Prevention of Significant Air Quality Deterioration Review
Of PCS Nitrogen Fertilizer – Augusta Plant
Located in Richmond County, Georgia

PRELIMINARY DETERMINATION
SIP Permit Application No. 14213
June 2004

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program (SSPP)
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SUMMARY

The Environmental Protection Division (EPD) has reviewed the PCS Nitrogen Fertilizer – Augusta Plant (PCS Nitrogen) application for a permit for the construction and operation of modifications at the facility located in Augusta, Georgia. The plant produces ammonia, nitric acid, urea, carbon dioxide, ammonium nitrate, and urea-ammonium nitrate solutions. The proposed physical changes will be to the C-002 Nitric Acid Plant.

The current production rate at the C-002 Nitric Acid Plant is limited by air flow rate and pressure equipment restrictions. The modifications will allow the plant to increase acid production rate by operating at a higher air flow rate and slightly higher pressure. The pre-modification acid capacity is 430,700 tons per year. The modification will add the ability to produce an additional 120 tons per day of nitric acid. After completion of the project the plant will operate at a total capacity of 474,500 tons per year of 100% nitric acid (1,300 tons per day). A portion of the additional nitric acid resulting from the proposed project will be sent to the C-002 Ammonia Nitrate (AN) Neutralizer. The C-001 Nitric Acid Plant will be unaffected by the proposed modifications.

The modifications proposed in the PSD application are physical changes to several C-002 Nitric Acid Plant systems including multiple components of the air compressor system, inlet air cooler, air heater, air / ammonia mixer, converter elbow, and turbine gas heater. The facility will also install a new waste heat boiler, tail gas heater, platinum filter, oxidation vessel, low-pressure water heat boiler, cooler condenser, and absorber. The air compressor system upgrades include a cooler for air entering the air compressor, upgrading the current air compressor, replacement of the intercooler, upgrading the tail gas expander, rerouting utility steam to the turbine, upgrading the surface condenser, upgrading the cooling towers, and installing a supplemental air supply.

PCS Nitrogen controls NO_X emissions from the nitric acid process with a Non-Selective Catalyst Reduction (NSCR) combustor (Source Code AP07), which reduces NO_X to elemental nitrogen, CO_2, CO, and water. PM emissions from the C-002 AN Neutralizer are controlled with a venturi scrubber (Source Code VS02). The proposed modifications will result in increased PM, SO_2, NO_X, CO, and VOC emissions.

PCS Nitrogen will continue to operate a continuous emissions monitoring system (CEMS) for the C-002 Nitric Acid Plant to monitor NO_X. The facility will also continue to monitor the venturi scrubber pump pressure, scrubbant flow rate, and sump concentration for control of PM and opacity from the C-002 AN Neutralizer. The facility will install a new CEMS to monitor CO from the C-002 Nitric Acid Plant.

PCS Nitrogen is located in Richmond County, which is classified as "attainment" or "unclassifiable" for SO_2, PM_{10}, NO_X, CO, and ozone (VOC) in accordance with Section 107 of the Clean Air Act, as amended August 1977.

The EPD review of the data submitted by PCS Nitrogen related to the proposed modifications indicates that the project will be in compliance with all applicable state and federal air quality regulations.

It is the preliminary determination of the EPD that the proposal provides for the application of Best Available Control Technology (BACT) for the control of NO_X and CO, as required by federal Prevention of Significant Deterioration (PSD) regulation 40 CFR 52.21(j).

It has been determined through approved modeling techniques that the estimated emissions will not cause or contribute to a violation of any ambient air standard or allowable PSD increment in the area surrounding the facility (the nearest Class I area is located 230 km from the facility). It has further been determined that the proposal will not cause impairment of visibility or detrimental effects on soils or vegetation. Any air quality impacts produced by project-related growth should be inconsequential.

This Preliminary Determination concludes that an Air Quality Permit should be issued to PCS Nitrogen Fertilizer – Augusta Plant for the construction and operation of the modifications to the C-002 Nitric Acid Plant. Various conditions have been incorporated into the current Title V operating permit to ensure and confirm compliance with all applicable air quality regulations. A copy of the draft permit amendment is included in Appendix A.

1.0 INTRODUCTION

On January 2, 2003, PCS Nitrogen submitted an application for an air quality permit for modifications to the C-002 Nitric Acid Plant. The modifications will be made at the plant located at 733 Laney Walker Blvd Extension, Augusta (Richmond County), Georgia. The plant currently produces ammonia, nitric acid, urea, carbon dioxide, ammonium nitrate, and urea-ammonium nitrate solutions. The application was considered complete on February 11, 2004.

PCS Nitrogen is located in an attainment area for all criteria pollutants. Any proposed project at the plant is therefore required to undergo a PSD applicability analysis in order to determine if the project triggers a PSD review for any pollutant. If a plant's operation is listed as one of 28 industrial categories specified in the PSD regulations and emits more than 100 tons per year of a PSD pollutant, the plant is considered a major source. Nitric acid plants fall under the list of 28 industrial categories and PCS Nitrogen emits in excess of 100 tons per year of NO_X. The facility is therefore considered a major source under the PSD program. As a major source, any project that results in a significant increase of any PSD regulated compound triggers a PSD review. The first step in determining if a PSD increase occurs is to calculate actual emissions for the two year period before the construction project (2000/2001) and compare this result to the future potential emissions after the completion of the project.

Affected Units

The C-002 Nitric Acid Plant has a single emission point. The PSD applicability analysis must also include any emission sources elsewhere in the facility that may be debottlenecked by the proposed project. The additional nitric acid that will result from the proposed project will normally be sent to the C-002 Ammonia Nitrate (AN) Neutralizer, which is a source of particulate matter. The resulting increase in particulate matter emissions from the C-002 AN Neutralizer is included in the PSD applicability analysis.

Based on the proposed project, the estimated incremental increases of regulated pollutants from the facility are listed in Table 1.

Table 1: Emissions Increases from the C-002 Nitric Acid Plant Modification Project

Pollutant	Potential Emissions Increase (tpy)	PSD Significant Emission Rate (tpy)	Subject to PSD Review
PM_{10}*	14.8	15	No
PM*	14.8	15	No
SO_2	0.027	40	No
NO_X	297	40	Yes
CO	1,452	100	Yes
VOC	10.3	40	No

*All particulate matter was assumed to be PM_{10} in order to calculate a conservative emissions analysis. The particulate matter quantified here includes filterable and condensible particulate matter.

Emissions of NO_X from the C-002 Nitric Acid Plant were based on NO_X stack testing that was completed on the unit during the baseline period. A deminimus amount of NO_X also comes from equipment leaks, truck loading, rail car loading, and the nitric acid tanks. Small amount of emissions of volatile organic compounds (VOC), sulfur dioxide (SO_2), and particulate matter (PM) from the C-002 Nitric Acid Plant are associated with the combustion of natural gas. Emissions of SO_2 and PM are based on AP-42 emission factors for natural gas combustion. Emissions of CO and VOC are based on previous stack testing and natural gas usage during the baseline period. The only other emissions source included in the PSD applicability analysis is the C-002 AN Neutralizer, which is a source of PM emissions. PM emissions from this source were estimated based upon stack test results.

Table 2 details the emissions summary for the individual equipment effected by the modification. The calculations for the C-002 Nitric Acid Plant and the C-002 AN Neutralizer can be found in detail in the facility's PSD submittal (see Exhibit A of Application No. 14213). These calculations have been reviewed and approved by the Division.

Table 2: Net Change in Emissions Due to the Major PSD Modification

Source	Annual Emissions (tpy)									
	PM / PM_{10}		SO_2		NO_X		CO		VOC	
	Past Actual	Future Potential	Past Actual	Future Potential	Past Actual	Future Potential	Past Actual	Future Potential	Past Actual	Future Potential
C-002 Nitric Acid Plant Stack	1.31	1.65	0.104	0.130	210	507	5,666	7,118	65.95	76.22
C-002 AN Neutralizer	36.6	51.0	--	--	--	--	--	--	--	--
Source	PM_{10}		SO_2		NO_X		CO		VOC	
Net Increase	14.8		0.027		297		1,452		10.3	
Significance Level	15		40		40		100		40	
PSD Applicable?	No		No		Yes		Yes		No	

As Table 2 shows, the modification to the C-002 Nitric Acid Plant will result in an increase in PM/PM_{10}, SO_2, and VOC emissions below the PSD significance level. As specified per Application No. 14213, the modification is classified as a major modification under PSD because the emissions increase for NO_X is greater than 40 tpy and the increase for CO is greater than 100 tpy.

The facility has proposed to accept a federally enforceable limit of 507 tpy NO_X (2.14 lb NO_X per ton 100% nitric acid) for the C-002 Nitric Acid Plant. This requirement limits the maximum net increase in NO_X emissions to 297 tpy. The facility will comply with this long-term limit in conjunction with a short-term BACT limit of 3.0 lb NO_X per ton of 100% nitric acid. It should be noted that this is the same standard set by 40 CFR 60 Subpart G. The facility has also proposed to accept a federally enforceable limit 30.0 lb of CO per ton of 100% nitric acid. Compliance will be determined on a 12 month rolling average. This requirement limits the maximum net increase in CO emission to 1,452 tpy.

Non-Affected Units

The only other emission source from the process is particulate from the two ammonium nitrate prill towers and the associated prill processing equipment. PCS currently operates these units at their maximum capacity; therefore any additional nitric acid that will be generated as a result of the proposed project will be manufactured into liquid ammonium nitrate solutions. Because the proposed project will not affect utilization of the prill towers they are not included in the PSD applicability analysis. Also, the nitric acid storage tanks are potential sources of a small amount of nitric acid emissions; however, these tanks are controlled by an acid vent recovery scrubber system.

The C-002 Nitric Acid Plant is currently a net exporter of steam. The plant conducted an assessment of the proposed changes, which include modifications to the steam system (not to the boilers themselves), and concluded that the plant will continue to be a net exporter of steam after the completion of the project. As a result the project will not result in an increased utilization of the utility boilers and, in fact, could potentially reduce emissions from the utility boiler although no credit is taken for a reduction.

Other than air, the major raw material in the nitric acid production process is ammonia. PCS Nitrogen's ammonia plant operates at its maximum capacity and still does not meet the demand for the other units so ammonia is purchased. Therefore, the increase in ammonia demand will be met through additional off-site purchases and will not affect emissions from the on-site ammonia production operations.

Through its new source review procedure, EPD has evaluated PCS Nitrogen's proposal for compliance with State and Federal requirements. The findings of the EPD have been assembled in this Preliminary Determination.

2.0 PROCESS DESCRIPTION

Nitric Acid Manufacturing Process

PCS Nitrogen operates two nitric acid plants, C-001 Nitric Acid Plant and C-002 Nitric Acid Plant. The proposed project involves changes to only the C-002 Nitric Acid Plant, the newer of the two plants. The production of nitric acid occurs in three steps: ammonia oxidization, nitric oxide (NO) oxidation, and NO_2 absorption.

The process begins with the compression of ambient air in a two-stage compressor. An intercooler between the two stages allows for temperature reduction and improved compression. A steam turbine and tail gas expander provide the mechanical energy used for the air compression. The steam for the turbine is currently provided by a waste heat boiler via superheater.

The compressed air is then combined with ammonia in a mixer. The mixed ammonia-air mixture is routed to a converter reactor where the gases cross a platinum catalyst mesh that oxidizes ammonia to NO. Due to the high cost of the catalyst used in this operation a filter is installed downstream of the heat exchangers to collect platinum that has been removed from the catalyst mesh. The oxidization process is an exothermic reaction and some of the heat generated is recovered in the waste heat boiler and two tail gas heat exchangers. The tail gas heat exchangers transfer heat from the process gas to the tail gas, which is exiting the nitric acid production process.

The gases next enter an oxidation vessel, which further oxidizes the NO to NO_2. The low-pressure waste heat boiler recovers additional heat generated in this oxidation step. Next, the NO / NO_2 goes through a cooler condenser to lower the temperature of the gases. A nitric acid solution is also condensed out. The gases exit the cooler and are routed to the bottom of an absorber where they travel up through vertically stacked trays. Water runs countercurrent from the top of the absorber and reacts with NO_2 to form nitric acid. The formation of nitric acid results in the formation of NO that must be reoxidized to NO_2 prior to being absorbed. For this reason, cooled air is also added to the bottom of the absorber to aid in the oxidation that occurs between the individual trays in the absorption column. The nitric acid is collected at the bottom of the absorber column and sent to a storage tank.

The gases exiting the absorber go through several steps aimed at the reduction of any residual NO_X emissions and the recovery of energy from the tail gas. This includes a mist eliminator to remove any remaining liquid in the stream, a tail gas pre-heater, and other heat exchangers for recovery of heat from the ammonia oxidation steps. Natural gas is then mixed with tail gas prior to entering a steam superheater.

After the superheater, the gases enter a Non-Selective Catalyst Reduction (NSCR) combustor where several chemical reactions take place to reduce the NO_X in the exhaust gas. The oxygen and natural gas are combusted, and secondly, the NO_X and natural gas are reacted. The products of these reactions are elemental nitrogen, CO_2, CO, and water.

When the cleaned gases exit the combustor, they are routed through a tail gas expander to generate mechanical energy that is used to operate the air compressor. The gas exiting the expander is routed through two heat exchangers to recover any residual heat prior to being vented to the atmosphere through Stack ST-19.

C-002 AN Neutralizer Process

The nitric acid from the C-002 Nitric Acid Plant is first reacted with ammonia vapor in the first stage neutralizer. The liquid from the first stage neutralizer overflows into a second stage neutralizer where additional ammonia is added. The gases from the first stage vent to a venturi scrubber. The scrubber is in place to collect any ammonium nitrate particulate matter that is emitted from the first stage. The liquid ammonium nitrate solution exiting the neutralizer goes to a buffer tank prior to being sent to the solutions blending plant or one of the two prill towers.

Project Description

The proposed project involves modifying several systems in the C-002 Nitric Acid Plant in order to increase the pressure rating of the system and thereby increase the air flow through the system. This air flow determines the amount of nitric acid produced. The amount of air flow rate is limited by the air compression system and the pressure rating of the equipment in the plant. System pressure is the limiting factor during the winter months and the air-compression system is the limiting factor during the summer months.

PCS Nitrogen will be installing an air cooler for the ambient air entering the air compressor. The air cooler will drop the temperature of the air entering the air compressor and thereby allow for increased air throughput and thereby increase production. The intercooler, which is part of the main air compressor, will be replaced with an improved design that will solve current leakage problems and slightly improve performance.

PCS Nitrogen also plans modifications to increase power from the steam turbine for additional air compression. This will include physical modifications to the turbine itself as well as the rerouting of steam from the utility boilers to the steam turbine. Currently, steam from the nitric acid plant boiler and steam superheater is routed to the steam turbine. However, by utilizing superheated steam directly from the utility boilers, which is at a higher temperature, the plant will be able to generate additional compression from the steam turbine. The lower temperature superheated steam generated at the C-002 Nitric Acid Plant will be utilized at other areas of the site. The surface condenser and cooling tower at C-002 Nitric Acid Plant will be upgraded to meet the additional cooling demands.

Finally, PCS Nitrogen plans to install a separate air supply entering directly at the absorber. Currently, this air stream is supplied by the main air compressor, and therefore utilizes some of the available compressor capability. By utilizing a separate air supply for this air stream, the plant can utilize the entire capacity of the existing compressor to compress air that enters the heat train and thereby increase production.

PCS Nitrogen also plans to replace the air heater, the ammonia / air mixer, the converter elbow, the turbine gas heater, waste heat boiler, the tail gas heater, the platinum filter, the oxidation vessel, the low pressure waste heat boiler, the cooler condenser, the absorption tower, and non-selective catalytic reduction combustor. All of these modifications will allow the units to operate at a higher pressure.

Neither the utility boilers or the ammonia plant at the site will be debottlenecked by the proposed expansion of the C-002 Nitric Acid Plant. The C-002 Nitric Acid Plant is a net exporter of steam, thus the project will not increase steam demand for the site. Instead the boiler load at the site should decrease due to these proposed modifications. PCS operates an ammonia production plant on site; however, it is currently operating at a maximum capacity. Additional ammonia demand will therefore be met through purchased ammonia.

As required by 40 CFR 60 Subpart G, and to assure compliance with the BACT/PSD permit limits, PCS Nitrogen will continue to monitor NO_X emissions from the C-002 Nitric Acid Plant. The facility is also required to develop a conversion factor through performance testing for calculating pounds NO_X per ton 100% nitric acid from the CEMS output. This information, along with production rate data, will allow the facility to calculate the 12-month rolling total. The facility will use the same CEMs / conversion factor strategy for monitoring the emissions of CO.

3.0 REVIEW OF APPLICABLE RULES AND REGULATIONS

State Rules

Georgia Rule (b) [391-3-1-.02(2)(b)] and Georgia Rule (e) [391-3-1-.02(2)(e)] are general rules limiting the opacity and PM emissions from the C-002 AN Neutralizer. Georgia Rule (b) limits the opacity of emissions from the unit to 40%. Georgia Rule (e), commonly known as the process weight rule, limits PM emissions based on either of the following equations:

For P ³ 30 ton/hr, $E = 4.1P^{0.67}$
For P > 30 ton/hr, $E = 55P^{0.11} - 40$

where E = emission rate (lb/hr) and P = process input rate (ton/hr). The second equation applies to the C-002 AN Neutralizer.

Federal Rule - PSD

The regulations for PSD in 40 CFR 52.21 require that any new major source or modification of an existing major source be reviewed to determine the potential emissions of all pollutants subject to regulations under the Clean Air Act. The PSD review requirements apply to any new or modified source which belongs to one of 28 specific source categories having potential emissions of 100 tons per year or more of any regulated pollutant, or to all other sources having potential emissions of 250 tons per year or more of any regulated pollutant. They also apply to any modification of a major stationary source which results in a significant net emission increase of any regulated pollutant.

The PSD regulations require that any major stationary source or major modification subject to the regulations meet the following requirements:

1. Application of BACT for each regulated pollutant that would be emitted in significant amounts;
2. Analysis of the ambient air impact;
3. Analysis of the impact on soils, vegetation, and visibility;
4. Analysis of the impact on Class I areas; and
5. Public notification of the proposed plant in a newspaper of general circulation.

Definition of BACT

Sources undergoing a PSD review must apply Best Available Control Technology (BACT) to any new or modified emission unit that emits a PSD triggered pollutant. Under 40 CFR 52.21, the federal PSD regulations define BACT as “an emission limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Clean Air Act, emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including cleaning or treatment or innovative fuel combustion techniques for control of each such pollutant.” No BACT determination may be less stringent that the applicable NSPS, National Emissions Standards for Hazardous Air Pollutants (NESHAPS) or State Implementation Plan (SIP) limits.

On December 1, 1987, the US EPA Assistant Administrator for Air and Radiation issued a memorandum that implemented certain program initiatives designed to improve the effectiveness of the New Source Review (NSR) programs within the confines of existing regulations and SIPs. Among these was the "top-down" method for determining BACT. The "top-down" process begins by identifying all available control technologies. Next, the technically infeasible options are eliminated. The remaining control technologies are then ranked by their control effectiveness. Next, the most stringent or "top" alternative is evaluated. This top alternative represents BACT, unless it can be demonstrated, and the permitting authority agrees, that technical considerations, energy, environmental, or economic impact justify a conclusion that the most stringent technology is not "achievable" in a particular case. If the most stringent technology is eliminated in this fashion, then the next most stringent alternative is considered, and so on, until the most appropriate control strategy is selected for each source.

<u>Federal Rule – 40 CFR 60 Subpart G</u>

The C-002 Nitric Acid Plant is subject to NSPS Subpart G, *Standards of Performance for Nitric Acid Plants*. Subpart G establishes a NO_X emission limit of 3.0 lb NO_X per ton of 100% nitric acid produced. The Permittee is required to monitor these emissions using a nitrogen oxide CEMS in conjunction with a conversion factor (ppm to pounds NO_X per ton nitric acid) determined through a performance test conducted once every year. The subpart also establishes an opacity limit of less than 10%. No monitoring is required for the opacity limit. The NO_X emission limit is low enough to keep opacity below 10%.

<u>Federal Rule – 40 CFR 64</u>

The C-002 Nitric Acid Plant is subject to 40 CFR 64 – *Compliance Assurance Monitoring* (CAM). CAM applies because the plant is located at a major source with a Title V permit, the plant is subject to an emission limit, and the facility uses a control device to achieve compliance with the limit. CAM has been triggered because the facility is making a significant modification to a unit with potential controlled NO_X emissions of at least 100 percent of the major source threshold. CAM requires the facility to submit a plan containing the following information: 1) indicators of emission control performance; 2) indicator ranges; 3) performance criteria; 4) indicator ranges and performance criteria for CEMs, COMs, and PEMs; 5) monitoring justification; 6) test data, if necessary; and 7) implementation and schedule for equipment installation, testing, and other activities, if necessary. The facility has submitted the CAM Plant as required and the Division has approved the plan. The facility will continue to monitor NO_X emissions with a CEMs.

4.0 CONTROL TECHNOLOGY REVIEW

The purpose of this section is to provide details of the steps taken in evaluating the "top down" BACT analysis for NO_X and CO emissions from the C-002 Nitric Acid Plant. Several pieces of process equipment in the C-002 Nitric Acid Plant are being physically modified as part of the proposed project. All the units operate in series as part of the plant and, in turn, vent through a single emission point.

<u>Nitrogen Oxides (NO_X)</u>

The first reaction in the production of nitric acid is the oxidation of ammonia to NO. Next, the NO is further oxidized to NO_2. The NO_2 gases are routed through a water absorber to create nitric acid. A portion of the NO_X gases are not absorbed and exit the control device. These gases must be treated to reduce emissions of the unreacted NO_X released to the atmosphere.

Step 1: Identify all control technologies

There are two NO_X emission reduction technologies that are utilized at nitric acid plants. These technologies are non-selective catalyst reduction (NSCR) and selective catalytic reduction (SCR). The PCS Nitrogen C-002 Nitric Acid Plant currently utilizes the NSCR technology for NO_X emission control.

The first step of the BACT analysis was a review of the NO_X emission rates that are currently being achieved by other nitric acid plants in the industry. These emission rates were determined through a review of the EPA BACT / LAER Clearinghouse. In addition, a review of other recently permitted nitric acid plants was also completed. The results of this review are summarized in Table 3.

Table 3: Permitted NO_X Emission Levels for Nitric Acid Plants Listed in BACT / LAER Database

Plant	Location	Unit	NO_X Emissions Control Technology	lbs NO_X / ton 100% Nitric Acid
Terra Nitrogen Ltd Partnership (1998)	Woodward, Oklahoma	Nitric Acid Plant	SCR	3.0
Arcadian Fertilizer LP – Geismar Facility (1997)	Geismar, Louisiana	Nitric Acid Train 4	NSCR	2.14 (primary) 3.0 secondary*
Apache Nitrogen Products, Inc. (1991)	Arizona	Nitric Acid Plant	NSCR	3.0
Wycon Chemicals (1984)	Wyoming	Nitric Acid Plant #1 Nitric Acid Plant #2	None Noted	6.0
Wycon Chemicals (1984)	Wyoming	Nitric Acid Plant #3	Catalytic NO_X Abator	3.0
California Ammonia (1981)	California	Nitric Acid Plant	Extended Absorption Column	210 ppm (primary) 3.0 (secondary)

*BACT was established at 3 lb/ton for the unit. In addition the plant took a 195 tpy NO_X limit (2.14 lb NO_X per ton 100% nitric acid) for its 500 T/D nitric acid plant in order to comply with the NAAQS.

The control technology options are as follows:

Option 1: Non-Selective Catalytic Reduction (NSCR)
Option 2: Selective Catalytic Reduction (SCR) – Method 1
(Replacing current NSCR unit with SCR unit)
Option 3: Selective Catalytic Reduction (SCF) – Method 2
(SCR as add-on controls).

Step 2: Eliminate technically infeasible options

Options 1 and 3 are considered technically feasible. Option 2 is technically infeasible as explained below:

Option 2 – Selective Catalytic Reduction (SCR) – Method 1

SCR uses a catalyst bed and ammonia injection to (1) consume the free oxygen in the absorber tail gas, (2) convert the NO_2 to NO (decolorization), and (3) reduce NO to elemental nitrogen, CO_2, CO, and water. The catalyst is termed selective because the ammonia preferentially reacts with NO_X in the absorber tail gas.

Two plants (BP Chemicals in Lima, Ohio which is owned by PCS Nitrogen and El Dorado Nitrogen in Baytown, Texas) both utilize only SCR technology and both have a lower NO_X emission limit than the proposed 3.0 lb/ton short term limit (1.4 lb/ton and 0.38 lb/ton respectively). While these plants represent Option 1, it must be noted that these plants are able to achieve these lower levels because they are of a more modern design (the BP Chemicals plant was built in 1991 and the El Dorado Nitrogen plant was built in 1999), which is crucial in being able to utilize SCR technology. By comparison, the PCS Nitrogen project in Augusta, Georgia is a modification of an existing plant built in 1977.

SCR is most effective at temperatures near 600 °F. Currently, at PCS Nitrogen and other old design plants, the gases entering the combustor are roughly 900 °F. Therefore, in order for the SCR to work, the temperature of the gases entering the SCR would need to be cooled by roughly 300 °F. This could be achieved by bypassing the turbine gas heater and the steam superheater; however, the effect of this change would be to derate the heat efficiency of the system. Secondly, the gases entering the combustion catalyst are raised to approximately 1250 °F. This increase in energy is removed and utilized in the C-002 Nitric Acid Plant tail gas expander. If the inlet temperature of the tail gas expander was 600 °F instead of 1250 °F the tail gas expander would be ineffective in supplying power to the air compressor. The tail gas expander provides roughly 75% of the horsepower for the air compressor that runs the nitric acid plant. This loss in power would therefore have to be made up by some other source. This would require a new steam or combustion turbine, which would increase NO_X emissions.

On the other hand, plants built around SCR technology are designed to recover heat generated from the ammonia and NO oxidation stages to generate steam. This steam is utilized to provide mechanical energy in a steam turbine. The steam turbine, in turn, powers the air compressor. In the case of an older plant designed around NSCR technology, the excess heat generated in the heat train is utilized to pre-heat the gases exiting the absorber prior to entering the combustor. This gas is next routed through the tail gas expander to generate mechanical energy. The tail gas expander in turn provides most of the power for the air compressor. A steam turbine is used at plants with NSCR technology, but only to power the air compressor during startup and to provide a small fraction of the power needing during normal operation. In a plant designed with SCR technology, the power to operate the air compressor is provided by the steam turbine, where as in the case of NSCR technology based plants, the power to compress the air is provided primarily by the tail gas expander and only secondarily by a team turbine. To modify the production process so that SCR could be used would require a complete redesign of the existing plant and is therefore not considered practical or economical.

Step 3: Rank remaining control technologies by control effectiveness

Table 4: Ranking of Control Technology

Control Technology Ranking	Control Technology	Control Efficiency
1	Non-Selective Catalytic Reduction	94.7-99.1%*
2	Selective Catalytic Reduction	97.2%*

*US EPA and BACT Clearinghouse

Step 4: Evaluate most effective controls and document

Option 1 – Non-Selective Catalytic Reduction (NSCR)

NSCR uses a catalyst bed and fuel to (1) consume the free oxygen in the absorber tail gas, (2) convert the NO_2 to NO (delecolorization), and (3) reduce NO to elemental nitrogen, CO_2, CO, and water. This process can utilize natural gas, propane, or hydrogen gas as the fuel. PCS Nitrogen utilizes natural gas as the primary fuel, however, hydrogen is utilized during startup of the plant.

The facility currently uses this control method, therefore it is feasible for control of the emissions following the proposed modifications. According to data taken from the EPA document "Alternative Control Techniques Document-Nitric and Adipic Acid Manufacturing Plants", a review of numerous plants utilizing the available control technologies found that on average, NSCR technology NO_X control efficiency was higher than that of SCR technology control efficiency.

As shown in Table 4-1, there are 5 listed units with NO_X BACT limits of 3.0 lb/ton. The Arcadian Fertilizer (now PCS Nitrogen) nitric acid plant located in Geismar, Louisiana, has a second NO_X permit limit of 195 tpy (2.14 lb NO_X per ton 100% nitric acid). This limit is lower than its 3.0 lb/ton BACT limit on a tpy basis (assuming maximum production) and was taken for modeling compliance purposes.

PCS proposes to meet a 507 tpy NO_X emission limit for the 1,300 tpd plant which is equivalent to the 195 tpy NO_X limit which was taken for the 500 tpd Arcadian Fertilizer plant. The proposed BACT level is therefore 3.0 lb/ton along with a 12-month rolling limit of 507 tpy NO_X (2.14 lb NO_X per ton 100% nitric acid). Compliance with both levels will be demonstrated with the existing continuous NO_X emissions monitor. Because the effectiveness of the NSCR unit is dependent upon the use of natural gas as a reducing agent, the reduction in the annual NO_X limit may require the increased utilization of natural gas, which is accounted for in the emission calculations.

Option 2 – Selective Catalytic Reduction (SCR) – Method 2

The use of SCR technology as an add-on control for the tail gases of the process, rather than a process conversion, was considered. The exhaust gases exiting the nitric acid plant are about 300 °F. In order for the SCR to be effective, the exhaust temperatures must be about 600 °F. The exhaust gases would therefore need to be raised by 300 °F in order for the SCR system to be effective. This temperature rise could be achieved through one of two methods: bypassing the economizer or adding a natural gas burner to add heat. Either approach would require additional energy consumption that would result in additional combustion emissions. A cost analysis was completed in order to determine the potential effectiveness of installing an SCR add-on control to the existing NSCR control system. This cost analysis is summarized in Table 5.

Table 5: Cost Effectiveness of SCR Retrofit

Variable	Value	Basis
NO_X Emissions at Proposed BACT Level	507 tpy NO_X	Proposed Annual BACT Level
NO_X Emissions at SCR Controlled Level	90 tpy NO_X	Based on vendor estimated emissions with SCR (0.38 lb/ton) and a production rate of 474,500 tpy
NO_X Emissions Reduction with Add-on SCR	417 tpy NO_X	Difference
Total Annualized Cost of SCR (including additional natural gas costs)	$4,330,000/yr	Annualized Cost Estimate for Add-on SCR System*
Cost Per Ton NO_X Reduction	$10,384/ton	Divided Annual Costs by Maximum NO_X Reduction

*See Exhibit C of the permit application for the cost analysis for the installation of add-on SCR technology.

As shown above the costs associated with installing an add-on SCR to the existing NSCR system well exceeds levels which are considered cost effective for the control of NO_X. Note that in order to be effective, the ammonia to NO_X ratio must be greater than stoichiometry (1 to 1). Some of the ammonia injected will therefore be emitted unreacted (ammonia slip). It should also be noted that no known nitric acid plants operate both NSCR and SCR technologies.

Step 5: Select BACT

Based on the above evaluation, BACT requires the plant to continue to use Non-Selective Catalytic Reduction to control NO_X from the modified C-002 Nitric Acid Plant.

Conclusion – NO_X Control

The Division has determined that PCS Nitrogen's proposal to use NSCR to minimize NO_X emissions constitutes BACT. The BACT emission limits have been established as 3.0 lb NO_X per ton 100% nitric acid and 507 total tons per year of NO_X (an annual average of 2.14 lb NO_X per ton 100% nitric acid).

Summary – NO_X Control Technology Review for the C-002 Nitric Acid Plant

To fulfill the PSD permitting requirements for NO_X, a BACT analysis was conducted for the modified C-002 Nitric Acid Plant. The BACT selection for the plant is summarized in Table 6. The emission limit selected is representative of previous PSD BACT determination levels published in U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) for plants of the similar type.

Table 6: BACT Summary for the Proposed Modified C-002 Nitric Acid Plant

Pollutant	Control Technology	Proposed BACT Limit	Averaging Period
NO_X	NSCR	3.0 lb NO_X per ton 100% nitric acid	3 hours
NO_X	NSCR	507 tpy NO_X (2.14 lb NO_X per ton acid)	12 months

Carbon Monoxide (CO)

The CO emissions from the nitric acid plant result from combustion of natural gas in the NSCR combustor. This increase in CO is considered justifiable because regionally NO_X is of greater concern that CO. By injecting natural gas the unit consumes all the available oxygen, and simultaneously but at a slower kinetic rate, the NSCR system reduces the natural gas and NO_X to nitrogen, CO_2, CO, and H_2O.

CO emissions from the plant tend to increase in the stoichiometric ratio of natural gas to oxygen and NO_X going to the combustor. For most catalysts, effectiveness degrades slowly over time, requiring an entire bed change approximately every two years. Therefore, keeping all other variables constant, NO_X emissions would tend to increase over time if nothing else was done. To counter this effect the amount of natural gas fed to the combustor is increased over time, which in turn raises the natural gas stoichiometric ratio, and ultimately CO emissions. This effect is represented by the "R-factor," which governs the proper operation of the combustor.

The R-factor is the ratio of the actual amount of natural gas feed to the combustor versus the stoichiometric amount of natural gas needed to reduce the NO_X to water and elemental nitrogen. The goal is to keep the R-factor as close to one as possible. If the factor is less than one then unreacted NO_X can leave the system and can cause non-compliance with the facility's short-term limits. A very high R-factor can drive NO_X emission down, however this condition indicates that too much fuel is being fed to the combustor. This can result in higher than necessary CO emissions and wasted natural gas.

The facility conducted a series of performance tests on June 19, 2002. The tests were conducted with the guidance of the equipment vendor. The facility monitored NO_X, CO, O_2, CO_2, and natural gas concentrations at various combustor conditions which included starving the system of natural gas, normal operation, and flooding the system with natural gas. The starvation, normal operation, and flooding conditions simulated the beginning, middle, and end of catalyst life. Based on testing conducted on the C-002 Nitric Acid Plant, CO emissions ranged from between 3.1 to 43.0 lb CO/ton of 100% nitric acid produced, and averaged 27.7 lb per ton of 100% nitric acid during the testing that represented the last 12 months of operation before the catalyst is replaced. The facility has proposed a BACT limit of 30.0 lb CO per ton of 100% nitric acid based on these results.

As with the NO_X BACT evaluation, a review of the EPA clearinghouse and the available permits for other recently permitted nitric acid plants was performed for CO emission limits. The facility stated that the PCS Nitrogen Geismar facility is the only site with CO limits for nitric acid plants. A review of the Geismar PSD permit documents shows that the facility netted out for CO during the PSD analysis. The net increase was 21.66 tpy. Because the net increase did not equal or exceed the PSD significance threshold of 100 tpy a BACT analysis was not performed. In addition, the Division has reviewed the EPA BACT / LAER Clearinghouse and no limits for CO emissions from a nitric acid plant were found.

Step 1: Identify all control technologies

No known nitric acid plants operate emission controls for CO emissions. The facility examined the use of a Regenerative Thermal Oxidizer (RTO) or a catalytic system for CO control as used in other manufacturing industries.

Option 1: Regenerative Thermal Oxidizer
Option 2: Catalytic System
Option 3: Good Design and Operation

Step 2: Eliminate technically infeasible options

Options 1 and 3 are considered to be technically feasible. Option 2 is technically infeasible as explained below:

Option 2 – Catalytic System

At sufficient temperatures, CO can be converted to CO_2 across a catalyst. As with an RTO, additional oxygen would be required to allow for the conversion of CO to CO_2. Discussions with vendors indicate that roughly 15% O_2 would be required for a catalyst system to be effective. The addition of sufficient air to raise the oxygen content to 15% O_2 would result in a 2.5 fold increase in the total flow of the exhaust stream. This dilution of the exhaust stream of ambient air would drop the temperature of the exhaust gases to well below minimum temperatures which are required for a catalyst system to operate (350 °F). A catalyst system is not therefore considered technically feasible.

Step 3: Rank remaining control technologies by control effectiveness

Table 7: Ranking of Control Technology

Control Technology Ranking	Control Technology	Control Efficiency
1	Regenerative Thermal Oxidizer	40% - 98%
2	Good Design and Operation	N/a

Step 4: Evaluate most effective controls and document

Option 1 – Regenerative Thermal Oxidizer

The most common means for CO control is oxidation. Oxidation completes the combustion process by converting CO into CO_2. The most practical combustion control device for a high flow application would be a RTO. In order for the combustion process to occur air would need to be added to the exhaust because the NSCR system consumes all available oxygen. The increase in oxygen content would, in turn, increase the operating exhaust flow rate and increase the operating costs associated with operating a RTO. Discussions with RTO vendors indicate that the oxygen content would need to be a minimum of 3% to ensure high combustion efficiency in an RTO. To achieve this minimum oxygen level, the RTO would need to bleed in an additional 17,000 acfm to the exhaust gas stream, which would result in a total exhaust flow rate to be treated of 117,000 acfm.

In order to determine the costs of installing an RTO, an economic evaluation was completed. This evaluation was based on the EPA cost estimating spreadsheets for RTOs. This evaluation concluded that an RTO sized to handle this exhaust stream would cost roughly $3,900,000 and require roughly $1,100,000 in operating costs per year. This would therefore result in a cost of $250 per ton of CO reduced.

However, the operation of an RTO or any combustion control device for CO would also create NO_X emissions, which is the pollutant that is originally being abated by the NSCR. It is estimated that an increase in NO_X of about 30 tpy would result from the installation of a RTO. As shown in Section 6.0 of this document, the modeling for CO emissions indicated that concentrations were only about 21% of the PSD Significance Level for a 1-hour average and 38% of the significance level on an 8-hour average. No additional modeling was required for the pollutant. The modeled NO_X concentration did exceed the significance level on an annual basis. Further modeling indicated that NO_X concentrations were 73.6% of the Class II PSD Increment and 77.1% of the NAAQS. Considering the small environmental benefit of reducing CO versus the environmental impact of a RTO (increased NO_X in an ozone sensitive area), the increased energy demands (increased natural gas and electrical usage in the RTO), and moreover because this control has never been demonstrated in this process application, the use of a RTO is not considered practical for the C-002 Nitric Acid Plant.

Option 3 – Good Design and Operation

The formation of CO is minimized by proper NSCR combustor design and operation. Good operation includes replacing the catalyst as needed and injecting natural gas to the system in the proper amounts.

Step 5: Select BACT

BACT requires that the plant continue to use good design and operation to control CO from the modified C-002 Nitric Acid Plant.

Conclusion – CO Control

The Division has determined that PCS Nitrogen Fertilizer's proposal to use good design and operation to minimize CO emissions constitutes BACT. The BACT emission limit has been established as 30.0 lb CO per ton 100% nitric acid on a 12 month rolling average.

Summary – CO Control Technology Review for the C-002 Nitric Acid Plant

To fulfill the PSD permitting requirements for CO, a BACT analysis was conducted for the modified C-002 Nitric Acid Plant. The BACT selection for the plant is summarized in Table 8.

Table 8: BACT Summary for the Proposed Modified C-002 Nitric Acid Plant

Pollutant	Control Technology	Proposed BACT Limit	Averaging Period
CO	Good Design and Operation	30.0 lb CO per ton 100% nitric acid	12 month rolling average

5.0 TESTING AND MONITORING REQUIREMENTS

Testing Requirements:

The facility will have to conduct performance testing for NO_X and CO from the C-002 Nitric Acid Plant. The facility will also be required to conduct performance testing for PM emissions from the C-002 AN Neutralizer.

Monitoring Requirements:

The Permittee is currently required to monitor NO_X emissions from the C002 Nitric Acid Plant using a CEMS. This requirement will continue to be applicable. The CEMS will provide a reasonable assurance of compliance with the NSPS and PSD permit limits. The facility must also operate the NO_X monitor in accordance with the CAM Plan.

The Permittee will now be required to monitor CO emissions from the C002 Nitric Acid Plant using a CEMS. The CEMS will provide a reasonable assurance of compliance with the PSD permit limit.

The facility will continue to monitor the C-002 AN Neutralizer scrubber. The monitoring data will provide a reasonable assurance of compliance with Georgia Rules (b) and (e).

CAM Applicability:

The permit amendment includes the CAM Plan submitted by PCS Nitrogen for monitoring NO_X emissions from the C-002 Nitric Acid Plant. The plan summarizes the CEMS requirements already in place at the facility.

6.0 AMBIENT AIR QUALITY REVIEW

An air quality analysis is required to determine the ambient impacts associated with the construction and operation of the proposed modifications to the C-002 Nitric Acid Plant. The main purpose of the air quality analysis is to demonstrate that emissions emitted from the proposed modified major stationary source, in conjunction with other applicable emissions from existing sources (including secondary emissions from growth associated with the new project), will not cause or contribute to a violation of any applicable National Ambient Air Quality Standard (NAAQS) or PSD increment in a Class II or Class I area. NAAQS exist for NO_2, CO, PM_{10}, SO_2, Ozone (O_3), and lead. PSD increments exist for SO_2, NO_2, and PM_{10}.

A separate air quality analysis is required for each pollutant emitted in an amount over the PSD significant emission rate threshold. As was shown in Table 1, NO_X and CO are to be emitted in amounts over the respective PSD significant threshold. Thus, an air quality analysis must be performed for these two air pollutants.

Compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the ambient estimates resulting from existing sources of air pollution (modeled source impacts plus measured background concentrations) and the modeled ambient impact caused by the applicant's proposed emission increase and associated growth. It is important to note that the air quality cannot be allowed to deteriorate beyond the concentration allowed by the applicable NAAQS, even if not all of the PSD increment is consumed.

Modeling:

In general, EPD assesses the ambient impact of a source through the use of mathematical dispersion models. The models are based on the assumption that the dispersion of pollutants is primarily a function of wind speed and direction, atmospheric stability conditions, and the characteristics of the effective point discharge of the exhaust plume. To predict ambient air concentrations, the models simulate the plume exhausting from the stack, rising a certain distance in the atmosphere, leveling off, and continuing downwind over relatively flat terrain. The concentrations of the pollutants are assumed to have Gaussian distribution about the downwind axis centerline of the plume.

The modeling was performed with the latest version of the Industrial Source Complex Short-Tem Version 3 (ISCST3). ISCST3 is a Gaussian plume dispersion model that estimates hour-by-hour ground-level concentrations of emissions from an elevated source. The model provides maximum 24-hour and annual average concentrations for receptors located on many grid types around the source for various downwind distances. The model also takes into account the effect of downwash caused by nearby buildings and structures.

The only NO_X and CO emission point included in the analysis is the C-002 Nitric Acid Plant stack because it is the only source impacted by the proposed project. Stack conditions are not expected to change significantly as a result of the project; therefore, the source was modeled as a single stack. The emission rate modeled was the difference in the future potential after the project is completed (maximum production at the established BACT emission level) minus the emission rate from the C-002 Nitric Acid Plant during the baseline period (2000/2001). Baseline emissions were based on the average of the CO and NO_X stack tests completed during the baseline periods and the average ton/yr production during the baseline period. Table 9 summarizes the emission rate and modeling parameters that were used for the stack.

Table 9: Modeled Stack Parameters

Parameter	Source Location		Temp (K)	Flow Rate (m/s)	Dia. (m)	Stack Height (m)	Increase in CO Emissions (g/s)	Increase in NO_X Emissions (g/s)
	UTM Northing (m)	UTM Easting (m)						
C-002 Stack	3700684	413532	447	32.83	1.52	21.0	41.77	8.57

For this review of the proposed PCS Nitrogen facility, the models utilized preprocessed hourly meteorological data based on surface measurements made in Augusta, Georgia and upper air measurements made in Athens, Georgia for the period of 1974-1978. EPA's Building Profile Input Program (BPIP) was used to calculate building dimensions for the required flow vectors for the short term ISC model in order to allow for building downwash. The BPIP developed results for 36 possible wind directions.

A Cartesian receptor grid was used for the model runs, with receptors spaced at 100 meters along the fence line and out to a distance of 1 kilometer from the center of the facility, with receptors spaced at 500 meters from 1 kilometer to 5 kilometers, and with receptors used in the ISC modeling. Digital Elevation Model (DEM) data obtained from the U.S. Geological Survey was used to determine receptor heights using the EPA AERMAP computer program. These heights were spot checked against topographic maps to ensure program accuracy.

PSD Screening Results:

The PSD regulations establish specific maximum allowable increases in ambient concentrations (or increments) for PM_{10}, NO_X, and SO_2 for all areas in compliance with the NAAQS. All areas of the country are categorized as a function of overall use. The regulations were designed to prevent significant air quality deterioration by specifying allowable incremental changes in PM_{10}, NO_X, and SO_2 concentrations within each area category. The area categories are defined below:

> Class I – Those areas where almost any deterioration of current air quality is undesirable, and little or no industrial development would be allowed (e.g., national parks, wilderness areas).
>
> Class II – Those areas where moderate, well-controlled energy or industrial growth is desired without air quality deterioration up to the national standards (all attainment areas not categorized as Class I were initially designated Class II).
>
> Class III – Those areas where substantial energy or industrial development is intended, and where modest increases in ambient concentrations above Class II increments, but below national standards, would be allowed (designation to Class III must follow strict redesignation procedures).

The Richmond County area and all other attainment areas in Georgia not designated as Class I areas are Class II areas. No Class I areas are located within 230 km of the PCS Nitrogen site. The first step in the air quality analysis was to determine whether the incremental ambient impacts due to the new emissions from the project were greater than U.S. EPA-prescribed Modeling Significance Levels. The "significance analysis" determined whether PCS Nitrogen could forgo a full-scale impact analysis to demonstrate compliance with the NAAQS and PSD Class II Increments for the C-002 Nitric Acid Plant.

The results of the significance analysis for the modified C-002 Nitric Acid Plant are summarized in Tables 10 and 11. The impacts due to the total projected emissions of NO_X and CO were calculated in this analysis using the ISCST3 dispersion model.

Table 10 shows the modeled concentration increases for CO from the C-002 Nitric Acid Plant following the proposed modifications are below the Significant Impact Level. The PCS Nitrogen project can reasonably be assumed to have an insignificant impact on the air quality surrounding the plant, and per U.S. EPA modeling procedures, no NAAQS or PSD Class II increment analyses are required for CO emissions.

Table 10: Results of CO Modeling Significance Analysis

Pollutant	Averaging Period	PSD Significant Impact Level ($\mu g/m^3$)	Significant Monitoring Concentration ($\mu g/m^3$)	Modeled Concentration ($\mu g/m^3$)	Notes
CO	1-Hour	2,000	575	421	No Additional Modeling Needed
CO	8-Hour	500	575	192	No Additional Modeling Needed

As shown in Table 11, modeled concentration increases for NO_X from the C-002 Nitric Acid Plant following the proposed modifications are above the Significant Impact Level. Additional NAAQS and PSD Class II increment analyses are therefore required for NO_X. Contributing nearby sources must be included in the model.

Table 11: Results of NO_X Modeling Significance Analysis

Pollutant	Averaging Period	PSD Significant Impact Level ($\mu g/m^3$)	Significant Monitoring Concentration ($\mu g/m^3$)	Modeled Concentration ($\mu g/m^3$)	Notes
NO_X	Annual	1	14	1.42	Additional Modeling Needed

Refined NO_X Analysis:

The refined modeling analysis determines compliance with the PSD increment standard and the National Ambient Air Quality Standards (NAAQS). In PSD increment modeling, ambient air quality within a predetermined Significant Impact Area (SIA) is evaluated through modeling to determine whether or not the total emissions from all sources, both onsite and offsite (within a 50-km radius extending outward from the SIA), could cause an exceedance of the allowable NO_X PSD Increment. The PSD Increment is the allowable incremental increase of ground-level concentration of a pollutant over the baseline level. The baseline for NO_X emissions is the NO_X emission level modeled for this area using September 1988 data.

The NAAQS Model also utilizes all off-site sources as well as PCS Nitrogen sources. Again, ambient air quality within the SIA is also evaluated to determine if an exceedance of the NAAQS standard occurs. The NAAQS standard is the maximum concentration of a pollutant allowed at ground level.

The first step in the analysis was to determine the project's maximum Area of Impact (AOI) for NO_X emissions. The AOI's critical distance is defined as the greatest distance from the facility at which the increase in NO_X emissions from the screen model exceeds the significant impact level (1 $\mu g/m^3$ for NO_X). The AOI is defined as the entire area within a radius of the AOI's critical distance. This evaluation was completed for all five years of NO_X screen models and is summarized in Table 5-4 of the permit application. This analysis determined that the farthest point which exceeds the significant impact level is 4.35 km from the plant site and occurred during the 1977 modeled year. Figure 5-3 of the permit application provides a plot of the results of the 1977 screen model, which identifies the level of 1 $\mu g/m^3$ NO_X concentration and the AOI. Per EPA guidance, all sources located within 50 km of the AOI (54.35 km) were included in the modeling analysis.

The AOI includes sources in both Georgia and South Carolina. A request was therefore made for both Georgia (EPD) and South Carolina (Department of Health and Environmental Control – DHEC) to provide data for NO_X emission sources within the project's area of impact. DHEC provided a current emission inventory for all counties located within the project's area of impact. The inventory identified NO_X emission rates, stack locations and parameters, as well as the status of each source as a baseline source, increment consumer, or increment expander. None of the South Carolina sources were identified as increment consumers, therefore the South Carolina off-site sources were only included in the NAAQS model.

The impact of these off-site sources on the air quality models is largely determined by the emission rates and the distance between the emission source and the PCS Nitrogen plant. The EPA "20D Rule: screening technique was utilized to reduce the large number of sources identified by the EPD and DHEC to those which could potentially impact the project. The "20D Rule" allows for the elimination of any sources for which emissions (tpy) are less than 20 times the distance (km) from the sources to the PCS site.

The 20D rule was only applied to sources for NAAQS modeling. All sources identified as increment consumers or expanders were included in the PSD increment analysis. Table 5-5 and 5-6 of the permit application provide a list of all plants identified by the EPD and DHEC, respectively, which are within the projects area of impact and are sources of NO_X. The tables identify the total emissions of NO_X from each site and the distance from the site to the PCS Nitrogen plant. The final column identifies those sites that were screened out using the 20D rule. Table 5-7 of the permit application identifies all off site emission points in South Carolina and Georgia that were not screened out and are therefore included in the NAAQS modeling analysis.

The EPD provided data for NAAQS sources from an EPA database. The data was validated by reviewing Title V permit applications and air quality files of the sources located within the area of impact. For the PSD increment modeling, the EPD maintains an up to date spreadsheet which identifies all NO_X increment consumers and expanders in the area as well as all data required for modeling. The most recent version (August 2002) was used in this analysis. The sources identified in this spreadsheet which are within the projects area of impact were included in the PSD increment model. Table 5-8 provides the emissions data for the off-site PSD increment consuming sources which are included in the modeling analysis.

There are several on-site operations which are sources of NO_X emissions other than the C-002 Nitric Acid Plant. These sources include the C-001 Nitric Acid Plant, the Ammonia Plant, and three boilers (AB01, AB02, and AB03). Table 5-9 of the permit application summarizes the status of each of these sources as baseline, PSD increment consumers, and PSD increment expanders.

The BPIP model was also updated to include any downwash impacts site buildings would have on these additional on site sources. This additional BPIP model run is included in both the PSD increment and NAAQS NO_X models.

NO_X Class II PSD Increment Modeling:

As shown in Table 12, modeled impacts of NO_X are below the PSD increment. Given this, the proposed modifications will comply with the PSD Class II increment. The nearest Class I area is located 230 km away from the facility, therefore the impacts from the proposed project were not evaluated for the Class I PSD increment.

Table 12: Results of Class II PSD Increment Impact for NO_X

Pollutant	Averaging Period	PSD Increment ($\mu g/m^3$)	Modeled Conc. ($\mu g/m^3$)	Notes
NO_X	Annual	25	18.4	All significant sources within 54.35 km

NAAQS NO_X Modeling:

The NAAQS are established as ambient ceilings applicable to the entire country, and they must be attained and maintained. PSD requires that any pollutant that has predicted significant impacts due to the modification alone must be evaluated for NAAQS compliance. Table 5 shows that NO_X impacts must be evaluated further. The ISCST3 model was run including all “significant sources” (as defined using the 20-D Rule) within 54.35 km of the plant. The background concentration for NO_X is 26 ug/m^3 (annual). This concentration has been added to the modeled concentration to determine total impact. Table 13 below includes the modeled concentration (including the background concentration) in comparison to the NAAQS. As can be seen from the table, the modeled impact is below the associated NAAQS limit.

Table 13: Results of Ambient Air Quality Impact for NO_X

Pollutant	Averaging Period	NAAQS (µg/m^3)	Modeled Conc. (µg/m^3)	Additional Notes
NO_X	Annual	100	77.1	All significant sources within 54.35 km

Complex Terrain Analysis:

Complex terrain (areas where the terrain is higher than the lowest stack height) has been identified in the areas surrounding the PCS Nitrogen plant. To determine if complex-terrain modeling is necessary for these areas, a comparison between the results of the NO_X screen modeling analysis in the default mode and the simple-terrain mode was performed for the 26 receptors which are above the height of the lowest stack and exceeded the NO_X significant impact level. This comparison was performed in order to determine whether predicted impacts in intermediate terrain areas are controlled by complex terrain algorithms or simple terrain algorithms per the EPA guidance on complex terrain modeling – “Complex Terrain Modeling Procedures” – May 19, 1999.

The results at each receptor for the default mode and the simple-terrain mode were compared. Exhibit D provides the results of this analysis for all 5 years of model runs. At each receptor, the difference between the “simple” result and the “default” result was calculated. In all cases were the default value exceeds the significant impact level, the difference between the “default” and “simple” case was less than the corresponding significance level for NO_X (1 µg/m^3). This indicates that either the simple-terrain algorithm is controlling the analysis or that the complex-terrain modeling algorithm demonstrates insignificant impacts at these locations. Based on this information, no further complex terrain modeling is necessary.

Georgia Toxics Analysis:

The C-002 AN Neutralizer scrubber is a potential source of both nitric acid and ammonia emissions that are considered toxic pollutants under Georgia state toxics policy. The ammonium nitrate neutralizer is not being modified as part of this project, but its emissions will increase due to greater throughput. In order to assess the air toxics impact on the environment, emissions from the entire plant were included in a modeling analysis. The results of these calculations are included in Exhibit A of the report.

Compliance with the toxic program was determined using the “Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions” – June 21, 1998. The first step was to determine the Ambient Air Concentration (AAC) for each of the compounds. Priority is given to inhalation reference concentrations (RfC) and Risked Based Air Concentrations (RBAC) which are identified in the EPA IRS database. The listed RfC for Ammonia (0.1 mg/m^3) was used for the ammonia analysis. Ammonia also has a Short Term Exposure level (STEL) of 27 mg/m^3, which was also evaluated. Nitric acid was not identified in the IRIS database; therefore, its AAC was based on its Occupational Safety and Health Administration (OSHA) Time Weighted Average (TWA) of 5 mg/m^3 and a STEL of 10 mg/m^3.

The nitric acid TWA was corrected for exposure levels (assuming a continuous operation of 168 hr/wk). Per EPD guidance neither of the STELs was adjusted for exposure levels. Next, a safety factor was applied depending on the classification of the pollutant as a carcinogen (100 for non-carcinogen, 300 for carcinogens). Per EPD guidance a safety factor of 10 was applied to the STELs. Nitric Acid is not considered a carcinogen so a safety factor of 100 was applied to the TWA. Table 14 summarizes the AAC for each compound. RfC values taken from the IRIS database required no adjustment.

Table 14: AACs for Ammonia and Nitric Acid

Compound	Toxicity Data	Adjustment for Exposure	Safety Factor Adjustment	AAC	Basis
Ammonia – RfC	0.1 mg/m^3	None	None	100 µg/m^3	EPA IRIS Database
Ammonia – STEL	27 mg/m^3	None	2,700 µg/m^3	2,700 µg/m^3	EPA IRIS Database
Nitric Acid – TWA	5 mg/m^3	1.3 mg/m^3	12 µg/m^3	12 µg/m^3	OSHA TWA
Nitric Acid – STEL	10 mg/m^3	None	1,000 µg/m^3	1,000 µg/m^3	OSHA STEL

Next, The EPA Screen 3 model was run for the source with the shortest stack (C-002 Nitric Acid Plant). A copy of the model results is included in Exhibit E of the permit application. The results for this model indicate that at a 1 g/s emission rate the model would result in a worst-case 1-hour concentration of 3.3 µg/m^3. The concentration of ammonia and nitric acid were next determined by multiplying this value times the actual emission rate of the specific pollutant in grams/second (55.82 g/s and 1.87 g/s respectively) from the entire plant. This analysis demonstrates the worst possible results by modeling all emission as coming from the worst-case stack. This result, which is a 1-hour average, was next converted to an annual, 24-hour, and 15-minute standard for comparison to the various AACs which were calculated using the correction factors (0.08, 0.4, and 1.32 respectively). Table 15 summarizes the results of this analysis. As shown, all compounds are below their corresponding AACs; therefore compliance with the Georgia toxics programs is confirmed.

Table 15: Maximum Ground Level Concentration Comparison to AACs

Compound	MGLC - 1 Hour Average (µg/m3)	MGLC for Averaging Period (µg/m3)	AAC (µg/m3)	Percentage of Allowable	Compliance
Ammonia – RfC	184.1	14.7	100	14.7%	Yes
Ammonia – STEL	184.1	243.0	2,700	9.0%	Yes
Nitric Acid – TWA	6.2	2.5	12	20.8%	Yes
Nitric Acid – STEL	6.2	8.1	1,000	8.1%	Yes

Class I Areas:

A review was completed to determine the proximity of Class I areas to the site in order to determine if any evaluation of the project's impact on a Class I area is required. The five closest Class 1 areas are the Shining Rock Wilderness, Cape Romain Wilderness, Smokey Mountains National Park, Joyce Kilmer – Slickrock Wilderness, and the Cohutta Wilderness. Table 16 summarizes the distance between PCS Nitrogen and the Class I areas.

Table 16: Distance between PCS Nitrogen and the Class I Areas

Area	Distance (km)
Shining Rock Wilderness, NC	230
Cape Romain Wilderness, SC	255
Smokey Mountains National Park, NC	261
Joyce Kilmer – Slickrock Wilderness, NC	283
Cohutta Wilderness, GA	349
Okefenokee Wilderness, GA	384
Wolf Island Wilderness, GA	402

All Class I areas are beyond 200 km from PCS Nitrogen, therefore no Class I evaluation was completed. Also, the Division notified representatives of the National Park Service and Fish and Wildlife Services of the emissions associated with the PCS Nitrogen application. No additional information was requested from the Division by either service.

Class II Visibility Analysis:

Emissions from certain sources can create visible, defined plumes that are noticeable to the casual observer. Therefore, an exhaust plume visibility analysis was performed for this project to assure that the emission from the project to not create a noticeably visible plume in a local Class II area of interest, the Augusta Regional Airport. No visibility analyses were required for Class I areas.

The primary variables that effect whether a plume is visible or not at a certain location are (1) quantity of emissions, (2) type of emissions, (3) relative location of source and observer, and (4) background visibility range. For this exhaust plume visibility analysis, an analysis was performed using the latest version of the EPA VISCREEN model according to the guidelines published in the *Workbook for Plume Visual Impact Screening and Analysis*.

The default particulate size and density from the VISCREEN model were used for the analysis. In order to determine the appropriate wind speed and stability class, an evaluation of meteorological data for the Augusta weather station located at the Augusta Regional Airport was completed. The meteorological information included the frequency distribution of various dispersion conditions (wind speed and stability) for a 5-year set of data (1974 – 1978). The PCS Nitrogen site is located north-northeast of the airport, therefore the data was evaluated fro the frequency of wind coming only from that direction.

Table 17 below shows the results from the frequency distribution evaluation for the Augusta area weather data. The table lists each of the evaluated dispersion conditions, which are ranked in order of decreasing severity. EPA procedures (as outlined in the VISCREEN guide) for defining worst case meteorology for Level 1 VISCREEN modeling indicates that the modeled dispersion condition is selected such that the sum of all frequencies of occurrence of conditions worse than this condition totals 1 percent (i.e., about four days per year).

Table 17: Wind Speed and Stability Class Frequency Distribution from NNE Direction

Dispersion Condition (Class, Wind Speed)	Number of 1-Hour Occurrences in 5 Years of Data	Frequency	Cumulative Frequency
F, 1	74	0.00169	0.00169
E, 1	27	0.00062	0.00230
D, 1	26	0.00059	0.00290
F, 2	145	0.00331	0.00621
E, 2	91	0.00208	0.00828
D, 2	123	0.00281	0.01109
F, 3	77	0.00176	0.01285
E, 3	85	0.00194	0.01479
F, 4	3	0.00007	0.01485

The frequency data indicates that the 1% cumulative frequency is not reached until the D, 2 dispersion condition is reached in the NNE direction. Therefore, the VISCREEN model was run at a wind speed of 2 m/s and a stability category of 4, or D. In addition, the PM_{10} and NO_X emission increases associated with the expansion project were used as input to the model. As directed in the VISCREEN Workbook, a background visual range of 25 km was used for the Augusta area.

For both views inside and outside the Class II area, calculations are performed by the model for the two assumed plume-viewing backgrounds. The VISCREEN model output shows separate tables for inside and outside the Class II area. Each table contains several variables: theta, azi, distance, alpha, critical and actual plume delta E, and critical and actual plume contrast. These variables are defined as:

1. *Theta* – Scattering angle (the angle between direction solar radiation and the line of sight). If the observer is looking directly at the sun, theta equals zero degrees. If the observer is looking away from the sun, theta equals 180 degrees.

2. *Azi* – The azimuthal angle between the line connecting the observer and the line of sight.

3. *Alpha* – The vertical angle between the line of sight and the plume centerline.

4. *Delta E* – Used to characterize the perceptibility of a plume on the basis of the color difference between the plume and a viewing background. A delta E of less than 2.0 signifies that the plume is not perceptible.

5. *Contrast* – The contrast at a given wavelength of two colored objects such as plume/sky or plume/terrain.

The analysis is generally considered satisfactory of delta E and contrast are less than critical values of 2.0 and 0.05 respectively, both of which are Class I, not Class II, area thresholds.

The Division has reviewed the VISCREEN results presented in the supplement to the permit application dated January 5, 2004 and has determined that the visual impact criteria (delta E and contrast) inside the Augusta Regional Airport are not exceeded for the proposed project. Since the project passes the Level 1 analysis for a Class I area for the Class II area of interest, no further analysis of exhaust plume visibility is required as part of this air analysis.

Preconstruction Monitoring:

The PSD regulations require that continuous preconstruction monitoring of regulated pollutants emitted in significant amounts be conducted to establish existing air quality concentrations in the vicinity of the proposed source or modification. However, no preconstruction monitoring data are required if the ambient air quality of the project impact from the source is below a certain *de minimis* concentration.

In performing this analysis, the maximum impacts for both scenarios are determined to be less than the corresponding *de minimis* concentrations of as shown in Tables 10 and 11. No ambient monitoring study will be required by the Division based on this data.

7.0 ADDITIONAL IMPACT ANALYSES

PSD requires an analysis of impairment to visibility, soils, and vegetation that will occur as a result of a modification to the facility and an analysis of the air quality impact projected for the area as a result of the general commercial, residential, and other growth associated with the proposed project.

Visibility:

Visibility impairment is any perceptible change in visibility (visual range, contrast, atmospheric color, etc.) from that which would have existed under natural conditions. Poor visibility is caused when fine solid or liquid particles, usually in the form of volatile organics, nitrogen oxides, or sulfur oxides, absorb or scatter light. This light scattering or absorption actually reduces the amount of light received from viewed objects and scatters ambient light in the line of sight. This scattered ambient light appears as haze.

Another form of visibility impairment in the form of plume blight occurs when particles and light-absorbing gases are confined to a single elevated haze layer or coherent plume. Plume blight, a white, gray, or brown plume clearly visible against a background sky or other dark object, usually can be traced to a single source such as a smoke stack.

PCS Nitrogen presented a visibility impact analyses for the expansion project discussed in this preliminary determination. The results of these analyses showed that the proposed project should have no perceptible impact on visibility within the Class II area of interest, the Augusta Regional Airport.

Soils and Vegetation:

Since ground level concentration of NO_X and CO are not expected to increase by a significant degree as a result of this project, the impacts on soil and vegetation are predicted to be insignificant. There are currently no known adverse impacts on local environment from PCS Nitrogen's emissions and no discernible changes are expected to results from the proposed modifications to PCS Nitrogen's operations.

Growth:

An increase in employment at PCS is not expected as a result of any proposed changes; therefore, there will be no permanent impact on the surround community with regard to demographics. All the plant modifications will occur on existing operations; therefore no grading will be required. The construction phase (being a small modification of an existing process) will not adversely impact air quality in the area.

8.0 EXPLANATION OF DRAFT PERMIT CONDITIONS

The permit requirements for this proposed facility are included in draft Permit Amendment No. 2631-193-0013-V-01-4.

Section 1.0 Facility Description

The facility description section describes the modification to the C-002 Nitric Acid Plant.

Section 3.0 Requirements for Emission Units

Condition 3.3.5 limits the emission of nitrogen oxides from the C-002 Nitric Acid Plant to 3.0 pounds per ton 100% nitric acid and limits opacity from the source to less than 10%. The citation for the condition has been updated to include reference to 40 CFR 52.21. The citation is necessary to reflect the results of the PSD BACT review for nitrogen oxide emissions from the C-002 Nitric Acid Plant.

Condition 3.3.10 has been added to the permit. The condition limits annual (12 consecutive month periods) nitrogen oxide emissions to 507 tons per year. This limit is a result of the PSD BACT analysis and represents an annual average of 2.14 pounds NO_X per ton 100% nitric acid.

Condition 3.3.11 has been added to the permit. The condition limits the emission of carbon monoxide from the C-002 Nitric Acid Plant to an average of 30.0 pound CO per ton 100% nitric acid on a 12 month rolling basis. This limit is the result of the PSD review.

Section 4.0 Requirements for Testing

Condition 4.2.2 has been modified to increase the frequency of nitrogen oxide testing for the C-002 Nitric Acid Plant and to require carbon monoxide testing for the C-002 Nitric Acid Plant. Annual performance tests for carbon monoxide have also been added to the condition. The tests are to be conducted annually due to the variability in carbon monoxide emissions as the effectiveness of the catalyst in the nitrogen oxide reduction device is lessened over time.

Condition 4.2.8 has been modified. The condition now requires the facility to calculate a conversion factor for converting carbon monoxide readings in ppm to pounds per ton 100% nitric acid in addition to calculating a conversion factor for nitrogen oxide tests.

Condition 4.2.11 has been added to the permit. The condition requires the facility to conduct performance testing for NO_X and CO upon completion of the modifications to the C-002 Nitric Acid Plant. The tests are necessary to establish the new conversion factors.

Condition 4.2.12 has been added to the permit. The condition requires the facility to conduct a performance test for particulate matter on the C-002 AN Neutralizer following the completion of the C-002 Nitric Acid Plant modifications. This test is required because the expansion of the C-002 Nitric Acid Plant will allow additional nitric acid to be sent to the neutralizer. The condition allows the facility to modify the excursion parameters for the C-002 AN Neutralizer scrubber if necessary.

Section 5.0 Requirements for Monitoring

Condition 5.2.1.b has been added to the permit. The condition requires the facility to install, calibrate, maintain, and operate a carbon monoxide CEMS for the C-002 Nitric Acid Plant. The data recorded, in addition to the conversion factor determined in accordance with Condition 4.2.8, will be used to determine compliance with the PSD limit in Condition 3.3.11 of the permit.

Condition 5.2.2.e has been added to the permit. The paragraph requires the facility to continuously monitor nitric acid production rate. This information is necessary to calculate the NO_X and CO emissions.

Conditions 5.2.5 and 5.2.6 have been added the to permit. The conditions describe the CAM requirements for the C-002 Nitric Acid Plant.

Section 6.0 Other Recordkeeping and Reporting Requirements

Condition 6.1.7.a(3) has been added to the permit. The condition defines as an excess emission any 12 consecutive month period during which the nitrogen oxides emission from the C-002 Nitric Acid Plant exceeds 507 tons.

Condition 6.1.7.a(4) has been added to the permit. The condition defines as an excess emission any 12 consecutive month period during which average carbon monoxide emissions from the C-002 Nitric Acid Plant exceeds 30.0 pounds CO per ton 100% nitric acid.

Condition 6.2.15 has been added the permit. The condition requires the Permittee to calculate and keep on record the monthly and 12-month rolling totals for the emission of NO_X from the C-002 Nitric Acid Plant. These records are necessary to determine compliance with the PSD limits found in Condition 3.3.10.

Condition 6.2.16 has been added the permit. The condition requires the Permittee to calculate and keep on record the average CO emissions (pounds per ton 100% nitric acid). The records should also include the 12-month rolling average. These records are necessary to determine compliance with the PSD limits found in Condition 3.3.11.

Condition 6.2.17 has been added to the permit. The condition requires the Permittee to commence construction of the proposed modifications within 18 months of the effective date of the permit amendment. This is a requirement of PSD.

Section 8.0 General Provisions

Conditions 5.1.1., 7.1.1, 7.2.1, 7.10.1, 8.2.1, 8.5.1, 8.5.3, 8.8.3, 8.10.1, 8.11, 8.14, 8.17.1, 8.20.1, and 8.22 have been modified. The conditions have been updated to reflect changes to the permit template.

Conditions 8.23, 8.24, 8.25, and 8.26 have been added to the permit. The conditions are now included in all Title V permits and have been included in this permit to bring the template conditions up to date.

APPENDIX A

Draft Revised Title V Operating Permit PCS Nitrogen Fertilizer – Augusta Plant
Augusta (Richmond County), Georgia

APPENDIX B

PCS Nitrogen Fertilizer – Augusta Plant PSD Permit Application and Supporting Data

Contents Include:

1. PSD Permit Application No. 14213, December 30, 2002
2. Visibility Analysis for PSD Permit Application No. 14213, January 5, 2004

APPENDIX C

EPD’S PSD Dispersion Modeling and Air Toxics Assessment Review