NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF AIR QUALITY
PERMITS SECTION

PREVENTION OF SIGNIFICANT DETERIORATION
PRE-CONSTRUCTION REVIEW AND PRELIMINARY DETERMINATION

FOR

PCS PHOSPHATE COMPANY, INC.
BEAUFORT COUNTY
AURORA, NORTH CAROLINA

THIS REVIEW WAS PERFORMED BY THE
DIVISION OF AIR QUALITY

In Accordance With NC DAQ Regulations For
Prevention of Significant Deterioration of Air Quality
15A NCAC 2D .0530 and 15A NCAC 2D 2Q .0300

November 2007

Mailing List

NEWSPAPER	Washington Daily News Ms. Brenda Foster Legal Classified Department P.O. Box 1788 Washington, North Carolina 27889 (252) 946-2144 FAX: (252) 946-9797 The Daily Reflector Ms. Jennifer Montgomery Legal Classified Department Post Office Box 1967 Greenville, North Carolina 27835	Public Notice
OFFICIALS	County Manager Mr. Donald Davenport 121 W. 3rd St. Washington, North Carolina 27889 (252) 946-0079	Public Notice
LIBRARY	BHM Regional Library 158 N. Market St. Washington, North Carolina 27889	Preliminary Determination & Application
SOURCE	Mr. Pete Wind Environmental Engineer PCS Phosphate Company, Inc. P.O. Box 48 Aurora, North Carolina 27806 (252) 322-8125	Preliminary Determination
FLM	Ms. Jill Webster USDA Forest Service 7333 W. Jefferson Ave., Suite 375 Lakewood, Colorado 80235 (303) 914-3804	Preliminary Determination

EPA	Mr. James Little Air Permits Section U.S. EPA Region IV Sam Nunn Atlanta Federal Building 61 Forsyth Street Atlanta, Georgia 30303-3104 (404) 562-9118 Preliminary Determination and Public Notice via electronic mail to: little.james@epa.gov with cc to: forney.kathleen@epa.gov worley.gregg@epa.gov	Preliminary Determination & Application
EPA	Mr. Bob Blaszczak BACT/LAER Clearinghouse OAQPS, MD-13 RTP, North Carolina 27711	BACT Input Summary Sheet
WASHINGTON REGIONAL OFFICE DAQ	Mr. Rob Fisher Regional Supervisor 943 Washington Square Mall Washington, North Carolina 27889 (252) 946-6481 FAX: (252) 975-3716	Preliminary Determination & Application

TABLE OF CONTENTS

SECTION **Page**

Fact Sheet

Applicant:
PCS Phosphate Company, Inc.
P.O. Box 48
Aurora, NC 27806
Beaufort County
(919) 850-9511

Consultant:
URS Greiner Woodward Clyde
3109 Poplarwood Court, Suite 301
Raleigh, North Carolina 27604
Contact: Mr. Randall Taylor, CCM, QEP

- The PCS facility is located in Aurora, Beaufort County, North Carolina at Highway 306 North (UTM 338.1 km E/3915.95 km N, Zone 17).

- The Prevention of Significant Deterioration (PSD) application was submitted to the North Carolina Division of Air Quality (DAQ), Permitting Section (AQS) on November 1, 2005 and was deemed complete for review purposes pursuant to 40 CFR 51.166(q) and 15A NCAC 2D .0530(o) on November 10, 2006.

- An addendum to this application was submitted on August 23, 2006 requesting re-determination of Best Available Control Technology (BACT) for particulate matter from the Indirect Cooling Towers No. 3 and No. 4 at the Purified Acid Plant No. 2 **(ID Nos. E1181 and TBDB)**.

- The applicant is proposing to construct a new Sulfuric Acid Plant **(ID No. S-7)** with the simultaneous shut down of two existing Sulfuric Acid Plants **(ID Nos. S-3 and S-4)** and to add equipment at Phosphoric Acid Trains No. 3 and No. 4 **(ID No. 433-TBD)** to increase the strength and throughput of amber acid production.

- The facility is a major source under the PSD definition contained in 40 CFR 51.166 and therefore is subject to a preconstruction PSD review for modifications resulting in significant increases in emissions. The modification will result in significant emissions of sulfuric acid mist and nitrogen oxides (as nitrogen dioxide). The cooling towers, addressed in the addendum, were part of a previous modification that was major for PM-10.

- BACT for nitrogen oxides at the proposed new Sulfuric Acid Plant No. 7 is no control with an emission rate of 0.6 pounds nitrogen oxides per ton of 100 percent sulfuric acid produced.

- BACT for sulfuric acid mist at the proposed new Sulfuric Acid Plant No. 7 is the use of a vertical tube mist eliminator with an emission rate of 0.075 pounds of sulfuric acid mist per ton of 100 percent sulfuric acid produced.

- BACT for the Indirect Cooling Towers No. 3 and No. 4 is an emission limitation of 0.072 pounds of PM-10 per hour.

- The proposed modifications will not have a significant impact on air quality, visibility, any Class I area, or air quality related values.

INTRODUCTION AND PRELIMINARY DETERMINATION

PCS Phosphate Company, Inc., (PCS) located in Aurora, North Carolina, mines phosphate ore and converts the phosphate ore (a.k.a. rock) into various grades of phosphoric acid and phosphate fertilizers. Sulfuric acid is used in the production of phosphoric acid through the chemical reaction with calcium phosphate rock. The facility falls under the Standard Industrial Classification (SIC) codes of 1475 for mining, 2819 for purified acid production, and 2874 for phosphate fertilizers and phosphoric acid production.

PCS has the potential to emit more than 100 tons per year of a regulated pollutant and is classified as a major facility under the Prevention of Significant Deterioration of Air Quality (PSD) regulations. PCS has submitted a PSD permit application to the North Carolina Division of Air Quality (DAQ) for significant emissions increases. The applicant is proposing to (1) construct a new sulfuric acid plant **(ID No. S-7)**, (2) increase the concentration and throughput of amber acid at Phosphoric Acid Trains No. 3 and No. 4, and (3) increase the existing particulate BACT emission limit for Indirect Cooling Towers No. 3 and No. 4 at the Purified Acid Plant No. 2 **(ID Nos. E1181 and TBDB)**. Sulfuric Acid Plant No. 7 **(ID No. S-7)** will be designed to produce 5,400 tons per day of sulfuric acid and the existing Sulfuric Acid Plants No. 3 and No. 4 **(ID Nos. S-3 and S-4)** (to be shut down) have a total production capacity of 3,850 tons per day of sulfuric acid. Two new evaporators will be installed in the phosphoric acid area to increase the concentration of amber acid to 54 percent and a new acid clarifier **(ID No. 433-TBD)** with scrubber control **(ID No. CD-433-TBD)** will be installed to serve the new amber acid throughput.

These modifications will result in emissions of carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide, volatile organic compounds, lead, sulfuric acid mist, fluorides (includes hydrogen fluoride and fluorides other than hydrogen fluoride), and hydrogen sulfide. Not accounting for contemporaneous emission reductions from Sulfuric Acid Plants No. 3 and No. 4 **(ID Nos. S-3 and S-4)**, significant increases would result for nitrogen oxides, particulate matter, sulfur dioxide, sulfuric acid mist, and hydrogen sulfide. However, significant emission increases will occur for only nitrogen oxides and sulfuric acid mist after accounting for contemporaneous emissions increases and decreases over the past seven years. A significant increase in emissions of nitrogen oxides is at least 40 tons per year and at least 7 tons per year for sulfuric acid mist. The revision of BACT for particulate matter at the cooling towers will result in emissions increasing from 51 pounds per year to 631 pounds per year and is not, in itself, significant. However, a full PSD review pursuant to 15A NCAC 2D .0530 is required for the revision of the existing BACT standard.

BACT for nitrogen oxides was determined to be no control with a maximum allowable emission rate of 0.6 pounds of nitrogen oxides per ton of 100 percent of sulfuric acid produced. PCS will demonstrate compliance with the limit by performing initial and annual stack testing.

BACT for sulfuric acid mist was determined to be a vertical mist eliminator with a maximum allowable emission rate of 0.075 pounds of sulfuric acid mist per ton of 100 percent sulfuric acid produced. PCS will

demonstrate compliance with an emission limit by performing an initial and annual stack test and performing regular, manufacturer-recommended inspection and maintenance on the vertical tube mist eliminator.

All required stack testing will be conducted in accordance with DAQ-approved testing protocols using the test methods stipulated in 15A NCAC 2D .0503(c). All testing will be performed at a production rate equal to or greater than the normal production rate. The DAQ must approve the normal production rate for the source test.

The DAQ has determined that the proposed modifications will comply with the requirements of the North Carolina Administrative Code. Therefore, the DAQ proposes to issue a permit for the construction and operation of the new Sulfuric Acid Plant No. 7, the modification of the Phosphoric Acid Plants No. 3 and No. 4, and the revision of the particulate BACT emission limit for Indirect Cooling Towers No. 3 and No. 4 at Purified Acid Plant No. 2. The permit will incorporate specific emissions limits and requirements for testing, monitoring, recordkeeping, and reporting. Preliminary preconstruction approval under the PSD requirements was contingent upon the following findings:

- The impact of NOx emissions is not significant in any Class I or Class II area and the PM-10 impact from the increased indirect cooling tower emissions will not exceed any PSD increment or National Ambient Air Quality Standard;
- Emissions resulting from the proposed facility will not adversely impact any Class I area air quality related value;
- BACT will be applied to each emission unit that contributes to a significant emission rate increase as a result of this modification pursuant to 15A NCAC 2D .0530;
- State-regulated toxic air pollutants (TAPs) will not exceed the acceptable ambient levels (AALs) pursuant to 15A NCAC 2D .1100;
- The proposed project will not cause adverse impacts to soils and vegetation or cause degradation of visibility; and
- Economic growth associated with the project will not cause a significant increase in regional air pollutant levels.

In addition to the modifications proposed above, the applicant has requested that existing PSD/BACT standards for Sulfuric Acid Plant No. 3 **(ID No. S-3)** be removed from the permit. In 1999, PCS went through PSD permitting to authorize various changes at the Sulfuric Acid Plant No. 3 **(ID No. S-3)** that would increase the throughput capacity at the plant from 1,850 tons per day (tpd) to 2,000 tpd. The modifications triggered PSD permitting for both sulfur dioxide (SO_2) and sulfuric acid mist. BACT for this sulfuric acid mist was determined to be vertical tube mist eliminators (versus the existing horizontal mesh pads). However, the proposed modification was never completed, and the 18 month construction window has expired. All PSD/BACT requirements for Sulfuric Acid Plant No. 3 **(ID No. S-3)** have been removed from the permit. In

addition, the nominal capacity of the Sulfuric Acid Plant No. 3 **(ID No. S-3)** has been changed back to 1,850 tpd (versus 2,000 tpd) and the associated control device has been changed from a vertical tube mist eliminator to horizontal mesh pads.

The proposed modifications and preliminary determination require public notice. The DAQ solicits and encourages participation by the general public, industry, and other affected entities that may be impacted by the proposed project. Public notice requires a 30-day public comment period before the DAQ may take final action. Appendix B contains a copy of the public notice.

PROCESSES DESCRIPTIONS

1.0 SULFURIC ACID PROCESS

PCS presently operates four sulfuric acid plants and purchases additional sulfuric acid. Sulfuric acid production occurs in three steps:

1) Molten sulfur is oxidized (combusted) to create sulfur dioxide;
2) Sulfur dioxide is converted to sulfur trioxide in the presence of a catalyst; and,
3) Sulfur trioxide is contacted with a dilute sulfuric acid solution. The sulfur trioxide is absorbed into the solution to form additional sulfuric acid.

Molten sulfur is introduced to the combustion zone with a horizontal spray burner. Combustion air is contacted with dilute sulfuric acid in a drying tower to remove moisture before it is introduced to the combustion zone to produce sulfur dioxide. After exiting the combustion chamber, the temperature of the sulfur dioxide gas stream is reduced in a heat recovery boiler and steam superheater before entering the first stage of the catalytic converter. Catalytic conversion of sulfur dioxide to sulfur trioxide proceeds in four separate passes. The gases are cooled by heat exchange after each stage because the reaction is exothermic. The gases leaving the first stage of the catalytic converter are cooled in a second heat recovery boiler before passing to the second stage of the catalytic converter. The gases leaving the second stage of the catalytic converter are used to heat the gases returning from the first absorption tower before entering the third stage of the converter. The gases leaving the third stage of the catalytic converter are sent to the first absorption tower (the interpass tower), after cooling, where it is contacted with dilute sulfuric acid to remove sulfur trioxide. The gases leaving the interpass tower are then returned, after reheating, to the fourth stage of the catalytic converter. The gases leaving the fourth and final stage of the catalytic converter are then cooled and sent to the second absorption tower (the final tower) where it is again contacted to remove sulfur trioxide. The gases exit the final tower through the vertical tube mist eliminator and are vented to the atmosphere. Heating of the gas streams is accomplished through indirect heat exchange (from hot gas to cold gas) and cooling is accomplished through heat recovery in steam boilers, steam superheaters, boiler feed water economizers, or indirect exchange with cooler sulfur dioxide/trioxide gas streams. Steam generated from the sulfuric acid plant is used in various process applications throughout the plant site and to generate electrical power in the cogeneration facility. The sulfuric acid used to absorb the sulfur trioxide is constantly diluted to a strength of 95 percent and a side stream of product is taken off at the drying tower pump tank.

1.1 Phosphoric Acid Process

PCS produces phosphoric acid by contacting processed (calcined and/or sized) calcium phosphate rock with sulfuric acid. Calcined rock is used to produce green acid and uncalcined rock is used to produce amber acid. The calcium is converted to calcium sulfate and the phosphate is converted to phosphoric acid. Uncalcined rock contains organic matter that is charred by the sulfuric acid, which results in the amber color. The process is known as the wet process and PCS operates four of these wet process conversion trains. Each train involves rock digestion, described above, filtration, and concentration.

Digestion takes place in a nine-compartment reactor train and the slurry is flash cooled before filtration in a vacuum-assisted tilting pan filter. Emissions from these processes are collected and sent to a scrubber. The solids in the filtrate (26 percent phosphoric acid) are settled out before it is sent to the concentrators where water is evaporated to concentrate the acid. The proposed amber acid concentration will be increased to 54 percent. The concentrated acid is then sent to the clarifiers to remove fluorosilicates, iron, and soluble gypsum (calcium sulfate). The two new evaporators will be equipped with fluoride recovery units to produce a salable product (hydrofluorosilicic acid) and the clarifier will be equipped with a venturi scrubber.

1.2 Purified Acid Process

This plant purifies phosphoric acid by solvent extraction with methyl isobutyl ketone to produce

- a low alkali, high-purity phosphoric acid suitable for use in technical and food grade manufacturing;
- a high alkali phosphoric acid suitable for manufacturing technical grade derivatives; and
- a raffinate, which is used in manufacturing fertilizers at the Aurora site.

The cooling towers are necessary to provide cooling water used in the solvent recovery phase of the operation.

REGULATORY ANALYSIS

2.0 Prevention of Significant Deterioration of Air Quality (PSD)

The PSD regulations [15A NCAC 2D .0530] ensure that significant deterioration of the air quality in clean (attainment) areas does not undergo significant deterioration by placing a limit on the additional ambient impact an area may sustain above a baseline level. This allowable growth increment cannot exceed the National Ambient Air Quality Standards (NAAQS) for the criteria pollutants of concern. The PSD regulations affect the construction of new (greenfield) major stationary sources and the modification of existing major sources that result in significant increases in regulated pollutants. The EPA promulgated final regulations governing the PSD permitting program in the Federal Register published August 7, 1980. Effective March 25, 1982, the DAQ received full authority from the EPA to implement PSD regulations in the State. Revisions to the PSD Regulations were subsequently promulgated on December 31, 2002 and adopted by the DAQ on July 28, 2006.

PSD regulations require all new and modified major stationary sources that emit air pollutants regulated under the Clean Air Act (CAA) to be reviewed and approved prior to construction. A "major stationary source" is defined as any of 28 named source categories that has the potential to emit 100 tons per year of any regulated pollutant, or any other stationary source that has the potential to emit 250 tons per year of any regulated pollutant. PCS is a chemical processing plant, which is one of the 28 named source categories with a 100 tons per year major source threshold, and PCS is an existing major source under the PSD permitting program. Emissions from the proposed modifications were assessed in conjunction with contemporaneous emission increases and decreases over the past seven years to determine if significant emissions increases of any regulated pollutants occur, as defined in 40 CFR 51.166(b)(23). It was determined that significant net increases in emissions of nitrogen oxides and sulfuric acid mist would occur. The shut down of the two existing sulfuric acid plants provide sufficient reductions by themselves to net out the increases in sulfur dioxide. A seven-year span of contemporaneous emission decreases was used to net the modification out of PSD review for particulate matter and hydrogen sulfide.

PCS evaluated the following for the affected pollutants and emission units pursuant to the PSD regulations.

a. Best Available Control Technology (BACT)

BACT is defined as, "an emissions limitation... based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant." [40 CFR 51.166(b)(12)] BACT is intended to ensure that the control systems incorporated in the design of the proposed facility and the resulting emission rates reflect the lowest and most feasible used in a particular industry. The BACT analysis must consider the impacts of

non-criteria pollutants and unregulated toxic air pollutants. BACT is required for nitrogen oxide and sulfuric acid mist emissions. BACT emission limits must, at a minimum, comply with any applicable New Source Performance Standard (NSPS - 40 CFR 60), National Emission Standards for Hazardous Air Pollutants (NESHAP - 40 CFR 61 and 63), and the State Implementation Plan (SIP) requirements.

b. Air Quality Impact Analysis

PSD requires that the impact of criteria pollutants (i.e., those with ambient standards) be assessed to determine if facility emissions after the modifications will comply with the NAAQS and PSD increments. Nitrogen dioxide is the criteria pollutant subject to review for the proposed modification. Sulfuric acid mist has no federal ambient standard. The NAAQS for nitrogen oxides is 100 micrograms per cubic meter (annual arithmetic mean). The Class II area increment for nitrogen dioxide is 25 micrograms per cubic meter (annual arithmetic mean) and the Class I increment is 2.5 micrograms per cubic meter (annual arithmetic mean). The significant impact for nitrogen dioxide in a Class II area is 1.0 microgram per cubic meter annual average, pursuant to 40 CFR 51.165(b)(2), and from 0.08 to 0.10 micrograms per cubic meter annual average for Class I area established pursuant to guidance from EPA and the Federal Land Manager. The significant value used to determine if a source is required to perform preconstruction and/or post construction monitoring is 14 micrograms per cubic meter annual average.

c. Additional Impacts Analyses

These analyses include the effects of the emissions on soils, vegetation, and visibility. Flora and fauna in the surrounding area are identified and a determination is made as to the effect, if any, that the pollutants may have on them. Secondary impacts such as construction activities and any increase in population or other use of natural resources are also identified and assessed. A review of degradation to visibility in Class I areas is also required. Visibility impacts are determined using EPA developed models and assumptions regarding the environmental fate of the pollutant subject to review (nitrogen dioxide).

2.1 Additional DAQ Air Pollution Regulations

State regulations require the owner or operator of stationary sources of air pollutants to apply for an air quality permit to construct/operate pursuant to 15A NCAC 2Q .0300. The owner or operator shall not begin construction or operation of the source without first obtaining a permit. Air pollution control requirements under Title 15A NCAC 2D that affect the proposed facility are summarized below:

a. 15A NCAC 2D .0517: Emissions From Plants Producing Sulfuric Acid

This regulation restricts sulfur dioxide emissions to 27 pounds of sulfur dioxide per ton of sulfuric acid produced. It also limits sulfuric acid mist to 0.5 pounds of sulfuric acid mist per ton of sulfuric acid produced. There are no monitoring, recordkeeping or reporting requirements contained within

this regulation. The permit will incorporate requirements deemed necessary to demonstrate continuous compliance with these requirements. These requirements will be identical to those required for demonstrating continuous compliance with the NSPS for sulfur dioxide and sulfuric acid mist emissions from sulfuric acid plants.

b. 15A NCAC 2D .0519: Control of Nitrogen Dioxide and Nitrogen Oxides

This regulation limits emissions of nitrogen dioxide to less than 5.8 pounds per ton of acid produced from any sulfuric acid manufacturing plant. There are no monitoring, recordkeeping or reporting requirements contained within this regulation. However, the permit contains provisions for the existing sulfuric acid plants **(ID Nos. S-3, S-4, S-5, and S-6)** that require an annual stack test at one of the plants to demonstrate compliance for all the plants. The permit will incorporate an additional annual testing requirement for the new plant as intermittent monitoring to demonstrate continuous compliance. The additional requirement for the new sulfuric acid plant is necessary because the BACT limit differs from the allowable emissions from the existing plants and the present provisions will not account for the difference in allowable emission rates. This requirement will be contained in the BACT provisions.

c. 15A NCAC 2D .0524: New Source Performance Standards (NSPS) [40 CFR 60, Subpart H – Sulfuric Acid Plants]

These standards require sulfur dioxide emissions to be limited to less than or equal to four pounds per ton of 100 percent sulfuric acid produced and sulfuric acid mist emissions to less than or equal to 0.15 pounds per ton of 100 percent sulfuric acid produced. Visible emissions are limited to less than or equal to 10 percent opacity. Initial compliance testing is required for each standard in addition to the determination of the relative accuracy of the production system to determine production rate. Continuous monitoring is required for sulfur dioxide emissions. Additional monitoring and recordkeeping requirements will be used to demonstrate continuous compliance with the opacity and sulfuric acid mist limits. These will consist of:

1. a monthly verification of normal opacity and an annual reference method 9 determination for the opacity standard; and
2. an annual stack testing and inspection and maintenance of the vertical tube mist eliminator control device for the sulfuric acid mist standard.

d. 15A NCAC 2D .1111: Maximum Achievable Control Technology (MACT) [40 CFR 63, Subpart AA – Phosphoric Acid Manufacturing Plants]

These standards require fluoride emissions from reactors, filters, evaporators, and hotwells to be less than or equal to 0.020 pounds per ton of phosphorous pentoxide fed to the process. Initial compliance testing is required in addition to the determination of the relative accuracy of the production system to determine the feed rate. Continuous monitoring is required for the

phosphorous pentoxide feed rate and the pressure drop across the scrubber. The permit already has monitoring, recordkeeping, and reporting requirements in place for existing equipment that will apply to the two new evaporators. This regulation exempts affected facilities from NSPS 40 CFR 60, Subparts T and U.

e. 15A NCAC 2D .1100: Control of Toxic Air Pollutant Emissions [State-Enforceable Only]

Any facility that emits a state-regulated toxic air pollutant (TAP) in quantities greater than the toxic pollutant exemption rates (TPER) listed in 15A NCAC 2Q .0711 must demonstrate compliance with the acceptable ambient level (ALL) guidelines provided in 15A NCAC 2D .1104(a) for a modification that results in an increase in that TAP. PCS has determined that there will be TAP emissions increases in hydrogen fluoride, fluorides (without HF), and hydrogen sulfide from the increase in amber acid production at the phosphoric acid lines No. 3 and No. 4 due to the installation of the new evaporators. Increased emissions of hydrogen fluoride and fluorides (without HF) were estimated from the new clarifier tank. Increases in sulfuric acid mist are anticipated due to the new sulfuric acid plant. Sulfuric acid mist modeling submitted with this application was reviewed and accepted by the Air Quality Analysis Branch (AQAB). Revised sulfuric acid emissions were added to the permit. Fluoride (excluding hydrogen fluoride) emissions and hydrogen fluoride emissions were evaluated in a facility-wide demonstration dated December 21, 2006 and have been incorporated in the permit prior to this permit action.

PCS did not include revised TAP modeling for hydrogen sulfide emissions because there was a net decrease in these emissions over a seven-year period. However, unlike PSD regulations, the state-enforceable TAP regulations do not allow a facility to "net out" of the TAP modeling/compliance evaluation once the facility has triggered the modeling requirements pursuant to 15A NCAC 2D .1100. Once a facility has triggered review of a TAP, the facility is required to remodel emissions for each emission rate and emission parameter change. Therefore, a permit condition was added to the proposed permit requiring remodeling of all hydrogen sulfide sources facility-wide to demonstrate compliance with the AAL guidelines prior to operation of the modified No. 3 and No. 4 phosphoric acid trains.

f. 15A NCAC 2Q .0317: Avoidance Conditions [15A NCAC 2D .0530 – Prevention of Significant Deterioration]

The evaluation of potential sulfur dioxide (SO_2) emissions increases submitted by PCS was based on an emission rate of 2 lbs SO_2/ton of sulfuric acid produced (in accordance with previously determined BACT emission rates and source testing levels). However, the highest allowable SO_2 emission rate from the new sulfuric acid plant in the proposed permit is based on the applicable NSPS, or 4 lbs SO_2/ton of sulfuric acid produced. However, if the potential emission increase had been estimated using the higher, allowable emission rate (i.e., 4 lbs/ton), it would have shown a net

emission increase in excess of 40 tpy, and would have triggered a full PSD review pursuant to 15A NCAC 2D .0530. Therefore, DAQ has included a PSD avoidance condition pursuant to 15A NCAC 2Q .0317 requiring PCS to monitor and record SO_2 emissions from Sulfuric Acid Plant No. 7 to ensure that a significant net emission increase (over a consecutive 12-month period) does not result from this modification. The proposed permit includes a PSD avoidance condition limiting SO_2 emissions from the Sulfuric Acid Plants No. 3, No. 4, and No. 7 to no greater than 2,006 tons per consecutive 12-month period. A summary the derivation of this limit (i.e., the emission netting exercise) is provided below. Note that all three plants are included in the PSD avoidance condition to accommodate for the shakedown period following initial start-up of Sulfuric Acid Plant No. 7, during which Sulfuric Acid Plants No. 3 and No. 4 may be operating.

Source ID No.	Source Description	SO_2 Emissions (tpy)
Baseline Emissions of Existing Sulfuric Acid Plant Nos. 3 and 4[(1)]		
S-3	Sulfuric Acid Plant No. 3	1,020.23
S-4	Sulfuric Acid Plant No. 4	996.85
N/A	**Total**	**2,017.08**
Potential Emissions Increase Resulting from Phosphoric Acid Train Nos. 3 and 4[(2)]		
423-225	Train No. 3 Crossflow Scrubber	20.0
424-225	Train No. 4 Crossflow Scrubber	30.2
N/A	**Total**	**50.2**
Derivation of PSD Avoidance Limitation for S-3, S-4, and S-7		
N/A	Baseline less Contemporaneous Increases	1,966.88
N/A	PSD SO_2 Significant Emission Rate (SER)	40
S-3, S-4, S-7	Allowable SO_2 Emissions from Modification (Adjusted Baseline + SER)	2,006

(1) Baseline emissions associated with S-3 and S-4 shutdowns are equivalent to past-actual emissions from the plants based on the most representative consecutive 2 years during the contemporaneous period.

(2) Emissions increases associated with PA Train Nos. 3 and 4 are potential emissions increases associated with this modification (Permit No. 04176T28, issued June 2005).

Testing, monitoring, recordkeeping, and reporting requirements have been added to the proposed permit to demonstrate compliance with this PSD avoidance condition.

g <u>15A NCAC 2D .0501(e): Compliance with National Ambient Air Quality Standards [SO_2]</u>

As part of this permit application, NC DAQ required that the applicant submit air dispersion modeling of the modified facility using AERMOD to demonstrate compliance with the SO_2 NAAQS in accordance with 15A NCAC 2D .0501(e). PCS had previously conducted a facility-wide NAAQS compliance demonstration using the ISCST3 air dispersion model. However, effective November 9, 2005, AERMOD is the DAQ-preferred model for most refined modeling applications, replacing ISCST3, and is the primary model used by DAQ to evaluate facility compliance or perform modeling as a part of any DAQ special modeling study.

In the revised NAAQS compliance demonstration, PCS modeled allowable SO_2 emissions from each potential on-site SO_2 emission source. Allowable SO_2 emissions used in the model were based on existing permit limitations. Allowable emissions from the larger SO_2 emission sources are summarized below:

- Sulfuric Acid Plant Nos. 3 though 7 – SO_2 emission rates are based on the NSPS emission limitation (4.0 lbs/ton sulfuric acid produced) and maximum daily throughput capacities (nominal).

- Calciner Nos. 1 through 6 – SO_2 emission rates for the 24-hour and daily standards are based on the existing NAAQS limitation pursuant to 15A NCAC 2D .0501(e) limiting total SO_2 emissions from the six calciners to no greater than 1,026 pounds per day. SO_2 emission rates for the 3-hour standard are based on the existing NAAQS limitation pursuant to 15A NCAC 2D .0501(e) limiting SO_2 emissions each of the six calciners to no greater than 0.75 pounds per million British thermal units (lbs/mmBtu).

- Superphosphoric Acid Plant Nos. 1 though 4 – SO_2 emission rates for Plant Nos. 1 and 2 are based on the existing NAAQS limitation pursuant to 15A NCAC 2D .0501(e) limiting SO_2 emissions from the plants to 30 lbs/day and 50 lbs/day, respectively. Allowable SO_2 emission rates for Plant Nos. 3 and 4 are based on the existing BACT limitation pursuant to 15A NCAC 2D .0530 limiting total SO_2 emissions from the two plants to 400 lbs/day.

- Phosphoric Acid Train Nos. 1 through 4 - Allowable SO_2 emission rates are based on the existing BACT/NAAQS limitations pursuant to 15A NCAC 2D .0530 and 15A NCAC 2D .0501(e) limiting daily SO_2 emissions from the plants.

Off-site SO_2 emission sources were also included in the model, based on inventories supplied by NC DAQ. The air dispersion model was conducted with full terrain features, regulatory defaults, and five years of meteorology (years 2001-2005, on-site surface data coupled with NWS upper air data from Newport). Receptors were placed at a density ensuring that maximum impact concentrations were detected, beginning at the property line. When background concentrations were added, modeled SO_2 impacts reached 91% of the 3-hour NAAQS, 82% of the 24-hour NAAQS, and 60% of the annual NAAQS.

Because allowable SO_2 emission rates were used for all modeled sources, no additional SO_2 emissions limits will be added to the permit to demonstrate compliance with NAAQS pursuant to 15A NCAC 2D .0501(e). In addition, existing limits based on the previously submitted facility-wide NAAQS model using the ISCST3 model will be removed from the permit (Section

2.2.A.1. of Permit No. 04176T34).

BEST AVAILABLE CONTROL TECHNOLOGY

3.0 Nitrogen oxides - NOx

Nitrogen oxides are formed during the combustion of the sulfur at the sulfuric acid plant. A review of the EPA RACT/BACT/LAER Clearinghouse for sulfuric acid plants reveals that there are no add-on controls at any facility.

Three potential control technologies are selective catalytic reduction, selective non-catalytic reduction, and combustion control. Selective and non-selective catalytic reduction occur at elevated temperatures. The predicted outlet temperature for the exhaust gases from a sulfuric acid plant is about 170 °F and they would have to be reheated since optimum temperature for catalytic reduction is from 480 °F to 800 °F and from 1,600 °F to 2,200 °F for non-catalytic reduction. Therefore; these NOx reduction techniques will not be considered further because of the severe energy penalty and resulting NOx increases that may occur for the gas stream reheat. Furthermore, low NOx burners and staged air combustion are not technologically feasible because this is not a conventional combustion process.

In summary, conventional combustion control practices, including low-NOx burners, catalytic/non catalytic NOx reduction, and good combustion practices, are not feasible for a chemical conversion process that is stoichiometrically tuned to the maximum conversion of sulfur-to-sulfur dioxide, and subsequently to sulfur trioxide. BACT has been determined to be no control. The North Carolina State Implementation Plan limits NOx emissions from sulfuric acid manufacturing plants to no greater than 5.8 pounds per ton (lbs/ton) of 100 percent sulfuric acid produced pursuant to 15A NCAC 2D .0519. NC DAQ has determined that lower NOx emission rates are achievable without the use of add-on control. BACT for nitrogen oxide emissions at the Sulfuric Acid Plant No. 7 **(ID No. S-7)** was determined to be 0.6 lbs/ton of 100 percent sulfuric acid produced. This translates to a maximum hourly NOx emission rate of 135 lbs/hr at the maximum production of 5,400 tons/day.

3.1 Sulfuric Acid Mist

A review of the EPA RACT/BACT/LAER Clearinghouse for sulfuric acid mist reveals that there are two BACT determinations below the NSPS limit of 0.15 lb H_2SO_4 mist/ton of 100 percent H_2SO_4 produced including: Cargill Fertilizers (0.12 lb H_2SO_4 mist/ton of 100 percent H_2SO_4 produced) using an impaction mist eliminator, and New Wales Plant in Mulberry (0.1 lb H_2SO_4 mist/ton of 100 percent H_2SO_4 produced) using an impaction mist eliminator.

In a 2004 PSD application for Sulfuric Acid Plant No. 4 at this facility, a limit of 0.075 pounds of sulfuric acid mist per ton of 100 percent sulfuric acid produced was determined to be BACT. This limit is achieved by using a vertical tube mist eliminator, which according to the vendor (Monsanto Enviro-Chem) is the lowest emission level practically achievable. No further analysis is required because the most stringent level of control is proposed.

Vertical tube mist eliminators consist of a number of vertically-oriented annular fiber elements installed in parallel at the top of the absorber. Each element consists of glass fibers packed between two concentric screens made of alloy steels. Mist particles from the gas collect on the surface of the fibers and become a part of the liquid film that wets the fibers. The gas drag causes the liquid film to move horizontally through the fiber beds and then downwards by gravity. The liquid continuously overflows into a seal pot and is returned to the process. Inertial impaction is the mechanism for the collection of large particles (normally greater than 3 microns) and Brownian movement to collect smaller particles. The velocity of the gas passing through the fiber bed is low (20 to 40 feet per second) and provides sufficient residence time for smaller particles to contact the wet fibers, effecting their removal from the gas stream. The vertical tube mist eliminator can be operated at a variable volumetric flow rate with no loss in efficiency because it does not depend only upon impaction for mist removal.

Testing will be required to ensure compliance with the BACT. An annual stack test, using EPA Stack Test Method 8, shall be required to ensure compliance with the BACT standard for sulfuric acid mist.

3.2 Particulate BACT Re-determination

The Indirect Cooling Towers No. 3 and No. 4 at Phosphoric Acid Plant No. 2 **(ID Nos. E1181 and TBDB)** are non-contact forced draft cooling towers that use evaporative cooling across cooling coils. The resulting drift loss of 0.002 percent of the cooling water due to the forced draft was determined to be BACT in the previous PSD application. However, the BACT emission rate of 0.0058 pounds per hour of particulate matter from the dissolved solid in the drift loss was incorrect because the actual dissolved solids are 1500ppmw rather than 120ppmw. The higher actual dissolved solid concentration results in a new BACT emission rate of 0.072 pounds per hour. Previously evaluated options for the operation of drift eliminators, based on the drift loss, for the Purified Acid Plant No. 2 Indirect Cooling Towers No. 3 and No. 4 are 0.0007 percent drift loss (0.0252 pounds per hour of particulate matter) and 0.002 percent drift loss (0.072 pounds per hour of particulate matter).

These control options were evaluated based on information obtained from Jacobs Engineering (designer of the Purified Acid Plant No. 2) and the Ceramic Cooling Tower Corporation for indirect cooling towers. According to the vendor, the minimum drift loss that is technically feasible in a counter flow tower is 0.0007 percent and the annual cost of operation is estimated to be approximately $1,436 per ton. The particulate reduction obtained is estimated to be 0.2 tons per year compared to a drift loss of 0.002

percent, thus resulting in a cost effectiveness of $7,005 per ton of PM controlled. Neither control option has a significant energy or environmental impact. Therefore, based on the high cost to benefit of additional particulate control the 0.0007 percent drift loss is being rejected. BACT is determined to be the use of a drift eliminator with 0.002 percent drift loss.

AMBIENT IMPACT ANALYSES

4.0 Air Quality Control Region

The PCS Phosphate facility is located in Beaufort County approximately seven kilometers north of Aurora, North Carolina along the Pamlico River near New Bern. Aurora is located in the coastal area of North Carolina and the terrain surrounding the site is predominantly flat with elevations changing only a few feet within a few kilometers of the plant site. The facility is located in a rural section of the state based on area classification systems recognized by EPA.

Beaufort County is classified as a Class II area in attainment with the NAAQS for the criteria pollutants PM-10, sulfur dioxide, nitrogen dioxide, carbon monoxide, and ozone. The PSD minor source baseline date for PM-10 and sulfur dioxide were triggered on July 14, 1978 by PCS. The nearest PSD Class I area is the Swanquarter National Wildlife Refuge in North Carolina (32 km east of PCS). The Cape Romain National Refuge in South Carolina is located 340 km southwest of PCS. A Class I area impact analysis is only required for the Swanquarter Class I area.

4.1 Air Quality Impact Analysis NOx

An air dispersion modeling analysis was performed for nitrogen oxides emissions from the proposed plant modifications. PSD regulations (40 CFR 51.166 (k)) require an applicant to perform an air quality ambient impact analysis to show that no NAAQS or PSD Increment will be exceeded in the area where the source has a significant impact. The modeling analysis shows that this facility will not cause or contribute to an exceedence of the NAAQS or PSD increments. Furthermore, per discussion with the Federal Land Manager (FLM), and from this analysis, this facility will have no impact on Air Quality Related Values (AQRVs) for any affected Class I area.

PCS evaluated NOx emissions using the EPA ISCST3 model and used five years of meteorology consisting of on-site surface data and upper air data from the National Weather Service (NWS) surface station at Newport, North Carolina. The processed meteorology was approved in an earlier submission to the Air Quality Analysis Branch. Terrain elevations were included, as were normal regulatory defaults. Receptors were placed beginning at the fence line and extending out over 50 km from the center of the facility in a sufficient density to establish maximum impacts. For this project's significant impact analysis, NOx emission increases were modeled from one source, the new sulfuric acid plant, at 26.98 lb/hr to determine the maximum annual ambient impacts. This emission rate is based on an emission rate of 0.12 lbs/ton of 100% sulfuric acid produced (determined from stack testing), and resulted in an ambient impact of 17% of the significant impact level (SIL) for a Class II area. DAQ is proposing a BACT NOx emission limitation of 0.6 lbs/ton, which would result in a maximum hourly emission rate of 135 lbs/ton. Scaling up the modeled impacts proportionally to the modeled emission rate results in an estimated annual impact of approximately 85% of the SIL for a Class II area. The analysis showed that no significant impact level would be exceeded for NOx, and thus no further modeling is required for NOx. The results are displayed below.

Class II Significant Impact Results (ug/m^3)

Pollutant	Averaging Period[(1)]	Facility Maximum Impact	Class II Significant Impact	% of the Class II SIL
NOx	Annual	0.17	1	17[(2)]

1. High First-High (H1H) modeled impact
2. Estimated impact of 85% of the Class II SIL at 135 lbs/hr: *17% * 135 lbs/hr / 27 lbs/hr = 85%*

4.2 Air Quality Impact Analysis PM-10

Although the projected PM-10 emissions decrease as a result of this project, an increase in the BACT limit for Indirect Cooling Towers No. 3 and No. 4 **(ID Nos. E1181 and TBDB)** at the Purified Acid Plant No. 2 prompted the DAQ to request that PCS conduct a NAAQS and increment analysis to demonstrate continued compliance with applicable PM-10 standards. PSD regulations (40 CFR 51.166 (k)) require an applicant to perform an air quality ambient impact analysis to show that no NAAQS or PSD Increment will be exceeded in the area where the proposed new source will have a significant impact. The modeling analysis shows that this facility will not cause or contribute to an exceedence of the NAAQS or PSD Increments. Furthermore, per discussion with the Federal Land Manager (FLM), and from this analysis, this facility will have no impact on Air Quality Related Values (AQRVs) for any affected Class I area.

The analysis was conducted using ISCST3 with 5 years of surface meteorology from the facility, which was combined with upper air data from Newport, North Carolina. Also included in the modeling were appropriate NAAQS and increment off-site sources. For the NAAQS analysis, appropriate background concentrations (16 ug/m^3 annual, 28 ug/m^3 24-hr) were added to the maximum, modeled impacts that were then compared to applicable NAAQS. As shown below, the Class II NAAQS and increment were protected.

Class II NAAQS and Increment Results (ug/m^3)

Pollutant: PM-10	% of NAAQS	% of Increment
24-hr	90	70
Annual	72	5

4.3 Additional Impact Analyses

PSD regulations [40 CFR 51.166 (o)] and the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Report, requires an applicant to provide information to determine if the proposed source would have an adverse impact on growth, soils, vegetation, regional visibility.

a. Growth Impacts - No change in the workforce population is anticipated with this project. Therefore, no new development in the region will result from this modification and there are not anticipated growth impacts.

b. Soils and Vegetation - The facility is located in the coastal plain of North Carolina, along the Pamlico River. The local geography is flat with a mix of forests, agricultural crops, and herbaceous vegetation. Since the preliminary analysis for NOx showed project impacts to be insignificant, no adverse impact to soils or vegetation is expected.

c. Visibility - The Class II visibility impairment analysis was conducted using the EPA VISCREEN model to determine the furthest distance to which a plume might exceed the standardized perceptibility and contrast values. Their analysis showed a range of 22km. There are no special visibility protected areas within a radius of 22 km, so no further analysis was required.

4.4 Swanquarter National Wildlife Class I Area Impact

PSD regulations [40 CFR 51.166 (p)] and the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Report, requires an applicant to provide information to determine if the proposed source would have an adverse impact on any Federal Class I area AQRVs. Swanquarter National Wildlife Refuge, which is about 32 km east of the site, is the only Class I area reviewed for potential impacts. This was coordinated with the Federal Land Manager.

a. Nitrogen Oxides

The Class I modeling analysis was accomplished to determine if there was a significant impact at Swanquarter National Wildlife Refuge, 32 km to the east of the facility. The modeling was performed in the same manner as the Class II analysis, but receptors were modeled on the full perimeter of Swanquarter NWR. The analysis, performed with ISCST3, showed this facility will not exceed the Class I significant impact level for NOx, thus no further modeling was required. The results are displayed below.

Class I Significant Impact Results (ug/m^3)

Pollutant	Averaging Period[1]	Facility maximum Impact	Class I Significant Impact	% of the Class I SIL
NOx	Annual	0.0103	0.1 to 0.08	10 to 12

1. High First-High (H1H) modeled impact

b. PM-10

PCS performed Class I Increment modeling of corrected PM-10 emissions for impacts at the Swanquarter NWR. The modeling was basically the same as for the PM-10 Class II Increment, but used a receptor array around the perimeter of Swanquarter NWR. Impacts reached 84% of the Class I Increment (using EPA Class I values) for the 24-hour period and 6% percent for the annual period.

c. Air Quality Related Value (AQRV) Regional Haze Impact Analysis

Per discussion with the Federal Land Manager, no regional haze modeling was required for this

project. However a visibility analysis was performed for Swanquarter using VISCREEN with a level 2 approach, utilizing a review of meteorological conditions for the site rather than the default worst-case conditions. With this refinement, the perceptibility and contrast values were far below maximum standards.

Based on the ambient impact analysis, this PCS project will not cause or contribute to any violation of the NAAQS, PSD increment standards, or any Class I area air quality related value.

APPENDIX A
DRAFT PERMIT

APPENDIX B
PUBLIC NOTICE