Project design document form for CDM project activities

(Version 08.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Omnia N_2O Abatement Project II
Version number of the PDD	03
Completion date of the PDD	23/11/2016
Project participant(s)	Omnia Fertilizer, Division of Omnia Group (Pty) Ltd Nordic Environment Finance Corporation Belektron d.o.o
Host Party	South Africa
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	Applied Methodology: ACM0019 v01.0.0.
Sectoral scope(s) linked to the applied methodology(ies)	Sectoral Scope: 05
Estimated amount of annual average GHG emission reductions	**348,138** tonnes of CO2 e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The increasing demand for fertilizer in South Africa induces the development of new and additional facilities related to fertilizer manufacturing. Omnia Fertilizer, a division of Omnia Group (Pty) Ltd. (hereafter ”Omnia”) is a leading Nitrogen Fertilizer producer in South Africa. Omnia already operates one nitric acid plant in Sasolburg, South Africa including N_2O Abatement registered as CDM Project 0752. A new nitric acid plant is currently being built and expected to be commissioned in the first half of 2012. This new plant is designed by Uhde GmbH with a confirmed production capacity of 400,000 tonnes 100% concentrated nitric acid per year.

Nitrous Oxide (N_2O) is an undesired by-product of the nitric acid (HNO_3) production process at the synthetic fertilizer production facility. However, N_2O emissions from nitric acid production are not regulated in South Africa. No N_2O abatement system was designed into the plant. Without the incentive of the proposed CDM project activity, approx. 800,000 t CO_2e per year[1] would be emitted at the new nitric acid plant. Therefore the baseline scenario without the CDM project would be the operation of the nitric acid plant without N_2O reduction catalyst.

The aim of the project activity is to reduce N_2O emissions in the tail gas by installing a tertiary catalyst after the absorption unit. It is expected that the N_2O abatement catalyst reduces 98 % of the N_2O[2]. Against the standardized baseline emissions factor the project would generate an estimated 3,481,376 t CO_2e emission reductions during a 10 year crediting period.

The project will have no negative impact on the environment. The project will reduce gaseous emissions of nitrous oxide (N_2O) from the plant tail gas and will therefore contribute to international efforts to reduce greenhouse gas emissions. The project will have no negative effects on local air quality. The project will have no impact on water pollution. No additional water is required for the project activity’s implementation or operation. Therefore, there is no impact on the sustainable use of water. The project will produce no additional waste streams. In case the catalyst might have to be replaced, the used catalyst will be recycled or if not possible disposed of by the catalyst supplier in accordance with international standards.

The technology will be introduced to the project, promoting the application of advanced emission reduction technology in South Africa. The implementation of the project activity includes the training course for operation of the total unit of a tertiary catalyst unit including guidance on accurate monitoring, which will provide the staffs of Omnia Fertilizer with an opportunity to improve skills. The implementation of the project activity is likely to create local employment.

A.2. Location of project activity

A.2.1. Host Party

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Republic of South Africa

[1] Taken into account an estimated business-as-usual emissions factor of 6.45kgN_2O/tHNO_3 (Average Baseline Emissionfactor of the first 5 monitoring periods of the first N_2O abatement project at Omnias existing nitric acid plant) and annual confirmed capacity of 400,000tHNO_3/year.

[2] While the calculations are based on this conservative assumption it should be noted that from experience from Omnia´s first N_2O reduction project as well as from other similar projects with the same technology even higher abatement efficiencies of up to 99.9 % were observed.

A.2.2. Region/State/Province etc.

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Free State Province, Republic of South Africa

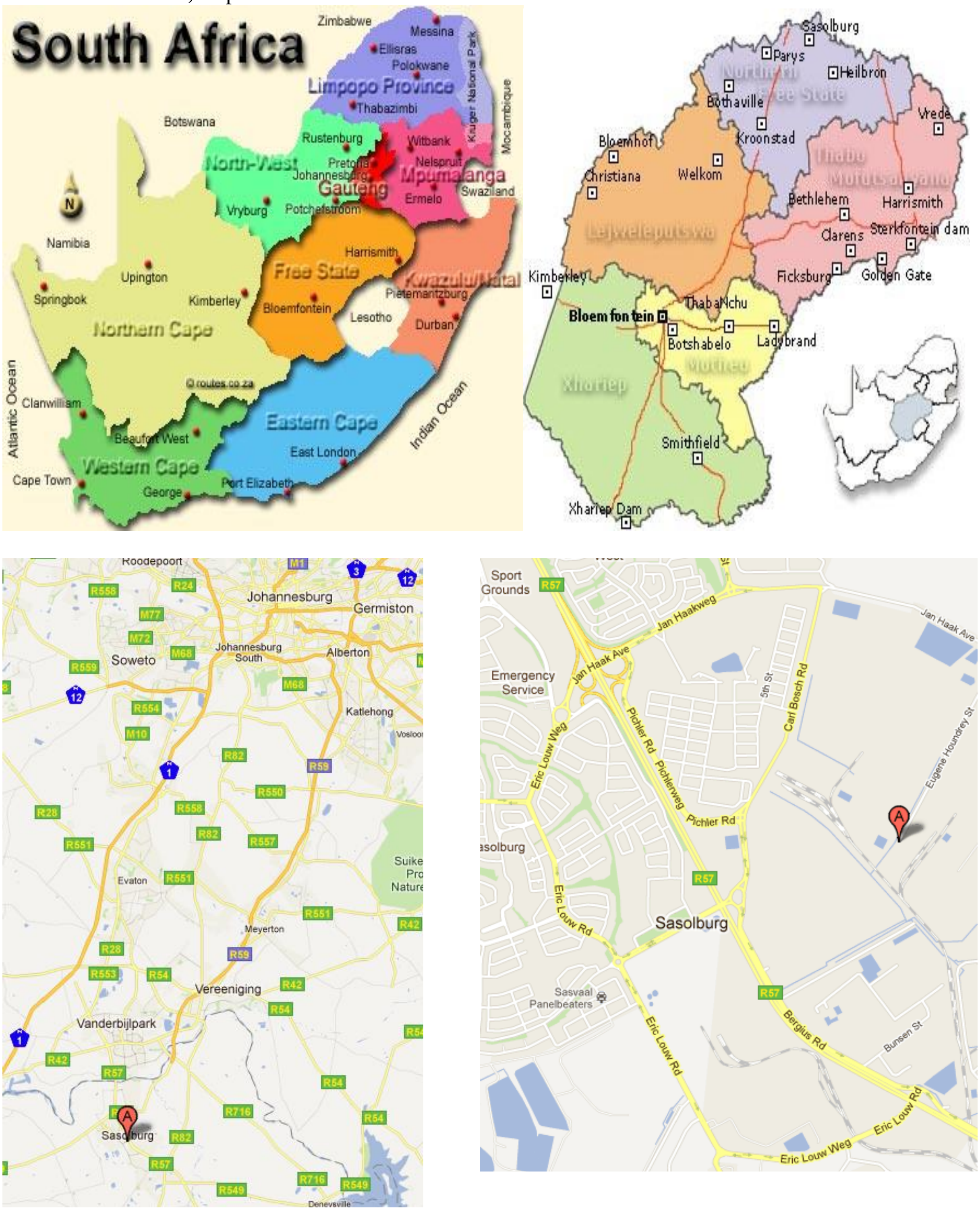

Figure 1: Physical location of the Omnia II nitric acid plant in Sasolburg, South Africa

A.2.3. City/Town/Community etc.

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Sasolburg in the municipality of Metsimaholo

A.2.4. Physical/Geographical location

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Omnia's plant is located at latitude of approx. 26°48'48" South and a longitude of 27°51'23" East.

A.3. Technologies and/or measures

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The new nitric acid plant is under construction and it is planned to take it into operation in April 2012. The original design and the order for the plant did not foresee the installation N_2O destruction catalyst systems. After the CDM methodology ACM0019 was approved in June 2011 it was decided to implement a CDM project with installation of a tertiary N_2O reduction catalyst. Therefore the baseline scenario without the CDM project would be the operation of the nitric acid plant without N_2O reduction catalyst.

The project activity entails the installation of:

- Tertiary N_2O abatement technology,
- Specialized monitoring equipment that is installed at the tail gas stream after the abatement of N_2O emissions (see Monitoring Plan in this PDD for further information).

Catalyst Technology

In the production process of nitric acid (HNO_3), NO_2 is produced as an intermediate material from ammonia (NH_3). The associated chemical reactions of oxidizing ammonia and simultaneous unwanted reactions are as follows:

1.	$NH_3 + 2\ O_2 \rightarrow HNO_3 + H_2O$		(overall desirable reaction)
2.	$4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$		(desirable in the NH_3 oxidization process)
3.	$2NO + O_2 \rightarrow 2\ NO_2$		(desirable in the NO oxidization process)
4.	$3\ NO_2 + H_2O \rightarrow 2\ HNO_3 + NO$		(desirable in the NO_2 absorption process)
5.	$4\ NH_3 + 3\ O_2 \rightarrow 2\ N_2 + 6\ H_2O$		(undesirable)
6.	$4\ NH_3 + 4\ O_2 \rightarrow 2\ N_2O + 6\ H_2O$		(undesirable)
7.	$2\ NH_3 + 8\ NO \rightarrow 5\ N_2O + 3\ H_2O$		(undesirable)

Through the sixth and seventh reactions, some N_2O is generated in the process.

The N_2O abatement technology will be installed in the tail gas downstream after the HNO_3 absorber and before the tail gas turbine. A tertiary catalyst reduces N_2O that is formed in the primary ammonia oxidation reaction. A wide range of metals (e.g. Cu, Fe, Mn, Co and Ni) have been shown to be of varied efficiency in N_2O abatement catalysts. The abatement efficiency of this pelleted catalyst has been shown to be up to 99.9% in the following reaction[3]:

$$4\ N_2O + CH_4 \rightarrow 4\ N_2 + 2\ H_2O + CO_2$$

In the tertiary abatement system N_2O is removed by catalytic reduction with a hydrocarbon, such as methane from natural gas.

[3] While the calculations of estimated emission reductions are based on the conservative estimation of an abatement efficiency of 98 %, it should be noted that from experience from Omnia´s first N_2O reduction project as well as from other similar projects with the same technology even higher abatement efficiencies of up to 99.9 % were observed.

The applied technology is chosen because it has negligible risk of decreasing HNO_3 production and a high expected N_2O reduction.

The expected lifetime of the N_2O reduction unit is at least 10 years. It is expected to be in the range of 25 years. However the installed catalyst itself may need to be replaced after a few years, depending on the achieved abatement performance.

In addition NOx is reduced in a separate catalyst bed by reduction with ammonia.

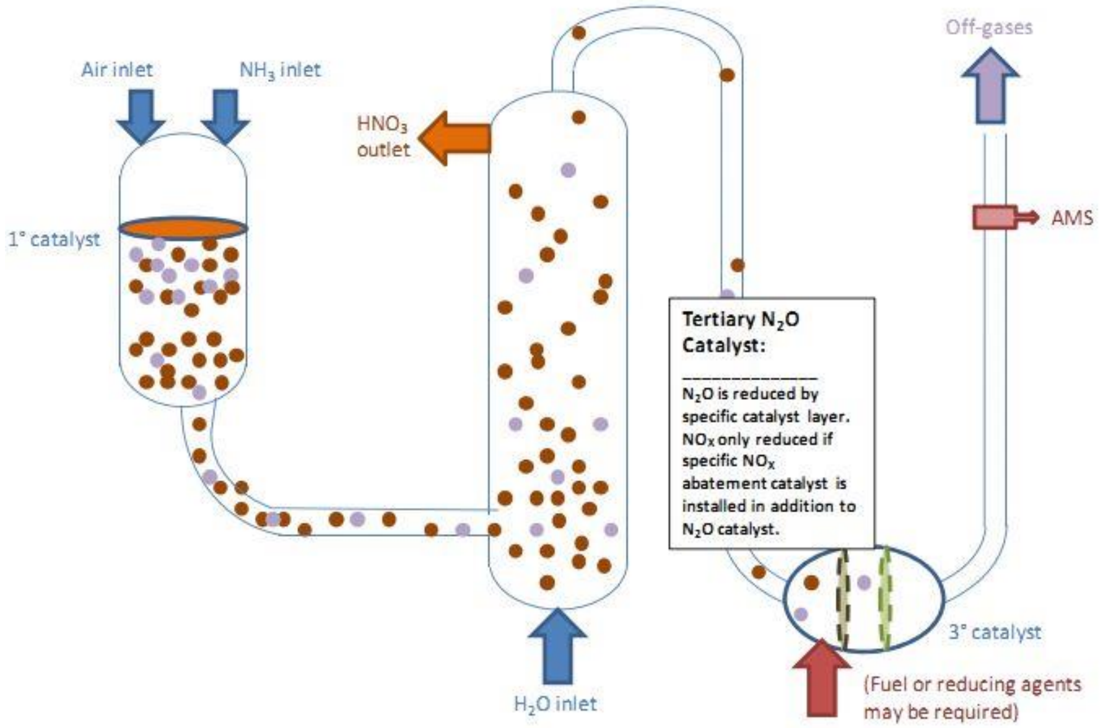

Figure 2: Image flow of tertiary catalyst unit

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
South Africa (host)	Omnia Fertilizer, Division of Omnia Group (Pty) Ltd	No
Norway	Nordic Environment Finance Corporation	No
United Kingdom of Great Britain and Northern Ireland	Belektron d.o.o.	No

A.5. Public funding of project activity

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No public funds are involved in the financing of the project activity. The project is solely financed by Omnia Fertilizer.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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Applicable baseline and monitoring methodology:

ACM0019 Version 01.0.0: “N_2O abatement from nitric acid production”

Methodological tools referred to in ACM0019 as applied in this PDD:

“Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”

(Version 02)

“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”

(Version 02.0.0)

B.2. Applicability of methodology and standardized baseline

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The chosen baseline methodology ACM0019 is applicable to projects in which tertiary N_2O abatement technology is installed in the tail gas leaving the absorption column in the nitric acid plant. This corresponds with the proposed project activity.

The applicability criteria of the chosen methodology are met by the project:

- Presently, no N_2O abatement technology is installed in the plant.
- The plant will be equipped with a complete Automated Monitoring System (AMS). It is used to continuously measure N_2O concentration and total gas volume flow in the stack during the plant’s operation throughout the crediting period.
- The host country does not apply any legal requirements to reduce N_2O emissions from nitric acid plants (see B.4 for further information).

B.3. Project boundary

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The spatial extent of the project boundary encompasses the facility and equipment for the nitric acid production process from the inlet of the ammonia burner to the outlet of the tail gas section.

As the project activity introduces tertiary N_2O abatement, any remaining N_2O emissions from the project plant and CO_2 emissions arising from the operation of the tertiary abatement system are included as project emissions in the project boundary.

The greenhouse gases included in or excluded from the project boundary are shown in the below table:

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	NH3 oxidation at the primary catalyst gauze	CO_2	NO	The project activity has no influence on these types of emissions, if present
		CH_4	NO	
		N_2O	Yes	Included, main emission source
Project scenario	NH3 oxidation at the primary catalyst gauze	CO_2	NO	The project activity has no influence on these types of emissions, if present
		CH_4	NO	
		N_2O	Yes	Included, main emission source
	Operation of a tertiary N2O Abatement facility	CO_2	Yes	In some cases, fossil fuels are used as reducing agent and/or for decomposing the tail gas as part of a tertiary N2O abatement facility. In this case the fossil fuels are mainly converted to CO2. CO2 emissions arising from the production of ammonia are assumed to be small and not taken into account.
		CH_4	NO	
		N_2O	Yes	Included

Table 1: Emission sources included in or excluded from the project boundary (source: ACM0019 version 01.0.0)

The boundary of the project will be from the inlet of the Ammonia Oxidation Reactor to the outlet of the stack of the nitric acid plant.

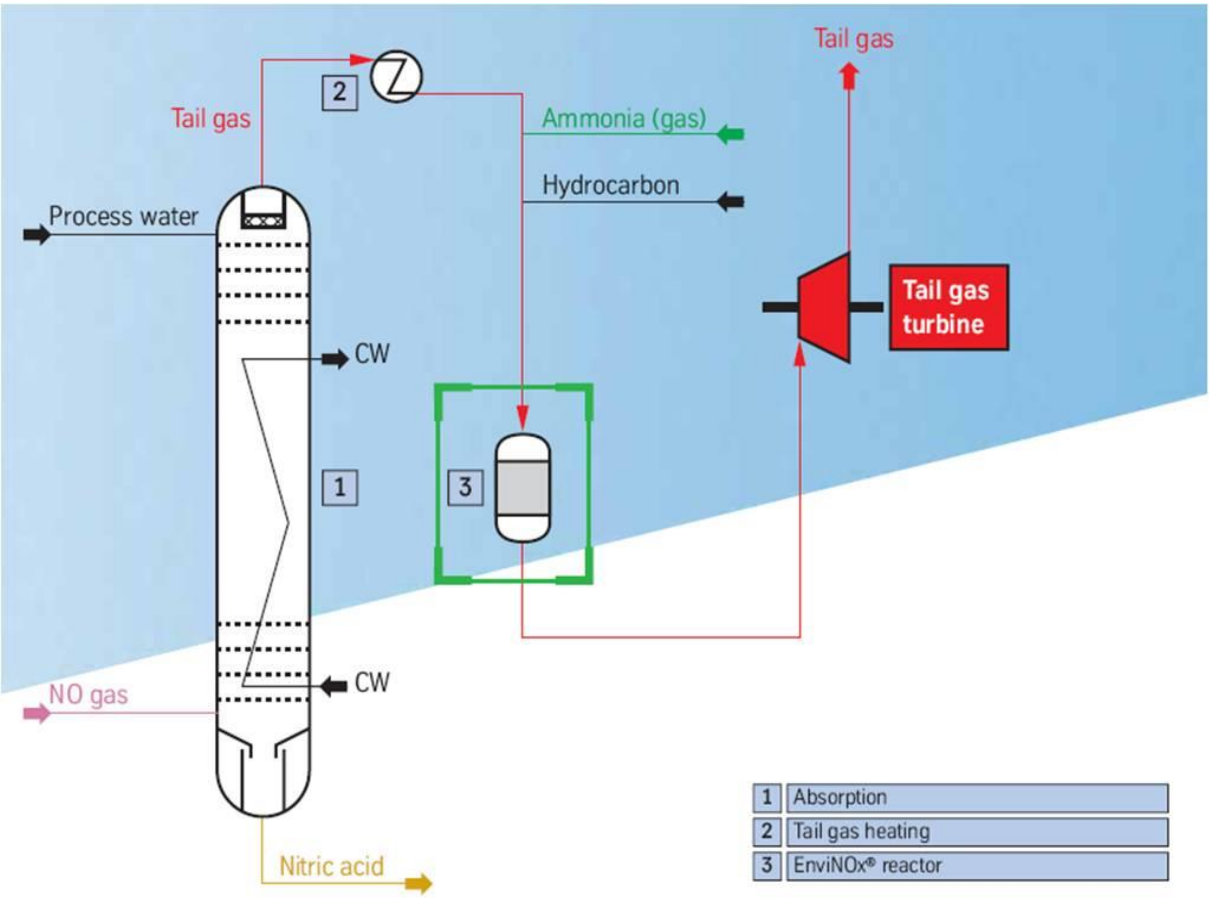

Figure 3: Project boundary for N_2O abatement project

B.4. Establishment and description of baseline scenario

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The Department of Environmental Affairs of the government of South Africa is responsible of any national/regional emission regulations. Air Quality legislation has changed recently in South Africa. The 1st of April 2010 marked the full enactment of the National Environmental Management: Air Quality Act (Act No. 39 of 2004). The responsibility for the implementation of the act was delegated to the regional municipalities from the national government, this is stipulated in section 36(1) of the act. The act itself was preceded by the promulgation of the listed activities and their associated minimum emission standards on 31 March 2010, as contemplated in section 21(1)(a) of the act. The listed activities describes the processes for which air quality licenses will be required.

There are currently no national regulations in South Africa that limit N_2O emissions from nitric acid production. This has been confirmed for the specific case of the Omnia nitric acid plant in a confirmation letter issued by Department of Environmental Affairs of the government of South Africa .

In the absence of regulations requiring the abatement of N_2O emissions, the operator of the nitric acid plant has no economic incentives to take any N_2O abatement measures because this entails capital and operating costs but no financial benefits.

Therefore, the CDM project activity is considered additional and the baseline scenario is that the N_2O is emitted to the atmosphere with no N_2O abatement measure being implemented.

B.5. Demonstration of additionality

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According to the baseline methodology procedure of the methodology ACM0019 Version 1.0.0, the project activity is considered to be additional in the absence of regulations requiring the abatement of N_2O emissions. The operator of the nitric acid plant has no economic incentives to take any N_2O abatement measure because this entails capital and operation costs but no financial benefits. In the absence of any regulation, the baseline scenario is emitting N_2O to the atmosphere with no N_2O abatement measure being implemented.

Since the project start date is after 02/08/2008 a “prior consideration” form has been submitted to the UNFCCC and the South African DNA within 6 months of the project start date.

Omnia closely followed the developments of new methodologies which would allow it to register a CDM project at its new nitric acid plant. The decision to implement an N_2O abatement project was taken on 30/06/2011 and the Omnia project team was instructed by management to request a quotation from Uhde GmbH for a tail gas N_2O abatement system. Omnia placed the order for the N_2O abatement system (“ENVINOX”) 20 July 2011. This decision was approved by the Omnia holdings board of directors on 28 July 2011. On 31 August 2011a CDM service agreement between N.serve Environmental Services GmbH and Omnia Fertilizer was signed. On 07 September 2011 prior consideration notices were sent to the DNA of South Africa and to UNFCCC. On 30 September 2011 a local stakeholder meeting was held. On 10 October 2011 a climate change service agreement was signed between DNV and Omnia Fertilizer.

The table below is only applicable if the proposed project activity is a type of project activity which is deemed automatically additional, as defined by the applied approved methodology or standardized baseline.

Specify the methodology or standardized baseline that establish automatic additionality for the proposed project activity (including the version number and the specific paragraph, if applicable).	n/a
Describe how the proposed project activity meets the criteria for automatic additionality in the relevant methodology or standardized baselines.	n/a

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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ACM0019, Version 01.0.0., is the methodology chosen for the implementation of this project activity.

In the following, the explanation of the calculation of baseline and project emissions, as required under the ACM0019, is presented.

Baseline emissions:

Explanation of calculation method and applicable formula

(1) $$BE_n = P_{NA,n} * EF_{BL,\,N2O,n} * GWP_{N2O} * 10^{-3}$$

Where:

BE_n = Baseline emissions in monitoring period n (tCO_2e)

$P_{NA,n}$ = Nitric acid produced in the monitoring period n ($tHNO_3$)

$EF_{BL, N2O,n}$ = Baseline N_2O emission factor for nitric acid production in the monitoring period n ($kgN_2O/tHNO_3$).

GWP_{N2O} = Global Warming Potential of N_2O valid for the commitment period (310 tCO_2e)

Determination of the baseline N_2O emission factor ($EF_{BL,N2O,n}$)

The baseline N_2O emission factor in the monitoring period n ($EF_{BL,N2O,n}$) shall be determined as a default emission factor $EF_{default,}$y given for each calendar year y for which BE_n is calculated (see monitoring table for $EF_{default,y}$), as follows:

(2) $$EF_{BL, N2O,n} = EF_{default, y}$$

Where:

$EF_{BL, N2O,n}$ = Baseline N_2O emission factor for nitric acid production in the monitoring period n ($kgN_2O/tHNO_3$).

$EF_{default,y}$ = Default N_2O baseline emissions factor in the calendar year of the monitoring period n ($kgN_2O/tHNO_3$) (see list of $EF_{default, y}$ values under B.6.2).

If the monitoring period n spans across two (or more) calendar years, the baseline emissions (BEn) shall be calculated separately for each calendar year, first establishing $EF_{BL,N2O,n}$ and then applying this to the nitric acid production of that calendar year.

Project Emissions:

Project emissions include emissions of N_2O which have not been destroyed by the project activity and, in case of the installation of a tertiary N_2O abatement facility, CO_2 emissions resulting from the operation of the N_2O abatement facility.

Project emissions are calculated using the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 2.0) referred to in ACM0019.

Project emissions are calculated as follows:

(3) $$PE_n = PE_{N2O,n} + PE_{CO2,tertiary,n}$$

Where:

PE_n = Project emissions in monitoring period n (tCO_2e)

$PE_{N2O,n}$ = Project emissions of N_2O from the project plant in monitoring period n (tCO_2e)

$PE_{CO2 ,tertiary,n}$ = Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility in monitoring period n (tCO_2)

The amount of N_2O emissions from the project activity includes two emission sources:

- The N_2O contained in the tail gas stream of the plant which is released to the atmosphere and;
- In the case of a tertiary N_2O abatement, the N_2O contained in any by-pass streams to the tertiary N_2O abatement facility.

(4) $$PE_{N2O,n} = (Q_{N2O, tail gas,n} + Q_{N2O,by-pass,n}) * GWP_{N2O}$$

Where:

$PE_{N2O,n}$ = Project emissions of N_2O from the project plant in monitoring period n (tCO_2e)

$Q_{N2O,\ tail\ gas,n}$ = Amount of N_2O released through the tail gas of the project plant to the atmosphere in monitoring period n (tN_2O)

$Q_{N2O,\ by\text{-}pass;n}$ = Amount of N_2O released through the by-pass to a tertiary N_2O abatement system to the atmosphere in monitoring period n (tN_2O)[4]

GWP_{N2O} = Global warming potential of N_2O valid for the commitment period (310 tCO_2e)

Determination of $Q_{N2O,tail\ gas,n}$

The amount of N_2O emissions from the tail gas stream of the project plant shall be determined using
the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream." In applying the tool, the following provisions apply:

- Throughout the crediting periods of the project activity, the N_2O concentration and volume or mass flow of the tail gas are to be monitored continuously. The monitoring system is to be installed and maintained throughout the crediting period based on the European Norm 14181 (2004), or any more recent update of that standard;
- The monitoring system should provide separate hourly average values for the N_2O concentration and the volume or mass flow of the tail gas based on (generally) 2 seconds interval readings that are recorded and stored electronically. These N_2O data sets shall be identified by means of a unique time / date key indicating when exactly the values were observed;
- The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN14181 must be applied to both the N_2O concentration and the volume or mass flow of the tail gas. This can either be applied automatically to the raw data recorded by the data storage system at the plant or it can be applied to the calculated hourly averages as part of the calculation of project emissions;
- If data for either the N_2O concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of N_2O concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the N_2O concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of N_2O calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum values;

According to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0) the mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* ($F_{i,t}$) is calculated based on measurements of

a) the total volume flow or mass flow of the gas stream and
b) the volumetric fraction of the gas in the gaseous stream and
c) the water content and gas composition.

The tool covers possible measurement options, providing six different calculation options to determine the volume or mass flow of a particular greenhouse gas (A-F).

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[4] Please note that for the underlying project activity no by-pass option is foreseen in the current project design. Accordingly, no by-pass emissions will occur throughout the project activity: However, in order to comply with the methodology and for keeping up flexibility in the event of a possible by-pass installation at a later point of time the parameter $T_{open,n}$ will be monitored throughout the crediting period and has been added to section B.7.2.

Furthermore, the tool provides several options for the determination of the moisture content of the gaseous stream. As the gaseous stream is assumed to be dry, Option A is applied. In order to apply this option, it shall be demonstrated that the gaseous stream is dry. As described in part (a) of Option A, the moisture content of the gaseous stream ($C_{H2O,t,db,n}$) will be measured and it shall be demonstrated that it is less or equal to 0.05 kg H_2O/m^3 dry gas.

The moisture measurement shall coincide with the Annual Surveillance Test or the calibration of the flow meter for the gaseous stream.

In accordance with Option A of the tool, the mass flow of greenhouse gas *i* ($F_{i,t}$) is calculated as follows:

(5) $$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t}$$

With:

(6) $$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$

Where:

$F_{i,t}$	= mass flow of greenhouse gas N_2O in the gaseous stream in time interval *t* (kg gas /h)
$V_{t,db}$	= Volumetric flow of the gaseous stream in time interval *t* on dry basis (m^3 dry gas/h)
$v_{i,t,db}$ a	= Volumetric fraction of greenhouse gas *i* in the gaseous stream in a time interval *t* on dry basis (m^3 gas *i*/m^3 dry gas)
$\rho_{i,t}$	= Density of greenhouse gas *i* in the gaseous stream in a time interval *t* (kg gas *i*/m^3 gas *i*)
P_t	= Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_i	= Molecular mass of greenhouse gas *i* (kg/kmol)
R_u	= Universal ideal gases constant (Pa.m^3/kmol.K)
T_t	= Temperature of the gaseous stream in time interval *t* (K)

The hourly values are then aggregated for the duration of the monitoring period n, as follows:

(7) $$Q_{N2O,tailgas,n} = \sum_{h=1}^{h=h_n} F_{N2O,tailgas,h} * 10^{-3}$$

Where:

$Q_{N2O,tailgas,n}$	= Amount of N_2O released through the tail gas of the project plant to the atmosphere in monitoring period n (tN_2O)
$F_{N2O,tailgas,h}$	= Mass flow of N_2O in the gaseous stream of the tail gas in the hour h (kgN_2O/h)
h_n	= Number of hours in monitoring period n during which the plant was in operation

During any periods in which a tertiary abatement system is by-passed, $F_{N2O,tailgas,h}$ is set to zero in order to avoid double counting of project emissions.

(8) $$Q_{N2O,by\text{-}pass;n} = EF_{BL,N2O,n} * P_{NA.n} * T_{open,n} * 10^{-3}$$

Where:

$Q_{N2O,by\text{-}pass;n}$	= Amount of N_2O released through the by-pass to a tertiary N_2O abatement system to the atmosphere in monitoring period n (tN_2O)

$EF_{BL, N2O,n}$ = Default N_2O baseline emissions factor in the calendar year y of the monitoring period n ($kgN_2O/t\ HNO_3$)

$P_{NA.n}$ = Nitric acid produced in the monitoring period n ($tHNO_3$)

$T_{open,n}$ = Fraction of time in monitoring period n during which the by-pass valve on the line feeding the tertiary N_2O abatement facility was open to vent the gas directly to the atmosphere.

Project emissions from the operation of the tertiary N_2O abatement facility ($PE_{CO2,tertiary,n}$)

The emissions related to the operation of the N_2O destruction facility include only on-site emissions due to the fossil fuel use as input to the N_2O destruction facility:

$$PE_{CO2,tertiary,n} = PE_{FF,n} \quad (9)$$

Where:

$PE_{CO2,tertiary,n}$ = Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility in monitoring period n (tCO_2)

$PE_{FF,n}$ = Project emissions related to fossil fuel input to the destruction facility and/or re-heater in monitoring period n ($t\ CO_2$)

For the determination of the project emissions related to the operation of the tertiary abatement system in monitoring period *n* the project proponents are required to use the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion."

The parameter $PE_{FC,j,y}$ used in the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" corresponds to the parameter $PE_{FF,n}$ in the applied methodology:

$$PE_{FF,n} = PE_{FC,j,n} \quad (10)$$

CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,n} = \sum_i FC_{i,j,n} * COEF_{i,n} \quad (11)$$

Where:

$PE_{FC,j,n}$ = CO_2 emissions from fossil fuel combustion in process *j* in monitoring period *n* (tCO_2/n)

$FC_{i,j,n}$ = Quantity of fuel type *i* combusted in the process *j* during the monitoring period *n* (mass or volume unit/n)

$COEF_{i,n}$ = CO_2 emission coefficient of fuel type *i* in monitoring period *n* (tCO_2/mass or volume unit)

i = fuel types combusted in process *j* during monitoring period *n*

As data about the chemical composition of the fuel type *i* is available $COEF_{i,n}$ is calculated based on its chemical composition of the fossil fuel type *i* using Option A of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02):

$$COEF_{i,n} = W_{c,i,n} * 44/12 \quad (12)$$

Where:

$COEF_{i,n}$ = CO_2 emission coefficient of fuel type *i* in monitoring period *n* (tCO_2/mass or volume unit)
$w_{C,i,n}$ = Is the weighted average mass fraction of carbon in fuel type *i* in monitoring period n (tC/mass unit of the fuel)

Leakage emissions:

Any leakage emissions sources are deemed to be negligible.

Emission reductions:

Emission reductions are calculated as follows:

$$ER_n = BE_n - PE_n \quad (13)$$

Where:

ER_n = Emission reductions in monitoring period n (tCO_2e)
BE_n = Baseline emissions in monitoring period n (tCO_2e)
PE_n = Project emissions in monitoring period n (tCO_2e)

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data / Parameter	$EF_{default,y}$
Unit	$kgN_2O/tHNO_3$
Description	Default N_2O baseline emissions factor in the calendar year y of the monitoring period n

<table>
<tr><td>Source of data</td><td>According to ACM0019 Version 01.0.0, the default N_2O baseline emission factor will vary every year. In year 2005, the emission factor will be 5.1 and then it will decrease every year until it reaches a final value of 2.5 in the year 2020. The value of 2.5 will remain constant after 2020, as provided in the following table:
<table>
<tr><td>Year</td><td>Emissions factor ($kgN_2O/tHNO_3$)</td></tr>
<tr><td>2005</td><td>5.10</td></tr>
<tr><td>2006</td><td>4.90</td></tr>
<tr><td>2007</td><td>4.70</td></tr>
<tr><td>2008</td><td>4.60</td></tr>
<tr><td>2009</td><td>4.40</td></tr>
<tr><td>2010</td><td>4.20</td></tr>
<tr><td>2011</td><td>4.10</td></tr>
<tr><td>2012</td><td>3.90</td></tr>
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<tr><td>2020</td><td>2.50</td></tr>
<tr><td>2021</td><td>2.50</td></tr>
<tr><td>Year n</td><td>2.50</td></tr>
</table>
</td></tr>
<tr><td>Value(s) applied</td><td>Not applicable</td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>No measurement procedures, specified in the methodology.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Additional comment</td><td>The decrease in the value for the baseline emission factor over time is to reflect the technological development. Please note that the factual business as usual emissions are estimated to be 6.45 kgN2O/tHNO3.</td></tr>
</table>

Data / Parameter	GWP_{N2O}
Unit	tCO_2e/tN_2O
Description	Global warming potential of the nitrous oxide
Source of data	Relevant decisions by the CMP
Value(s) applied	310
Choice of data or Measurement methods and procedures	Specified in the methodology.
Purpose of data	Calculation of baseline emissions and Calculation of project emissions
Additional comment	

Parameters from the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0):

Data / Parameter	R_u
Unit	Pa,m^3/kmol.K
Description	Universal ideal gases constant
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	8,314
Choice of data or Measurement methods and procedures	n/a
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	MM_i
Unit	kg/mol
Description	Molecular mass of greenhouse gas *i* (N_2O)
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	44.02
Choice of data or Measurement methods and procedures	n/a
Purpose of data	
Additional comment	

Data / Parameter	P_n
Unit	Pa
Description	Total pressure at normal conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	101,325
Choice of data or Measurement methods and procedures	Normalization of gas measurement
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	T_n
Unit	K
Description	Temperature at normal conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	273.15 K
Choice of data or Measurement methods and procedures	Normalization of gas measurement
Purpose of data	Calculation of project emissions

Additional comment	

Data / Parameter	$T_{open,n}$
Unit	%
Description	Fraction of time in monitoring period n during which the by-pass valve on the line feeding the tertiary N_2O abatement facility was open to vent the gas directly to the atmosphere.
Source of data	N/A
Value(s) applied	0
Choice of data or Measurement methods and procedures	N/A
Purpose of data	Calculation of project emissions
Additional comment	No by-pass is foreseen in the project design and therefore no by-pass valve will be installed from the beginning of the project activity. If necessary, plant will shut down.

B.6.3. Ex ante calculation of emission reductions

>>

For the calculation of the estimated emission reductions it was taken into account:

- The confirmed capacity of 400,000 $tHNO_3$/year,
- A default factor ($EF_{default,y}$) (see B.6.2) for calculating baseline emissions (BE_n),
  Please note that factual business as usual emissions are assumed to be approximately 6.45 $kgN_2O/tHNO_3$. However, as defined in the methodology, instead of factual business as usual emissions, the default factor is used in order to calculate credible emission reductions.
- An expected reduction efficiency of 98% and
- Project emissions from the operation of the tertiary N_2O abatement facility: $PE_{FC,j,n}$ = 905 tCO_2e (ex-ante calculation) for the operation of the tertiary system.

Baseline emissions:

$$BE_n = P_{NA,n} * EF_{BL,N2O,n} * GWP_{N2O} * 10^{-3} \quad (14)$$

Where:

BE_n = Baseline emissions in monitoring period n (tCO_2e)

$P_{NA,n}$ = Nitric acid produced in the monitoring period n ($tHNO_3$)

$EF_{BL,N2O,n}$ = Default N_2O baseline emissions factor in the calendar year y of the monitoring period n ($kgN_2O/tHNO_3$). The baseline N_2O emission factor in the monitoring period n ($EF_{BL,N2O,n}$) shall be determined as a default emission factor $EF_{default,y}$ given for each calendar year y for which BE_n is calculated (see monitoring tables for $EF_{default,y}$)

GWP_{N2O} = Global Warming Potential of N_2O valid for the commitment period of 310 tCO_2e

The following table displays the estimated baseline emissions for the project activity over the crediting period of 10 years starting in 01/04/2012.

Year	$EF_{default,y}$ ($kgN_2O/tHNO_3$)	$P_{NA,n}$ ($tHNO_3$)	GWP (N_2O)	BE_n (tCO_2e)
04/2012	3.90	150,000	310	**181,350**
2013	3.70	400,000	310	**458,800**
2014	3.50	400,000	310	**434,000**
2015	3.40	400,000	310	**421,600**
2016	3.20	400,000	310	**396,800**
2017	3.00	400,000	310	**372,000**
2018	2.80	400,000	310	**347,200**
2019	2.70	400,000	310	**334,800**
2020	2.50	400,000	310	**310,000**
2021	2.50	400,000	310	**310,000**
03/2022	2.50	100,000	310	**77,500**
Total		3,850,000		**3,644,050**

Table 2: Overview of estimated baseline emissions during the project activity over the 10 years crediting period.

Project Emissions:

(15) $PE_n = PE_{N2O,n} + PE_{CO2,tertiary,n}$

(16) $PE_{N2O,n} = (Q_{N2O, tail gas,n} + Q_{N2O,by-pass,n}) * GWP_{N2O}$

Where:

PE_n = Project emissions in monitoring period n (tCO_2e)

$PE_{N2O,n}$ = Project emissions of N_2O from the project plant in monitoring period n (tCO_2e)

$PE_{CO2,tertiary,n}$ = Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility in monitoring period n (tCO_2)

$Q_{N2O,tail gas,n}$ = Amount of N_2O released through the tail gas of the project plant to the atmosphere in monitoring period n (tN_2O)

$Q_{N2O, by-pass;n}$ = Amount of N_2O released through the by-pass to a tertiary N_2O abatement system to the atmosphere in monitoring period n (tN_2O)

GWP_{N2O} = Global warming potential of N_2O valid for the commitment period

Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility will be assessed by using the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (version 2.). However, since no abatement technology is installed yet, the parameter will be correctly determined during the first verification.

For the purpose of estimating the complete project emissions, an ex-ante calculation was undertaken on the basis of design consumption figures provided by Uhde. The catalyst system will be fed with natural gas providing CH_4, which will be utilized as a reduction agent for the decomposition of N_2O in a quantity of 0.35 mol CH_4/ mol N_2O. Formula (11) is applied for the determination of the parameter $PE_{FC,j,n}$, which is equal to parameter $PE_{CO2,tertiary,n}$ of the applied methodology ACM0019 resulting in estimated emissions from the operation of the tertiary abatement facility of 905 tCO_2/year.

Year	$PE_{N2O,n}$ (tCO2e)	$PE_{CO2,tertiary,n}$ (tCO_2e)	PE_n (tCO_2e)

04/2012	5,999	340	**6,339**
2013	15,996	905	**16,901**
2014	15,996	905	**16,901**
2015	15,996	905	**16,901**
2016	15,996	905	**16,901**
2017	15,996	905	**16,901**
2018	15,996	905	**16,901**
2019	15,996	905	**16,901**
2020	15,996	905	**16,901**
2021	15,996	905	**16,901**
03/2022	3,999	227	**4,226**
Total	153,962	8,712	**162,674**

Table 3: Overview of estimated project emissions during the project activity over the 10 year crediting period.

Emission reductions

(17) $ER_n = BE_n - PE_n$

Where:

ER_n = Emission reductions in monitoring period n (t CO_2e)
BE_n = Baseline emissions in monitoring period n (t CO_2e)
PE_n = Project emissions in monitoring period n (t CO_2e)

Year	**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 overall emission reductions (tonnes of CO_2e)**
04/2012	6,339	181,350	0	**175,011**
2013	16,901	458,800	0	**441,899**
2014	16,901	434,000	0	**417,099**
2015	16,901	421,600	0	**404,699**
2016	16,901	396,800	0	**379,899**
2017	16,901	372,000	0	**355,099**
2018	16,901	347,200	0	**330,299**
2019	16,901	334,800	0	**317,899**
2020	16,901	310,000	0	**293,099**
2021	16,901	310,000	0	**293,099**
03/2022	4,226	77,500	0	**73,274**
Total	162,674	3,644,050	0	**3,481,376**

Table 4: Overview of estimated emission reductions during the project activity over the 10 year crediting period

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
04/2012	181,350	6,339	0	**175,011**
2013	458,800	16,901	0	**441,899**
2014	434,000	16,901	0	**417,099**
2015	421,600	16,901	0	**404,699**
2016	396,800	16,901	0	**379,899**
2017	372,000	16,901	0	**355,099**
2018	347,200	16,901	0	**330,299**
2019	334,800	16,901	0	**317,899**
2020	310,000	16,901	0	**293,099**
2021	310,000	16,901	0	**293,099**
03/2022	77,500	4,226	0	**73,274**
Total	3,644,050	162,674	0	**3,481,376**
Total number of crediting years	10			
Annual average over the crediting period	364,405	16,267	0	348,138

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter	$P_{NA,n}$
Unit	$tHNO_3$
Description	Nitric acid produced in the monitoring period n
Source of data	Mass flow of HNO_3 is continuously measured by a mass flow meter. Density & acid concentration are determined by laboratory analysis.
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Volume of HNO_3 is continuously measured by a flow meter. Density & acid concentration are determined by laboratory analysis. 100 % HNO_3 is calculated by the available data.
Monitoring frequency	Continuously
QA/QC procedures	Maintenance and calibration of the flow meter and density meter are applied
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$F_{N2O, tailgas,h}$
Unit	kg N_2O/h
Description	Mass flow of N_2O in the gaseous stream of the tail gas in the hour h

Source of data	N_2O concentration: N_2O analyser Stack gas volume flow: flow meter
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	• Throughout the crediting periods of the project activity, the N_2O concentration and volume or mass flow of the tail gas are to be monitored continuously. The monitoring system is to be installed and maintained throughout the crediting period based on the European Norm 14181 (2004); • The monitoring system should provide separate hourly average values for the N_2O concentration and the volume or mass flow of the tail gas based on 2 seconds (or shorter) interval readings that are recorded and stored electronically. These N_2O data sets shall be identified by means of a unique time / date key indicating when exactly the values were observed; • The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN14181 must be applied to both the N_2O concentration and the volume or mass flow of the tail gas. This can either be applied automatically to the raw data recorded by the data storage system at the plant or it can be applied to the calculated hourly averages as part of the calculation of project emissions; If data for either the N_2O concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of N_2O concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the N_2O concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of N_2O calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum values; The hourly values are then aggregated as follows $$Q_{N2O,tailgas,n} = \sum_{h=1}^{h=h_n} F_{N2O,tailsgas,h} * 10^{-3}$$
Monitoring frequency	Continuously
QA/QC procedures	According to EN 14181, the flow meter and the analyzer will be tested and calibrated by an external laboratory with EN ISO IEC 17025 Accreditation. The QAL2 test is conducted once every 5 years; the AST test is conducted once per year. Every 5 years the AST test is part of the QAL2 test.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	h_n
Unit	Hours
Description	Number of hours in monitoring period n during which the plant was in operation
Source of data	Omnia production log and continuous monitoring according to operational parameters
Value(s) applied	Not available for validation. Will be monitored ex-post.

Measurement methods and procedures	The total operating hours are logged continuously in the production log.
Monitoring frequency	Continuously
QA/QC procedures	Operating hours are cross checked against other operational parameters of the plant according to internal QA/QC procedures.
Purpose of data	Calculation of project emissions
Additional comment	In order to calculate the expected emission reductions in section B.5 the expected operating hours of the plant within one year were applied.

Data / Parameter	$T_{open,n}$
Unit	%
Description	Fraction of time in monitoring period n during which the by-pass valve on the line feeding the tertiary N_2O abatement facility was open to vent the gas directly to the atmosphere.
Source of data	measured
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	N/A
Monitoring frequency	N/A
QA/QC procedures	N/A
Purpose of data	Calculation of project emissions
Additional comment	No by-pass is foreseen in the project design and therefore no by-pass valve will be installed from the beginning of the project activity. If necessary, plant will shut down.

Data / Parameter	$PE_{FF,n}$ (corresponding to $PE_{CO2,tertiary,n}$)
Unit	tCO_2e
Description	Project emissions related to fossil fuel input to the destruction facility and/or re-heater in monitoring period n (tCO_2)
Source of data	The emissions related to the operation of the N_2O destruction facility include only on-site emissions due to fossil fuel use as input to the N_2O destruction facility. Natural gas consumption will be measured by a mass-flow meter
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	calculated based on measurement of natural gas consumption and $\mathbf{w_{C,i,y}}$
Monitoring frequency	Continuously
QA/QC procedures	Maintenance and calibration of the mass flow meter is applied under the internal QA/QC procedures.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$\mathbf{w_{C,i,y}}$
Unit	tC/mass unit of the fuel

Description	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data	The following data sources may be used if the relevant conditions apply: **Data source** — **Conditions for using the data source** a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the project participants — If a) is not available
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Measurements should be undertaken in line with national or international fuel standards. The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
Monitoring frequency	N/A
QA/QC procedures	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	Calculation of project emissions
Additional comment	Applicable where Option A of "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0) is used

Data / Parameter	$FC_{i,j,y}$
Unit	Mass unit per year (ton/yr)
Description	Quantity of fuel type *i* combusted in process *j* during the year y
Source of data	Onsite measurements
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectric devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions
Monitoring frequency	Continuously

QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Purpose of data	Calculation of project emissions
Additional comment	Applicable where Option A of “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0) is used

Data / Parameter	$V_{t,db}$
Unit	m^3 dry gas/h
Description	Volumetric flow of the gaseous stream in time interval *t* on a dry basis
Source of data	Tail gas volume flow meter
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Volumetric flow measurements should always refer to the actual pressure and temperature.
Monitoring frequency	Continuously
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. According to EN 14181, the flow meter will be tested and calibrated by an external laboratory with EN ISO IEC 17025 Accreditation. The QAL2 test is conducted once every 5 years; the AST test is conducted once per year. Every 5 years the AST test is part of the QAL2 test.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$v_{i,t,db}$
Unit	m^3 gas *i*/m^3 dry gas
Description	Volumetric fraction of greenhouse gas *i* in a time interval *t* on a dry basis
Source of data	N_2O gas analyzer
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Continuous gas analyser operating in dry-basis.
Monitoring frequency	Continuously
QA/QC procedures	Calibration should include zero verification with an inert gas (e.g. N_2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$C_{H2O,t,db,n}$

Unit	mg H_2O/m^3 dry gas
Description	Moisture content of the gaseous stream at normal conditions, in time interval *t*
Source of data	Measurements according to the USEPA CF42 method 4 – Gravimetric determination of water content
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Discrete measurement procedure
Monitoring frequency	The mean value among three consecutive measurements performed in the same day (at least 2 hours each) shall be considered. Measurements should coincide with the Annual Surveillance Test (associated with requirements of the EN 14181 standard) or the calibration of the flow meter for the gaseous stream.
QA/QC procedures	According to the USEPA CF42 method 4
Purpose of data	Calculation of project emissions
Additional comment	Required for proving that the gaseous stream is dry.

Data / Parameter	T_t
Unit	K
Description	Temperature in the gaseous stream in time interval *t*
Source of data	Tail gas temperature measurement
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Instruments with recordable electronic signal (analogical or digital) are required.
Monitoring frequency	Continuously
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer’s specifications
Purpose of data	Calculation of project emissions
Additional comment	Required for conversion of parameter to normal conditions.

Data / Parameter	P_t
Unit	Pa
Description	Pressure of the gaseous stream in time interval *t*
Source of data	Tail gas pressure measurement
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Instruments with recordable electronic signal (analogical or digital) are required
Monitoring frequency	Continuously

QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. According to EN 14181, the flow meter (including the parameter P_t) is tested and calibrated by an external laboratory with EN ISO IEC 17025 Accreditation. The QAL2 test is conducted once every 5 years; the AST test is conducted once per year. Every 5 years the AST test is part of the QAL2 test.
Purpose of data	Calculation of project emissions
Additional comment	Required for conversion of parameter to normal conditions.

Data / Parameter	ER_n
Unit	tCO_2e
Description	Emission reductions in monitoring period n
Source of data	Calculated
Value(s) applied	Not available for validation. Will be monitored ex-post.
Measurement methods and procedures	Not applicable. Is calculated using the following formula: $ER_n = BE_n - PE_n$
Monitoring frequency	Monitoring period
QA/QC procedures	N/A
Purpose of data	N/A
Additional comment	

B.7.2. Sampling plan

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N/A

B.7.3. Other elements of monitoring plan

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1. Organization Structure with Management & Operation Process

As an operator of nitric acid plants since many years, the plant's staff in general and its instrument department in particular is accustomed to operating technical equipment adhering to high quality standards.

Omnia Fertilizer will train the staff selected for the operation of the relevant monitoring systems and ensures that the operational standards required for the appropriate handling of the equipment will be maintained throughout the crediting period. Measuring instruments will be calibrated by the instrumentation engineer in accordance with the requirements of the instrument suppliers. The operations and equipment engineers of the nitric acid plant are responsible for the daily operation and maintenance of the systems.

The monitoring of the N_2O for the project will be the responsibility of the monitoring department. All relevant data will be recorded automatically and stored on electronic media.

2. Quality Assurance

ACM0019 requires the use of the European Norm EN14181 (2004) "Stationary source emissions - Quality assurance of automated measuring systems" as a guidance for installing and operating the Automated Monitoring System (AMS) for the monitoring of N_2O emissions in the nitric acid plant.
The plant will be equipped with such Automated Monitoring Systems (AMS) to monitor the mass emissions of N_2O in the tail gas of the nitric acid plant.

In the following, it is described how the procedures given in EN14181 for QAL1-3 will be applied at the plant.

QAL 1

In accordance with EN14181, the monitoring system for N_2O concentration measurements shall have been proven suitable for its measuring task (parameter and composition of the flue gas) by use of the QAL1 procedure as specified by EN ISO 15267 or equivalent standards. This standard's objective is to prove that the total uncertainty of the results obtained from the AMS meets the specification for uncertainty stated in the applicable regulations. Such suitability testing has to be carried out under specific conditions by an independent third party on a specific testing site.

QAL2

QAL2 is a procedure for the determination of the calibration function and its variability. According to EN14181, the QAL2 test including the SRM need to be conducted by an independent "testing house" or laboratory which has to be accredited to EN ISO/IEC 17025. The QAL2 tests are performed on suitable AMS that have been correctly installed and commissioned on-site (as opposed to QAL 1 which is conducted off-site).

A calibration function is established from the results of a number of parallel measurements performed with a Standard Reference Method (SRM). The variability of the measured values obtained with the AMS is then evaluated by the independent qualified "testing house". QAL2 tests are to be performed at least every 5 years according to EN 14181.

AST

In addition, Annual Surveillance Tests (AST) should be conducted in accordance with EN 14181; these are a series of measurements with independent measurement equipment in parallel to the existing AMS. The AST tests are performed annually. If a full QAL 2 test is performed (at least every 5 years), an additional AST test is not necessary in that same year.

QAL3

QAL3 describes the ongoing quality assurance and maintenance procedures and documentation for the AMS conducted by the plant operator. With this documentation it can be demonstrated that the AMS is in control during its operation so that it continues to function within the required specifications.
In essence, staff performs QAL 3 procedures through the established calibration procedures.

Accuracy and calibration of instruments

All meters will be purchased and maintained to ensure a high level of accuracy. The exact specifications of each meter will be determined during the detailed design of the project. Thereafter the meter accuracies will be included in this procedure and steps taken to maintain those levels of accuracy.

All key meters will be subject to a quality control regime that will include regular maintenance and calibration. A record will be maintained showing the location and unique identification number of each meter, the calibration status of that meter (when last calibrated, when next due for calibration) and who performs the calibration service. Calibration certificates will be retained for all meters until two years after the end of the crediting period.

Archiving of data

The monitoring team will periodically archive data to a secure and retrievable storage format on a periodic basis. This step of data archiving can also be implemented as an automated routine within the data collection unit. Calibration records may be archived by scanning and storage in an

accessible electronic format. These data will be stored until 2 years after the end of the crediting period or the last issuance of CER's whichever occur later.

Document Control

The Project Manager will implement a document control system that ensures that the current versions of necessary documents are available at the point of use. All documents must be maintained in English with local translations because English is the formal language of the CDM.

Preparation of monitoring report

The archived / live data will be used to prepare a periodic monitoring report to be submitted to the UNFCCC secretariat for verification and issuance of CERs. An internal technical review process will be conducted and documented before such a report will be submitted for verification.

Data recording system

The CDM Project Manager will implement a data recording system for collection and archiving of the monitoring raw data. The data recording frequency for the continuously monitored parameters is 2 seconds. From these raw data hourly average values are calculated automatically.

Treatment of missing or corrupted data

If data for either the N_2O concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of N_2O concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the N_2O concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of N_2O calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum values.

Similar provision may apply for the CH_4 inflow and the nitric acid produced. If data for the CH_4 inflow is not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of CH_4 inflow observed during the monitoring period.

In case of missing hourly data for the nitric acid produced in the monitoring period n ($P_{NA,n}$) the value will be replaced by a nitric acid production value from another source of data e. g. measurements of nitric acid storage tank levels in combination with a production – consumption mass balance. Only in the case that there should be no other reliable data source available the missing value should be replaced with the lowest measured value during plant operations of that monitoring period. Values observed during five operating hours before and after a plant start-up and shut down shall not be used for the determination of the maximum and minimum values.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

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Company	Responsibility	Project Proponent
N.serve Environmental Services GmbH	Martin Stilkenbäumer and Albrecht von Ruffer	No
Omnia Fertilizers, Omnia Group (Pty) Ltd.	Eden Jack and Johann Peek	Yes

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

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The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. The start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity.

In the light of the above definition the project start date is defined as the date on which Omnia placed the order for the N_2O abatement system (“ENVINOX”). This order was placed 20 July 2011.

Starting date of the project activity: 20/07/2011.

C.1.2. Expected operational lifetime of project activity

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The nitric acid plant has a remaining operational lifetime of at least 25 years and is not expected to be decommissioned before that time. The expected lifetime of the N_2O reduction unit is at least 10 years. It is expected to be in the range of 25 years. However the installed catalyst itself may need to be replaced after a few years, depending on the achieved abatement performance.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

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The project participants have chosen a fixed term crediting period of ten years.

C.2.2. Start date of crediting period

>>

01/04/2012 or the day of the registration of the project at UNFCCC whichever occurs later.

C.2.3. Length of crediting period

10 years and 0 month

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

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The project will reduce gaseous emissions of nitrous oxide (N_2O) from the plant tail gas and will therefore contribute to international efforts to reduce greenhouse gas emissions. The project will have no negative effects on local air quality.

The project will have no impact on water pollution. No additional water is required for the project activity's implementation or operation. Therefore, there is no impact on the sustainable use of water.

The contributions to sustainable development from the project activity are as follows:

- The project will reduce 98% of existing N_2O emissions during the crediting period and thus contributes to reducing the negative impact of global climate change.
- The technology will be introduced to the project, promoting the application of advanced emission reduction technology in South Africa.
- The implementation of the project activity includes the training course for operation of the a tertiary catalyst unit for N_2O abatement. This includes also guidance on accurate monitoring of N_2O emissions and stack gas flow, which will provide the staffs of Omnia Fertilizer with an opportunity to improve skills.
- The implementation of the project activity is likely to create local employment.

D.2. Environmental impact assessment

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Environmental Impact Assesments (EIA) are required by South African legislation for listed activities as published by the regulator. Even though the Nitric Acid process is a listed activity, it is listed specifically for the regulation of NO_X and it is not listed or prescribing any requirements for the regulation of N_2O. Therefore, for the installation of a N_2O-destruction facility, no EIA is required under South African legislation.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

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Stakeholders have been invited for comments and for participation at the local stakeholder consultation by publishing public notices in the following local newspapers from 12/09/2011 to 16/09/2011:

- Vaalweekblad
- Vaal Ster
- Vaal Vision

REGSKENNIS-GEWINGS

NOTICE

It is the responsibility of the Advertiser to make sure that his advertisement is correct on the first day of publication and placed according to his/her instructions and that all mistakes are corrected before the next edition.

MooiVaal Media does not accept any responsibility for more than one faulty placing.
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OMNIA

NOTICE OF MEETING TO INFORM STAKEHOLDERS OF PROJECT TO REDUCE THE N_2O / NO_x EMISSIONS FROM OMNIA FERTILIZER'S PROPOSED NEW NITRIC ACID PLANT IN SASOLBURG.

Omnia Fertilizer, a division of the Omnia Group (Pty) Ltd obtained an environmental authorization for the establishment of a new Nitric Acid Plant at its Sasolburg site. The scope of the EIA and environmental authorization included the installation of a De-NO_x facility to reduce the NO_x emissions (which is regulated in terms of the National Environmental Management: Air Quality Act 39 of 2004) from the tail gas of the proposed Nitric Acid Plant, within acceptable limits.

Omnia Fertilizer, after investigating the feasibility of a Clean Development Mechanism Project, decided to implement proven EnviNO_x® abatement technology that was developed by Uhde GmbH, Germany, in addition to the proposed De-NO_x facility. The technology, once implemented will reduce both the Nitrogen Oxide (NO_x) and Nitrous oxide (N_2O) emissions by more than 80%. The reduction of N_2O is not required by current state and/or Provincial Regulations and the EnviNO_x® facility will be registered as a Clean Development Mechanism project in terms the Kyoto Protocol.

Interested and affected parties who wish to enquire about the project, are invited to attend a public meeting that is scheduled to be held from 09:00 – 12:00 in the Leeu Conference Room, Omnia Fertilizers factory, 1 Eugene Houdry Street, Sasolburg Northern Industrial Area on Friday the 30th of September 2011.

Enquiries regarding the Project can alternatively also be directed to:

- Peet Janse van Rensburg (082) 889 3202 or E-mail : pjansevanrensburg@omnia.co.za
- Julia Mnengwane (082) 968 3554 or E-mail: mnengwane@omnia.co.za
- Eden Jack (083) 655 4617 or E-mail: ejack@omnia.co.za

On 30/09/2011 2011 from 09h00 to 12h00 hours a local stakeholder meeting took place at the premises of Omnia at Eugene Houdry Drive, Sasolburg, South Africa.

The meeting was attended by three stakeholders. One stakeholder sent an apology for not being able to attend. One of the attendees was from the local government and two of the attendees were from local industry. A presentation was made to on the details of the project. Positive feedback was received from each of the stakeholders, with no concerns raised.

The documentation of the attendee list and the comments and questions received has been made available to the validator.

The presentation given to the participants were focused on the following:

- History of Omnia as a company
- An explanation of the structure within the company
- An overview of the operations at the Omnia Factory
- An overview of Omnia's commitment to sustainability in terms of Quality, Safety and Environmental Management
- An overview of the principles, general design and intention of the project
- An overview of the projects' impact on the environment

E.2. Summary of comments received

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The meeting was held in a conference facility at the Omnia plant in Sasolburg, South Africa. The information regarding the project was presented using a Powerpoint presentation. After the presentation a discussion was held where-in the participants were able to raise any questions arising from the presentation. The attendees signed an attendance register and were provided with a form onto which they gave their details and also could raise any concerns or positive comments. No concerns were raised. The only requests received from the participants were:

- For the distribution of the powerpoint slide. This has been done.
- For the discussion of the project at other local stakeholder meetings in the immediate area, such as the Local Sasolburg Community Working Group and the Vaal Triangle Air Pollution Association, in order to increase awareness of positive projects regarding air quality improvements in the area. This will be done if and when such meetings are scheduled.

E.3. Report on consideration of comments received

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The information regarding the presentation given was sent to all the participants on the day of the meeting. The communication to the participants is attached. The project will be presented to the two forums requested at the first available date.

SECTION F. Approval and authorization

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Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Omnia Fertilizer, Division of Omnia Group (Pty) Ltd
Street/P.O. Box	Eugene Houdry Street / P.O.Box 384
Building	
City	Sasolburg
State/Region	Free State
Postcode	1947
Country	South Africa
Telephone	
Fax	
E-mail	
Website	www.omnia.co.za
Contact person	
Title	
Salutation	Mr.
Last name	Jack
Middle name	
First name	Eden
Department	
Mobile	+27 83 6554617
Direct fax	+27 86 6273447
Direct tel.	+27 16 9707238
Personal e-mail	ejack@omnia.co.za

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Nordic Environment Finance Corporation
Street/P.O. Box	Fabianinkatu 34 / P.O.Box 241
Building	
City	Helsinki
State/Region	
Postcode	FI-00171 Helsinki
Country	Finland
Telephone	+358 (0)10 618 003
Fax	+358 9 630 976
E-mail	info@nefco.fi
Website	http://www.nefco.org
Contact person	

Title	
Salutation	Ms.
Last name	Helle
Middle name	
First name	Lindegaard
Department	
Mobile	
Direct fax	
Direct tel.	+358 10 6180 664
Personal e-mail	helle.lindegaard@nefco.fi

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Belektron d.o.o
Street/P.O. Box	V Karlovce 033A
Building	Podmolnik
City	Ljubljana
State/Region	
Postcode	1261 Ljubljana Dobrunje
Country	Slovenia
Telephone	+386 1 620 88 54
Fax	+386 1 620 88 55
E-mail	info@belektron.eu
Website	
Contact person	
Title	
Salutation	Mr.
Last name	Bandelj
Middle name	
First name	Bostjan
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2. Affirmation regarding public funding

No public funds are used for this project activity.

Appendix 3. Applicability of methodology and standardized baseline

Not applicable

Appendix 4. Further background information on ex ante calculation of emission reductions

Not applicable

Appendix 5. Further background information on monitoring plan

Not applicable

Appendix 6. Summary of post registration changes

Post registration changes are as follows:

1. Project participants:

Update of the list of project participants on the cover page, Chapter A.4 and Appendix 1 from Omnia Fertilizer, Division of Omnia Group (Pty) Ltd.
to
Omnia Fertilizer, Division of Omnia Group (Pty) Ltd,
Nordic Environment Finance Corporation,
Belektron d.o.o

2. Section B.6.2 and Section B.7.1

Information for "Purpose of data" added as this is a new requirement of the new PDD template.

Parameter "$w_{C,i,y}$" removed from the section B.6.2 as this is a Parameter to be monitored and not fixed ex-ante

3. Section B.7.1

Information for "Monitoringfrequency " added as this is a new requirement of the new PDD template

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4. Section B.7.1.; Parameter Pt:

Permanent change of the QA/QC calibration procedure of the monitoring parameter Pt (part of the stack gas flow meter) described in the PDD as "Periodic calibration against a primary device must be performed periodically and records of calibration procedures must be kept available as well as the primary device and its calibration certificate. Pressure transducers (either capacitive or resistive) must be calibrated monthly",
to

“Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. According to EN 14181, the flow meter (including the parameter Pt) is tested and calibrated by an external laboratory with EN ISO IEC 17025 Accreditation. The QAL2 test is conducted once every 5 years; the AST test is conducted once per year. Every 5 years the AST test is part of the QAL2 test.”

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Document information

Version	*Date*	*Description*
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; Editorial improvement.
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from *F-CDM-PDD* to *CDM-PDD-FORM;* • Editorial improvement.
04.1	11 April 2012	• Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Version	*Date*	*Description*

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