CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Sasol Nitrous Oxide Abatement Project
Version 2
20 October 2006

A.2. Description of the project activity:

>>
Nitrous Oxide (N_2O) is an undesired by-product gas from the manufacture of nitric acid. Nitrous oxide is formed during the catalytic oxidation of Ammonia. Over a suitable catalyst, a maximum 98% (typically 92-96%) of the fed Ammonia is converted to Nitric Oxide (NO). The remainder participates in undesirable side reactions that lead to the production of Nitrous Oxide, among other compounds.

Waste N_2O from nitric acid production is typically released into the atmosphere, as it does not have any economic value or toxicity at typical emission levels. N_2O is an important greenhouse gas which has a high Global Warming Potential (GWP) of 310.

The project activity involves the installation of a secondary catalyst to abate N_2O inside the reactor once it is formed.

The baseline scenario is determined to be the release of N_2O emissions to the atmosphere at the currently measured rate, in the absence of regulations to restrict N_2O emissions. If regulations on N_2O emissions are introduced during the crediting period, the baseline scenario shall be adjusted accordingly.

Baseline emissions rate will be determined by measuring N_2O emission factor (kg N_2O/tonnne HNO_3) during a *complete* production campaign prior to project implementation. To assure that the data obtained during the initial N_2O measurement campaign for baseline emission factor determination are representative of the actual GHG emissions from the source plant, a set of process parameters known to affect N_2O generation that are under the control of the plant operator, will be controlled from historical data.

Baseline emissions will be dynamically adjusted from activity levels on an ex-post basis through monitoring the amount of nitric acid production. Project N_2O emission will be monitored directly in real time. Additional N_2O monitoring and recording facilities will be installed to measure the amount of N_2O emitted by the project activity.

Project additionality is determined using the most recent version of the “tool for demonstration and assessment of additionality”, approved by the CDM Executive Board.

The project activity will contribute to the sustainable development of the country through industrial technology transfer (catalyst technology from a developed country to South Africa). The project activity will reduce N_2O emissions and will not increase nor decrease direct emissions of other air pollutants.

The project does not impact on the local communities or access of services in the area. The project activity will not cause job losses at Sasol's plants.

Sasol nitrous oxide abatement project has the potential to be replicated by other nitric acid plants in the country and in other developing countries.

A.3. Project participants:

>>

Name of Party involved (*). ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicates if the Party involved wishes to be considered as project participant (Yes/No)**
Republic of South Africa (host)	Sasol Nitro, a division of Sasol Chemical Industries Limited. Private entity. Project Developer.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Sasol Nitro (hereinafter called "Sasol") is a division of Sasol Chemical Industries Limited, a private company incorporated under the laws of the Republic of South Africa. Sasol Chemical Industries Limited is part of the Sasol group of companies (the Sasol Group) whose activities are coordinated by the holding company Sasol Limited, founded in 1950. The Sasol Group is an integrated oil and gas entity with substantial chemical interests. It is based in South Africa with its head office in Johannesburg, but also has manufacturing and marketing facilities elsewhere in Africa, Europe, Asia and the Americas. Sasol is listed on the Johannesburg Securities Exchange (JSE), symbol SOL, and the New York Stock Exchange (NYSE), symbol SSL. Sasol Chemical Industries Limited represents the Sasol Group's chemicals businesses with its portfolio including polymers, solvents, olefins, surfactants, waxes, phenolics and nitrogenous products. Sasol Nitro, a division of Sasol Chemical Industries Limited, represents the nitrogenous products and related goods; it manufactures and markets ammonia, nitric acid, fertilizers, phosphoric acid, a phosphoric detergent, commercial explosives and specialized blasting accessories. The division also markets ammonia, sulfur and specialty gases produced by other Sasol divisions. Sasol Nitro operates two nitric acid plants. The smaller 557 ton 100% nitric acid per day unit in Sasolburg is linked to a downstream ammonium nitrate plant. The ammonium nitrate is processed in Sasolburg to produce low-density ammonium nitrate for use in the production of commercial explosives. The larger 860 ton per day unit in Secunda supplies a downstream ammonium nitrate plant linked to a 500,000 ton per annum fertilizer granulation facility that produces limestone ammonium nitrate (LAN) and various other fertilizer grades containing nitrogen, phosphorus and potassium. Ammonium nitrate for industrial use is sourced from both sites.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

>>
Republic of South Africa

A.4.1.2. Region/State/Province etc.:

>>
Free State and Mpumalanga provinces

A.4.1.3. City/Town/Community etc:

>>
Sasolburg and Secunda.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

>>
The project activity is located at two nitric acid plants owned by Sasol. The smaller unit (557 tonne per day) is located in Sasolburg and the other nitric acid plant (860 tonne per day) in Secunda.

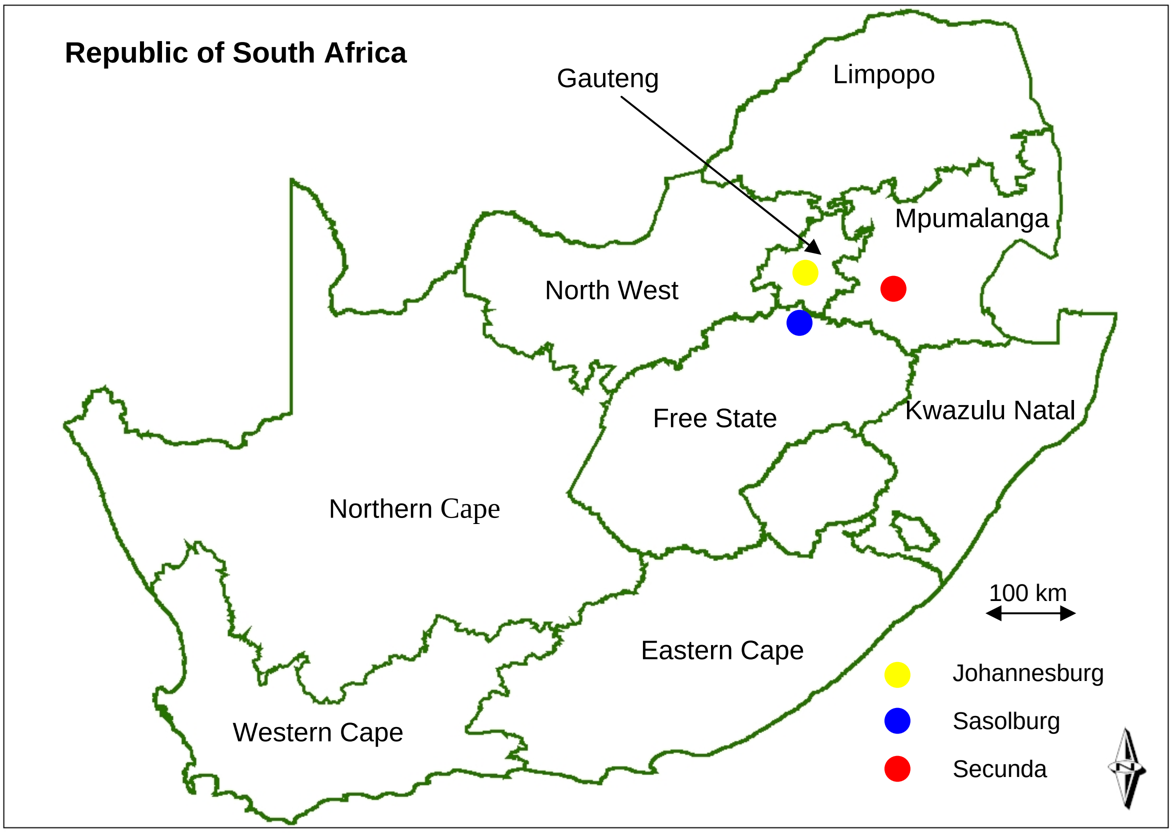


Figure 1. The location of Sasolburg and Secunda Plants

A.4.2. Category(ies) of project activity:

>>
The project activity fall within *Sectoral scope*: "(5) Chemical industries".

A.4.3. Technology to be employed by the project activity:

>>
The Ostwald process

Nowadays, all commercial Nitric Acid is produced by the oxidation of ammonia, and subsequent reaction of the oxidation products with water, through the Ostwald process.

The basic Ostwald process involves 3 chemical steps:

A) Catalytic oxidation of ammonia with atmospheric oxygen, to yield Nitrogen Monoxide (or Nitric Oxide).

(1) $4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$

B) Oxidation of the Nitrogen Monoxide to Nitrogen Dioxide or Dinitrogen Tetroxide

(2) $2\ NO + O_2 \rightarrow 2\ NO_2 \rightarrow N_2O_4$

C) Absorption of the Nitrogen Oxides with water to yield Nitric Acid

(3) $3\ NO_2 + H_2O \rightarrow 2\ HNO_3 + NO$

Reaction 1 is favored by lower pressure and higher temperature. Nevertheless, at too high temperature, secondary reactions take place that lower yield (affecting nitric acid production); then, an optimal is found between 850-950 degrees C, affected by other process conditions and catalyst chemical composition (figure 2)[1]. Reactions 2 and 3 are favored by higher pressure and lower temperatures.

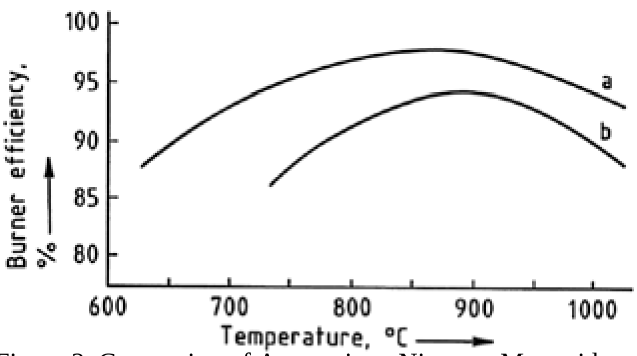


Figure 2. Conversion of Ammonia to Nitrogen Monoxide on Platinum Gauze as a function of temperature a) 100 kPa; (b) 400 kPa [1]

[1] Thieman et al., "Nitric Acid, Nitrous Acid, and Nitrogen Oxides", *Ullmann's Encyclopedia of Industrial Chemistry 6th Edition*, Wiley-VCH Verlag GmbH & Co. KGaA. All rights reserved.

The way in which these three steps are implemented, characterizes the various Nitric Acid processes found throughout the industry. In mono pressure or single pressure processes ammonia combustion and nitrogen oxide absorption take place at the same working pressure. In dual pressure or split pressure plants the absorption pressure is higher than the combustion pressure.

Nitrous Oxide formation

Nitrous oxide is formed during the catalytic oxidation of Ammonia. Over a suitable catalyst, a maximum 98% (typically 92-96%) of the fed Ammonia is converted to Nitric Oxide (NO) according to reaction (1) above. The remainder participates in undesirable side reactions that lead to Nitrous Oxide (N_2O), among other compounds.

Side reactions during oxidation of Ammonia:

(4) $4\ NH_3 + 4\ O_2 \rightarrow 2\ N_2O + 6\ H_2O$ (Nitrous Oxide formation).

(5) $4\ NH_3 + 3\ O_2 \rightarrow 2\ N_2 + 6\ H_2O$

(6) $2\ NO \rightarrow N_2 + O_2$

(7) $4\ NH_3 + 6\ NO \rightarrow 5\ N_2 + 6\ H_2O$

N_2O abatement technology classification

The potential technologies (proven and under development) to treat N_2O emissions at Nitric acid plants, have been classified as follows, based on the process location of the control device:

Primary: N_2O is prevented from forming in the oxidation gauzes.
Secondary: N_2O once formed, is eliminated anywhere between the outlet of the ammonia oxidation gauzes and the inlet of the absorption tower.
Tertiary: N_2O is removed at the tail gas, after the absorption tower and previous to the expansion turbine.
Quaternary: N_2O is removed following the expansion turbine, and before the stack.

Selected technology for the project activity

General description

The current project activity involves the installation of a new (not previously installed) catalyst below the oxidation gauzes (a "secondary catalyst") whose sole purpose is the decomposition of N_2O; the secondary approach has the following advantages:

- The catalyst does not consume electricity, steam, fuels or reducing agents (all sources of leakage) to eliminate N_2O emissions; thus, operating costs are negligible and the overall energy balance of the plant is not affected.
- Installation is relatively simple and does not require any new process unit or re-design of existing ones (reactor basket needs some modifications to accommodate the new catalyst).
- Installation can be done simultaneously with a primary gauze changeover; thus, the loss in production due to incremental down time will be limited.
- Considerably lower capital cost when compared to other approaches.

The selected technology has been developed by **W.C. Heraeus GmbH** (Hanau, Germany; hereinafter called "Heraeus"), a wholly owned subsidiary of Heraeus Holding GmbH; the Heraeus Group has been in the precious metals business for more than 150 years. Heraeus is currently engaged in the production and trade of precious metals as well as complex material technology such as dental material, sensors, fused silica and specialty lighting sources. Heraeus began production of catalyst gauzes for nitric and cyanic acid production in 1915, and now serves this industry through the W.C. Heraeus Nitro Technologies Group business unit.

After extensive research, Heraeus has developed a "secondary" catalyst that decomposes N_2O without affecting Nitric Acid production. The active element of the catalyst is a proprietary coat of precious metals (the same elements already present in the oxidation gauzes) deposited over ceramic pieces made of alfa-alumina (a common reactor material used in e.g. Raschig rings) of several shapes and sizes. The catalyst has a very high activity for N_2O decomposition; in a typical medium pressure plant, a catalyst weight of 30 kg/m^2 of cross sectional surface is sufficient to reduce N_2O concentration well below 100 ppmv. Theoretically, any given level of N_2O abatement can be reached, but in practice the abatement will be limited by practical and economical considerations. Heraeus secondary catalyst is not designed as catchment for precious metals, so it does not adsorb any material lost from the primary gauzes.

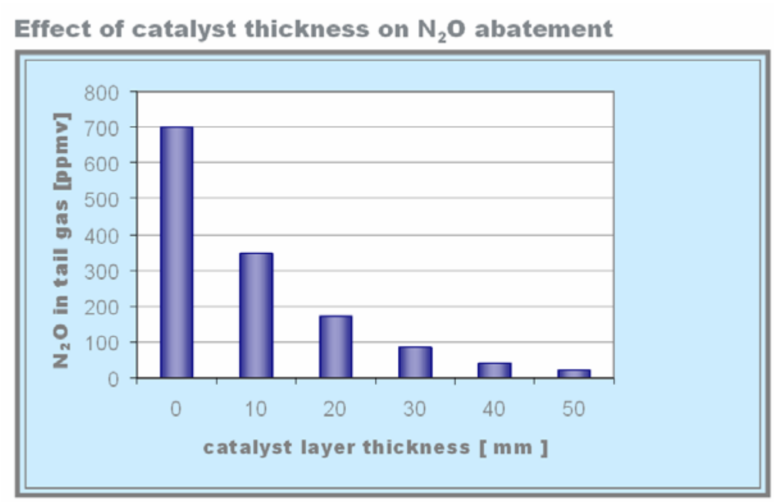


Figure 3. Effect of catalyst thickness on N_2O abatement
(Courtesy of W.C. Heraeus)

Some advantages specific to the selected secondary catalyst are:

- No measurable effect on ammonia to nitric oxide yield.
- Any level of N_2O in tail gas is achievable by adjusting the catalyst bed thickness.
- No new elements (like foreign metals) are introduced to the process, thus plant risk remains unchanged.
- Proven performance. As of today, six successful industrial-scale installations have been made with extremely low N_2O emissions.
- The longest current run is 24 months, representing the 2nd campaign of the specific middle pressure plant.

Secondary catalyst installation

Figure 4 depicts a simplified diagram of the secondary catalyst installation to be performed at Sasol. Both Sasol plants have a Raschig ring bed as part of the support/homogenization system on their oxidation reactors. Due to its high degree of selectivity (towards N_2O decomposition) the depth of the secondary catalyst bed to be installed is only a few centimetres thick, much thinner than the actual Raschig ring bed.

To create space to insert the new catalyst, enough layers of Raschig rings will be removed from the basket. The precious metal coated ceramic pieces (the secondary catalyst) will come inside a cage of Kanthal or Megapyr steel (same material used for separating screens on the primary gauze pack) to secure even distribution of the pieces over the cross section area of the reactor. The outside rim of the caged catalyst is sealed with the reactor walls, in order to avoid any by-passing of the N_2O rich gases. Once the secondary catalyst is installed, the primary gauzes are placed on top of the basket, as usual. Then, the secondary catalyst acts as support system for the primary gauze pack and both catalysts are in close contact.

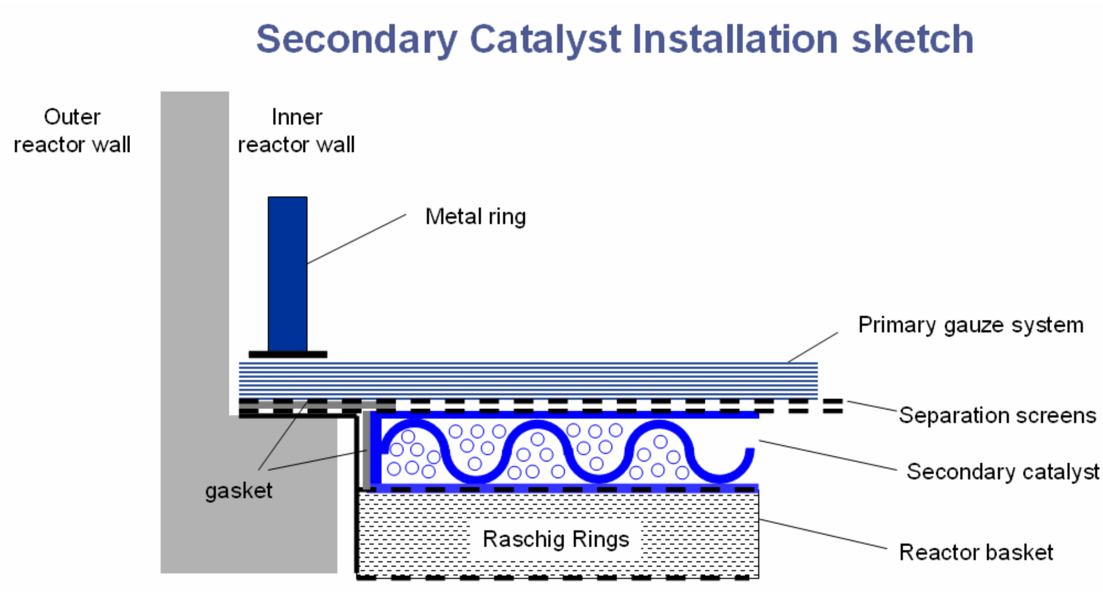


Figure 4. Secondary catalyst installation sketch

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

>>

Total *ex-ante* emissions reductions are estimated to be 937,440 tonnes CO_2e/year for the first seven-year crediting period, which may be renewed. Note that actual emissions reductions will be based on monitored data and may differ from this estimate.

Year	**Annual estimation of emission reduction in tonnes of CO_2e**		
	Sasolburg	**Secunda**	**Total**
Year 1	371,070	566,370	937,440
Year 2	371,070	566,370	937,440
Year 3	371,070	566,370	937,440
Year 4	371,070	566,370	937,440
Year 5	371,070	566,370	937,440
Year 6	371,070	566,370	937,440
Year 7	371,070	566,370	937,440
Total estimated reductions (tonnes of CO_2e)	**2,597,490**	**3,964,590**	**6,562,080**
Total number of crediting years	7		
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	371,070	566,370	937,440

A.4.5. Public funding of the project activity:

>>

No funds from public national or international sources are involved in any aspect of the proposed project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

>>

The selected methodology is the version 1 of AM0034 “Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants”. Version 2 of the “Tool for the demonstration and assessment of additionality” is used to demonstrate additionality.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

>>

The proposed project activity would reduce N_2O emissions from Sasolburg and Secunda Nitric Acid Plants meeting all the conditions specified in the selected approved methodology (AM0034):

- Sasolburg and Secunda plants limit the application of this project activity to existing nitric acid production installed no later than 31 December 2005.
- The project activity will not result in the shut down of any existing N_2O destruction or abatement facility or equipment in the plant.
- The project activity shall not affect the level of nitric acid production.
- There are currently no regulatory requirements or incentives to reduce levels of N_2O emissions from nitric acid plants in South Africa.
- No N_2O abatement technology is currently installed in Sasolburg or in Secunda plant.
- The project activity will not increase NO_X emissions.
- NO_X abatement catalyst installed, if any, prior to the start of the project activity is not a Non-Selective Catalytic Reduction (NSCR) $DeNO_X$ unit.
- Operation of the secondary N_2O abatement catalyst installed under the project activity does not lead to any process emissions of greenhouse gases, directly or indirectly.
- Continuous real-time measurements of N_2O concentration and total gas volume flow can be carried out in the stack:
  - Prior to the installation of the secondary catalyst for one campaign, and
  - After the installation of the secondary catalyst throughout the chosen crediting period of the project activity.

B.3. Description of the sources and gases included in the project boundary

>>

The project boundary encompasses the physical, geographical site of Sasolburg and Secunda nitric acid plants and equipment for the complete nitric acid production process from the inlet to the ammonia burner to the stack. The only GHG emission relevant to the project activity is N_2O contained in the waste stream exiting the stack. The abatement of N_2O is the only GHG emission under the control of the project participant.

The secondary catalyst utilizes the heat liberated by the highly exothermal oxidation reaction (that occurs on the precious metal gauzes of the primary catalyst) to reach its effective operating temperature. Once the operating temperature is reached, no incremental energy is necessary to sustain the reaction.

	Source	Gas	Included?	Justification / Explanation
Baseline	Nitric Acid Plant (Burner Inlet to Stack)	CO_2	Excluded	The project does not lead to any change in CO_2 or CH_4 emissions, and, therefore, these are not included.
		CH_4	Excluded	
		N_2O	Included	
Project Activity	Nitric Acid Plant (Burner Inlet to Stack)	CO_2	Excluded	The project does not lead to any change in CO_2 or CH_4 emissions
		CH_4	Excluded	
		N_2O	Included	
	Leakage emissions from production, transport, operation and decommissioning of the catalyst.	CO_2	Excluded	No leakage emissions are expected.
		CH_4	Excluded	
		N_2O	Excluded	

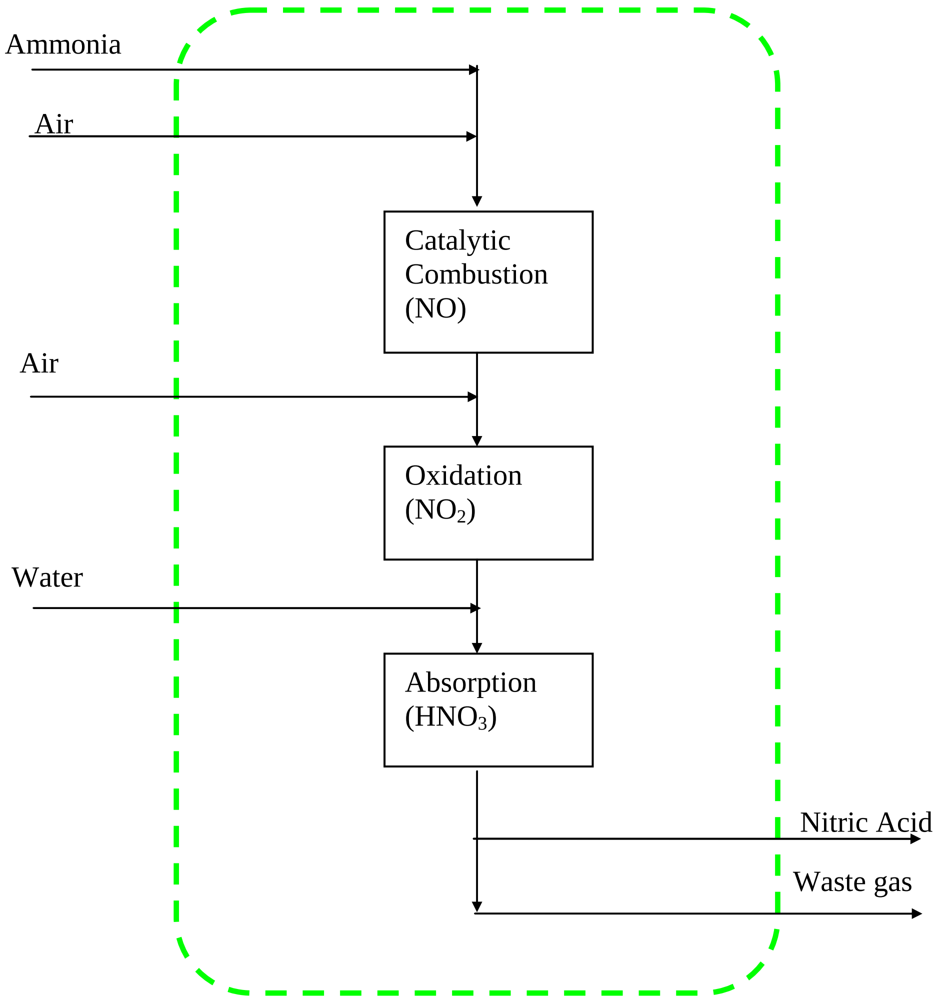


Figure 5. Project boundary

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

>>

The baseline methodology application first involves an identification of possible baseline scenarios, and eliminating those that would not qualify. The procedures followed for baseline scenario selection correspond to AM0028 "Catalytic N_2O destruction in the tail gas of Nitric Acid Plants" as it is specified in selected AM0034. The analysis of baseline scenarios involves six steps:

Step 1. Identify technically feasible options to the project activity.

The first step in determining the baseline scenario is to analyse all options available to project participants. These include the business-as-usual case, considering sectoral policies and circumstances to determine whether this case corresponds to the continuation or not of the current operation of the nitric acid industry, the project scenario, and any other scenarios that might be applicable. This *first step* can be further broken down into two sub-steps:

Step 1a: The baseline scenario alternatives should include all possible options that are technically feasible to handle N_2O emissions. These options include:

- Continuation of *status quo.* The continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N_2O.
- Alternative use of N_2O, such as:
  - Recycling N_2O as a feedstock
  - Use of N_2O for external purposes
- The installation of an N_2O destruction or abatement technology:
  - Primary approach
  - Secondary approach
  - Tertiary approach, including Non Selective Catalytic Reduction (or NSCR De NO_X)[2]
  - Quaternary (or end of pipe) approach.

The options include the CDM project activity not implemented as a CDM project.

Step 1b: In addition to the baseline scenario alternatives of Step 1a, all possible options that are technically feasible to handle NO_X emissions should be considered, since some NO_X technical solutions could also have an effect on N_2O emissions. The alternatives include:

- The continuation of the current situation, whether a $DeNO_X$ unit is installed or not
- Installation of a new Extended Absorption tower
- Installation of a new Selective Catalytic Reduction (SCR) $DeNO_X$ unit
- Installation of a new Non Selective Catalytic Reduction (NSCR) De NO_X unit
- Installation of a combined NO_X /N_2O abatement unit (e.g. UHDEs Envinox process)
- Installation of a new end-of-pipe treatment such as chemical (H_2O_2) scrubbing system

Step 2: Eliminate baseline alternatives that do not comply with legal or regulatory requirements.

---

[2] NSCR: A NSCR $DeNO_X$-unit will reduce N_2O emissions as a side reaction to the NO_X--reduction., Consequently, new NSCR installation can be seen as an alternative N_2O reduction technology.

Currently, there are no national regulations or legal obligations in South Africa concerning N_2O emissions. It is unlikely that any such limits on N_2O emissions will be imposed in the near future. In fact, given the cost and complexity of suitable N_2O destruction and abatement technologies, it is unlikely that a limit would be introduced at South Africa considering it has ratified the Kyoto Protocol and actively participates in CDM.

Sasolburg and Secunda nitric acid plants are in compliance with the Atmospheric Pollution Prevention Act of the Republic of South Africa, which covers NO_X regulations, as indicated in Air permits 238-1 and A1308/1 (for Sasolburg and Secunda, respectively). Therefore the continuation of the status quo is a valid baseline alternative.

None of the baseline alternatives can be eliminated in this step because they are all in compliance with legal and regulatory requirements.

Step 3: Eliminate baseline alternatives that face prohibitive barriers (barrier analysis):

On the basis of the alternatives that are technically feasible and in compliance with all legal and regulatory requirements, a complete list of barriers that would prevent alternatives to occur in the absence of CDM is established.

The identified barriers are:

- Investment barriers, inter alia:
    - Debt funding is not available for this type of innovative project activity;
    - Limited access to international capital markets due to real or perceived risks associated with domestic or foreign direct investment in the country where the project activity is to be implemented.

- Technological barriers, inter alia:
    - Technical and operational risks of alternatives;
    - Technical efficiency of alternatives (e.g. N_2O destruction, abatement rate);
    - Lack of infrastructure for implementation of the technology;

- Barriers due to prevailing practice, inter alia:
    - The project activity is the “first of its kind”: No project activity of this type is currently operational in the host country or region.

There are four different groups of N_2O destruction or abatement technologies at nitric acid plants: primary, secondary, tertiary and quaternary (or end of pipe) measures.

Currently, there is no technology from the primary approach group that reaches high enough removal efficiency, as to represent a potential N_2O abatement solution in itself.

Available tertiary approaches are the NSCR (Non Selective Catalytic Reduction) and the EnviNOx® process commercialized by Uhde GmbH (Germany); both systems are not selective towards N_2O abatement, and also actuate over acidic species (NO_X). Although Uhde’s process is more efficient than the traditional NSCR system, both technologies have significant requirements regarding space and downtime for installation, and consume reducing agents (fuels and/or Ammonia) to attain N_2O abatement (high operating costs).

The potential removal of N_2O after the expansion turbine (the quaternary or end-of-pipe approach) has been only studied from the theoretical standpoint and at a laboratory scale. Worldwide, no full scale installations that use such technology are known.

The use of N_2O for external purposes is technically not feasible at Sasol Nitric Acid Plants, as the quantity of gas to be treated is extremely high, compared to the amount of nitrous oxide that could be recovered. The use of N_2O for external purposes is practiced neither in South Africa nor anywhere else.

We may discard recycling N_2O as a feedstock for the nitric acid plant. This is because nitrous oxide is not a feedstock for nitric acid production. Nitrous oxide is not recycled at nitric acid plants in South Africa, or anywhere else.

Therefore the following baseline alternatives are eliminated in this step:

- Installation of a primary or quaternary N_2O abatement technology
- The use of N_2O for external purposes
- Recycling of N_2O as a feedstock for the plant

Other possible alternatives face no major technological barriers, but require additional investments. These alternatives are considered in Step 4 below.

Step 4: Identify the most economically attractive baseline scenario alternative:

To conduct the investment analysis, the following sub-steps are used:

Sub-step 4a: Determine appropriate analysis method:

Since the project alternatives generate no financial or economic benefits other than CDM related income, then the simple cost analysis should be applied.

Sub-step 4b: Apply simple cost analysis:

The possible alternatives listed in Step 1a above, and not discarded in the barrier analysis stage, involve the installation of some form of secondary or tertiary N_2O destruction or abatement technology. Both approaches involve substantial investment, and would need to provide benefits other than CDM revenue in order to qualify as valid baselines. Furthermore, tertiary technologies have significant running costs since they consume incremental fuel and/or reducing agents (such as Ammonia) to operate.

No income from any kind of potential product or by-product except CERs are able to pay back investment costs as well as running costs for the installation of any available secondary or tertiary abatement systems as no marketable products or by-products are generated by these N_2O treatment methods.

According to the baseline methodology,

> *"If all alternatives do not generate any financial or economic benefits, then the least costly alternative among these alternative pre-selected as the most plausible baseline scenario."*

As a result the only feasible baseline is a continuation of the *status quo*, which meets current regulations, and requires neither additional investments nor additional running costs.

Therefore the continuation of the current situation can be pre-selected as the baseline scenario.

Sub-step 4c is not applied, since a simple cost analysis is adequate for this project.

Sub-step 4d: Sensitivity analysis

Since the economic analysis is based on simple cost analysis, the baseline methodology does not require a sensitivity analysis: the results are not sensitive to such factors as inflation rate, investment costs, etc. since there are no economic benefits.

Step 5: Common practice analysis

The proposed project activity (or any other form of nitrous oxide abatement technology) is not common practice since no similar project at nitric acid plants are identified in South Africa. The nitric acid industry typically releases into the atmosphere the N_2O generated as a by-product, as it does not have any economic value or toxicity at typical emission levels. N_2O emissions in the stack gas can be considered the business-as-usual activity and it is spread all over the country. No nitric acid plant in South Africa has a secondary catalyst (or any other type of N_2O abatement technology) installed.

Therefore the pre-selected baseline scenario can be adopted as the Baseline Scenario.

Step 6: Re-assessment of Baseline Scenario in course of proposed project activity lifetime:

In the event of re-assessment of the baseline scenario as a consequence of new NO_X regulations over the course of the crediting period of the proposed project activity, the reassessment of baseline scenario shall be undertaken using the same 5 step process. In such a case the additionality of the project too must be re-demonstrated.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality): >>

Sasol Nitrous Oxide Abatement Project involves the installation of secondary catalysts whose only purpose and effect is the decomposition of nitrous oxide once it is formed.

Following the selected methodology project emissions are determined from N_2O measurements in the stack gas of the nitric acid plants:

Thus, baseline emissions are calculated from an emission factor measured before the implementation of the project activity, considering that it is physically very difficult to measure N_2O concentration upstream of the abatement system accurately.

Then, baseline will be determined by measuring N_2O baseline emission factor (kg N_2O/tonne HNO_3) during a *complete* production campaign, called "initial N_2O measurement campaign for baseline determination", prior to project implementation.

To ensure that data obtained during such initial campaign are representative of the actual GHG emissions from the source plant, a set of process parameters known to affect N_2O generation and that are under the control of the plant operator, has been gathered from historical data of last campaigns.

Based on plant historical operating conditions, and plant design data, a range of values for any given parameter has been established considering specific control capabilities of Sasol' nitric acid plants. In order to properly characterize baseline emission rates, operation during such initial campaign is controlled during the specified range (a maximum, minimum or range has been established for each parameter). Only those N_2O measurements taken when the plant is operating within the permitted range will be considered in the calculation of baseline emissions. The level of uncertainty determined for the N_2O monitoring equipment will be deducted from the baseline emissions factor.

At the moment of presenting this PDD Sasolburg and Secunda plants are carrying out their initial campaigns for baseline emission factor determination. The emissions factor determined from such measurements will be presented for crediting of emission reductions.

The additionality of the project activity is demonstrated and assessed using the latest version of the "Tool for demonstration and assessment of additionality". We will demonstrate that the **baseline scenario** is the continuation of the status quo and N_2O emissions are not reduced by any N_2O destruction or abatement technology at Sasolburg and Secunda nitric acid plants.

Step 0 of the tool can be avoided since the proposed methodology, requiring baseline measurements prior to project implementation, cannot be retroactive.

Moreover, Step 1 of the tool can also be avoided since the selection of alternative scenarios was already covered in analysis carried out in section B.4 above.

Step 2. Investment analysis:

Sub-step 2a. Determine appropriate analysis method:

As catalytic N_2O destruction facilities generates no financial or economical benefits other than CDM related income, a simple cost analysis is applied.

Sub-step 2b. – Apply simple cost analysis

Project scenario: No income from any kind of potential product or by-product except CERs are able to pay back investment costs as well as running costs for the installation of the secondary catalyst as no marketable product or by-product exists.

The investment (excluding potential financing costs) consists of the engineering, construction, shipping, installation and commissioning of the secondary catalyst and the measurement equipment. The running costs consist of the regular change of the catalysts as well as personnel costs for the supervision and the measurement equipment.

Baseline scenario: The baseline scenario "The continuation of the current situation" will neither require any additional investments costs nor any additional running costs.

Therefore, the proposed CDM project activity is, without the revenues from the sale of certified emission reductions, obviously less economically and financially attractive than the baseline scenario.

Step 3. Barrier analysis is not used for demonstrating additionality in this project.

Step 4. Common practice analysis

A Common practice analysis was conducted in Step 5 of Section B.4. No similar project at nitric acid plants are identified in South Africa or in the region. The nitric acid industry typically releases into the atmosphere the N_2O generated as a by-product, as it does not have any economic value or toxicity at typical emission levels. N_2O emissions in the stack gas can be considered to be the business-as-usual activity and it is spread all over the country. No nitric acid plant in South Africa has a secondary catalyst installed.

Since similar project activities are not observed the proposed project activity is not common practice.

Step 5. Impact of CDM registration

The approval and registration of the project activity as a CDM activity, and the attendant benefits and incentives derived from the project activity, will offset the substantial cost of the catalyst and any plant modifications and will enable the project activity to be undertaken.

Based on the *ex-ante* estimation of N_2O emission reductions over the first crediting period, it is expected that the income from selling of CERs of the registered CDM project activity is at least as high as the investment, financing and running costs. Therefore Sasol is willing to finance the project activity under the condition of the registration of the project activity.

Conclusion:

Currently, there are no national regulations or legal obligations in South Africa concerning N_2O emissions. It is unlikely that any such limits on N_2O emissions will be imposed in the near future. In fact, given the cost and complexity of suitable N_2O destruction and abatement technologies, it is unlikely that a limit would be introduced by South Africa that has ratified the Kyoto Protocol and actively participates in CDM.

Sasol is in no need to invest in any N_2O destruction or abatement technology. Neither are there any national incentives or sectoral policies to promote similar project activities.

Without the sale of the CER's generated by the project activity the NPV and IRR of the project would be negative, no revenue would be generated and the technology would not be installed. The secondary catalyst technology when installed will reduce the Nitrous Oxide emissions by up to 90% below what they would otherwise be without the catalyst technology installed.

The proposed CDM project activity is undoubtedly additional, since it passes all the steps of the "Tool for demonstration and assessment of additionality", approved by the CDM Executive Board. No income from any kind of potential product or by-product except CERs are able to pay back investment costs as well as running costs for the installation of the proposed project activity as no marketable product or by-product exists.

The registration of the project activity as a CDM Project and corresponding CER revenues are the single source of project revenues. CDM registration is therefore the decisive factor for the realization of the proposed project activity.

B.6. Emission reductions:

>>

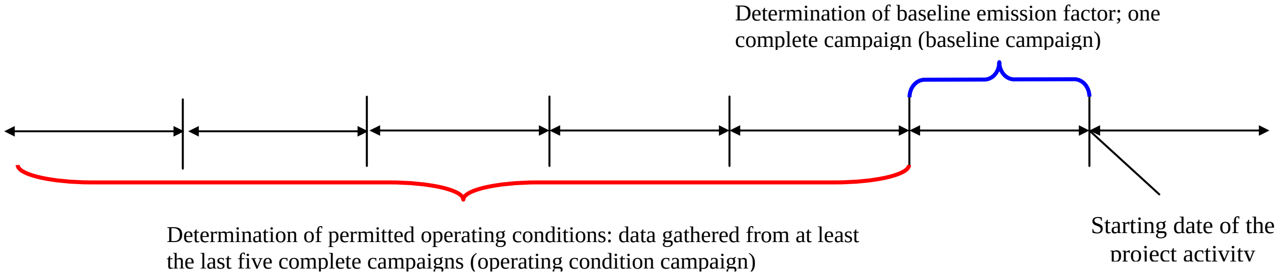
B.6.1. Explanation of methodological choices:

>>

Baseline emissions procedure

Following AM0034 the baseline shall be established through continuous monitoring of both N_2O concentration and gas flow volume in the stack of the nitric acid plant for *one complete* campaign prior to project implementation.

The schematic of the procedure is as follows:



1 - Determination of the permitted operating conditions of the nitric acid plant to avoid overestimation of baseline emissions:

Oxidation temperature and pressure

For Sasolburg, the "permitted range for oxidation temperature" is calculated based on historical data from previous campaigns. For Secunda, this range is determined taking into consideration the plant design data.

When historical data is used to calculate the "permitted range of operating conditions", this range is determined through a statistical analysis in which the time series data is to be interpreted as a sample for a stochastic variable. All data that falls within the upper and lower 2.5% percentiles of the sample distribution is defined as abnormal and shall be eliminated. The permitted range of operating temperature and pressure is then assigned as the historical minimum (value of parameter below which 2.5% of the observation lie) and maximum operating conditions (value of parameter exceeded by 2.5% of observations).

Statistical analysis of historical data, and design data to define "permitted operating conditions" will be available for the validation process of the project activity.

For both Sasolburg and Secunda nitric acid plants, the range of oxidation pressure as indicated in the operating manual for the existing equipment is used to determined "permitted operating conditions", due to lack of sufficient historical data.

Technical documents to demonstrate design operating conditions will be available for the validation process of the project activity.

Ammonia gas flow rates and ammonia to air ratio input into the ammonia oxidation reactor

For both Sasolburg and Secunda nitric acid plants, the upper limits for ammonia flow and ammonia to air ratio as specified by the ammonia oxidation catalyst manufacturer will be used to determined "permitted operating conditions".

Ammonia oxidation catalyst design data as per the gauze manufacturer will be available for the validation process of the project activity.

2 - Determination of baseline emission factor: measurement procedure for N_2O concentration and gas volume flow

For the determination of the baseline emission factor N_2O concentration and gas volume flow will be monitored throughout the baseline campaign. Separate readings for N_2O concentration and gas flow volume for a defined period of time (e.g. every hour of operation, it provides an average of the measured values for the previous 60 minutes) will be performed. Error readings (e.g. downtime or malfunction) and extreme values will be eliminated from the output data series.

Measurement results can be distorted before and after periods of downtime or malfunction of the monitoring system and can lead to maverick. To eliminate such extremes and to ensure a conservative approach, the following statistical evaluation is to be applied to the complete data series of N_2O concentration as well as to the data series for gas volume flow. The statistical procedure will be applied to data obtained after eliminating data measured for periods where the plant operated outside the permitted ranges:

a) Calculate the sample mean (x)
b) Calculate the sample standard deviation (s)
c) Calculate the 95% confidence interval (equal to 1.96 times the standard deviation)
d) Eliminate all data that lie outside the 95% confidence interval
e) Calculate the new sample mean from the remaining values (volume of stack gas (VSG) and N_2O concentration of stack gas (NCSG))

Then, the average mass of N_2O emissions per hour is estimated as product of the NCSG and VSG. The N_2O emissions per campaign are estimates product of N_2O emission per hour and the total number of complete hours of operation of the campaign using the following eq. 1 from AM0034:

$$BE_{BC} = VSG_{BC} \cdot NCSG_{BC} \cdot 10^{-9} \cdot OH_{BC} \qquad \text{(Eq. 1)}$$

where:

BE_{BC}	Total baseline emissions in the baseline measurement period, in, tN_2O
VSG_{BC}	Mean stack gas volume flow rate in the baseline measurement period, in Nm^3/h
$NCSG_{BC}$	Mean concentration of N_2O in the stack gas in the baseline measurement period, in mg N_2O/Nm^3
OH_{BC}	Number of operating hours in the baseline measurement period, in h

The plant specific baseline emissions factor representing the average N_2O emissions per tonne of nitric acid over *one full campaign* is derived by dividing the total mass of N_2O emissions by the total output of 100% concentrated nitric acid for that period for baseline emission factor determination.

The overall measurement uncertainty of the monitoring system shall also be determined and the measurement error will be expressed as a percentage (*UNC*). The N_2O emission factor per tonne of nitric acid produced in the baseline period (EF_{BL}) shall then be reduced by the estimated percentage error as follows:

$$EF_{BL} = \frac{BE_{BC}}{NAP_{BC}}(1 - \frac{UNC}{100}) \qquad \text{(Eq. 2)}$$

where:

EF_{BL}	Baseline emission factor, in $tN_2O/ tHNO_3$
NAP_{BC}	Nitric acid production during the baseline campaign, in, $tHNO_3$
UNC	Overall measurement uncertainty of the monitoring system, in %, calculated as the combined uncertainty of the applied monitoring equipment

Impact of regulations

Should N_2O emissions regulations that apply to nitric acid plants be introduced in the South Africa or jurisdiction covering the location of the nitric acid plants (Sasolburg and Secunda), such regulations shall be compared to the calculated baseline emission factor (EF_{BL}), regardless of whether the regulatory level is expressed as:

- An absolute cap on the total volume of N_2O emissions for a set period;
- A relative limit on N_2O emissions expressed as a quantity per unit of output; or
- A threshold value for specific N_2O mass flow in the stack;

In this case, a corresponding plant-specific emissions factor cap (max. allowed $tN_2O/tHNO_3$) is to be derived from the regulatory level. If the regulatory limit is lower than the baseline factor determined for the project activity, the regulatory limit shall become as the new baseline emission factor, that is.

If $EF_{BL} > EF_{reg}$, then $EF_{BL} = EF_{reg}$ for all the calculations.

Composition of the ammonia oxidation catalyst

In the case of the Sasolburg plant the composition of the ammonia oxidation catalyst used for the baseline campaign and after the implementation of the project are identical to that used in the campaigns for setting the operating conditions (previous five campaigns), then there shall be no limitations on N_2O baseline emissions.

In case of the Secunda plant there has been a change in the composition of the ammonia oxidation catalyst during the last five campaigns. The FTC system was replaced by an FTC plus, which has better performance than the original. so that the change is justified by the performance as it is stated in page 7 of AM0034:

"The change in the catalyst composition is justified by its availability, performance, relevant literature, etc."

Campaign Length

In order to take into account the variations in campaign length and its influence on N_2O emission levels, the historic campaign lengths and the baseline campaign length are to be determined and compared to the project campaign length. Campaign length is defined as the total number of metric tonnes of nitric acid at 100% concentration produced with one set of gauzes.

Historic Campaign Length

For Sasolburg and Secunda nitric acid plants the average historic campaign length (CL_{normal}) defined as the average campaign length for the historic campaigns used to define operating condition (the previous campaigns), will be used as a cap on the length of the baseline campaign.

Historical data and statistical analysis to determine "historic campaign length" will be available for the validation process of the project activity.

If baseline campaign length *(CL_{BL}) is lower* than CL_{normal} , all N_2O values measured during the baseline campaign can be used for the calculation of EF_{BL} (subject to the elimination of data that was monitored during times where the plant was operating outside of the "permitted range").

"If baseline campaign length (CL_{BL}) is higher than CL_{normal}, all N_2O values that were measured beyond the length of CL_{normal} during the production of the quantity of nitric acid (i.e. the final tonnes produced) will be eliminated from the calculation of EF_{BL}."

Parameters to be monitored for composition of the catalyst are as follows:
GS_{normal} Gauze supplier for the operation condition campaigns
GS_{BC} Gauze supplier for baseline campaign
$GS_{project}$ Gauze supplier for the project campaign
GC_{normal} Gauze composition for the operation condition campaigns
GC_{BC} Gauze composition for baseline campaign
$GC_{project}$ Gauze composition for the project campaign

Project emission procedure

Actual project emissions will be determined during the project activity from continuous measurements of N_2O concentration and total flow rate in the stack gas of the nitric acid plant.

Project measurements are subjected to exactly the same procedure as the baseline measurements in order to be coherent.

Estimation of campaign-specific project emissions

The monitoring system will provide separate reading for N_2O concentration and gas flow for a define pediod of time (e.g. every hour of operation, i.e. an average of the measuring values of the past 60 minutes). Error readings (e.g. downtime or malfunction) and extreme values are eliminated from the output data series. Next, the same statistical evaluation that was applied to the baseline data series has to be applied to the project data series:

a) calculate the sample mean (x)
b) calculate the sample standard deviation (s)
c) calculate the 95% confidence interval (equal to 1.96 times the standard deviation)
d) eliminate all data that lie outside the 95% confidence interval
e) calculate the new sample mean from the remaining values

The mean values of N_2O concentration and total flow rate are used in the following formula (Eq. 3 from AM0034) to calculate project emissions:

$$PE_n = VSG_n \cdot NCSG_n \cdot 10^{-9} \cdot OH_n \qquad \text{(Eq. 3)}$$

where:

PE_n	Total Project emissions of the nth campaign, in tN_2O
VSG_n	Mean stack gas volume flow rate for the nth project campaign, in Nm^3/h
$NCSG_n$	Mean concentration of N_2O in the stack gas for the project campaign, in mg N_2O/Nm^3
OH_n	Number of operating hours in the project campaign, in h

<u>Derivation of a moving average emission factor</u>

In order to take into account possible long-term emissions trends over the duration of the project activity and to take a conservative approach a moving average emission factor is estimated as follows:

Step1: estimate campaign specific emissions factor for each campaign during the project's crediting period by dividing the total mass of N_2O emissions during that campaign by the total production of 100% concentrated nitric acid during that same campaign.

For example, for the *nth* campaign the campaign specific emission factor would be:

$$EF_n = \frac{PE_n}{NAP_n} \qquad \text{(Eq. 4)}$$

where:

EF_n	Emission factor calculated for the *nth* campaign, in kg N_2O/ton HNO_3
PE_n	Total Project emissions of the *nth* campaign, in tN_2O
NAP_n	Nitric acid production in the *nth* campaign, in ton 100% HNO_3

Step 2: estimate a moving average emissions factor calculated at the end of the *nth* project campaign as follows:

$$EF_{ma,n} = \frac{\sum_n EF_n}{n} \qquad \text{(Eq. 5)}$$

This process will be repeated for each campaign such that a moving average, $EF_{ma,n}$ is established over time, becoming more representative and precise with each additional campaign.

To calculate the total emission reductions achieved in the *nth* campaign, the higher of the two values $EF_{ma,n}$ and EF_n shall be applied as the emission factor relevant for that particular campaign (EF_p).

If $EF_{ma,n} > EF_n$, then $EF_p = EF_{ma,n}$
If $EF_{ma,n} < EF_n$, then $EF_p = EF_n$ (Eq. 6)

<u>Minimum project emission factor</u>

A campaign-specific emissions factor shall be used to cap any potential long-term trend towards decreasing N_2O emissions that may result from a potential built up of platinum deposits. After the first ten campaigns of the crediting period of the project, the lowest EF_n observed during those campaigns will be adopted as a minimum (EF_{min}). If any of the later project campaigns results in an EF_n that is lower than EF_{min}, the calculation of the emission reductions for that particular campaign shall used EF_{min} and not EF_n.

<u>Project Campaign Length</u>

a. Longer Project Campaign

If the length of each individual project campaign CL_n is longer than or equal to the average historic campaign length CL_{normal}, then all N_2O values measured during the baseline campaign can be used for the calculation of EF_n (subject to the elimination of data from the Ammonia/Air analysis).

b. Shorter Project Campaign

If $CL_n < CL_{normal}$, recalculate EF_{BL} by eliminating those N_2O values that were obtained during the production of tonnes of nitric acid beyond the CL_n (i.e. the last tonnes produced) from the calculation of EF_n.

Leakage procedure

No leakage calculation is required.

Emission reduction calculation

The emissions reductions of the project activity, *ER*, expressed in tonnes of CO_2 equivalent per year (tCO_2e/yr), are given by Eq. 7 (Eq. 7 from AM0034):

$$ER_n = (EF_{BL} - EF_p) \cdot NAP_n \cdot GWP_{N_2O} \qquad \text{(Eq. 7)}$$

where

ER_n	Emission reductions for the *nth* campaign , tCO_2e
EF_{BL}	Baseline emission factor, in $tN_2O/\ tHNO_3$
EF_p	Project emission factor, in $tN_2O/\ tHNO_3$
NAP	Nitric acid production during the *nth* campaign of the project activity, in, $tHNO_3$
GWP_{N_2O}	global warming potential, of N_2O set as 310 tCO_2e/tN_2O for the 1^{st} commitment period

Note. The nitric acid production used to calculate emission reduction should not exceed the design capacity (nameplate) of the nitric acid plant.

Documentation to prove design capacity (nameplate) of the nitric acid plant should be available for the validation process of the project activity.[3]

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**Normal Operating Temperature, OT_{normal} (range of temperature)**
Data unit:	ºC
Description:	The "permitted range" for oxidation temperature and pressure is to be determined using one of the following sources: a) Historical data for the operating range of temperature and pressure from the previous five campaigns (or fewer, if the plant has not been operating for five campaigns); or, then b) If no data on historical temperatures and pressures is available, the range of temperature and pressure stipulated in the operating manual for the existing equipment; or, c) If no operating manual is available or the operating manual gives insufficient information, from an appropriate technical literature source. If option a) is selected, the permitted range is determined through a statistical

[3] By nameplate (design) implies the total yearly capacity (considering 365 days of operation per year) as per the documentation of the plant technology provider (such as the Operation Manual). If the plant has been modified to increase production, and such de-bottleneck or expansion projects were completed before December 2005, then the new capacity is considered nameplate, provided proper documentation of the projects is available (such as, but not limited to: properly dated engineering plans or blueprints, engineering, materials and/or equipment expenses, or third party construction services, etc.).

	analysis of the historical data in which the time series data is to be interpreted as a sample for a stochastic variable. All data that falls within the upper and lower 2.5% percentiles of the sample distribution is defined as abnormal and shall be eliminated. The permitted range of operating temperature and pressure is then assigned as the historical minimum (value of parameter below which 2.5% of the observation lie) and maximum operating conditions (value of parameter exceeded by 2.5% of observations).
Source of data used:	Calculated from historical process data (Sasolburg) and from plant design data (Secunda).
Value applied:	For Sasolburg: 652ºC- 884ºC For Secunda: 860-920ºC
Justification of the choice of data or description of measurement methods and procedures actually applied :	Sasolburg Plant has complete historical registers for oxidation temperature (previous 5 campaigns); then, historical data is used to determine normal oxidation temperature. Secunda Plant stores operational data for 6 months only (electronically); then, plant design data was used to determine normal oxidation temperature.
Any comment:	None

Data / Parameter:	**Normal Operating Pressure, OP_{normal} (range of pressure)**
Data unit:	Bar
Description:	The “permitted range” for oxidation temperature and pressure is to be determined using one of the following sources: a) Historical data for the operating range of temperature and pressure from the previous five campaigns (or fewer, if the plant has not been operating for five campaigns); or, then b) If no data on historical temperatures and pressures is available, the range of temperature and pressure stipulated in the operating manual for the existing equipment; or, c) If no operating manual is available or the operating manual gives insufficient information, from an appropriate technical literature source. If option a) is selected, the permitted range is determined through a statistical analysis of the historical data in which the time series data is to be interpreted as a sample for a stochastic variable. All data that falls within the upper and lower 2.5% percentiles of the sample distribution is defined as abnormal and shall be eliminated. The permitted range of operating temperature and pressure is then assigned as the historical minimum (value of parameter below which 2.5% of the observation lie) and maximum operating conditions (value of parameter exceeded by 2.5% of observations).
Source of data used:	Both plants define it based on Plant design data (the operating manual).
Value applied:	For Sasolburg: 3.7 bar- 4.7 bar For Secunda: 2.5 bar - 5.0 bar

Justification of the choice of data or description of measurement methods and procedures actually applied :	At Sasolburg Plant, complete historical registers for oxidation pressure (previous 5 campaigns) are unavailable; then, plant design data was used to determine normal oxidation pressure. Secunda Plant stores operational data for 6 months only (electronically); then, plant design data was used to determine normal oxidation pressure.
Any comment:	None

Ammonia gas flow rates and ammonia to air ratio input into the ammonia oxidation reactor

Data / Parameter:	**Maximum Ammonia Flow Rate, AFR_{max}**
Data unit:	Kg NH_3/hour
Description:	The upper limits for ammonia flow and ammonia to air ratio shall be determined using one of the following three options, in preferential order: a. Historical maximum operating data for hourly ammonia gas and ammonia to air ratio for the previous five campaigns (or fewer, if the plant has not been operating for five campaigns; excluding abnormal campaigns; or, b. If no data is available, calculation of the maximum permitted ammonia gas flow rates and ammonia to air ratio as specified by the ammonia oxidation catalyst manufacturer or for typical catalyst loadings; or, c. If information for (b) above is not available, based on a relevant technical literature source.
Source of data used:	Defined considering option b (as specified by the ammonia oxidation catalyst manufacturer) for both plants.
Value applied:	For Sasolburg: 5.87 For Secunda: 10.63
Justification of the choice of data or description of measurement methods and procedures actually applied :	At Sasolburg Plant, complete historical registers for ammonia flow to reactor (previous 5 campaigns) are unavailable; then, maximum ammonia load as specified by the primary catalyst manufacturer was used to determine maximum ammonia flow rate. Secunda Plant stores operational data for 6 months only (electronically); then, maximum ammonia load as specified by the primary catalyst manufacturer was used to determine maximum ammonia flow rate.
Any comment:	None

Data / Parameter:	**Maximum Ammonia to Air Flow Rate, $AIFR_{max}$**
Data unit:	Kg NH_3/kg air
Description:	The upper limits for ammonia flow and ammonia to air ratio shall be determined using one of the following three options, in preferential order: a. Historical maximum operating data for hourly ammonia gas and ammonia to air ratio for the previous five campaigns (or fewer, if the plant has not been operating for five campaigns; excluding abnormal campaigns; or, b. If no data is available, calculation of the maximum permitted ammonia gas flow rates and ammonia to air ratio as specified by the ammonia oxidation

	catalyst manufacturer or for typical catalyst loadings; or, c. If information for (b) above is not available, based on a relevant technical literature source
Source of data used:	Defined considering option b (as specified by the ammonia oxidation catalyst manufacturer) for both plants.
Value applied:	For Sasolburg: 0.063 (Kg NH_3/kg air) For Secunda: 0.063 (Kg NH_3/kg air)
Justification of the choice of data or description of measurement methods and procedures actually applied :	At Sasolburg Plant, complete historical registers for ammonia flow rate to reactor (previous 5 campaigns) are unavailable; then, maximum load as specified by the primary catalyst manufacturer was used to determine maximum ammonia to air flow rate. Secunda Plant stores operational data for 6 months only (electronically); then, maximum ammonia load as specified by the primary catalyst manufacturer was used to determine maximum ammonia to air flow rate.
Any comment:	None

Data / Parameter:	**Normal Campaign Length, CL_{normal}**
Data unit:	Ton 100% HNO_3
Description:	The normal historic campaign length (CL_{normal}) is defined as the average campaign length for the historic campaigns used to define normal operating condition (the previous five campaigns). This parameter will be used as a cap on the length of the baseline campaign.
Source of data used:	Calculated from historical process data.
Value applied:	For Sasolburg: 114,735 Tons HNO_3 For Secunda: 183,603 Tons HNO_3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated for both plants as described (above), from historical data. One untypical recent campaign was excluded for Secunda (campaign cut short to install AMS and start with baseline measurements).
Any comment:	None

Data / Parameter:	**Normal Gauze Supplier, GS_{normal}**
Data unit:	Company name
Description:	Gauze supplier during operating condition campaigns (the previous five campaigns).
Source of data used:	From historical process data
Value applied:	W.C. Heraeus

Justification of the choice of data or description of measurement methods and procedures actually applied :	W.C. Heraeus supplies primary catalyst package to Sasol on a contract basis for commercial/economic reasons.
Any comment:	None

Data / Parameter:	**Normal Gauze Composition, GC_{normal}**
Data unit:	
Description:	Sasol uses the Heraeus FTC-system as primary catalyst which is a fully integrated catalytic package made of PGM alloys using the knitting technique. Each package is designed individually for the reactor and consists of different welded layers of HA- and FTC-gauzes.
Source of data used:	From historical process data.
Value applied:	For Secunda: Pt 54.0 to 55.0 %, Rh 3.5 to 3.8 %, Pd 41.0 to 43.0 % For Sasolburg: Pt 54.0 to 56.0 %, Rh 3.6 to 3.9 %, Pd 40.0 to 42.0%.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Current gauze composition (the FTC-system) for each plant delivers acceptable performance (as per contractual basis considering commercial/economic issues).
Any comment:	None

B.6.3 Ex-ante calculation of emission reductions:

>>

For completing this PDD with the estimation of project emissions the following assumptions are used:

- Nitric acid production is assumed to be constant for each plant, so that project emissions do not vary from year to year.
- An N_2O emission factor from IPCC (7 kg N_2O / ton HNO_3) is used.
- The technology provider, Heareus, indicate that the estimated reduction efficiency to be achieved as a consequence of project implementation is 90%. Then, in order to present estimative values in this PDD, we consider project emission factor to be equal to the 10% of baseline emission factor (EF_p =0.7 kg N_2O / ton HNO_3)

Then, *ex-ante* estimations of emission reduction are determined using the following formula:

$$ER_n = (EF_{BL} - EF_p) \cdot NAP_n \cdot GWP_{N_2O} \quad \text{(Eq. 8)}$$

where

ER_n — Emission reductions for the *nth* campaign , tCO_2e
EF_{BL} — Baseline emission factor, in $tN_2O/tHNO_3$
EF_p — Project emission factor, in $tN_2O/tHNO_3$
NAP — Nitric acid production during the *nth* campaign of the project activity, in, $tHNO_3$
GWP_{N_2O}

The assumptions parameters are specified in the following table:

Estimated values	**Sasolburg**	**Secunda**	**Total**
NAP, $t\ HNO_3/yr$	190,000	290,000	480,000
EF_{BL} , $t\ N_2O\ /t\ HNO_3$	0.007	0.007	-
EF_p , $t\ N_2O\ /t\ HNO_3$	0.0007	0.0007	-
GWP_{N_2O} tCO_2e/tN_2O	310		

Then,

$$ER_n = (0.0070 - 0.0007) \cdot 480{,}000 \cdot 310 = 937{,}440\ tonCO_2e/year \quad \text{(Eq. 9)}$$

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

The ex-ante estimations of project emission reductions are summarized in the table below:

Years	**Estimation of project activity emissions (tonnes of CO_2e)**	**Estimation of baseline emissions (tonnes of CO_2e)**	**Estimation of leakage (tonnes of CO_2e)**	**Estimation of emission reduction (tonnes of CO_2e)**
Year 1	104,160	1,041,600	-	937,440
Year 2	104,160	1,041,600	-	937,440
Year 3	104,160	1,041,600	-	937,440
Year 4	104,160	1,041,600	-	937,440
Year 5	104,160	1,041,600	-	937,440
Year 6	104,160	1,041,600	-	937,440
Year 7	104,160	1,041,600	-	937,440
Total	**729,120**	**7,291,200**	-	**6,562,080**

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**Baseline Volume Flow in the Stack Gas, VSG_{BC}**
Data unit:	Nm^3 / hour
Description:	Mean gas volume flow rate in the stack gas during baseline campaign
Source of data to be used:	AMS (Flow meter) at Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	Stack flow is measured by ANNUBAR device (multiple pressure differential principle) with automatically compensates for actual stack pressure and temperature in order to normalize output data, in the case of Secunda Plant. An Ultrasound principle device is used at Sasolburg, with independent probes to measure pressure and temperature; calculations to normalize flow are performed automatically by the AMS.
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognised industry standards. Staff will be trained in monitoring procedures and a reliable technical support infrastructure will be set up.
Any comment:	Measured during a complete campaign before project implementation to properly characterize baseline emissions factor.

Data / Parameter:	**Baseline N_2O Concentration in the Stack Gas, $NCSG_{BC}$**
Data unit:	mg N_2O/ m^3 (converted from ppmv if necessary)
Description:	Mean concentration of N_2O in the stack gas for the baseline campaign
Source of data to be used:	AMS (Infrared gas analyzer) of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction
Description of measurement methods and procedures to be applied:	N2O concentration is measured by on-line analyzer (Non Dispersive Infra Red principle). A gas stream is continuously drawn from the stack by the sampling system under proper conditions (line is heat traced to avoid condensation), and driven to the infrared cell. The device is set up to measure concentration and record the output electronically every 2 seconds.

QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognised industry standards. Staff will be trained in monitoring procedures and a reliable technical support infrastructure will be set up.
Any comment:	Measured during a complete campaign before project implementation to properly characterize baseline emissions factor.

Data / Parameter:	**Baseline Operating Hours, OH_{BC}**
Data unit:	Hours
Description:	Total operating hours for the baseline campaign
Source of data to be used:	Process control system of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	The distributed control system of each plant (Sasolburg and Secunda) will record effective operating time of the plant by monitoring periods when oxidation temperature falls outside the normal operational range (= downtime)
QA/QC procedures to be applied:	Operating up time of the plant will be cross check against production logbook data. Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	Measured during a complete campaign before project implementation to properly characterize baseline emissions factor.

Data / Parameter:	**Uncertainty of the monitoring system, UNC**
Data unit:	%
Description:	Overall uncertainty of the monitoring system, calculated as the combined uncertainty of the applied monitoring equipment.
Source of data to be used:	The infrared analyzer supplier will issue a manufacturer’s performance declaration. The declaration specifies the uncertainty level of the instrument. Uncertainty from the flow measuring device will also be estimated and accounted for using proper statistical methods, to determine the overall uncertainty of the AMS (Automated Measuring System).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.

Description of measurement methods and procedures to be applied:	The overall uncertainty will be determined as the combined uncertainty of the flow meter and uncertainty of the N_2O concentration measurement.
QA/QC procedures to be applied:	No QA/QC procedure is needed.
Any comment:	None

Data / Parameter:	**Nitric Acid Production, NAP_{BC}**
Data unit:	ton 100% HNO_3
Description:	Total nitric acid production for the baseline campaign.
Source of data to be used:	Production logs of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nitric acid production is assumed to be constant for each plant, so that project emissions do not vary from year to year. The values of the nitric acid production used for the calculation of expected emission reductions are: 190,000 ton HNO_3/year and 290,000 ton HNO_3/year for Sasolburg plant and for Secunda plant respectively.
Description of measurement methods and procedures to be applied:	At Secunda, daily production is measured by using an accurate mass flow meter (Coriolis principle), and correcting by the average of several concentration checkups performed in analytical lab. Sasolburg performs daily mass balances at the end-product storage tanks with the help of electronic level indicators and load cells to determine production.
QA/QC procedures to be applied:	Cross checking of production measured by mass balance vs direct flow measurement is performed routinely on both plants. Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	Measured during a complete campaign before project implementation to properly characterize baseline emissions factor.

Data / Parameter:	**Baseline Emission Factor, EF_{BL}**
Data unit:	kg N_2O / ton 100% HNO_3
Description:	Baseline emission factor is calculated from monitored data for the baseline campaign
Source of data to be used:	Calculated from monitored data.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A default value for baseline emission factor corresponding to the type of nitric acid production facility is selected from IPCC. Since Sasolburg and Secunda nitric acid plants are in the same type of nitric acid facilities the same emission factor is applied for both plants: 7 kg N_2O / ton 100% HNO_3.
Description of measurement methods	Calculated from monitored data.

and procedures to be applied:	
QA/QC procedures to be applied:	No QA/QC procedure is needed.
Any comment:	Baseline emission factor per unit of nitric acid produced will be calculated based on measurements of the nitric acid production, stack gas flow rate, N_2O concentration, and the operating hours. All parameters will be measured during a complete campaign before project implementation to properly characterize baseline emissions factor. A baseline emission factor will be determined for Sasolburg and Secunda plants independently.

Data / Parameter:	**Baseline Oxidation Temperature, OT_{BC}**
Data unit:	ºC
Description:	Oxidation temperature of the ammonia reactor for the baseline campaign
Source of data to be used:	Process control system of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	Reactor temperature is measured by 3 thermocouples installed through the reactor wall, near the oxidation catalyst; the signal from such devices is acquired by the Distributed Control System and stored electronically at a given time interval.
QA/QC procedures to be applied:	New thermocouples are installed on a routine basis when required (off or open signal – meaning the unit is broken).
Any comment:	Monitored during the initial campaign for baseline emission factor determination in order to avoid manipulations that could increase baseline N_2O formation.

Data / Parameter:	**Baseline Oxidation Pressure, OP_{BC}**
Data unit:	Bar
Description:	Oxidation pressure of the ammonia reactor for the baseline campaign
Source of data to be used:	Process control system of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.

Description of measurement methods and procedures to be applied:	At both Plants, oxidation pressure is tracked by measuring device with electronic signal transmission; the signal is acquired by the Distributed Control System and stored electronically at a given time interval.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	Monitored during the initial campaign for baseline emission factor determination in order to avoid manipulations that could increase baseline N_2O formation.

Data / Parameter:	**Baseline Ammonia Flow Rate, AFR_{BC}**
Data unit:	Kg NH_3/hour
Description:	Ammonia flow rate to the ammonia oxidation reactor for the baseline campaign.
Source of data to be used:	Process control system of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	At both plants, ammonia flow to oxidation reactor is tracked by a mass flow measuring device (orifice plate principle) with automatic pressure and temperature compensation; the signal from the device is acquired by the Distributed Control System and stored electronically at a given time interval.
QA/QC procedures to be applied:	Overall mass balances of ammonia to the plant are performed on a monthly basis to cross check flows and overall conversion efficiency. Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9000).
Any comment:	Monitored during the initial campaign for baseline emission factor determination in order to avoid manipulations that could increase baseline N_2O formation.

Data / Parameter:	**Baseline Ammonia to Air Flow Rate, $AIFR_{BC}$**
Data unit:	Kg NH_3/hour
Description:	Ammonia to air flow rate to the ammonia oxidation reactor for the baseline campaign.
Source of data to be used:	Process control system of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in	Not applicable. We do not use this parameter to estimate expected emission reduction.

section B.5	
Description of measurement methods and procedures to be applied:	Air flow to oxidation reactor is tracked by 2 mass flow measuring devices in series (orifice plate principle); the signal from the device is acquired by the Distributed Control System and stored electronically at a given time interval. The Ammonia to Air ratio is calculated based on the actual flow analysis from the individual streams.
QA/QC procedures to be applied:	Overall mass balances of ammonia to the plant are performed on a routine basis to cross check flows and overall conversion efficiency.
Any comment:	Monitored during the initial campaign for baseline emission factor determination in order to avoid manipulations that could increase baseline N_2O formation.

Data / Parameter:	**Baseline Campaign Length, CL_{BL}**
Data unit:	ton 100% HNO_3
Description:	Campaign length is defined as the total number of metric tonnes of nitric acid at 100% concentration produced with one set of gauzes. (see baseline nitric acid production, NAP_{BC})
Source of data to be used:	Plant production log book
Value of data applied for the purpose of calculating expected emission reductions in section B.5	For Sasolburg: 114,735 Tons HNO_3 For Secunda: 183,603 Tons HNO_3
Description of measurement methods and procedures to be applied:	At Secunda, daily production is measured by using an accurate mass flow meter (Coriolis principle), and correcting by the average of several concentration checkups performed in analytical lab. Sasolburg performs daily mass balances at the end-product storage tanks with the help of electronic level indicators and load cells to determine production.
QA/QC procedures to be applied:	Cross checking of production measured by mass balance vs direct flow measurement is performed routinely on both plants. Critical instruments are calibrated on a routine basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	None

Data / Parameter:	**Baseline Gauze Supplier GS_{BC}**
Data unit:	Company name
Description:	Gauze supplier for the baseline campaign
Source of data to be used:	Procurement offices of Sasolburg and Secunda Plants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.

Description of measurement methods and procedures to be applied:	Cover of supply contract or bill for gauzes for baseline campaign, or equivalent document to prove commercial transaction.
QA/QC procedures to be applied:	None
Any comment:	None

Data / Parameter:	**Baseline Gauze Composition, GC_{BC}**
Data unit:	%(Pt, Rh, Pd)
Description:	Gauze composition for the baseline campaign
Source of data to be used:	Nitric plant procurement office and gauze Supplier technical service department
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	Section of supply contract for gauzes that specifies the technical characteristics agreed during baseline campaign. If necessary, additional data could be requested to supplier's technical service office in order to provide complete technical profile of gauzes.
QA/QC procedures to be applied:	None
Any comment:	None

Data / Parameter:	**Project Volume Flow in the Stack Gas, $VSG_{project}$**
Data unit:	Nm^3 / hour
Description:	Volume flow rate in the stack gas for the project campaign
Source of data to be used:	AMS (Flow meter) at Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	Stack flow is measured by ANNUBAR device (multiple pressure differential principle) which automatically compensates for actual stack pressure and temperature in order to normalize output data, in the case of Secunda Plant. An Ultrasound principle device is used at Sasolburg, with independent probes to measure Pressure and temperature; calculations to normalize flow are performed automatically by the AMS.

QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognised industry standards. Staff will be trained in monitoring procedures and a reliable technical support infrastructure will be set up.
Any comment:	Measured during the complete lifetime of the project activity.

Data / Parameter:	**Project N_2O Concentration in the Stack Gas, $NCSG_{project}$**
Data unit:	mg N_2O/ m^3 (converted from ppmv if necessary)
Description:	N_2O concentration in the stack gas for the project campaign
Source of data to be used:	AMS (Infrared gas analyzer) at Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	N_2O concentration is measured by on-line analyzer (Non Dispersive Infra Red principle). A gas stream is continuously drawn from the stack by the sampling system under proper conditions (line is heat traced to avoid condensation), and driven to the infrared cell. The device is set up to measure concentration and record the output electronically every 2 seconds.
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognised industry standards. Staff will be trained in monitoring procedures and a reliable technical support infrastructure will be set up.
Any comment:	Measured during the complete lifetime of the project activity.

Data / Parameter:	**Project Operating Hours, $OH_{project}$**
Data unit:	Hours
Description:	Total operating hours for the project campaign
Source of data to be used:	Process control system of Sasolburg and Secunda plants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction
Description of measurement methods and procedures to be applied:	The distributed control system of the plant will record effective operating time of the plant by monitoring time when both ammonia and air flows signals (coming from the devices installed to measure flow of both parameters) have reached their normal operational levels.

QA/QC procedures to be applied:	Operating time of the plant will be cross checked against production logbook data. Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	Measured during the complete lifetime of the project activity.

Data / Parameter:	**Project Nitric Acid Production, $NAP_{project}$**
Data unit:	ton 100% HNO_3
Description:	Total nitric acid production for the project campaign
Source of data to be used:	Production logs of Sasolburg and Secunda plants..
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nitric acid production is assumed to be constant for each plant, so that project emissions do not vary from year to year. The values of the nitric acid production used for the calculation of expected emission reductions are: 190,000 ton HNO_3/year and 290,000 ton HNO_3/year for Sasolburg plant and for Secunda plant respectively.
Description of measurement methods and procedures to be applied:	Daily production is measured by using a very accurate mass flow meter (Coriolis principle), and correcting by the average of several (3 to 5) concentration checkups performed in analytical lab.
QA/QC procedures to be applied:	Mass balance at the end-product storage tanks is performed on a monthly basis; cross checking of production from mass balance with direct flow measurement is performed routinely. Critical instruments are calibrated on a routine basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	Measured during the complete lifetime of the project activity.

Data / Parameter:	**Project Emission Factor, EF_n**
Data unit:	kg N_2O / ton 100% HNO_3
Description:	Project emission factor calculated from monitored data for the project campaign
Source of data to be used:	Calculated from monitoring data.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A default value for baseline emission factor corresponding to the type of nitric acid production facility is selected from IPCC. That emission coefficient is reduced in 90% following the specifications of the technology provider, Heraeus. Then, project emission factor applied for Sasolburg and Secunda nitric acid plants is: 7 kg N_2O / ton 100% HNO_3.
Description of measurement methods and procedures to be applied:	Calculated from monitored data.
QA/QC procedures to be applied:	No QA/QC procedure is needed.

Any comment:	Project emission factor per unit of nitric acid produced will be calculated based on measurements of the nitric acid production, stack gas flow rate, N_2O concentration, and the operating hours. All parameters will be measured during a complete campaign before project implementation to properly characterize baseline emissions factor. A baseline emission factor will be determined for Sasolburg and Secunda plants independently.

Data / Parameter:	**Project Campaign Length, CL_n**
Data unit:	Ton 100% HNO_3
Description:	The project campaign length for the nth campaign (CL_n) is defined as the nitric acid produced during the nth campaign (see project Nitric Acid Production)
Source of data to be used:	Sasolburg and Secunda production log books.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	At Secunda, daily production is measured by using an accurate mass flow meter (Coriolis principle), and correcting by the average of several concentration checkups performed in analytical lab. Sasolburg performs daily mass balances at the end-product storage tanks with the help of electronic level indicators and load cells to determine production.
QA/QC procedures to be applied:	Cross checking of production measured by mass balance vs direct flow measurement is performed routinely on both plants. Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001).
Any comment:	None

Data / Parameter:	**Project Gauze Supplier, GS_n**
Data unit:	Company name
Description:	Gauze supplier for the project campaign
Source of data to be used:	Procurement offices of Sasolburg and Secunda Plants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.

Description of measurement methods and procedures to be applied:	Cover of supply contract or bill for gauzes for project campaigns, or equivalent document to prove commercial transaction.
QA/QC procedures to be applied:	None
Any comment:	None

Data / Parameter:	**Project Gauze Composition, GC_n**
Data unit:	%
Description:	Gauze concentration for the project campaign
Source of data to be used:	Procurement offices of Sasolburg and Secunda Plants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	Section of supply contract for gauzes that specifies the technical characteristics agreed during baseline campaign. If necessary, additional data could be requested to supplier’s technical service office in order to provide complete technical profile of gauzes.
QA/QC procedures to be applied:	None
Any comment:	None

Data / Parameter:	**Emission Factor set by regulation, EF_{reg}**
Data unit:	Kgs N_2O/ ton HNO_3
Description:	Local and national regulations on N_2O and NO_X emissions
Source of data to be used:	Local and National Regulations
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not applicable. We do not use this parameter to estimate expected emission reduction.
Description of measurement methods and procedures to be applied:	At date of introducing or change of regulation.

QA/QC procedures to be applied:	None.
Any comment:	None

B.7.2 Description of the monitoring plan:

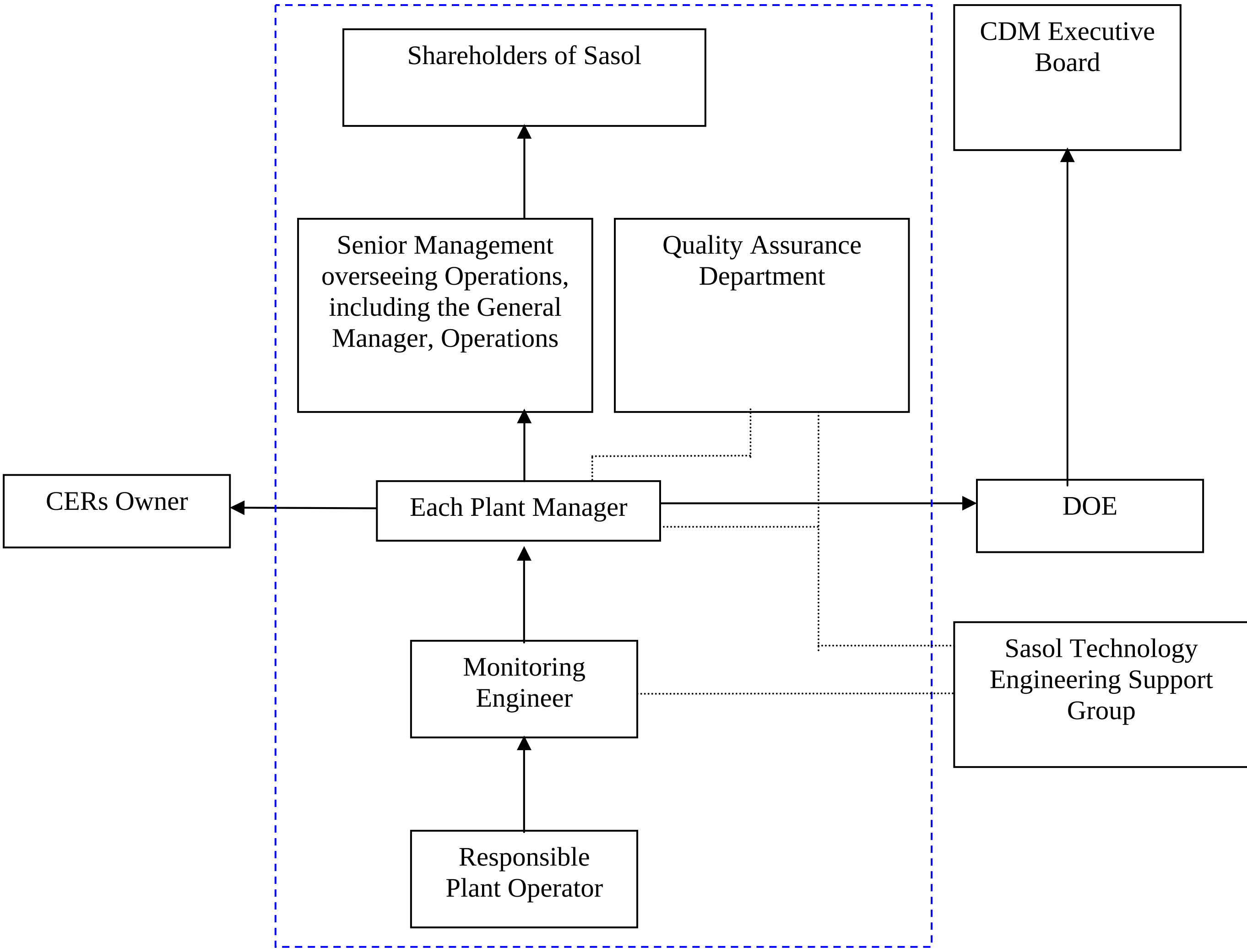
>>

Sasol Nitric Acid Plants have been operating NO_X analysers for a number of years. As operators of the nitric acid plant for several years, Sasolburg and Secunda staffs are operating technical equipment to a high level of quality standards. The plant also has access to specialized technical services available from Sasol Technology, a division of the Sasol Group.

The plant manager will be responsible for the ongoing operation and maintenance of the N_2O monitoring system. Operation, maintenance, calibration and service intervals will be according to the manufacturer specifications and incorporated into the management structure of ISO 9000 standard procedures.

The proposed CDM project will be closely monitored, metered and recorded. The management and operation of the proposed nitrous oxide abatement project at the two Sasol plants will be the responsibility of each plant. The emission reductions will be verified at least annually by an independent entity, which will be a Designated Operational Entity (DOE). A regular (annual) reporting of the emission reductions generated by the project will be emitted to the CERs owner, coincidently with the DOE verification.

An illustrative scheme of the operational and management structure that will monitor the proposed CDM project activity is as follows:



Note: the dashed line shows the operational and management structure boundaries of the proposed project.

The relation between the project operational and management structure, and other actors of the proposed CDM project activity, is described as follows:

- At each plant, the responsible Plant Operator will be in charge of the supervision of the data acquisition system (DAS) that will be implemented to record plant operation data. Supported by the DAS, the Plant Operator will report the relevant data to the Monitoring Engineer.

- The Monitoring Engineer will be a member of the plant staff structure that will also be in charge of processing the data generated by the data acquisition system. The Monitoring Engineer will receive the relevant plant data from the responsible Plant Operator. These data will by entered into a spreadsheet especially designed for the monitoring plan.

- The Plant Manager of the respective plant will be responsible to ensure that the CDM project activity at plant level is implemented in compliance with the PDD and other relevant standards. The Plant Manager will be assisted by the Quality Assurance Department which will conduct routine compliance audits. The Plant Manager will routinely report to the General Manager Operations as to the overall progress with the CDM project activity. At any time that the Plant Manager wants or needs to follow the implementation of the CDM project activity, he/she will ask for a report from the Monitoring Engineer. For every one period, the Plant Manager will send a report which will basically be the monitoring plan spreadsheet to the CERs owner, as well as to the corresponding DOE.

- Sasol Technology Engineering Support Group can at any time be used as a support function to the Monitoring Engineer in case of personnel loss or changes. The relevant Plant Manager and QA Department also has Sasol Technology available as a resource for assistance when required.

- The DOE will then send the corresponding verification report to the CDM Executive Board in order to evaluate it and make able the issuance of the CERs.

- Shareholders of Sasol Nitro will receive annually from the plant manager, the same report sent to the DOE.

Considering the arguments and the schematic illustration above, compliance with the monitoring methodology and the monitoring plan will be completely guaranteed.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completion of the application of this baseline and monitoring methodology to this project activity is: 22/09/2006 (reported here). Emissions factors, determined from measurements, would be used for actual emission reductions determination.

The baseline and monitoring methodology has been applied by:

Walter Hügler, Nuria Zanzottera, and Gautam Dutt, MGM International Ltda. (not project participant).
Tel: +54-11-5219-1230
e-mail: whugler@mgminter.com; nzanzottera@mgminter.com; gdutt@mgminter.com.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/06/2006

C.1.2. Expected operational lifetime of the project activity:

>>
25 years.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>
01/05/2007, following completion of measurements to establish baseline emissions factor.

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

>>
Not selected.

C.2.2.1. Starting date:

>>
N.A.

C.2.2.2. Length:

>>
N.A.

SECTION D. Environmental impacts

>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
Sasol Nitrous Oxide Abatement Project involves the installation of secondary catalysts whose only purpose and effect is the decomposition of nitrous oxide once it is formed. After project implementation waste N_2O will be converted into N_2 and O_2 avoiding the high global warming effects of the GHG.

The installation of secondary catalysts has a positive environmental impact because it reduces N_2O emissions to the atmosphere and thereby results in cleaner overall air quality.

The project activity involves the installation of a secondary catalyst system inside the reactor immediately underneath the primary gauze system. The exhausted catalyst will be removed and replaced by the technology provider, who has developed the selected technology. No waste liquids, solids or gases are generated by using this technology. No further environmental impacts are expected.

Then, an Environmental Impact Assessment (EIA) is not necessary for this activity as it is stated in the national regulation. Sasolburg and Secunda nitric acid plants are in compliance with the Atmospheric Pollution Prevention Act of the Republic of South Africa, which covers NO_X regulations, as indicated in Air permits 238-1 and A1308/1 (for Sasolburg and Secunda, respectively).

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

No significant negative environmental impacts are expected from the implementation of the project activity. An environmental impact study is not required by South African authorities.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

Specific stakeholders were contacted telephonically to request their participation in the stakeholder consultation process. After the phone communication, several documents were delivered to each of them (by fax or e-mail):

- A letter inviting them to participate,
- An executive summary of the proposed project and
- A survey document for completion by the stakeholder.

The lists of the stakeholders who were contacted are indicated below:

Sasolburg Plant

Surname	Name	Organisation
Jacobs	Arisja	Echo Ridge Newspaper
de Beer	Lizelle	Highveld Herald
van Wyk	Johan	Highveld East Tourism Organisation
Dlamini	Mpilo	Highveld East Tourism Organistaion
Michele	M Ernest	Town Planner
King	Nicolas (Dr)	Endangered Wildlife Trust
Maseko	Mauritius	Emabalenhle Environmental Club
Gumbi	Sibongile	Earthlife Africa
Knowles	Mike	Govan Mbeki Munici
Moatsi	Ramsadi	Dep of Environmental Affairs and Tourism
Batchelor	Garth (Dr)	Department of Agriculture
Mashego	Phillip	Chemical Workers Industrial Union
Machema	Tahleo	Dep of Education - Zamokuhle Primary

Secunda Plant

Surname	Name	Organisation
Piet	Odendaal	National Association for Clean Air
J T	Mothatle	Zamdela Environmental Steering Committee
Greg	Jacobs	Earthlife Africa
Florah	Pitsu	Tourism Board
Kennedy	Mahlatsi	Sasolburg TLC
Masithela	NH	Depatment of Tourism, Environment and Economic Affairs
Denis	Boden	Air Pollution Action Committee
Harold	Annegarn	Atmosphere and Energy Research Group
Basil	Baker	Save the Vaal Environment
Veronica	Cronje	Sasolburg Community Chest
Monica	Gibbs	Sasolburg Technical College
Wimpie	Lodewyk	Technical High School
Duma J	Plaatjie	Western Vaal Metropolitan Local Council
Isaac	Ramathesele	Metsimaholo Local Municipality
Albert	Phanyana	South African Chemical Workers Union
Karen	Benade	Sasol Chemical Industries

Stakeholders were asked to submit their opinions within 7 days. After this period, stakeholders who didn't response were contacted again and requested several times for comment with an additional 14 days response period allowed. In general stakeholder agreed that they would support this kind of project activities.

In addition to contacting specific stakeholders, an article of the proposed project was placed in two local publications, one in Secunda and the other in Sasolburg.

The article briefly describes the proposed project and invites any person to submit comment. It also invites the public to attend a public presentation of the project which was conducted at Sasol Nitro's offices in Secunda and Sasolburg respectively. The specific stakeholders were also contacted individually with an invitation to attend the public presentation.

E.2. Summary of the comments received:

>>

At the time of submitting this PDD, comments received from the stakeholders can be summarised as follows:

Surname	Name	Organisation	Comments
Jacobs	Arisja	Echo Ridge Newspaper	The stakeholder commented that she "think it is good", and confirmed that she would recommend other institutions to consider projects of this kind and that that the project will contribute to sustainable development for the region and South Africa. No other comments were given and no further information was required.
Gumbi	Sibongile	Earthlife Africa	The stakeholder commented that "this is a good initiative" and that Sasol should "keep it up". She confirmed that she "would recommend other industries and government to develop such projects" and that that the project will contribute to sustainable development for the region and South Africa. The only other comment made was that her "concern is that the project is only about N_2O. what about other gases suc as SO_2". No other comments were given and no further information was required.
Knowles	Mike	Govan Mbeki Municipality	The stakeholder commented that the project will make a "positive contribution to the environment" and that "a reduction in air pollution is a positive step". He confirmed that he would recommend other institutions to consider projects of this kind and that that the project will contribute to sustainable development for the region and South Africa "by not depleting natural resources and decreasing pollution". No other comments were given and no further information was required.

Piet	Odendaal	National Association for Clean Air	The stakeholder commented that "the project is highly commendable" and confirmed that he would recommend other institutions to consider projects of this kind and that that the project will contribute to sustainable development for the region and South Africa. No other comments were given and no further information was required.
Veronica	Cronje	Sasolburg Community Chest	The stakeholder commented that "according to the information received the project sounds necessary and environmentally friendly", confirmed that she would recommend other institutions to consider projects of this kind and that that the project will "hopefully" contribute to sustainable development for the region and South Africa. No other comments were given and no further information was required.
Madelein	Barnard	Technical High School Sasolburg	The stakeholder commented that "the project has many merits" and confirmed that she would recommend other institutions to consider projects of this kind and that that the project will contribute to sustainable development for the region and South Africa. She also commented that "this issue is not only the responsibility of the Government and Industries but of each and everyone". No other comments were given and no further information was required.
Monica	Gibbs	Flavius Mareka FET College	The stakeholder commented that "technology must be adapted to contribute to a cleaner and saver environment" and that "Sasol once again is responsible in this regard." She confirmed that she would recommend other institutions to consider projects of this kind and that that the project will contribute to sustainable development for the region and South Africa. She also commented that the company and community will benefit from the project. No other comments were given and no further information was required.
King	Nicolas(Dr)	Endangered Wildlife Trust	The stakeholder commented that "the project as outlined seems to have merit" but expressed opinion that "we are not necessarily supportive of the CDM as a means for payment" as "Sasol should implement such prevention programmes as a matter of course and not simply because they can be offset by CDM payments". The stakeholder confirmed that the project will contribute to sustainable development for the region and South Africa, but commented that "at a global scale the impact must be considered neutral as it is a CDM offset". "Were Sasol to implement it independently, then it would be an overall positive contribution."

E.3. Report on how due account was taken of any comments received:

>>

As indicated in section E.2. above, all stakeholders whom responded at the date of submission of the PDD supported the project and that the project supports sustainable development in the region and South Africa. All stakeholders, with the exception of Dr N King of the Endangered Wildlife Trust, confirmed that they would recommend others to develop projects of this kind and that the project supports sustainable development. No comments required further actions with the exception of Dr King and Ms Sibongile Gumbi from Earthlife Africa. Ms Sibongile Gumbi from Earthlife Africa was contacted personally concerning her comment about "other gases" and Sasol's commitment to reduce pollution on all fronts was discussed with her. Dr King was also contacted personally concerning his comments regarding the CDM mechanism as method of payment for the project. In discussion with Dr King, he re-confirmed that first price would be if industry would implement emission reductions without looking at income from CER sales to offset costs, thereby ensuring a global net benefit. He did, however, also indicate that he appreciates why Sasol Nitro is looking at the CDM process as method to offset project costs.

As such no further specific action is required based on the feedback received other than for Sasol to proceed with the implementation of the project upon receipt of approval.

Sasol will continue to seek response from stakeholders whom have not responded at the date of submission of the PDD and will take due account of any comments that may still be received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sasol Nitro
Street/P.O.Box:	15 Baker Street, Rosebank / PO Box 5486, Johannesburg, 2000
Building:	Sasol Nitro
City:	Rosebank, Johannesburg
State/Region:	Gauteng
Postfix/ZIP:	2000
Country:	South Africa
Telephone:	27 11 344 2400
FAX:	27 11 344 2287
E-Mail:	
URL:	www.sasol.com
Represented by:	
Title:	General Manager: Fertilizers
Salutation:	Dr.
Last Name:	Louw
Middle Name:	
First Name:	Johannes
Department:	Management, Fertilizer Business
Mobile:	27 82 441 7846
Direct FAX:	27 11 522 2587
Direct tel:	27 11 344 2156
Personal E-Mail:	johannes.louw1@sasol.com

Organization:	Sasol Nitro
Street/P.O.Box:	15 Baker Street, Rosebank / PO Box 5486, Johannesburg, 2000
Building:	Sasol Nitro
City:	Rosebank, Johannesburg
State/Region:	Gauteng
Postfix/ZIP:	2000
Country:	South Africa
Telephone:	27 11 344 2400
FAX:	27 11 344 2287
E-Mail:	
URL:	www.sasol.com
Represented by:	
Title:	Safety, Heath, Environment and Risk Manager
Salutation:	Mr.
Last Name:	Swanepoel
Middle Names:	
First Name:	Etienne
Department:	Safety, Heath, Environment and Risk
Mobile:	27 82 499 4061
Direct FAX:	27 11 522 0659
Direct tel:	27 11 344 2189
Personal E-Mail:	etienne.swanepoel@sasol.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funds are available for the financing of the project activity. Therefore, Sasol Nitro will finance the project activity on the expectation of its approval.

Annex 3

BASELINE INFORMATION

Baseline emissions for each plant are calculated from an emission factor measured during a complete campaign before the implementation of the project activity, under normal operation conditions.

Ex-ante estimations of the key baseline parameters are listed in the following table:

Nitric acid plant	Sasolburg	Secunda
Parameter		
Tail gas N_2O concentration (ppm)	1,200	1,200
Typical Nitric acid production output (ton 100% HNO_3/year)	190,000	290,000
Maximum historic Nitric acid production (ton 100% HNO_3/day)	557	860
N_2O baseline emission factor (kg N_2O / ton 100% HNO_3)	7	7
N_2O destruction factor (%)	90	90
Operating days	347	347

Annex 4

MONITORING INFORMATION

The CDM "Nitrous Oxide Abatement Project." will continuously measure the concentration of N_2O and the gas flow volume in the stack of the nitric acid plant using state of the art monitoring technologies and procedures in accordance with AM0034: "Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants".

The monitoring procedures will be fully integrated in Sasol's quality and environmental management system. Please note that Sasolburg and Secunda plants are already ISO 9001/2000 and ISO 14001/2004 certified.

All monitoring equipment will be serviced, calibrated and maintained according to the manufacturers instructions and international standards. Monitoring principles such as monitoring frequencies and reporting will be implemented in accordance with international standards.

The monitoring will involve the volume flow rate of the tail gas and the N_2O concentration in the tail gas. The volume flow rate will be measured by using an international standard method. The monitoring system will automatically record volume under conditions of standard temperature and pressure. Also the measurement of the tail gas temperature and tail gas pressure is a part of the volume flow rate monitoring system.

The monitoring system, N_2O concentration and gas flow volume, will be carried out according international standard for gas concentration analyzer.

In addition, the total amount of nitric acid (expressed in tonnes of 100% concentrate) and the number of hours of operation will be recorded.

All data will be collected by an electronic data storage system from where it can be processed and analyzed to deliver the data streams and factors necessary to determine the emission reductions of the project.

Data will be stored for the duration of the crediting period, and for two years thereafter, as prescribed in the Monitoring Methodology.

A plant specific emissions factor expressed in kg N_2O/ $tHNO_3$ will be calculated from the emissions monitoring data, during the period for baseline emission factor determination. Statistical evaluation is applied to eliminate outliers from distorting these emissions factors.

It is the responsibility of the Project Developer and Plant Operator to ensure that required and experienced capacity is available and that their operational staff participates in training to be enable to operate the monitoring system properly. Initial training must be provided to the staff before the project activity starts operation. It is also the responsibility of the Project Developer and Plant Operator to organize and implement a quality management system that ensures the integrity of the data.

In case any monitoring instrument is down, the last measured value will be valid and applied for the next 48 hours. In case the down time is longer than 48 hours, the period following the first 48 hours down time until the monitoring system is operational again, will not be taken into account, neither in the baseline emissions factor nor in a campaign specific emission factor.

- - - - -