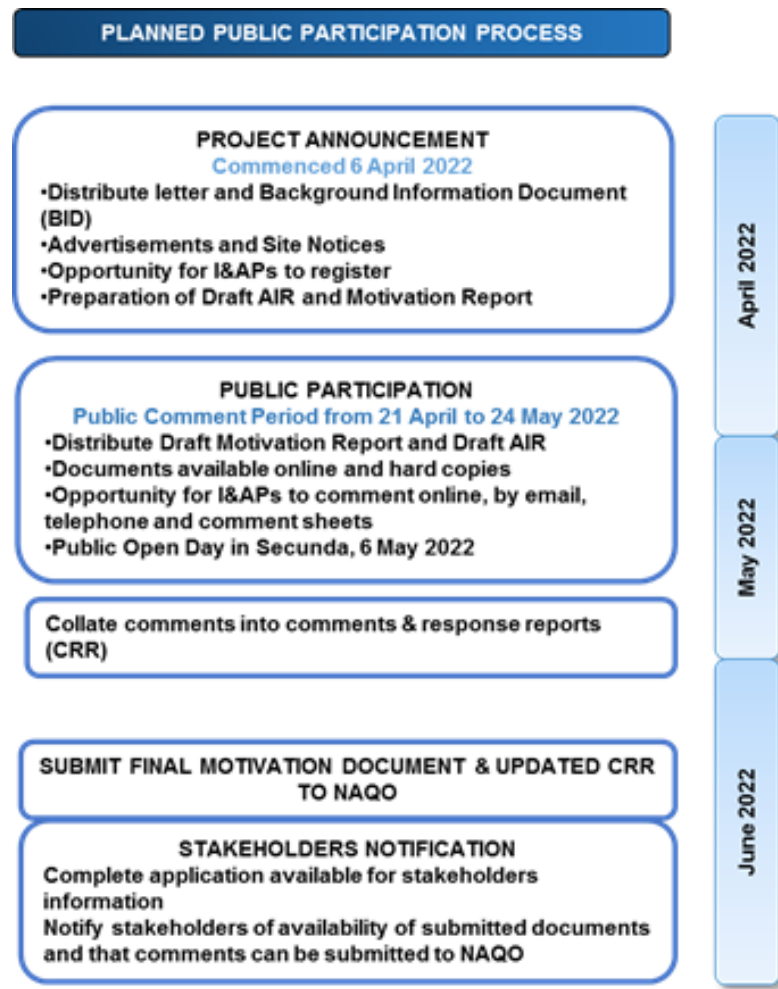


Figure 19: Planned Public Participation Process

### 6.1 Public announcement of Clause 12A application

Advertisements were placed in three newspapers as indicated in Table 8, reaching Afrikaans, English and isiZulu speaking audiences which are the predominantly spoken languages in the area of impact (airshed).

Table 8: Newspaper outlets, language and publication dates

Newspaper	Type	Language	Publication Date
Ridge Times	Local newspaper	English and Afrikaans	08/04/2022
Seskhona	Local newspaper	Zulu	19/04/2022
Seskhona	Online newspaper	Zulu	19/04/2022
Daily Sun	Regional newspaper	English and Zulu	20/04/2022
Beeld	Regional newspaper	Afrikaans	20/04/2022

Site notices (A2) were placed at the following venues:

- 1) Sasol Site Offices;
- 2) Secunda Public Library;
- 3) Govan Mbeki Local Municipality;

In addition to this, flyers were distributed in the local communities and radio adverts broadcasted on various local and regional radio stations in an effort to raise awareness and encourage participation by fenceline communities.

Stakeholders were also informed of the application process, the public comment period, the availability of documentation and the public meeting via SMS and email notifications

## 6.2 Public participation

During the public consultation period (from 21 April to 24 May 2022), the BID, Draft AIR and Motivation report will be available on the ARM website. Hardcopies will also be available at the Govan Mbeki Local Municipality, the Secunda Public Library and at the entrance to the Sasol Secunda facility. During the public participation period I&APs can review and comment on the draft AIR and the motivation report by email or telephonically. Stakeholders are further able to contact ARM directly for assistance in accessing the documentation, registering as an I&AP or to submit comments telephonically or by email.

A public open day is planned on the 6th of May 2022 from 10:00 to 16:00 at the Lilian Ngoyi Centre in Secunda. At the open day, information on the contents of the draft AIR and motivation report will be shared with I&APs. I&APs can submit comments at the open day and ARM will be available to assist in capturing comments. I and Aps will also be able to register at this event.

## 7. Conclusion

The Secunda Operations remains committed to legal compliance and ambient air quality improvement.

This is aligned with Sasol's ambition to transform its operations to lower carbon options, meet its GHG reduction targets communicated in 2021 and to reduce its overall environmental footprint. Therefore, the Secunda Operations is of the view that the implementation of the integrated air quality and GHG reduction roadmap, involving the turning down of boilers not only to reduce SO<sub>2</sub> emissions with benefits intended to be realised already from 2025 onwards, is the best approach towards ambient air quality improvement as envisaged by the MES. This approach would see the overall mass of SO<sub>2</sub> and other pollutants emitted from the boilers, per day and per unit of final product,

reduced. This will significantly increase the Secunda Operations' contribution to ambient air quality improvement.

The reasons informing the clause 12A application to enable this transition as well as how the applicable criteria specified for the application are met, is explained in this report.

Should the Clause 12A application be approved,

- a) The Secunda Operations' steam plants will be able to operate lawfully on load-based limits from 1 April 2025 whilst implementing the integrated GHG and SO<sub>2</sub> reduction roadmap;
- b) The aim of enabling a 4% load reduction in SO<sub>2</sub> before April 2025 will be enabled with the bulk of the intended reduction to be realised in 2030 (total of 30%), which is significantly more than the 15% reduction to be realised via a concentration-based limit;
- c) Load reductions in other pollutants will also be enabled, significantly increasing the Secunda operations' contribution to ambient air quality improvement. There would be a proportional reduction in the loads of all other atmospheric emissions from the steam plant including PM and NO<sub>x</sub>, which would not be realised by simply reducing the SO<sub>2</sub> emissions concentration to comply with the MES limit. The benefits on the criteria pollutants of PMs and NO<sub>x</sub> will be realised over and above Sasol's air quality compliance roadmap of low NO<sub>x</sub> burner installation for NO<sub>x</sub> abatement, and high frequency transformer installation for PM abatement;
- d) In contrast to the concentration-based coal beneficiation solution, the load-based solution does not have associated, negative, environmental impacts like additional water use, waste water generation and solid waste disposal.

To enable the load reduction through the integrated reduction roadmap, multiple projects such as renewable electricity, energy efficiency and infrastructure developments are required to supply the Secunda Operations with the electricity and steam that would be lost through reducing boiler operations. As the steam plants boilers utilise fine coal as a feedstock, reduced boiler operations would mean less fine coal burnt resulting in a fine coal excess. A project to address the expected fine coal excess must also be in place to enable the integrated reduction roadmap. Due to the magnitude and complexity of the roadmap and the associated projects it will not be possible to complete this by 1 April 2025<sup>3</sup>. An initial reduction of 23 tons of SO<sub>2</sub> per day (4%) is envisaged by before April 2025, with the bulk of the reduction of 161 t/d (30%) intended to be realised by 2030.

The Secunda Operations is therefore requesting to be governed by SO<sub>2</sub> emission load-based limits. This will allow for an improvement in ambient air quality equivalent or better than what would be achieved via the concentration limits, aligned with the objectives of the NEMAQA. Accordingly, the Secunda Operations will also be enabled to increase its contribution to ambient air quality improvement.

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<sup>3</sup> It should be noted that coal beneficiation, were it to have been implemented, could also not be implemented by 1 April 2025.

## 8. Declaration of accuracy of information

Name of Company: Sasol South Africa (Pty) Limited acting through its Secunda Operations

I, **Hannes Buys**, in my capacity of emission control officer for Secunda Operations, declare that the information provided in this report is in all respects factually true and correct, to the best of my knowledge and as at the date of signature.

Signed at Secunda this 20 day of April 2022.

## 9. References

Airshed (2022). Atmospheric Impact Report: Sasol's Secunda Operations, Mpumalanga Province, Report No: 21SAS06\_AIR

DFFE (2018) The 2017 National Framework for Air Quality Management in the Republic of South Africa. Last accessed 19/04/2022.

Available from: [https://saaqis.environment.gov.za/Pagesfiles/2017\\_National\\_Framework.pdf](https://saaqis.environment.gov.za/Pagesfiles/2017_National_Framework.pdf)

Sasol (2014) Secunda Synfuels Operations: Motivation for the postponement of compliance timeframes in terms of Regulation 11 of the Listed Activities and associated Minimum Emission Standards identified in terms of Section 21 National Environmental Management: Air Quality Act 39 of 2004 as amended

Sasol (2019) Motivation for the postponement of compliance timeframes in terms of Regulation 11 of the Listed Activities and associated Minimum Emission Standards identified in terms of Section 21 National Environmental Management: Air Quality Act 39 of 2004

Sasol (2020) Motivation for the postponement of compliance timeframes in terms of Regulation 11 of Section 21 NEM: AQA Minimum Emission Standards, for Sasol South Africa Limited operating through Secunda Synfuels Operations: Comments and Response Report

Sasol (2021a) Sustainability Disclosure, Last accessed 19/04/2022. Available from: <https://www.sasol.com/sustainability/sustainability-disclosure>

Sasol (2021b) Atmospheric Emissions Licences, Last accessed 19/04/2022. Available from: <https://www.sasol.com/sustainability/environment/air-quality/atmospheric-emissions-licences/atmospheric-emissions-licences>

Sasol (2021c) Proposed amendment to the application for postponement of certain requirements of the National Environmental Management: Air Quality Act - Minimum Emission Standards, for Sasol South Africa Limited operations in Secunda

## 10. Annexures

### 10.1 Annexure 1: Atmospheric Impact Report



## 10.2 Annexure 2: Atmospheric Emissions License

## 11. Report disclaimer

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