KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
352/377-5822 ▪ FAX/377-7158

KA 690-05-01
September 29, 2005

Via Hand Delivery

Mr. Al Linero
FDEP
Twin Towers Office Bldg
2600 Blair Stone Rd
Tallahassee, FL 32399-2400

RE: American Cement Company
Sumter County, Florida
Application for Air Construction Permit

Dear Al,

As we've discussed with you on various occasions, the attached permit application is being submitted on behalf of Natural Resources of Central Florida, doing business as the American Cement Company, for a 1,000,000 ton per year (cement) Portland cement plant to be located in Sumter County, Florida. Six copies of the application are provided for your review.

The proposed plant will be located on the north side of State Route 470 in Sumter County, approximately four miles east of Interstate 75 and approximately six miles west of the Florida Turnpike. The plant is located on an approximate 1200 acre site which will provide the majority of the raw materials for the production of cement. The plant will be of the preheater/precalciner design with the designer/supplier yet to be determined. The preliminary engineering for the plant that was necessary to support the air construction permit application was provided by the Krupp Polysius Corporation.

The application package consists of a report in support of the permit application and a permit application on FDEP Form No. 62-210.900(1), effective 06/16/03. An electronic copy of the project report and permit application will be provided under separate cover to facilitate your review. The project report includes a description of the proposed plant, the identification of the emission points of regulated air pollutants, an air quality impact analysis, a review of Best Available Control Technology and the other requirements of Rule 62-212.400, F.A.C. Included in each application package is an electronic copy of all of the data used for the air quality impact analyses.

Also attached is a check in the amount of $7500.00 to cover the fee for the permit application and a letter authorizing Cary Cohrs to be the Responsible Official for the project. Mr. Cohrs is the General Manager of the American Cement Company.

As this application is hand delivered, we will review the project with you at the time of delivery. If you have additional questions or comments as your review proceeds, please do not hesitate to contact Cary Cohrs at 352-629-0666 or ccohrs@direcway.com and/or me at 352-377-5822 or jkoogler@kooglerassociates.com. We look forward to working with you on this project.

Very truly yours,

KOOGLER & ASSOCIATES, INC.

John B. Koogler, Ph.D., P.E.

JBK/lt

Enclosure

cc: Ms. Trina Vielhauer
Mr. Cary Cohrs

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
352/377-5822 ▪ FAX/377-7158

KA 690-05-01
October 10, 2005

Via Email and USPS

RECEIVED
OCT 13 2005
BUREAU OF AIR REGULATION

Mr. Al Linero, Program Adminstrator
FDEP
Twin Towers Office Bldg
2600 Blair Stone Rd
Tallahassee, FL 32399-2400

RE: American Cement Company
Sumter County, Florida
Supplemental Information in Support for an Air Construction Permit Application

Dear Al,

During our September 30, 2005 meeting, during which the application for an air construction permit for the American Cement Company was submitted, various issues were discussed that might require information in addition to that provided in the application, or a clarification of information provided in the application. Attached is this additional information. In our opinion, none of the information is substantive enough to require a resetting of the permit review time clock.

We appreciated meeting with you, Cindy Mulkey and Debbie Nelson to discuss our application and appreciate the preliminary comments that you and the other provided.

We will stay in touch during the 30-day review period and will provide additional information as needed. If there are questions regarding the attached or if other questions come up during the review, please do not hesitate to contact either Cary Cohrs or me.

Very truly yours,

KOOGLER & ASSOCIATES, INC.

John B. Koogler, Ph.D., P.E.

JBK/lt

Enclosure

cc: Ms. Cindy Mulkey
Ms. Debbie Nelson
Mr. Cary Cohrs

STATEMENT OF INFORMATION

Shipment/Receipt of Off-Site Materials

No rail access is available to the site. The closest rail spur is approximately 10 miles away. All materials procured off-site and delivered to the plant will be delivered by truck. Most of the trucks providing raw material deliveries will be associated with back-hauls from the base rock (limestone) operations in the area. Therefore, only minimal additional truck traffic is added to the roadways for deliveries to the site.

The cement produced by the plant will be transported from the site by enclosed tanker trucks and on trucks hauling palleted bagged cement. The balance of the traffic at the plant will be employee automobiles and miscellaneous deliveries necessary to support plant operations.

All of this traffic has been included in the air quality impact analysis prepared and submitted with the permit application. The fugitive particulate matter emission factor for roadways used to assess PM10 impacts of the plant and its operation was developed at a similar operating cement plant and has been previously reported to the Department. Dust loading on the plant roadways will be controlled to assure the fugitive particulate matter factor is representative by paving plant roads and controlling the surface dust loading on the roadways by the daily vacuum sweeping. The vacuum sweeper will operate daily except during days with measurable rainfall.

Fuel Firing

The fuels that will be fired to the kiln and calciner will include coal, petroleum coke, tires, natural gas and No. 2 fuel oil. The natural gas and No. 2 fuel oil will be primarily used as start up fuels and fuels for the auxiliary dryer associated with the raw mill. High-carbon flyash will not be used as a fuel ~~or raw material.~~ won't be injected into calciner or combustion chamber. → see letter Dated 10/14/05 NPCF/ACC

Coal and petroleum coke will be fired in both the kiln and the calciner. The ratio of coal to petroleum coke (pet coke) will be dependent upon process conditions such as material

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build up, the alkali content of the feed, the heating value of the fuel, and other such factors. It is not expected that pet coke will exceed 25-30 percent of pet coke/coal fuel mix.

As the alkali content of the feed will be one of the factors controlling the pet coke/coal ratio, American Cement does not anticipate adding additional alkaline materials to maintain an acceptable alkali/sulfur ratio.

The fuel split between the kiln burner and the calciner burner will vary depending on fuel and feed characteristics and operating parameters such as refractory. The typical starting point for the fuel split is 50/50. This will ultimately change with the aforementioned factors; hence, a precise fuel ratio cannot be stated and, for that matter, a precise ratio will never exist because of the changing characteristics of the feed, fuel, and refractory. Regarding the effects of this fuel split on regulated pollutant emission rates, the following comments are provided.

Particulate matter emissions from the kiln/raw mill are independent of fuels and heat input ratio. The majority of the particulate matter leaving the preheater and eventually entering the kiln particulate matter control device (a baghouse) will be a mixture of raw meal and partially to fully calcined meal. It is estimated that approximately 7-10 percent of the preheater feed is carried back toward the kiln/raw mill baghouse. It is this particulate matter, not particulate matter associated with fuel combustion that will affect particulate matter emissions from the plant.

Sulfur dioxide generated during fuel combustion will be adsorbed in the kiln, calciner, and the lower sections of the preheater. It has been reported that virtually none of the SO_2 emitted from a modern preheater/precalciner cement plant in Florida results from fuel sulfur. SO_2 emissions, if they do occur from Florida plants are associated with sulfur in feed materials. Analytical data from CTL (a wholly owned subsidiary of the Portland Cement Association) provided with the permit application by American Cement demonstrates no pyritic sulfur or organic sulfur in the on-site raw materials. Raw materials procured off-site will be managed such that there will be no organic or pyritic sulfur in these materials. And, as previously stated, American Cement will control the alkali/sulfur balance in the plant to assure that this ratio is maintained in an acceptable range for both plant operations and to assure no SO2 from fuel sulfur is released. Hence SO_2 emissions will be independent of the fuel split.

Nitrogen oxides emissions will be affected by burner design, plant design, and plant operations. As stated in the permit application, American Cement has not selected a designer/supplier for the proposed plant, nor has the company selected specific burners. The Department can be assured that the kiln burner will be a low-NOx burner of the Pillard, Greco, or equivalent design. Information regarding the Pillard and Greco burners was provided to the Department at the time the permit application was submitted. The burner in the calciner will be a burner provided by the plant designer/supplier to be compatible with calciner design and expected plant operations.

Regarding plant design, the design will incorporate multistage combustion (MSC) capability. The MSC will be able to function with either fuel staging or combustion air staging, and there will be flexibility meal splitting.

The plant operations that most affect NOx emissions include the amount of excess air fired at the kiln burner, the degree to which multistage combustion is employed and various factors associated with meal splitting. In addition to these operating factors, American Cement will employ SNCR for NOx control. As a result of SNCR, NOx emissions will be independent of the fuel firing ratio.

As discussed in the permit application, VOC emissions from the plant will be a function of the organic component of the feed materials and CO emissions, in large part, will be a function of organic carbon in the raw meal. As stated in the application, material management will be used to assure the CO and VOC emissions resulting from the feed materials are maintained in an acceptable range.

p-coke?

A fraction of CO emissions will be associated with fuel firing, but this will be controlled by plant design and plant operation as described in the permit application. Although a designer/supplier has not been selected for the plant, it is expected that the residence time in the calciner will be in the range 5-7 seconds; adequate time to provide for fuel and CO burnout (also, see below – **Calciner Design/Residence Time**). The pet coke/coal firing ratio in the calciner will also be controlled to assure that there is proper fuel burnout in the calciner and that CO emissions from fuel combustion are minimized.

During startup of the plant, fuel consumption will be greater than during steady state operation because heat is not recovered for combustion air. Emissions may likewise be affected as the kiln system is heated and raw materials are initially introduced into the preheater. Data from operating cement plants in Florida have demonstrated that mass emission limits are typically not exceeded during plant startup. Again, with reasonable averaging times for permitted emission limits, startups are not expected to cause compliance problems. During plant shutdowns, excess emissions are not expected as preheater feed is stopped and the fuel supplies to the kiln and calciner are cut off at approximately the same time.

As a side note, American Cement stated in their permit application that it does not intend to fire high-carbon flyash into the calciner or into the kiln as a fuel. Thus, potential operating problems and effects on emissions associated with the firing of this material will not occur at the American Cement plant.

Regarding the use of tires as a supplemental fuel, the tires (when used) will be fired through a double air-lock feed onto the feed shelf of the kiln. Tires are expected to provide up to 10-12 percent of the total pyroprocessing heat input. Data from operating plants in Florida have shown that the use of tires as a fuel has virtually no effect on emissions from the kiln system.

Calciner Design/Residence Time

As stated in the permit application, American Cement has not selected a supplier/designer for the proposed plant. Because of this, the residence time in the calciner cannot be specified, and likewise, dimension/volume information cannot be provided. If required by the Department, this information can be provided prior to the beginning of plant construction.

Regarding the residence time in the calciner, it can be stated that if an F.L. Smidth (FLS) plant is selected with the in-line calciner design, the residence time in the calciner will be in the order of seven seconds. On the other hand, if a Polysius plant with a separate calciner is selected, the calciner residence time will be in the order of five seconds.

The permit application submitted by American Cement includes a description of the FLS and Polysius designs and the factors driving these designs. The factors include both the necessity to provide a residence time for the burn-out of hard-to-burn fuels such as pet coke and for the burn-out of CO. It is doubtful that information exists that can provide insight into the relationship between the amount of combustion CO entering the preheater and the combustion of various fuels or fuel mixes.

For example, the Department has cited the Titan Plant in Dade County and the reported CO emission rates in the range of 0.5-1.0 pounds per ton of clinker. It was pointed out in the American Cement permit application that these emission levels are achieved in an FLS plant designed to burn pet coke when:

- the plant was operating at approximately 82 percent capacity,
- bituminous coal (a readily burnable fuel) was fired to the calciner (not pet coke), and
- bauxite was used in the raw feed as an alumina source.

Providing levels of combustion CO entering the preheater as a function of calciner residence time and a function of coal/pet coke/tire firing ratios in the calciner for a plant like the Titan plant, or any other plant, is probably not possible with information currently available.

Collected Particulate Matter

The proposed American Cement Plant will have a single baghouse controlling particulate matter emissions from the kiln/raw mill and clinker cooler and approximately 20 additional baghouses controlling particulate matter emissions from other processing material handling points. Particulate matter collected in all of these baghouses will be returned to the system. There will not be any waste dust streams.

Regarding the intergrinding of dust collected in the kiln/raw mill/cooler baghouse during periods of time when the raw mill is not operating with clinker and additives in the finish mill, has been discussed with the Department. There is a potential for such a practice to reduce mercury emissions from the plant. American Cement has discussed this matter with the Department and has provided the Department with information that American Cement believes is outside of the scope of the permit application. Based upon the information provided by American Cement, the major obstacles that must be overcome before the intergrinding can occur are matters related to cement specifications and the operational difficulties of blending and grinding two materials with extremely different bulk densities.

Regarding the reduction of mercury emissions, one of the factors that has been pretty much ignored during Florida cement plant permitting thus far is the mercury contained in clinker. The assumption made thus far is that negligible amount of mercury exit the kiln with clinker. In other words, the assumption is that all of the mercury that enters the plant in feed and fuels is released to the atmosphere, and none leaves with the product.

In a paper presented by Grossman* it is reported that the mercury concentration of clinker can be as high as 0.02-0.04 milligrams per kilogram. For a plant producing one million tons a year of clinker, 40 or more pounds of mercury per year could be tied up in the clinker and eventually in the finished cement.

Fuel Storage Tanks

40 CFR 60, Subpart Kb applies to storage tanks that are 75 cubic meters (approximately

* Grossman, *A Comparison of Normal and Worst Case Cement Plant Emissions*, a paper presented at AWMA International Specialty Conference on Waste Combustion on Boilers and Industrial Furnaces, March 1996.

19,800 gallons) or larger and are used to store volatile organic liquids. The largest fuel oil storage tank anticipated at the American Cement Plant site will be approximately 10,000 gallons in capacity.

Growth Related Impacts

Growth related impacts were addressed in the permit application submitted to the Department on September 30, 2005. As suggested by the Department, this section has been expanded and a revised Section 5.2 of the report supporting the permit application is included as Attachment 1 hereto.

Compatibility of Plant Design and Materials Mined On-Site

During the meeting between American Cement and the Department on September 30, 2005, an opinion letter from Fred W. Cohrs was provided to the Department. This letter stated Mr. Cohrs' opinion regarding the emission control technology proposed by American Cement, the technologies offered by various plant designers/suppliers, the probability of constructing a plant achieving the proposed production capacity and emission limits and, the compatibility of the raw materials mined at the American Cement site with current cement plant technology. Mr. Cohrs concluded that the cement plant technology is available, the control technology as proposed by American Cement is reasonable and that a plant of the capacity proposed by American Cement could operate without difficulty given the on-site raw materials and current cement plant technology. A copy of Mr. Cohrs letter is provided again as Attachment 2.

Plant Manager/Operator Experience

The manager of the proposed American Cement Plant will be Cary Cohrs. A copy of Mr. Cohrs' resume is provided in Attachment 3.

Also included in Attachment 3 is a policy statement by Mr. Cohrs outlining the staffing of the remaining positions at the plant. As stated in the original permit application, the plant will have approximately 80 employees. It is anticipated that a limited number of these positions will be filled by experienced people relocated to the site. These will include the plant manager, the production manager, and the chief chemist. The majority of the remaining employees will be from the regional work force.

Past Violations

As American Cement (Natural Resources of Central Florida, Incorporated, d/b/a American Cement Company) has just been incorporated, the plant has no previous operating record and thus, no past violations. Companies that share some degree of common ownership with American Cement include Trap Rock Industries, Inc. with several operations in New Jersey and Dixie Lime and Stone with operations in Florida.

The New Jersey Department of Environmental Protection, Bureau of Compliance and Enforcement public records were reviewed on that department's website. Attachment 4 provides the enforcement record of nine Trap Rock operations in New Jersey for the period 1995-October 2005. Only one of the facilities (the Kingston Quarry) had any unresolved enforcement actions as of October 5, 2005. These enforcement actions were for minor alleged water quality monitoring violations.

In Florida, the Dixie Lime and Stone mine in Sumter County also has an unresolved water quality monitoring citation issued by the Florida Department of Environmental Protection. This violation is related to a discharge of water from a limerock mining operation during a period of excessive rainfall. It is anticipated that this citation will be resolved shortly.

To the best of our knowledge, the compliance records reported herein accurately represent compliance action against companies sharing some degree of common ownership with the American Cement Company.

Attachment 1

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5.2 Growth Related Impacts on Air Quality (revised 10/06/05)

The permit application submitted to the Department on September 30, 2005 included a section on *Growth Related Impacts*. This addendum is provided at the suggestion of the Department and incorporates growth related information for both Sumter County and Lake County. This addendum is provided even though the proposed project will not have a significant impact on sulfur dioxide, nitrogen oxides, or carbon monoxide levels in the ambient air at any point and will have a significant impact on particulate matter (PM10) levels only within three kilometers of the plant site. The three kilometer radius of significant impact for PM10 falls entirely within Sumter County.

The area in which the plant is located is in the northern part of Sumter County on the north side of State Road 470. The plant site is approximately four miles west of the Sumter/Lake County line and approximately four miles east of Interstate 75. The area in which the plant is located is rural and land use activities are primarily agricultural and limerock mining. There are a few scattered residences in the area and immediately east of the plant site is the Coleman Federal Correction Facility.

In the following sections, the growths in both Sumter County and Lake County are documented. Sumter County is still a rural county, with a 2004 population of 60,705. The majority of the population increase in the county has been in the far northern section of the county in the Villages; a planned development. A significant part of the growth of Lake County is in this same development which extends from Sumter County across into the northern part of Lake County. The other major growth area of Lake County is along the US 441 corridor between Leesburg and Apopka.

5.2.1 Population & Housing

The population of Sumter County increased from 24,272 in 1980, to 60,705 in 2004; an increase of 150% over the 24-year period. The population of Sumter County was 0.2% of the population of Florida in 1980, and this percentage slightly increased to 0.3% of Florida's population in 2004. The population ranking versus other counties slightly changed from 41st in 1980 to 40th in 2004, of 67 counties. Total housing units increased from 11,083 in 1980 (0.3% of statewide total), to 28,956 in 2002 (0.4% of statewide total).

The population of Lake County increased from 104,870 in 1980, to 260,788 in 2004; an increase of 148% over the 24-year period. The population of Lake County was 1.1% of the population of Florida in 1980, and this percentage increased to 1.5% of Florida's population in 2004. The population ranking versus other counties slightly changed from 21st in 1980 to 19th in 2004, of 67 counties. Total housing units increased from 50,511 in 1980 (1.2% of statewide total), to 112,535 in 2002 (1.5% of statewide total).

5.2.2 Manufacturing

The number of manufacturing establishments in Sumter County increased from 11 in 1977, to 26 in 2003; an increase of 136% over the 26-year period. The manufacturing establishments in Sumter County were 0.1% of the total manufacturing establishments in Florida in 1977, and this percentage slightly increased to 0.2% in 2003. The ranking versus other counties changed from 64th to 43rd of 67 counties.

The number of manufacturing establishments in Lake County increased from 105 in 1977, to 162 in 2003; an increase of 54% over the 26-year period. The manufacturing establishments in Lake County were 0.8% of the total manufacturing establishments in Florida in 1977, and this percentage increased to 1.1% in 2003. The ranking versus other counties changed slightly from 18th to 19th of 67 counties.

5.2.3 Retail

The number of retail establishments in Sumter County decreased from 192 in 1977, to 130 in 2003; a decrease of 32% over the 26-year period. The retail establishments in Sumter County were 0.2% of the total retail establishments in Florida in 1977, and this percentage was unchanged at 0.2% in 2003. The ranking versus other counties changed slightly from 45th to 46th of 67 counties.

The number of retail establishments in Lake County decreased from 993 in 1977, to 869 in 2003; a decrease of 12% over the 26-year period. The retail establishments in Lake County were 1.2% of the total retail establishments in Florida in 1977, and this percentage was unchanged at 1.2% in 2003. The ranking versus other counties changed slightly from 21st to 22nd of 67 counties.

5.2.4 Wholesale

The number of wholesale establishments in Sumter County increased slightly from 23 in 1977, to 27 in 2003; an increase of 17% over the 26-year period. The wholesale establishments in Sumter County were 0.1% of the total wholesale establishments in Florida in 1977, and this percentage was unchanged at 0.1% in 2003. The ranking versus other counties changed from 47th to 44th of 67 counties.

The number of wholesale establishments in Lake County increased from 121 in 1977, to 253 in 2003; an increase of 109% over the 26-year period. The wholesale establishments in Lake County were 0.8% of the total wholesale establishments in Florida in 1977, and this percentage was unchanged at 0.8% in 2003. The ranking versus other counties was unchanged from 20th of 67 counties.

5.2.5 Agriculture

The number of farms in Sumter County increased from 646 in 1978, to 902 in 2002; an increase of 40% over the 24-year period. The farms in Sumter County were 1.8% of the total farms in Florida in 1978, and this percentage was slightly increased at 2.0% in 2002. The ranking versus other counties changed from 17th to 15th of 67 counties. Land acreage in farms was 187,003 acres in 1978 (1.4% of state-wide total), and was essentially unchanged at 187,373 acres in 2002 (1.8% of state-wide total).

The number of farms in Lake County increased from 1,678 in 1978, to 1798 in 2002; an increase of 7% over the 24-year period. The farms in Lake County were 4.6% of the total farms in Florida in 1978, and this percentage was decreased at 4.1% in 2002. The ranking versus other counties changed from 3rd to 5th of 67 counties. Land acreage in farms was 314,816 acres in 1978 (2.4% of state-wide total), and was decreased at 180,245 acres in 2002 (1.7% of state-wide total).

5.2.6 Growth Related Impact of the Project

The construction of the proposed plant will require 18-24 months. During this period, the construction personnel will peak at approximately 300. The majority of this work force will be drawn from the regional work force or will be brought on site by the contractor or subcontractors on a temporary basis. There will be no permanent or long-term impact on growth related activities associated with construction personnel.

Once the proposed facility becomes operational, it will employ approximately 80-100 people. The majority of these people will be drawn from the regional work force; with only a limited number of individuals with special skills relocating into the area.

Ancillary growth associated with the proposed plant will not be significant.

5.2.7 Air Quality Impacts Associated with Growth

The major growth factors in the two-county area that will impact air quality is the increased population and the associated air pollutant emissions associated with general anthropogenic activities and air pollutant emissions from manufacturing and/or commercial facilities. In general, the growth of commercial and manufacturing facilities in the two-county area has been quite limited as described in preceding sections. Facilities with significant air pollutant emissions are regulated by FDEP permits. As a result of this, the impacts of emissions from these facilities have been taken into consideration in the air quality impact analysis associated with this project.

The population increase in the two-county area during the period 1977-2005 has been approximately 150%. This growth translates to an increase in vehicle traffic and vehicle-miles-traveled (VMT). It is estimated that the increase in VMT is approximately proportional to the increase in population. As a result of this increase in VMT, and the contemporaneous reduction in emissions from motor vehicles as a result of fuel economy and more efficient combustion, carbon monoxide and VOC emissions related to mobile sources in the two-county region have decreased 35-45 percent. During this same period, there has been approximately a 10 percent increase in NOx emissions from mobile sources.

Ambient air quality monitoring has not been conducted in the two-county area until 1997 for PM10 and 2004 ozone. As a result, long-term trends of ambient air pollutant levels are not available. It can be presumed, however, that as ambient air quality monitoring was not conducted there has been no concern about the possibility of air quality standards being exceeded or even approached in the region. The overall quality of the air is reflected by the attainment status of both counties during the period 1977-2005.

The minor growth related impacts on air quality coupled with the fact that the proposed project will not have a significant impact on sulfur dioxide, nitrogen oxide and carbon monoxide levels provide assurance that compliance with air quality standards for these three pollutants in the two-country area will continue to be achieved. Likewise, for particulate matter (PM10), the moderate growth in the two-county area and the minimal growth in the area immediately surrounding the proposed plant coupled with the projected impact of the proposed plant, provide assurance that the growth related impacts of PM10 will not cause the air quality standard for PM10 to be exceeded.

Attachment 2

Cohrs Opinion Letter
September 29, 2005

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

Cohrs Consulting, LLC
598 Queen's Harbor Boulevard
Jacksonville, FL 32225
Tel: 904-221-6188/e-mail: cohrsfw@aol.com

September 29, 2005

Florida Department of Environmental Protection
Division of Air Resource Management
2600 Blair Stone Road MS 5500
Tallahassee, Florida 32399-2400

Re: American Cement Company/Air Construction Permit Application

Dear Sir/Madam:

In support of the permit application submitted by American Cement Company (ACC) to construct a Portland cement manufacturing facility in Sumter County, Florida I am offering my professional opinion on the viability of the emission control technology proposed by the applicant with respect to its meeting the emission limits contained in the application.

ACC and I have reviewed representations made by various suppliers of cement process equipment to determine the state of the art in the industry, examined recently issued permits for similar plants, both by FDEP and authorities of other U.S. states and have concluded that BACT can be achieved with any of the methods discussed in the application.

Based on my experience with a great number of raw materials used to manufacture Portland cement, particularly materials available and commonly used in Florida for this purpose, as well as the process designs offered by recognized technology and equipment suppliers under consideration by American Cement Company for the proposed Cohrs Consulting, LLC plant, I am confident that FDEP can be assured of ACC's ability to comply with the proposed permit limits.

Respectfully,

Fred W. Cohrs

Fred W. Cohrs
Cohrs Consulting, LLC

Attachment 3

Plant Manager and Operator Experience Statement

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

Curriculum Vitae

Cary O. Cohrs

4909 SW 95th Terrace
Gainesville, Florida 32608

Phone: (352) 371-1232
Cohrs5@ aol.com

SUMMARY OF QUALIFICATIONS

- An individual with a proven track record in managing profitable operations.
- Experienced at leading a team to establish and grow a Greenfield Cement Manufacturing Facility.
- Goal oriented, dedicated and committed leader who focuses on maximizing the potentials of individuals and assets to meet objectives.
- An excellent communicator with a strong technical background in all facets of cement manufacturing and chemical limestone production.

PROFESSIONAL EXPERIENCE

AMERICAN CEMENT COMPANY — Ocala, Florida

General Manager — 2005

Responsible for the development of a newly established Cement Company in Florida, including all facets related the construction of a Greenfield Plant. Duties include plant design, raw material analysis, permitting, financial justification, market development and personal issues.

COHRS CONSULTING, LLC — Jacksonville, Florida

Principle — 2004-2005

Consulting services related to the development of a Greenfield Cement Plant in North Carolina. Duties included site selection, raw materials evaluation, mix design and plant design. Additional projects included an aggregate rail terminal study, kiln operation evaluation and quarry assessment.

FLORIDA ROCK INDUSTRIES, INC. — Newberry, Florida

Vice President Operations/Plant Manager, Cement Group — 2000-2003

Operating and P&L responsibility for an 860,000 TPY cement manufacturing facility and two calcium carbonate grinding plants. Directly managed 12 professionals and was responsible for 130 employees.

- Facilitated the development and presented the annual operating budget.
- Created an environment for continued operational efficiencies and improvements.
- Established a team for oversight on personnel issues.
- Directly involved with environmental and legal issues as necessary.
- Plant production increased from a rated 750,000 TPY to new permitted level of 860,000 TPY.

PROFESSIONAL EXPERIENCE (continued)

Plant Manager 1998-2000

Operating responsibility for a 750,000 TPY, preheater precalciner cement plant. Involved in the hiring and training of over 90 persons in the process of completing construction and commissioning of a Greenfield plant.

- Established a team to develop operating and information reporting procedures for plant.
- Coordinated and assisted in the implementation of a plant personnel training program, preventative maintenance program and community outreach program.
- Lead a team of highly motivated mangers to successfully commission and operate a Greenfield plant.
- Temporarily filled roles as Production Manager, Quality Control Manager, E&I Manager and Environmental Manager and implemented a 1.4 mm ton per year mining plan.
- Was responsible for purchasing of off site raw materials used in operations.

Assistant Plant Manager/Construction Manager 1996-1998

Plant site manager for the construction of a Greenfield cement plant. Was actively involved in the planning and building of the facility. Participated in legal issues and permitting of the facility. Was company's representative and actively involved in the coordination between the equipment supplier, general contractor and subcontractors. Participated in the negotiation of purchasing over $16 mm in plant machinery, auxiliary equipment and sub contracts.

ESSROC MATERIALS, INC. Bath, Pennsylvania

Corporate Project Manager 1994-1996

Participated in the development and was responsible for the installation and commissioning of capital projects in six cement plants and two grinding plants

CAROLINAS CEMENT COMPANY, LLC. Roanoke, Virgina

Plant Engineer 1991-1994

CLAUDIUS PETERS, INC Dallas, Texas

Applications Engineer 1989-1991

Professional Affiliations

Portland Cement Association, Manufacturing Technical Committee

Member IEEE National Committee, Local Chairman for the 2003 IEEE/PCA

Education

THE FLORIDA STATE UNIVERSITY Tallahassee, Florida
Bachelor of Science – Industrial Engineering 1989

THE FLORIDA STATE UNIVERSITY Tallahassee, Florida
Bachelor of Science – Business 1986

Greenfield Cement Plant/Staffing

Cement plant employees for a Greenfield facility are generally inexperienced when it comes to detailed knowledge of plant operations. Many factors play into this; 1) Efforts made to provide jobs to local residents, 2) Cost of relocation of experienced personnel and 3) Management's ability to develop personnel to function within a new system and with methods.

A few key positions, requiring experience in the process are typically filled from industry personnel. These, however, can be limited to the Plant Manager, Production Manager and Chief Chemist. In these roles, knowledge of plant operations, functioning of the equipment and the natural progression of the process is required to assist in training those with limited or no experience.

These key personnel typically come from various backgrounds, i.e. mechanical maintenance, process engineer, environmental compliance, project management, plant engineering etc. Their success in these respective roles is the ability to lead people, exhibit good mental skills, react to changing conditions and above all, the desire to succeed. This desire is what allows people to work thru problems and complications despite the time required or time of day issues. Higher level education is not necessary, but helpful as the training assists in deductive reasoning. There is no set number of years of experience required, rather the confidence that a, "get it done" attitude exists.

The plant has many positions all requiring different basic skill sets. Maintenance Technicians, QC Technicians, Shipping Clerks, Equipment Operators, Process Attendants, Electricians and Control Room Operators to name a few. Each position has some unique skill that is helpful in the person's performance, although not always necessary. For example, maintenance technicians should have some basic welding skills, but if that is missing then a good mechanical aptitude will be just as beneficial. Shipping Clerks need to be attentive to detail, like interacting with the public, but could also spend their time in the bagging operation where neither skill is required.

Control Room Operators must have the ability to stay focused on the plant control interface, have a certain amount of curiosity and exhibit good deductive reasoning. However previous control room experience at times can be detrimental, as those things previously learned could be problematic in a new or different operation. Many commissioning engineers prefer to train operators with no previous experience, as all new things learned are first and foremost.

The backgrounds, training and experience of new personnel is not always applicable from location to location, rather the method by which people interact, the effort put forth and the desire to learn will make for a better employee.

The few key positions that require knowledge of the process can be filled with people who have varying backgrounds and experiences. But in the end, desire makes the for success. The remaining positions will be filled with people who are conscientious, motivated and have a willingness to learn.

Attachment 4

Compliance Record of Trap Rock Industries, Inc.

Operations in New Jersey

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF COMPLIANCE AND ENFORCEMENT
OPEN PUBLIC RECORDS ACT (OPRA)
October 5, 2005

SITE NAME	ADDRESS	REPORTS
TRAP ROCK INDUSTRIES	9525 RIVER RD , Camden, Pennsauken Twp, 081100000	No Enforcement Action 7/1995-10/2005
TRAP ROCK INDUSTRIES INC	79 UPPER SAREPTA RD , Warren, White Twp, 07823	No Enforcement Action 7/1995-10/2005
TRAP ROCK INDUSTRIES INC	1949 JACKSONVILLE JOBSTOWN RD , Burlington, Springfield Twp, 08041	No Unresolved Enforcement Issues No Enforcement Action Since 2001
TRAP ROCK INDUSTRIES INC	RIVER RD , Somerset, Franklin Twp, 08528	No Enforcement Action 7/1995-10/2005
TRAP ROCK INDUSTRIES INC	RT 29 , Hunterdon, Delaware Twp, 07833	No Enforcement Action 7/1995-10/2005
TRAP ROCK INDUSTRIES INC KINGSTON QUARRY	130 LAUREL AVE , Somerset, Franklin Twp, 08528	See Attached; Minor Water Quality Monitoring Issues for Quarry Pending
TRAP ROCK INDUSTRIES MOORES STATION QUARRY	RT 29 & PLEASANT VALLEY RD , Mercer, Hopewell Twp, 085600000	No Enforcement Action 7/1995-10/2005
TRAP ROCK INDUSTRIES PENNINGTON PLNT	RT 31 , Mercer, Hopewell Twp, 08528	No Enforcement Action 7/1995-10/2005
TRAP ROCK INDUSTRIES RUNNEMEDE PLANT	1201 BLACKHORSE PK , Camden, Runnemede Boro, 08078	No Enforcement Action 7/1995-10/2005

Enforcement Actions Issued At The TRAP ROCK INDUSTRIES INC KINGSTON QUARRY - Site ID: 15929 Between 7/4/1995 and 10/4/2005

Oct 04, 2005 03:29

NOTE: The information contained in this report will be limited to the date each program began using the Department's integrated database, NJEMS. The programs began using the system for this information as follows: Air - 10/1998; Hazardous Waste - 1/2000; Water - 7/2000; Right To Know - 11/2000; TCPA - 12/2001; Land Use 12/2001; DPCC - 1/2002; Solid Waste - 1/2002 and Pesticides - 4/2002. For complete information prior to these dates, please submit an official OPRA request form to the Department. If printing this report, select landscape orientation. For a list of terms and definitions, click on the following link:http://www.state.nj.us/dep/infoview/enforcement.html

Disclaimer: All listed enforcement actions address alleged violations based on facts and information known to the Department at the time the violation information was determined. Errors or omissions in the factual basis for any violation may result in a future change in classification as a violation when such information becomes known. Persons cited for violations may contest the Department's enforcement action or penalty assessment. The resultant final decision may uphold, negate or modify the original violation findings or penalty.

Program Description:	**Air**	Program Interest ID:	**35021**
Program Interest Name:	**TRAP ROCK INDUSTRIES INC**		
Activity Number:	**NEA 030001**	Document Type:	**Settlement Agreement**

Effective Start Date	Current Document	Penalty	Received Amount	Related Activities

	Status and Date	Assessed		
2/5/04	Closed 3/2/04	$375.00	$375.00	Supersedes: 35021 - PEA 030001

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
You failed to submit the test report to the Department within 30 days after the completion of the sampling, unless a longer period for submission is approved in writing by the Department. The test was conducted July 26, 2002. The test results submitted September 19, 2003.	[N.J.A.C. 7:27- 8.13(d)4]	Satisfied	Inspection	Violations

Activity Number: PEA 030001 **Document Type:** AONOCAPA

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
11/10/03	Superseded 3/2/04	$500.00	Cancelled	Superseded By: 35021 - NEA 030001

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
You failed to submit the test report to the Department within 30 days after the completion of the sampling, unless a longer period for submission is approved in writing by the Department. The test was conducted July 26, 2002. The test results submitted September 19, 2003.	[N.J.A.C. 7:27- 8.13(d)4]	Satisfied	Inspection	Violations

Program Description: Water Quality **Program Interest ID:** 46995

Program Interest Name: KINGSTON QUARRY

Activity Number: PEA 010001 **Document Type:** NOV

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
7/3/01	Superseded 7/21/03	N/A	N/A	No Related Activities

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations

Failure to maintain a current O&M Manual which includes an emergency plan	[N.J.A.C. 7:14A- 6.12(c & d)]	No Further Action	Inspection	Violations
Failure to maintain a current O&M Manual which includes an Emergency Plan	[N.J.A.C. 7:14A- 6.12(c)&(d)]	No Further Action	Inspection	Violations

Activity Number: **PEA 040001** **Document Type:** **NOV**

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
7/21/03	**Effective 7/21/03**	**N/A**	**N/A**	**No Related Activities**

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
Failure to conduct monitoring as specified in Part III of the permit	[N.J.A.C. 7:14A- 6.5(b)]	Pending	Inspection	Violations
Failure to report the results of stormwater analyses on Waste Characterization Reports Waste Characterization Quarterly Reports not submitted for 9/01-11/01, 9/02-11/02, 12/02-2/03and 3/03-5/03.	[N.J.A.C. 7:14A- 6.8]	No Further Action	Inspection	Violations
Failure to submit the appropriate storm event information with Waste Characterization Reports See above	[N.J.A.C. 7:14A- 6.5(b)]	No Further Action	Inspection	Violations
Failure to maintain a current O&M Manual which includes an emergency plan.	[N.J.A.C. 7:14A- 6.12(c & d)]	No Further Action	Inspection	Violations

Activity Number: **PEA 040002** **Document Type:** **NOV**

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
7/21/03	**Effective 7/21/03**	**N/A**	**N/A**	**No Related Activities**

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
pH is not tested immediately	[N.J.A.C. 7:14A- 6.5(b)4]	Pending	Inspection	Violations

Failure to properly perform analyses	[N.J.A.C. 7:14A- 6.5(a)2]	Pending	Inspection	Violations
Failure to properly conduct sampling	[N.J.A.C. 7:14A- 6.5(b)4]	Pending	Inspection	Violations
Failure to conduct monitoring as specified in Part III of the permit. 1. pH is not tested immediately 2. Analysis time for samples collected on 9/20/02 at IO1 not indicated on the laboratory data/reports. 3. Laboratory report for samples collected on 9/20/02 at IO2 not available. 4. Monitoring reports & Laboratory data for 12/01 - 5/02 (IO1 and IO2) not available	[N.J.A.C. 7:14A- 6.5(b)]	Pending	Inspection	Violations
Failure to retain monitoring records as required by the permit	[N.J.A.C. 7:14A- 6.6(a)]	Pending	Inspection	Violations

Activity Number: **PEA 040003** **Document Type:** **NOV**

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
7/21/03	**Closed 7/20/04**	**N/A**	**N/A**	**No Related Activities**

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
Failure to maintain a current O&M Manual which includes an emergency plan.	[N.J.A.C. 7:14A- 6.12(c & d)]	No Further Action	Inspection	Violations

Activity Number: **PEA 040004** **Document Type:** **NOV**

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
7/20/04	**Effective 7/20/04**	**N/A**	**N/A**	**No Related Activities**

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
Failure to conduct monitoring as specified in Part III of the permit. PH is not tested immediately. Exceeded holding time for pH during 9/03-11/03, 12/03-2/04 and 3/04-5/04	[N.J.A.C. 7:14A- 6.5(b)]	Pending	Inspection	Violations

monitoring periods at 008A				

Activity Number: **PEA 040005** **Document Type:** **NOV**

Effective Start Date	Current Document Status and Date	Penalty Assessed	Received Amount	Related Activities
7/20/04	**Effective 7/20/04**	**N/A**	**N/A**	**No Related Activities**

Description of Non-compliance	Violated Citation	Violation Status	Related Inspection	Related Violations
Failure to conduct monitoring as specified in Part III of the permit. pH is not tested immediately. Exceeded holding time for pH at I01 during 12/02-5/03, 6/03-11/03 and 12/03-5/04. Exceeded holding time for pH at I02 during 12/02-5/03, 6/03-11/03 and 12/03-5/04 monitoring periods.	[N.J.A.C. 7:14A- 6.5(b)]	Pending	Inspection	Violations

NRCF **AMERICAN CEMENT COMPANY**

October 14, 2005

RECEIVED
OCT 18 2005
BUREAU OF AIR REGULATION

Ms. Cindy Mulkey
Engineer
Bureau of Air Regulation
Division of Air Resource
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400

Dear Cindy:

In reviewing the recent letter John Koogler sent to Al Linero discussing some of the items that were mentioned in our meeting, I found a few that might need a little additional explanation. Many topics have been discussed between Al, John and me, in some manner either collectively or individually, which of course leads to an abbreviated statement at times. I have identified the following as requiring a little more input for your benefit:

JK "High-carbon fly ash will not be used as a fuel or raw material"

Although we will not be injecting high carbon ash into the calciner or combustion chamber, ash is a valuable raw material in the process of making cement. It provides an excellent balance of $Al2O3$, $SIO2$ and the missing alkalis needed for early strengths in concrete while positively impacting coating in the kiln as a fluxing agent. My past experience has been to attempt to control LOI to an upper limit of 10% on average which typically falls in line with the needed addition of ash.. Additionally the consumption of ash provides for an economic and environmental benefit by eliminating the need for land filling.

JK "And, as previously stated, American Cement will control the alkali/sulfur balance in the plant to assure that this ratio is maintained in an acceptable range for both plant operations and to assure no $SO2$ from fuel sulfur is released"

The alkali sulfur balance in the clinker is of course dependent on the sulfur and alkali levels in both the fuel and raw materials. The balance is maintained for a couple of reasons both equally important. The first is environmental; as John stated one must maintain the proper balance to meet the regulated $SO2$ limit, the second is related to build up of $SO2$ in the pyro processing system. Excess $SO2$ combines with the lime in the kiln feed and attaches itself to surfaces of the preheater and kiln, causing build-ups and plugging. Over time the result will be difficult operating conditions including kiln stoppages. In Florida given the low levels of alkali in the native raw materials, the use of components such as ash provide the much needed alkalis.

American Cement Company
Natural Resources of Central Florida, Inc.
P.O. Box 1209 Anthony, Fl 32617
Phone (352) 629-0666 • Fax (352) 629-2655

Although you may find the information provided by Dr. Koogler to be self-explanatory, I thought these additional comments could be helpful.

We are available for any questions or clarifications you may have, therefore please do not hesitate to ask.

Sincerely,

AMERICAN CEMENT COMPANY

Cary O. Cohrs
General Manager

Cc: Al Linero
John Koogler

SUMTER COUNTY CEMENT
CENTER HILL, FLORIDA, USA

RECEIVED
OCT 18 2005
BUREAU OF AIR REGULATION

October 17, 2005

Mr. A.A. Linero
Bureau of Air Regulation
Department of Environmental Protection
2600 Blair Stone Road, MS # 5500
Tallahassee, Florida 32399-2400

SUBJECT: Response to Request for Additional Information dated October 7, 2005
Sumter Cement – Center Hill Plant
DEP File No. 1190041-001-AC (PSD-FL-358)
Proposed Portland Cement Plant in Sumter County, Florida

Dear Mr. Linero:

Sumter Cement Company (SCC) includes the following information in response to the Florida Department of Environmental Protection's (Department) request for additional information (RAI) dated October 7, 2005. SCC has included text from the Department's RAI in *italics* for clarity with SCC responses following each question.

Should the Department have additional questions or wish to meet to discuss the application, SCC would welcome this opportunity. SCC would be pleased to meet with the Department to clarify any outstanding issues or present the information in the application.

If the Department should have any additional questions please feel free to contact me directly to discuss at (386) 935-5039 or by e-mail at jbhorton@suwanneecement.com.

Sincerely,

Joe Horton
Sumter Cement Company

CC: Trina Vielhauer – DEP (w/o Attachments)
Dan Fritz - SCC
Celso Martini – SCC

1. *SCC relies on "good combustion" (GC) to control carbon monoxide (CO). SCC proposes a best available control technology (limit) by GC of 3.6 pounds of CO per ton of clinker (lb/ton) on a 30-day basis. The cost of further control by other technologies was calculated presuming that emissions without further control by GC will be 3.6 lb/ton. Please estimate the costs and cost-effectiveness of further control by GC by evaluating the following possibilities. Applicant's own possibilities are also encouraged.*

Carbon Monoxide (CO) is generated primarily from two sources in the cement pyro-processing. First from the incomplete combustion of fuel, and second from incomplete combustion and/or release from raw materials. Additionally, CO can be formed as a secondary reaction in the SNCR process depending on reagent usage and the location for injection for the primary reaction of oxidizing NO to NO_2. If reagents such as urea are used, CO is generated in the dissociation of the urea to ammonia (NH_3) and ultimately NH2 radicals. Even if ammonia is used directly a competitive reaction between the OH radicals for conversion of NO to NO2 and CO to CO2 occurs which can result in increased CO emissions. Suwannee American Cement (SAC), through testing at its other facilities, has seen increases in CO with the use of SNCR as a control technology. This has been reported to the Department in test reports from SAC and Polysius dated February 10, 2005. If the intent of SNCR is to minimize NOx, then the unintentional formation of CO may be unavoidable.

SCC has estimated CO emissions for the project with the assumptions of good combustion controls. This is meant to insure the design and operation of the combustion source (calciner) and insure the proper burn-out of CO to CO2. This is accomplished by proper oxygen, temperatures, mixing and residence time. This minimizes the amount of CO generation from the combustion of fuel only. Typical calciner designs allow for 3 to 5 seconds of retention time with mixing and the presence of oxygen to insure proper burn-out of the selected fuels. SCC will insure the correct amount of residence time for all proposed fuels in the final design of the calciner. Additionally, the use of SNCR will minimize the need to utilize harsh reducing conditions for the reduction of NO. This will again allow for the most efficient means to minimize the CO associated with incomplete combustion. However, use of the SNCR may contribute to the overall CO as a secondary reaction.

The second portion of CO generation comes from the raw materials and, in the case of SCC, is the primary means of generation. Little can be done to minimize the generation of CO from naturally occurring organic materials in the raw materials. As the materials travel through the pyro-process, they are heated through a temperature profile in a gradual manner allowing for the release of and incomplete combustion of hydrocarbons.

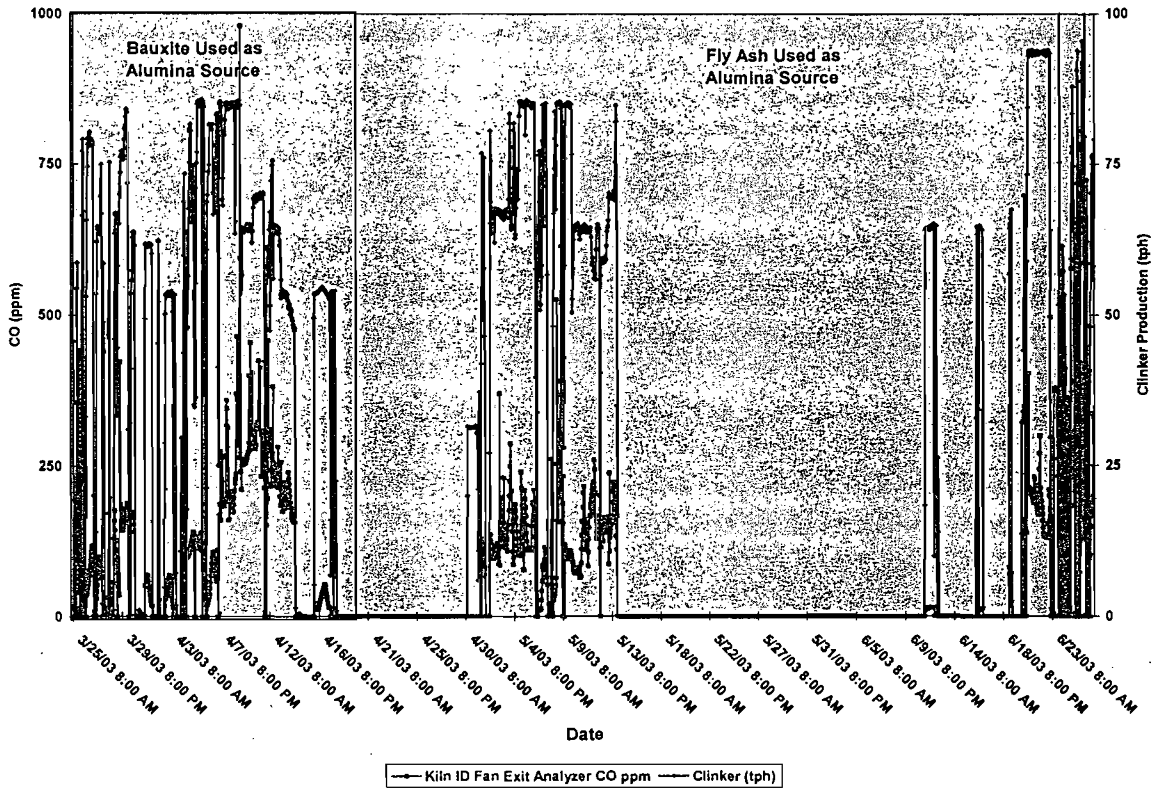
Based on 2.5 years plus of CO process data, CO stack testing, SNCR data, and Fly Ash Injection data at SAC, which fundamentally uses similar raw materials, a baseline for CO was developed. Improvements to combustion controls were evaluated and added to SCC, reducing the CO formation from incomplete combustion of fuels in the calciner. Projects such as Fly Ash Injection, which contribute some reduction to CO, were also included at SCC. SNCR for control of NO_x emissions was included for SCC, and the subsequent possible increase in CO was accounted for. The overall evaluations of these factors lead to a CO emission rate of 3.6 pounds per ton of clinker. This included the primary control of good combustion through extension of the retention time in the calciner to insure proper burn-out of fuel generated CO regardless of the fuel and including low volatile fuels such as Pet Coke.

a. Given the present calciner design, estimate the CO emissions when using bauxite instead of fly ash as a raw material and only coal as fuel (except during startup).

SCC has yet to design or have a calciner designed. The process flow sheets were done with the help of Polysius Corporation, a worldwide cement design expert to help in proper sizing and layout of the plant. Any preheater tower with vendor specific calciner such as FL Smidth, Polysius, or KHD could be utilized. SCC would insure the proper retention time of the calciner regardless of vendor and for all operating scenarios including proposed fuels.

Based on data from SAC, which actually ran with bauxite for several months prior to using fly ash, SCC determined minimal impact to CO emission from the use of bauxite versus fly ash. Chart 1 shows the CO as measured by a process analyzer for CO located in the downcomer after formation of CO from raw materials. It can be seen that during the limited time frame of bauxite use, the CO emissions appear comparable to the use of fly ash.

Chart 1: CO with Bauxite and Fly Ash Use at SAC



As stated previously, provisions for the injection of fly ash into the calciner will be included in the SCC project as a means to insure proper combustion of fly ash with higher carbon content instead of gradual heating through the tower. The data from SAC with use of bauxite as well as Fly Ash Injection were used to develop the baseline CO emissions for SCC at 3.6 lb per ton of clinker.

b. Evaluate costs of using bauxite instead of fly ash or other material high in carbon.

The cost evaluation for bauxite is not the determining factor for its selection as alumina source for the raw materials. As previously discussed SAC originally used bauxite as an alumina source, and SCC has made provisions in the design for the use of bauxite with storage areas shown in the site layout. Bauxite, although very high in alumina, contains little to no alkalis. SAC switched use from bauxite to fly ash for the alkalis present in the fly ash. For SAC as well as SCC it is foreseen that fly ash will be the major source of alkali which will be discussed in detail later in the RAI response for their impact to the sulfur-alkali balance.

c. Evaluate costs of minimizing petroleum coke and other difficult to burn fuels to maximize burnout in the calciner and ducting to the lower cyclone.

The calciner and associated ducting will be designed to insure proper burn-out of CO from any fuel used. The design will incorporate proper retention time to insure that CO from 100% pet coke will have the needed retention time for the burnout of CO, limiting the CO from the calciner region of the pyro-process. As stated previously, the major portion of the CO presumed from SCC is from raw materials.

d. Evaluate costs and benefits of increasing retention time (in increments of 0.5 seconds) in the calciner and duct work to the lower cyclone to maintain the requested fuel and raw materials options while achieving the CO emissions estimated in paragraph a. above.

As outlined in paragraph a and c, the calciner will be designed with maximum retention time to insure proper combustion and minimize the CO generation. The retention time will be on the order of 3 to 5 seconds, and any increase beyond that will not result in any measurable decrease in CO emissions from the fuels used. Extensions in calciner length and subsequent retention time would have no impact on CO generation from the raw material. The choices of raw materials and impacts from use of 100% fly ash to 100% bauxite have also been evaluated in determining the CO emissions. SCC has yet to decide on the alumina source for the project and has made provisions for the use of 100% fly ash, 100% bauxite, or a combination of the two. Storage and transportation for both sources have been included in the application in duplicate for each of the sources. The availability of sources and overall chemical composition of the raw mixture will decide the usage rates of each source.

e. The Department notes that the above procedure would certainly be considered by any operator prior to assuming that a regenerative thermal oxidizer (RTO), estimated by the applicant at $47,000,000 (capital) and $17,900,000 per year, would be necessary to achieve lower CO emissions.

SCC agrees that minimization of CO from proper design and operation of the calciner and reduction in organic materials in the raw materials is the most cost effective means to reduce CO emissions. In the cost analysis and baseline CO emissions, SCC has incorporated a calciner with the maximum retention time to reduce CO emissions from incomplete or partial combustion. Additionally, the major portion of CO present in the presumed 3.6 lb/ton BACT limit comes from raw materials, with fly ash only contributing a small portion. The use of bauxite versus fly ash seemed to have little impact on the overall CO emissions based on data from SAC. Although fly ash does contribute more to the overall CO emissions, it appears that the overall reduction in CO from the use of bauxite does not result in drastic reductions in CO. Naturally occurring organics in the limestone, which makes up far more of the raw material input, would be believed to be the primary source of CO. These factors in conjunction with unknown contributions of CO from SNCR at SCC were the basis used when arriving at a BACT limit of 3.6 lb/ton.

f. With respect to the comment on page 35 about the decommissioning of the RTO at TXI, an agreement was reached between TXI and petitioners to operate the RTO all year round.

SCC has learned that TXI in fact has reached an agreement to run the RTO unit year round. SCC understood that TXI had requested to operate the RTO only during ozone season and was unaware of the most recent agreement. However, it should be noted that SCC has learned the RTO still experiences operational problems and does not operate year round due to these operational problems.

g. Provide estimate of impacts on CO due to operation rates between the guaranteed manufacturer production rates and the expected (greater) production rates foreseen by SCC. This may be just a part of the exercise described in d. above.

All emission rates for SCC are based on a maximum production rate above and beyond the design rates. SCC has only worked with Polysius Corporation in developing process flows and design calculations and not obtained quotes or guarantees for any throughputs from a vendor. All emissions are estimated from maximum throughput rates which are above the design rates, insuring all emissions are at the absolute maximum for the equipment designed and presented to the Department. No greater production rates are foreseen from those presented in the application.

[Rule 62-212.400(h)3., F.A.C. Requirement for: "A detailed description of the system of continuous emissions reduction proposed by the facility or modification as BACT, emissions estimates and any other information as necessary to determine that BACT would be applied to the facility or modification"]

2. Tarmac America, LLC, dba Titan Florida Cement, recently proposed a BACT limit for CO of 2.0 lb/ton (30-day basis) at the Pennsuco cement plant in Miami-Dade County. Please replace the "ND" value in Table 5-1 with the revised proposal. Also replace the value of 1.77 lb/ton given in the table for the Suwannee American Cement (SAC) Plant with the present BACT limit. It is possible that as many as half of the lb/ton values in the table are erroneous or possibly shifted by one row.

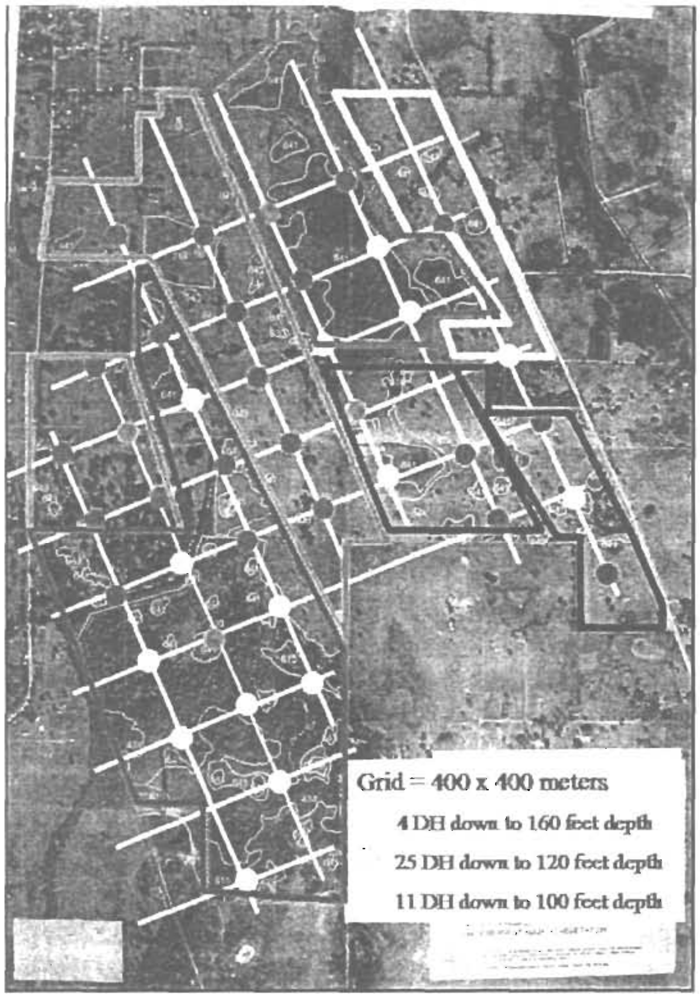
Table 5-1 in the BACT has been updated and corrected. It is included as part of Attachment 1 and is also provided in electronic form on the enclosed CD.

3. VOC control to achieve 0.12 lb/ton of clinker is also given as GC. Regardless of combustion practices, VOC emissions can be high unless raw materials (especially additives) are selected that will not evolve VOC in the preheater. Please describe the raw material procurement practices for mill scale, fly ash, etc. that can influence both VOC and CO emissions. The proposed value appears to be adequate.

[Rule 62-4.070(1), F.A.C. (1) "A permit shall be issued to the applicant upon such conditions as the Department may direct, only if the applicant affirmatively provides the Department with reasonable assurance based on plans, test results, installation of pollution control equipment, or other information, that the construction, expansion, modification, operation, or activity of the installation will not discharge, emit, or cause pollution in contravention of Department standards or rules."]

SCC has evaluated the naturally occurring limestone and silica sources (sand/clay) onsite for organic deposits. SCC conducted an extensive drilling campaign to insure the appropriate amounts of limestone and quality of limestone including carbon content. The data was compared to similar raw materials present at SAC for comparison of organics and correlation to VOC emissions. The following diagram shows the drilling and sampling campaign for the silica and limestone sources.

Diagram 1: Drilling Campaign



The carbon content in the limestone area proposed for use at SCC was similar or lower than that at SAC, eliminating concerns of high organic material homogenously mixed in the limestone and silica. SCC would closely monitor additional raw materials used onsite in a similar manner to what is presently done at SAC to insure that high carbon sources are not introduced that could adversely impact the VOC emissions. All raw materials used onsite would be pre-approved for use based on control limits for several parameters. This is done to insure proper quality of product as well as eliminate materials which could lead to elevated emissions such as VOC and SO_2. Control limits for fixed carbon and hydrocarbons for sources such as mill scale and fly ash would be established and all materials would be analyzed to insure that they are under these limits prior to use in the process. This has also allowed SCC to re-evaluate and lower its proposed VOC limit to the newly proposed 0.115 lb of VOC per ton of clinker. This will be discussed in further detail in response to question 17.

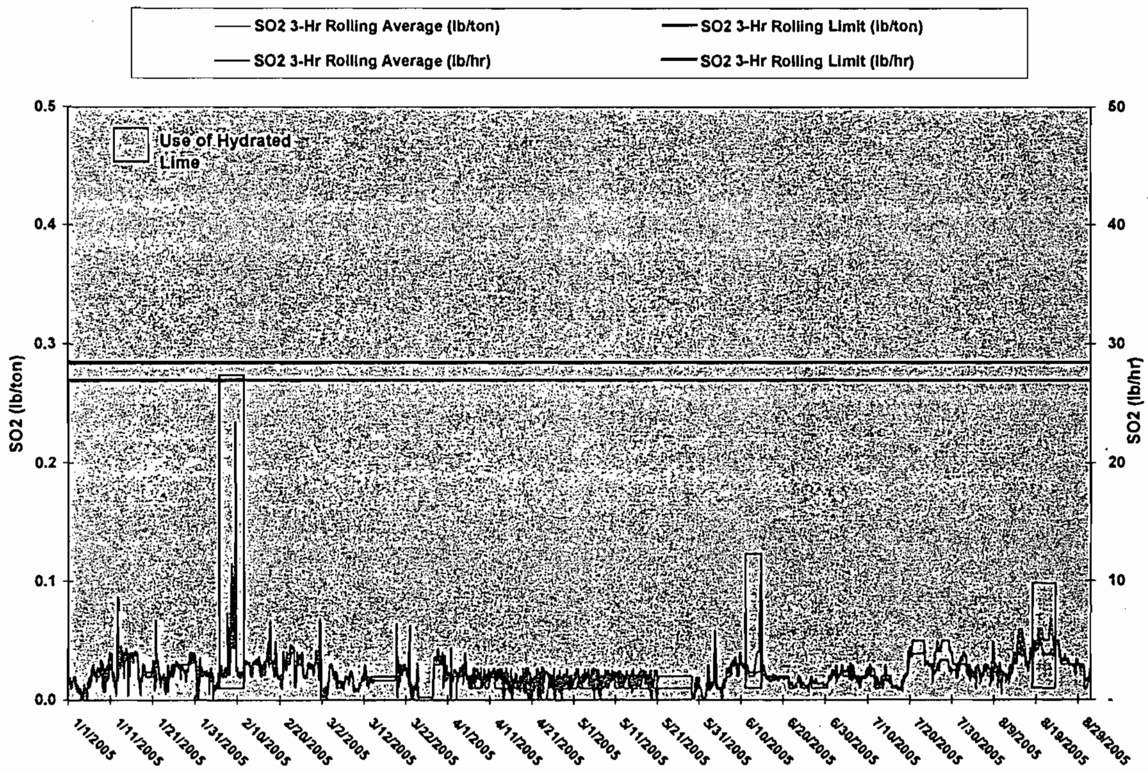
4. *Please provide a disk that includes a summary of 2005 data for 24-hr-averaged SO_2 emissions in terms of lb/ton from operation of the SAC plant. Indicate instances when injection of hydrated lime was practiced and the total amount of hydrated lime actually used for this purpose in 2005.*
[Rule 62-212.400(h)3., F.A.C.]

SCC has included a spreadsheet on the enclosed disk with the hourly and 24 hour data for SO_2 emissions as well as the hydrated lime usage for SAC. SAC has to date used approximately 60 tons of hydrated lime during 2005. Hydrated lime acts as a backup to insure compliance with SO_2 emissions during critical time periods when the sulfur-alkali balance has shifted and proper amounts of alkali are not present to capture the sulfur in the clinker. The hydrated lime does not alleviate the sulfur cycle but only traps the sulfur in the internal kiln cycle until the alkali balance can shift to a proper balance and the sulfur can exit through the clinker. SAC has only had to use this backup system on a few occasions.

SAC closely monitors the sulfur inputs, but due to limited alkali the smallest shift in sulfur in limestone can cause the balance to be lost and excess sulfur to circulate in the raw mill/kiln system. SCC proposed to install the hydrated lime system as SAC has done as a means to insure compliance with the extremely low SO_2 limit. The use of the system would be very limited, with control of sulfur inputs being the means to insure long term compliance.

Chart 2 shows the SO_2 emission data for SAC for 2005.

Chart 2: SAC SO_2 Emission Data 2005



5. *Please clarify whether fly ash injected into the calciner will be introduced within the area of the calciner burner as described on Section 1, page 1 or in the upper section of the calciner as apparent in the drawing referenced as Sheet 5 in Appendix F. The different locations have different implications regarding carbon monoxide burnout and emissions. [Rules 62-4.070(1) and 62-212.400(h)3., F.A.C.]*

Fly ash will be injected into the calciner as described in Section 1, page 1. Sheet 5 in Appendix F is for process flow only and does not show the correct detail.

6. *With reference to Table 3-1, please note that a 24-hour limit of 0.16 lb SO_2/ton applies to Florida Rock Industries pursuant to a permit issued in 2002 for a production increase at the existing FRI kiln.*

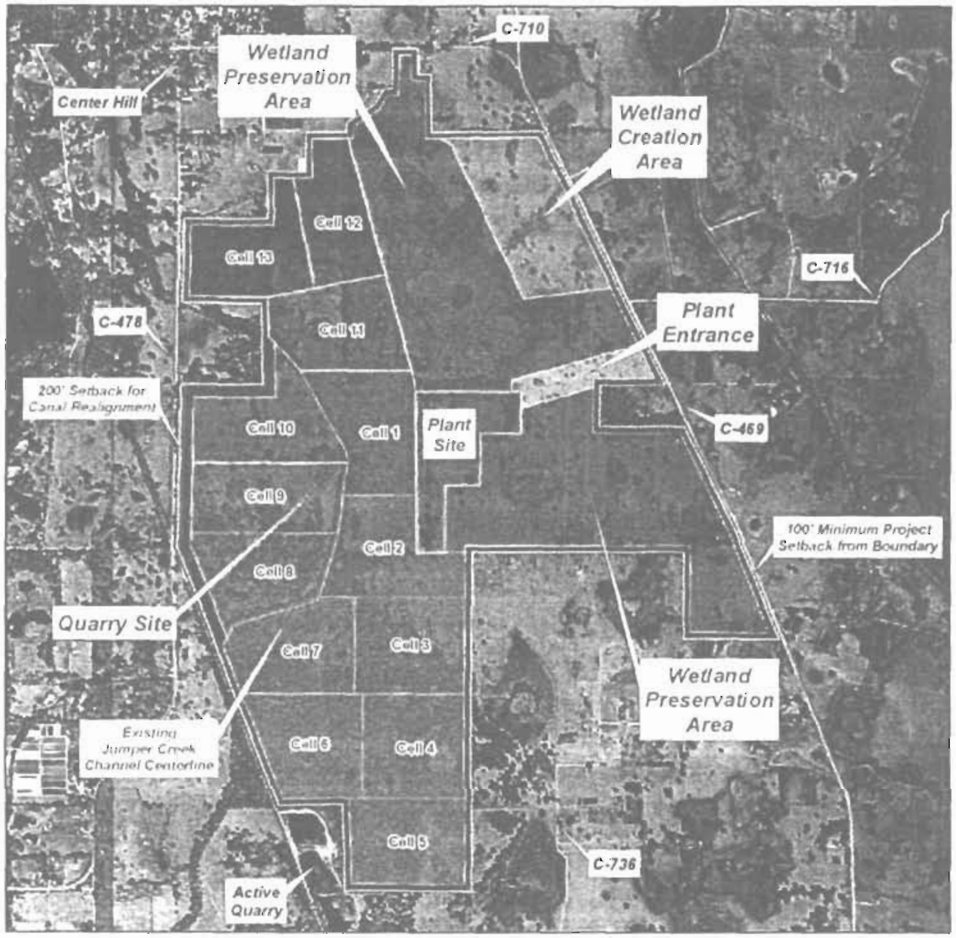
Table 3-1 in the BACT has been updated. It is included as part of Attachment 1 and provided in electronic form on the enclosed CD.

7. *Provide a qualitative if not quantitative discussion of the differences in sulfur and SO_2 generation potential due to raw materials differences between the quarries at SAC and SCC.*
[Rule 62-212.400(h)3., F.A.C.]

As described in Response 3, SCC has conducted an extensive drilling campaign to identify the chemical composition of the possible quarry reserves for mix calculations and design of equipment as well as for possible concerns over VOC and SO_2 emissions. Due to the relatively low alkali content of the raw materials currently available, stringent monitoring of raw materials is the only means to insure compliance with the SO_2 limits proposed as BACT. This includes the quarrying of limestone and silica which are generally low in sulfur, however isolated pockets of material have been identified at SAC which are high in sulfur. Selectively quarrying and continuous monitoring of raw materials is required at SAC to insure these materials are not introduced into the system in improper ratios as to negatively affect the sulfur-alkali ratio. The same practices will be followed at SCC.

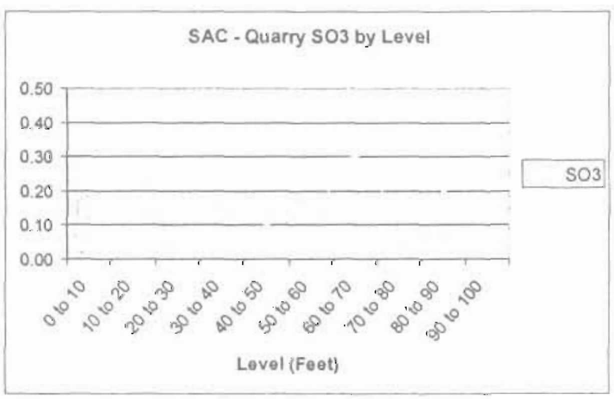
For SCC, the results of the quarry survey revealed that in areas were the limestone was present very little sulfur was detected. Some areas which did not present high concentrations of limestone contained sulfur levels similar to those found at SAC, which is predominately pyritic sulfur. SCC has designed its quarry around these areas as shown in the following Figure.

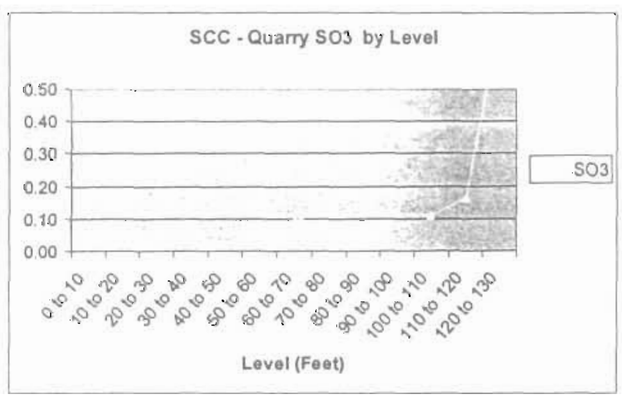
Figure 1: SCC Proposed Quarry Area



Analysis of the coring conducted in the proposed quarrying area were similar or lower in SO_3 (oxide of sulfur detected by X-Ray Diffraction) than SAC. The following charts show the relation at the varying depths between SAC and SCC.

Chart 3: SCC and SAC Limestone Sulfur Comparison





From the quarry survey and analysis, SCC will be able to control its sulfur contribution from the quarry in a similar manner to SAC. Monitoring of the limestone will insure the sulfur-alkali balance is kept and the quarry survey areas with higher concentrations of sulfur will be avoided.

8. *SCC relies on selective non-catalytic reduction (SNCR) to control nitrogen oxides (NO_X) carbon monoxide (CO). SCC proposes a BACT limit by SNCR of 1.95 lb NO_X/ton on a 30-day basis. The cost of further control by other technologies was calculated presuming that emissions without further control by SNCR would be 1.95 lb/ton. Please estimate the costs and cost-effectiveness of further control by SNCR by evaluating the following possibilities. Applicant's own possibilities are also encouraged.*

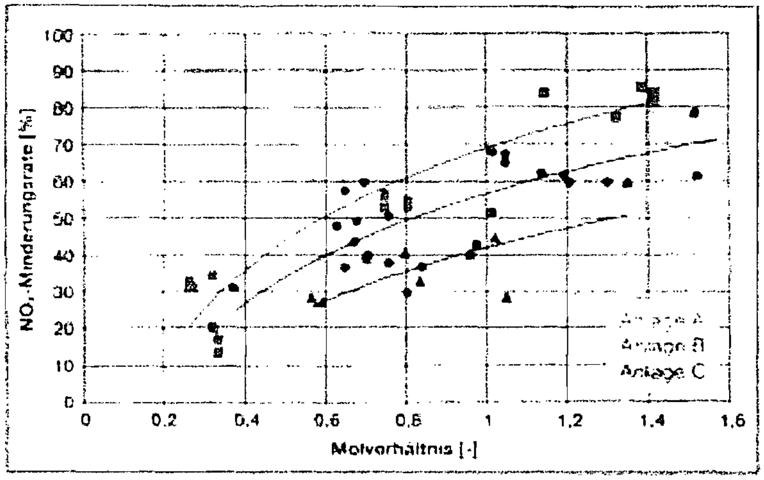
SCC has evaluated and selected SNCR for control of NO_x emissions. SCC used testing and long term data generated from SAC to help in determining the BACT limit. SAC was one of the first facilities in the U.S. to install and operate a SNCR system. To date SAC has over 6 months of continuous operating data on SNCR reduction of NO_x. SCC is also owned and operated by Votorantim Cimentos (VC) who has conducted extensive testing on SNCR at other locations throughout North America. SCC has relied on this extensive data and expertise in developing a BACT limit for NO_x.

a. *Evaluate costs and NO_X reductions of further increasing ammonia injection up to a molar ratio of 1.0 (NH_3/NO_X) in increments of 0.1 moles NH_3 per mole NO_X. There would be separate cases depending upon the extent to which the calciner is operated in a reducing atmosphere for NO_X reduction prior to further control. [Rule 62-212.400(h)3., F.A.C.]*

In Appendix B of the BACT Report submitted in the application, SCC outlines the assumptions made for SNCR and cost associated with the system. On page 3 of 13 in Appendix B of the BACT Report, SCC gives a maximum molar ratio of 1.0 which was used in the cost analysis. SCC has already evaluated the maximum molar ratio for cost analysis and would not propose to exceed a 1:1 molar ratio of ammonia to NO_x.

The assumptions for efficiency of reduction from the SNCR system for uncontrolled NO_x come from the data and operation experience gained at SAC. NO_x levels with and without SNCR can vary greatly and in setting a baseline for the NO_x levels to be controlled by SNCR, SCC took into consideration the NO_x reductions from the calciner as well. With all of this, SCC felt that 1.95 lb/ton was an extremely low NO_x limit and would require reduction of uncontrolled NO_x with all tools listed in the BACT and use of SNCR injection with a normalized stoichiometric ratio of around 1:1. SCC has also assumed a very high reduction efficiency for the SNCR system of around 70%. This level has been demonstrated at SAC but is not guaranteed to directly transfer over to a new facility even with similar raw materials. Changes in the dynamics of the gas flow and gas interaction, as well as material interaction and calciner design may not allow for the same reductions seen at SAC. SCC, through its parent company VC, has assisted in several SNCR pilot tests and has yet to achieve efficiency such as those seen at SAC at other facilities for a variety of reasons. Additionally, the SCC plant will be approximately 65% greater in size for gas flows and material throughput. This will greatly increase ducting size which has been shown to decrease the efficiency of the injection of SNCR. This was noted by Polysius during testing of several kilns in varying sizes, "It can be presumed from the investigations that the dependence on size is attributable mainly to the fact that the blending of a small quantity of liquid into a large quantity of exhaust gas becomes more difficult, with increasing quantity of gas and increasing calciner diameter" (D. Rose, K. Adler, R. Erpelding). The following chart, also from Polysius, shows the decrease in SNCR efficiency as a relation to size of the plant.

Chart 4: NOx Reduction as a Function of Molar Ratio and Plant Size



Therefore, the final BACT cost analysis and limit was based upon all of this information and with the assumption of a molar ratio of 1:1 (NH_3 to NO_x as NO_2).

b. *The Department notes that the above procedure would certainly be considered by any operator prior to assuming that a selective catalytic reduction (SCR) system, estimated by the applicant at $5,520,000 (capital) and $9,580,000 per year, would be necessary to achieve lower* NO_X *emissions.*

SCC agrees with the Department that an increase of the SNCR injection molar ratio to 1:1 is more cost effective then consideration of a SCR system. However, SCC has already evaluated the maximum injection molar ratio in determining its' BACT for both cost and NO_x reductions as discussed in response to paragraph a.

c. *With respect to the "experimental" nature (Section 4.4, page 23) at an SCR unit in Europe, it is noted that articles by the supplier, plant representative, and German government expert describe the system as a success. This is noteworthy because fewer of the factors claimed in the application to reduce the effectiveness of SCR are actually present in Florida compared with Germany. These include amount of sulfur and alkali in the exhaust gases.*

SCC is aware of documented reports of the success of the system at Solnhofen. Through conversations and visits to Solnhofen, SCC has been able to gather data and form its own opinion. SCC agrees that the system had demonstrated successful NO_x reduction but at great cost and over several years as the process evolved. The actual reductions in comparison to baseline emissions are unclear and currently proposed BACT technologies such as SNCR in conjunction with MSC may offer equal or greater reductions then the SCR system.

[Rule 62-212.400(h)3., F.A.C.]

9. *Please advise the meaning of the statement in Section 4, Page 22, "For the reaction to occur the ammonia must be present in excess molar ratio". If this means that the NH_3/NO_X ratio must be greater than 1.0, then the applicant is referred to the papers by the mentioned authors (Haug, Samant, and Sauter) showing that substantial reduction is possible at molar ratios much less than 1.0 (by SCR) at the Solnhofer Portland Cement Plant.*

The intent of the statement was that ammonia reaction efficiencies are not 100%. Thus one mole of ammonia does not react equally with one mole of NO. Some portion of the reagent goes un-reacted with NO and is utilized. NO_x reductions should be present at stoichiometric ratios well below 1:1 as the Department has noted.

10. *Please submit the information required on Page 3-61 related to the Process Fuel Segment for all fuels to be used at the facility.*

Please see Appendix H, Raw Material and Fuel Chemical Analyses, of the Application submitted to the Department.

11. *Typical fuel specifications were provided for the proposed fuels with the exception of tires, the non-hazardous liquids including on-spec used oil, non-hazardous solids including plastics, filter fluff and wood waste. From the application, non-hazardous solids and non-hazardous liquids may account for up to 50 % of the total heat input in the kiln and calciner respectively. Provide a description and expected analysis of these additional fuels to be combusted.*

Please find a table below including example fuel analysis for tires, used oils, oil filter fluff, wood waste, and plastic.

Table 1: Fuel Information

Fuel Type	Moisture (%)	Sulfur (%)	Ash (%)	Volatiles (%)	Cal. Value BTU/lb
Tires	0.62	1.3	4.78	65	15,500
Used Oils	10 - 25	0 - 1	0 - 5	-	10,000 – 15,000
Oil Filter Fluff	-	0.36	3.63	-	14,000
Wood Waste	-	0.01	0.36	-	7,000
Plastics	-	0.02	1.81	93	16,000

During discussions with the Department in regards to utilization of similar fuels as SAC, the intent was to outline possible fuels that could be utilized in the system. With the exception of tires, the following fuels would require specific permission from the Department to test and evaluate each of the fuels before allowing usage and setting acceptable rates based on testing. For each of the fuels, SCC would request permission from the Department to test and then request permission from the Department for continual use on the basis of the testing.

12. *What additives will be used to insure the correct alkali to sulfur ratio is maintained when using petroleum coke? Florida limestone is low in alkali. Use of high sulfur petroleum coke can upset the balance between alkali and sulfur that is needed to insure fuel sulfur is incorporated into the clinker rather than deposited within the internal cycle (calciner/bottom cyclone/kiln inlet). Submit a projected chemical analysis of the additives likely to be used at this plant.*

As the Department is aware, sulfur from fuels used in the calciner and kiln main burner do not exit the lower stages of the preheater during normal conditions due to the large amounts of CaO present and its scrubbing affect. However, during upset conditions or with high levels of CO the scrubbing presence of CaO is greatly reduced. The source of sulfur in relation to SO_2 emissions is from raw materials. As previously discussed, SCC has already conducted extensive sampling of the proposed quarry for deposits of sulfur and would closely monitor all raw material inputs to insure that excess sulfur is not introduced into the upper portions of the tower as is done at SAC. The hydrated lime would serve as a means to insure compliance should excess sulfur occur in the feed materials.

Sulfur cycles in the lower stage of the cyclone from fuel contributions or more stable forms of sulfur present in raw materials have limited options for release out of the system. A bypass could be incorporated for large amounts of sulfur to release excess sulfur while it is volatilized. The sulfur can also be captured into the clinker through the formation of stable sulfur-alkali compounds. This is the need for alkalis in the process, to allow for the alleviation of the lower sulfur cycle and entrap the sulfur in the clinker. If either of these are not present then the sulfur will be forced into buildup, typically called sulfospurrite (2C2S·CS or C2S2S), which will then begin to restrict flow and ultimately lead to blockage of the kiln.

As discussed in Response 1 paragraph c, alkali sources for the area are extremely limited. This led SAC to use fly ash as the major source of alkali. For SCC, it was assumed as well that fly ash would make up the major portion of alkali and, with the small amounts of sulfur present in the raw materials and in most fuels, lead to an acceptable sulfur-alkali balance. SCC through testing at SAC and other VC plants throughout the world is confident it can utilize pet coke with the readily available sources of alkali. If sulfur cycles in the lower stages of the cyclone are formed then operational sacrifices will be experienced and these will not lead to SO_2 emissions.

SCC has evaluated several sources of alkali but most have limiting factors that would preclude their use. Very few sources of alkali are present in the immediate area. Most sources that SCC has considered are high in both alkali and sulfur, negating the advantage of the alkali. Others have organics which could lead to elevated VOC emissions. Some are difficult to grind and increase the burnabilty of the kiln feed leading to higher NO_x. SCC has proposed the use of Feldspar in Appendix H of the application, which if needed is an available source of high alkali. The following is the information pertaining to Feldspar presented in the Appendix H of the application.

From Appendix H of Permit Application

Raw Material Additive Type	Moisture %	CaO %	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	MgO %	K_2O %	NaO %	SO3 %	LOI %	Fixed C %
Feldspar (Alkali Source)	0.55	1.73	73.80	15.90	0.52	0.00	3.47	4.00	0.00	-	-
Feldspar (Alkali Source)	1.01	2.10	70.90	18.30	0.46	0.00	3.03	4.72	0.00	-	-

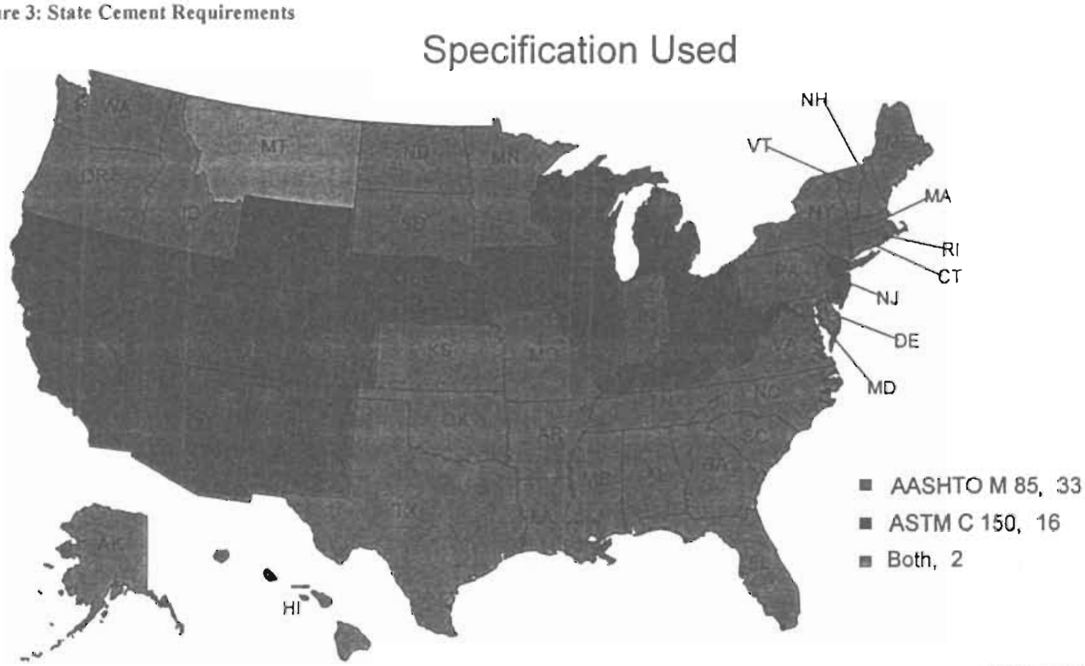
13. *What measures have been considered to minimize emissions of mercury entering the process or emitted from the kiln stack? Has SCC considered the possibility of inter-grinding a small portion of the dust collected in the (kiln/calciner/raw mill) air pollution control device with the clinker?*

SCC has closely examined the mercury emissions from the stack. As stated in the application, SCC will closely monitor all inputs into to the system to track the mercury input. SCC will assume detection limits of all materials as the input concentration which will insure conservatively high estimates of mercury to insure the actual mercury never exceeds proposed limits. SCC will assume all mercury inputs, which as stated will be overestimated, will be emitted out the stack as well. All of this will insure the proposed limitations will not be exceeded.

Additionally, SCC has studied the possibility of reducing the mercury through the possible use of enriched baghouse dust in finished grinding to entrap mercury in the cement. SAC voluntarily performed an extensive mercury study over several days to determine the feasibility of such a process. The overall conclusion was that baghouse dust although higher then raw material inputs in mercury due to the cycling of mercury in the kiln-mill system was never at a level to sufficiently purge the system of mercury. To adequately reduce mercury from the kiln-raw mill system, thousands of tons of baghouse dust would have to be wasted and then incorporated into cement. This constitutes more baghouse dust then could possibly be used in finish grinding.

Secondly, even if mercury could be concentrated in baghouse dust, the Department of Transportation (DOT) for the State of Florida requires its' cement meet the AASHTO M 85, 33 standards. This prohibits the use of limestone or baghouse dust in the finish grinding product. SCC, along with the Portland Cement Association (PCA), is working with state DOT offices to evaluate alternatives to the standard that may allow the use of limestone or baghouse dust in the final product. Without the re-evaluation of this, SCC could not sell its cement to the majority of its consumers. The following figure from PCA shows the states and what standard they are currently using for cement.

Figure 3: State Cement Requirements



(From PCA)

14. *Has Sumter Cement Company or its affiliates had any violations (or received warning letters) in the past two years related to any Department regulations at any of their facilities? Please provide the status of any matters that have not yet been resolved.*

[Rule 62-4.070(5), F.A.C., "The Department shall take into consideration a permit applicant's violation of any Department rules at any installation when determining whether the applicant has provided reasonable assurances that Department standards will be met".

SCC is operated by Votorantim Cimentos (VC) which also operates SAC. SAC resolved compliance issues that occurred shortly after startup of the existing facility in late 2003 and early 2004. These issues were finalized in Consent Order OGC File No.: 03-2031. SAC also has received and responded to a warning letter from the Department (WL05-30-AP61-NED). SCC is unaware of any other violations or warning letters from the Department against SAC or VC.

15. *Has Sumter Cement Company or its cement operations affiliates (such as Votorantim and St. Mary's Cement) had any violations (or received warning letters) in the past two years related to the regulations of other states or EPA? Please provide the status of any matters that have not yet been resolved. Provide additional information in case the matters relate to actions by previous owners of the assets. [Rule 62-4.070(5), F.A.C.]*

SCC is operated by VC which owns and operates St. Mary's Cement. SCC is unaware of any violations or warnings issued against its operations by other states or the EPA while under operations of VC. Issues prior to ownership by VC are not available to SCC or relevant to the operations under VC.

16. *If the positions of plant manager and plant production manager are still to be determined, please describe the minimum requirements for this position established by your company including, but not limited to, total years experience in the cement industry, total years experience as plant operator, educational background, etc. [Rule 62-4.070(1), F.A.C.]*

As previously stated, VC will be in charge of operations of the SCC Plant. VC has been established in the cement industry since 1936 and currently is the 7th largest producer of cement in the world. VC operates 12 cement plants in South America with over 25 million metric tons of cement capacity. In North America, VC operates 5 cement plants and 2 grinding facilities. VC has among the highest operating standards of any cement company in the world. It has tremendous experience in the cement industry and technical expertise from its 20,000 employees.

VC will insure the positions of Plant Manager and Production Manager are filled with personnel with experience in the cement industry and appropriate educational background. VC would prefer not to set defined years for experience or education as these can limit the opportunities for promotion and growth within the company. To give an example of typical qualifications, the position of Plant Manager at SAC has been filled by two people under VC's period of operations. Both had 20+ years of experience in the cement industry and strong technical backgrounds in education.

17. *According to the application, the project has the potential to emit 103 tons per year of VOC. If a project has the potential to emit VOC over 100 tons per year, the applicant is required to perform an air quality analysis for this PSD pollutant. This includes a Pre-Construction Monitoring Analysis. Please provide a Pre-Construction Analysis for VOC and further, please explain how projected VOC emissions will not contribute to a violation of the National Ambient Air Quality Standard for ozone.*

VOC PTE emissions from the SCC Plant were conservatively estimated based on 0.12 lb VOC per short ton of clinker. SCC has decided to reduce the level of conservatism associated with VOC emissions. With current annual PTE VOC emissions at 103 short tons per year, this would require SCC to perform an ambient impact analysis, including pre-construction monitoring. As a result, SCC is revising the estimated annual PTE VOC emissions based on a revised emission factor of 0.115 lb VOC per short ton of clinker. This will result in annual PTE VOC emissions of 98.7 short tons per year and eliminates the requirement to perform an ambient impact analysis, including pre-construction monitoring.

Provided in Attachment 2 and 5 are applicable updated sections of the Permit-To-Construct Application. This information is also included on the enclosed CD.

18. *Although associated growth is addressed in the application, please provide an additional analysis to comply with Rule 62-212.400(5)(h)5, F.A.C.*

The secondary impact analysis addressed the direct impact of PTE TSP and PM_{10} emissions on surrounding soils, flora, fauna, and any associated direct and indirect growth attributable to the proposed project. These two regulated NSR pollutants had predicted maximum 24-hour and annual air quality impacts above their corresponding "significant impact levels" (SIL).

The recommended EPA methodology specified in "*A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals*" (EPA 450/2-81-078, December 12, 1980) and the EPA document "*New Source Review Workshop Manual*" (Draft October 1990) were used as references to perform the secondary impact analysis. Also, the secondary impact analysis of the project's air pollution impact on soil, vegetation, wildlife, direct growth, and indirect growth was assessed per the requirements stipulated in Florida Rule 62-212.400(5)(e)(1-3) and 62-212.400(5)(h)(5). Specifically, Rule 62-212.400(5)(h)5 states "*Information relating to the air quality impacts of, and the nature and extent of, all general commercial, residential, industrial and other growth which has occurred since August 7, 1977, in the area of the facility or modification would affect.*"

In the PTC Application, the following was presented relative to soils, flora, and fauna, including wildlife:

- **Soils, Flora, and Fauna, Including Wildlife**

  The estimated, maximum, total annual PM_{10} impact plus representative annual PM_{10} background value is 29.96 $\mu g/m^3$. This value is within the applicable annual PM_{10} NAAQS value of 50.0 $\mu g/m^3$.

  The estimated, highest second-highest, total 24-hour PM_{10} impact plus representative annual PM_{10} background value is 79.88 $\mu g/m^3$. This value is within the applicable 24-hour PM_{10} NAAQS value of 150.0 $\mu g/m^3$.

From the results of this analysis it is concluded that there will be no adverse impacts from PTE PM_{10} emissions on any surrounding soils, flora, or fauna, including wildlife, from the SCC Plant.

To supplement the information presented in the PTC Application, the following additional information is provided in response to Item No. 18.

- **Associated Direct and Indirect Growth**

  Work Force
  The construction of the SCC Plant is expected to produce 500 temporary jobs for a period of 18 months. The operation of the SCC Plant will also produce approximately 118 new permanent jobs. Of the 118 new permanent jobs, 24 of the jobs will be initially filled with technical personnel from the SCC parent, Votorantim Cementos. Votorantim Cementos will be the operator of the SCC Plant and also operates SAC which has a cement plant located in nearby Branford, Florida. The remaining 94 new permanent jobs are expected to be filled by the existing workforce from the surrounding population. No new significant air emissions are expected associated with the construction or operation of the SCC Plant from workers traveling to and from the SCC Plant.

  Residential
  The predominant existing housing units in the vicinity of the SCC Plant are single family and mobile homes. The easy availability of mobile homes and lots in the vicinity of the SCC Plant provides a local capacity for quick expansion. It can be anticipated that 12 new homes can be expected to be built in Center Hill and an additional 89 new homes can be expected to be built in Sumter County. The anticipated air emissions associated with the new home construction will be temporary and are considered insignificant because of the limited number of new homes expected to be constructed as the result of the SCC Plant. New air emissions associated with the heating of any new homes are also expected to be minimal and considered insignificant due to the climatology of the area.

  Industrial
  The construction and operation of the SCC Plant is not expected to produce any new industrial growth and no new air emissions.

  Commercial
  It is possible that a modest increase in commercial growth associated with the establishment of new small commercial establishments such as restaurants, convenience stores, and gas stations can be expected. However, it is concluded that no new significant emissions are expected from any realized commercial growth.

  Other
  No other direct or indirect growth is expected as the result of the construction and operation of the SCC Plant.

To summarize, no significant new emissions associated with direct and indirect growth impacts due to the construction or operation of the SCC Plant are expected.

19. *The modeling submitted with the application has fugitive road emissions evaluated as "Area" sources. Please provide justification for using this type of source for the roads.*

In the Modeling Protocol submitted to the Department in June of 2005, fugitive emissions from roads were identified as area sources and outlined to the Department that they would be modeled as such.

Fugitive emissions from roads were selected to be modeled as area sources since area sources are characterized as having a low-level release with no plume rise. Volume sources were not selected since they have initial dispersion prior to release which is not representative of particulate emissions from haul roads. Representing haul roads as area sources in generally considered more conservative than representing them as volume sources. The treatment of haul roads as area sources is consistent with EPA modeling guidance. As stated in the User's Guide for the ISC3 Dispersion Models[1], "The use of the ISC area source algorithm for elongated rectangles would be most applicable to near ground level line sources."

[1] Air Quality Modeling Guidelines, July 2001, South Carolina Department of Health & Environmental Control, Bureau of Air Quality.

20. *Please provide a table summarizing all pollutant emission rates from all sources that were included in the Class II PSD increment and NAAQS modeling. Include a list of major nearby sources that were omitted as well.*

Provided in Attachment 4 are three tables which identify the emission rates for all sources included in the Class II PSD Increment and NAAQS modeling, identify the sources excluded based on the 20D rule, and identify the sources excluded which were located just outside of the significant impact area (60 km). These tables are also provided in electronic format on the enclosed CD.

21. *Since the modeling protocol was deemed sufficient, the standard for the Receptor Grid has become more refined within the Department. In order to have continuity with other cement projects in the State, it is requested that a 25 meter plant boundary receptor grid interval be used for this project. This includes 2 receptors, one on either side of each road where it intersects the plant boundary, at a minimum distance of 25 meters from the road edge. Please update modeling to reflect the new standard to ensure that this continuity is satisfied.*

SCC submitted a modeling protocol for the Department's review and comment on June 16th. SCC and the Department reviewed and modified the protocol on several occasions before receiving final approval on the protocol from the Department on August 18th. The intent of submitting a protocol for review and approval was to avoid this exact situation where the Department would change the parameters by which the modeling should be performed causing SCC to remodel, and expending time and resources to do so. SCC understands the changing parameters by which the Department may need to re-evaluate modeling results, but SCC made every possible effort to work with the Department to insure modeling would be conducted in the appropriate manner prior to submittal of the updated Application on September 8th. Irregardless, SCC has conducted the requested modeling changes and remodeled the results as requested and attached the updated modeling results and associated input, output and intermediate files on the enclosed CD.

22. *Please provide a more detailed plot plan. The Department is requesting both an electronic version (preferably a .dwg file) and an updated paper plan (preferably 2 x 3 feet). Please grid the plot plan in UTM coordinates and highlight the buildings and structures.*

Updated drawings are included as AutoCAD files (.dwg file) on the enclosed CD. The UTM coordinates of the center of the kiln stack are noted on each file and have been provided below:

Easting 403754.39 (M), Northing 3167561.97 (M), Zone 17, WGS-84 Ellipsoid.

23. *Please provide a diagram showing each road segment, its location and its emission parameters.*

Provided in Attachment 3 is a table listing the exact location and emission parameters for each road segment and a chart showing the location of each road segment. The table and chart are also provided electronically on the enclosed CD.

24. *Please provide any Excel files for Tables in Appendix A to show how emission calculations were completed.*

SCC has provided in the Modeling Protocol, Modeling Report, Calculation Methodology (Section 4), and Potential to Emit (PTE) Spreadsheets in Appendix A all formulas used in calculating emissions. From these formulas every emission output can be duplicated and checked. SCC will provide the actual spreadsheets in Excel to the Department so they may more easily track the calculations through the spreadsheet cells. These can be found on the enclosed CD. SCC would request this Excel version of Appendix A be deemed a "Proprietary Work Product" and only the PDF version be made available to the public so that the work product may be protected. An updated PDF version of these spreadsheets is also included in the enclosed CD.

25. *On page 5-18 of the application, Table 5-7 details the results of the PSD Class II Increment PM10 analysis. According to the text above the table, the modeling results for the 24-hour averaging period are based on the High, Fourth-High concentrations. The Increment should be based on the High, Second-High concentrations for the 24-hour averaging period. Please correct the table/Increment analysis.*

We have modified the modeling runs and report to reflect the usage of High, Second-High for the 24-hour period. Provided in Attachment 6 is a copy of the revised Modeling Report. An electronic copy of the Modeling Report is also included along with the modeling files on the enclosed CD.

26. *Please update Tables in Appendix A to reflect the "Source ID" or "Source Description" for all sources in the modeling or vice versa.*

Provided in Attachment 5 is an updated Appendix A or PTE Inventory which now includes a column labeled "Modeling Source ID" to identify the Source ID used in the modeling input and output files for each emission source. As mentioned in the response above, the PTE Inventory is also provided on the enclosed CD in both PDF and Excel format.

27. *Please explain how the Initial Lateral Dimension and Initial Vertical Dimension were determined for the Volume Sources.*

Initial lateral dimensions for volume sources, such as buildings, were defined as the length of a side (square) divided by 4.3 which is consistent with EPA modeling guidance. Rectangular buildings were assumed to be a square with the same area as the actual building. Initial vertical dimensions for volume sources were determined for elevated sources not on or adjacent to a building by taking the vertical dimensions of the source and dividing it by 4.3. Initial vertical dimensions for volume sources were determined for elevated sources on or adjacent to a building by taking the building height and dividing it by 2.15. This approach is consistent with EPA modeling guidance.[2]

[2] U.S. EPA 1995 – "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volume I – User Instructions", U. S. Environemntal Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 1995.

28. *Please explain how the Initial Vertical Dimension of the Plume of 1.86m was determined for the Road Sources in the modeling.*

The initial vertical dimension of 1.86 meters represents an estimated value of approximately six feet which represents the average physical tire height and attending turbulent vertical dispersion initially produced by the truck tire traveling over plant road surfaces.

29. *Although Building Downwash is included in the modeling, please provide the actual BPIP input and output files.*

BPIP input and output files are included on the enclosed CD.

30. *Please ask your professional engineer to review the seal used for compliance with the latest requirements of the Florida Board of Professional Engineers. It may be necessary to resubmit the P.E. certification. These are given at: http://www.engineerseals.com/order/floridape.php*

Contact was made with the Florida Board of Professional Engineers regarding the validity of the Florida P.E. Seal used for the SCC PTC Application. The Florida P.E. Seal used for the SCC PTC Application and this response is still valid until December 31, 2005. Beginning January 1, 2006, the new Florida P.E. Seal referenced in the RAI is required to be used.

Attachment 1

Revised Table 3-1 and Table 5-1 from the BACT Analysis (Appendix B)

TABLE 3-1. SUMMARY OF RECENT SO_2 BACT DETERMINATIONS FOR CEMENT KILNS (2000-PRESENT)

Company	Location	Kiln Type	Permit Date	Technology Applied and $/Ton	Removal (%)	In Operation (Yes/No)	Limit (lb/ton clinker)	Rejected Technology and $/Ton
CEMEX	Demopolis, AL	PC (mod)	09/13/02	Low S Coal	NA	Yes	1.14	WS - $10,327
Florida Rock Industries	Newberry, FL	PC (mod)	2002	Process – NA	NA	Yes	0.16	
Florida Rock Industries	Newberry, FL	PC (new)	App. 11/8/04	Process – NA	NA	No	0.28 (proposed)	WS - $20,453
GCC Dacotah	Rapid City, SD	PC (mod)	04/10/03	Process – NA	NA	Yes	2.16	Fuel or raw mix S limits
Holcim	Holly Hill, SC	PC (new)	12/22/99	Process - NA	NA	Yes	3.26	
Holcim	Artesia, MS	WET (mod)	See Note 1	No BACT limit for SO2		Yes		
Holcim (Devil's Slide)	Morgan, UT	PC (mod)	11/20/02	No BACT limit for SO2		Yes		
Holcim	Theodore, AL	PC (mod)	02/04/03	Limit not based on BACT	NA	Yes	0.13	
Holcim	Lee Island, MO	PC (new)	06/08/04	Lime spray drying – mill off	93	No	1.26	WS - $13,225
Lafarge	Davenport, IA	PC (mod)	11/09/99	Process	NA	Yes	1.01	
Lehigh Portland Cement	Mason City, IA	PC (mod)	12/11/03	Wet Scrubbing	90	Yes	7.26	
Lone Star Industries	Cape Girardeau, MO	PC (new)	See Note 1		NA	No		
Monarch Cement	Humboldt, KS	2PC (mod)	01/27/00	Process – NA	NA	Yes	1.10	WS - $10,345 Lo S Fuel, WAA, DAA
North Texas Cement	Whitewright, TX	PC (new)	03/04/99	Wet Scrubbing	85	No[2]	2.75	
St. Lawrence Cement	Hudson, NY	PC (new)	See Note 1	Dry & Wet Scrubbing		No	0.65	
Suwannee American Cement	Branford, FL	PC (new)	06/01/00	Process	NA	Yes	0.27	WS - $29,700 DAA - $7,400
Rinker/Florida Crushed Stone	Brooksville, FL	PC (new)	App. 12/04	Process – NA	NA	No	0.23 (proposed)	

Notes:
1. Permit under negotiation
2. May never be built

TABLE 5-1. CARBON MONOXIDE (CO) LIMITS FOR PRECALCINER KILNS

Facility Name	Plant Name	Facility Location	Facility Status	Annual average emissions (lb/h)	Annual average emissions (lb/ton clinker)	Control Technology*
Alamo Cement Company	1604	San Antonio, TX	Existing	460.00	4.14	GC
Ash Grove Cement Company	Chaunte	Chaunte, KS	Existing	321.69	1.66	GC
Ash Grove Cement Company	Durkee	Durkee, OR	Existing	490.00	4.34	GC
Ash Grove Cement Company	Louisville	Louisville, NE	Existing	NL	NL	GC
Ash Grove Cement Company	Leamington	Nephi, UT	Existing	502.27	4.88	GC
Ash Grove Cement Company	Seattle	Seattle, WA	Existing	537.21	6.27	GC
Blue Circle Cement, Inc.	Harleyville	Harleyville, SC	Existing	1209.59	9.68	GC
Calaveras Cement Company	Redding	Redding, CA	Existing	1156.85	15.83	GC
Calaveras Cement Company	Tehachapi	Tehachapi, CA	Existing	900.00	11.86	GC
California Portland Cement	Mojave	Mojave, CA	Existing	183.50	2.85	GC
California Portland Cement	Arizona Portland	Rillito, AZ	Existing	1157.31	4.41	GC
Capitol Aggregates, Inc.	Capitol Cement Division	San Antonio, TX	Existing	622.50	7.47	GC
Capitol Cement Corporation	Capitol Cement Corporation	Martinsburg, WV	Withdrawn	468.75	2.50	GC
Capitol Cement Corporation	Capitol Cement Corporation	Martinsburg, WV	Existing – Modification	3960.00	4.00	GC
Sunbelt Cement, Inc. (prev Cemex USA)	Balcones	New Braunfels, TX	Existing	497.72	4.52	GC
Continental Cement Co., Inc.	Continental Cement Co., Inc.	Hannibal, MO	Withdrawn	ND	ND	
CSR/Rinker Materials, Inc.		Miami, FL	Existing	412.40	3.01	GC
ESSROC	Nazareth	Nazareth, PA	New – Not Constructed	1364.06	4.50	GC
Florida Crushed Stone – Kiln 1		Brooksville, FL	Existing	208.33	2.00	GC
Florida Rock Industries, Inc.		Brooksville, FL	Proposed	292.92	3.60	GC
Florida Rock Industries, Inc.	Thompson S. Baker Plant	Newberry, FL	Existing	294.20	3.62	GC
Florida Rock Industries, Inc.	Thompson S. Baker Plant	Newberry, FL	Proposed	450.00	3.60	GC
Hanson Permanente Cement	Permanente	Cupertino, CA	Existing	1008.72	4.72	GC
Holcim (US)	Portland	Florence, CA	Existing	1940.64	6.80	GC
Holcim (US)	Holly Hill	Holly Hill, SC	Constructed		8.00	GC
Holcim (US)		Lee Island, MO	Proposed	2739.73	6.00	GC
Holcim (US)	Fort Collins	Laport, CO	Existing	26.48	0.40	GC
Holcim (TEXAS)LP	Holcim (TEXAS)LP	Midlothian, TX	Existing – Modification	811.99	5.33	GC
Holcim (TEXAS)LP	Holcim (TEXAS)LP	Midlothian, TX	Existing – Modification	811.99	5.33	GC
Holcim (US)	Devil's Slide	Morgan, UT	Existing	620.00	5.05	GC
Holcim (US)	Theodore	Theodore, AL	Existing	NL	NL	GC
Kosmos Cement Company	Kosmosdale	Louisville, KY	Existing	1325.00	10.60	GC
Lafarge Corporation	Davenport	Buffalo, IA	Existing	313.00	2.15	GC
Lafarge Corporation	Sugar Creek	Sugar Creek, MO	Existing	192.24	1.64	GC
Lehigh Portland Cement	Union Bridge	Union Bridge, MD	Existing	ND	ND	
Lehigh Portland Cement	Mason City	Mason City, IA	Existing – Prop. Mod.	NL	NL	GC
Lone Star Industries	Cape Girardeau	Cape Girardeau, MO	Existing	NL	NL	GC
Lone Star Industries	Cape Girardeau	Cape Girardeau, MO	New – Not Constructed	ND	ND	
Lone Star Industries	Greencastle	Greencastle, IN	Existing	552.97	3.02	GC

TABLE 5-1. CARBON MONOXIDE (CO) LIMITS FOR PRECALCINER KILNS (CONTINUED)

Facility Name	Plant Name	Facility Location	Facility Status	Annual average emissions (lb/h)	Annual average emissions (lb/ton clinker)	Control Technology*
Mitsubishi Cement Corporation	Cushenbury	Lucerne Valley, CA	Existing			
National Cement Company of Alabama	Ragland	Ragland, AL	Existing			
National Cement Company of California	Lebec	Lebec, CA	Existing	384.00	2.71	GC
North Texas Cement Company		Whitewright, TX	New – Not Constructed	ND	ND	
Phoenix Cement	Clarkdale	Clarkdale, AZ	New – Not Constructed	ND	2.00	GC
RC Cement Company, Inc.	Hercules Cement Company	Stockertown, PA	New – Not Constructed	ND	ND	GC
Rio Grande Portland Cement		Pueblo, CO	New – Not Constructed	254.06	2.11	GC
RMC Pacific Materials	Santa Cruz	Davenport, CA	Existing	NL	NL	GC
Roanoke Cement Company	Roanoke Cement Company	Cloverdale, VA	Existing – Modification	494.67	3.00	GC
St. Lawrence Cement		Hudson, NY	Proposed	783.48	2.59	GC
Signal Mountain Cement		Chattanoga, TN	Existing	248.00	2.77	GC
Southdown, Inc.	Charlevoix	Charlevoix, MI	Existing	179.91	2.14	GC
Southdown, Inc.	Clinchfield	Clinchfield, GA	Existing	1187.50	12.42	GC
Southdown, Inc.	Knoxville Plant	Knoxville, TN	Existing	NL	NL	GC
Southdown, Inc.	Lyons	Lyons, CO	Existing	98.21	1.32	GC
Southdown, Inc.	Victorville Cement	Victorville, CA	Existing	ND	ND	
Suwannee American Cement		Branford, FL	Existing	378.00	3.60	GC
Tarmac America, Inc.	Pennsuco Cement	Medley, FL	Existing	369.61	1.77	GC
Texas Industries	Hunter Plant	New Braunfels, TX	Existing	ND	ND	GC
Texas Industries (Riverside Cement)	Oro Grande	Oro Grande, CA	New – Not Constructed	375.00	1.50	GC
Texas-Lehigh Cement Company	Buda	Buda, TX	Existing	1262.10	9.37	GC
TXI Operations, L.P.	Midlothian	Midlothian, TX	Existing	84.42	0.34	RTO

* GC = Good Combustion, RTO = Regenerative Thermal Oxidizer

Attachment 2

Revised Application Section 3 Emission Unit Form Page 3-70

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL/ESTIMATED FUGITIVE EMISSIONS

(Optional for unregulated emissions units.)

Potential/Estimated Fugitive Emissions

Complete for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

1. Pollutant Emitted: **VOC**	2. Total Percent Efficiency of Control: **N/A**
3. Potential Emissions: **23.95** lb/hour **98.64** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **0.115 lb/ton clinker** Reference: **Proposed BACT**	7. Emissions Method Code: **2**
8. Calculation of Emissions: **See Section 4 and Appendix A**	
9. Pollutant Potential/Estimated Fugitive Emissions Comment:	

Attachment 3

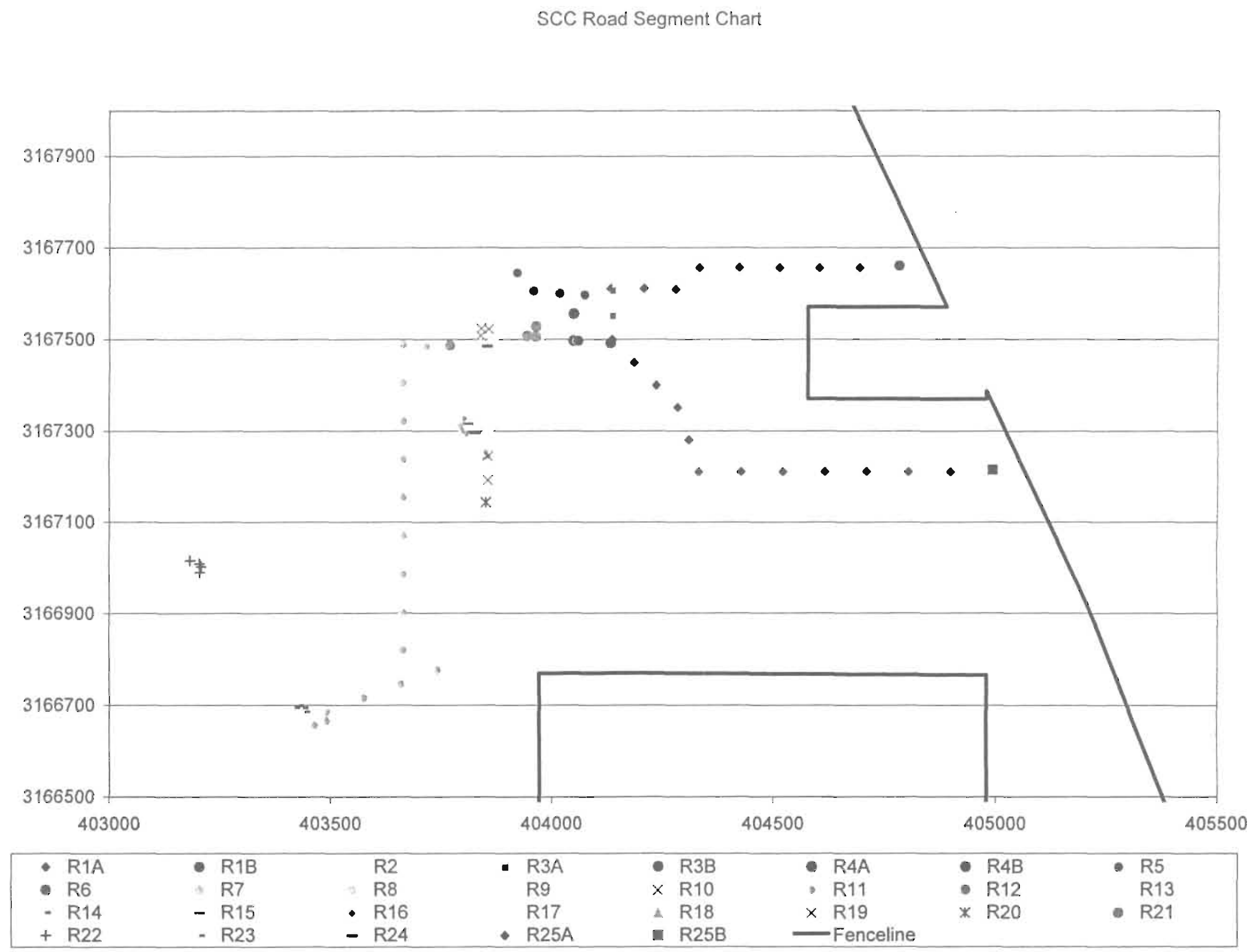
Road Segment Emission Parameter Table and Road Segment Chart

SCC Road Segment and Emission Parameter Table

Road Segment	UTM X	UTM Y	Q (g/s)	Release Height (m)	Width (m)	Length (m)	Angle	Szinit (m)
R1A_1	404130.4	3167611	1.32E-05	4	9.91	75	90	1.86
R1A_2	404205.4	3167611	1.32E-05	4	9.91	75	90	1.86
R1A_3	404276.9	3167610	1.32E-05	4	9.91	70.71	45	1.86
R1A_4	404330.4	3167656	1.32E-05	4	9.91	90	90	1.86
R1A_5	404420.4	3167656	1.32E-05	4	9.91	90	90	1.86
R1A_6	404510.4	3167656	1.32E-05	4	9.91	90	90	1.86
R1A_7	404600.4	3167656	1.32E-05	4	9.91	90	90	1.86
R1A_8	404690.4	3167656	1.32E-05	4	9.91	90	90	1.86
R1B_1	404780.4	3167661	7.15E-06	4	18.29	70	90	1.86
R2_1	404135	3167606	6.56E-06	4	9.14	58.19	-175.32	1.86
R3A_1	404135	3167606	6.53E-06	4	9.14	54.75	180	1.86
R3A_2	404135	3167552	6.53E-06	4	9.14	54.75	180	1.86
R3B_1	404130.4	3167492	2.25E-05	4	9.14	78.53	-89.82	1.86
R4A_1	404047.3	3167497	7.86E-06	4	9.14	57.5	-0.4	1.86
R4B_1	404047.3	3167556	7.86E-06	4	9.14	51.45	24.01	1.86
R5_1	404072.1	3167597	5.00E-08	4	9.14	56.22	-86.18	1.86
R5_2	404016	3167601	5.00E-08	4	9.14	56.22	-86.18	1.86
R5_3	403957.1	3167606	5.00E-08	4	9.14	57.1	-45.53	1.86
R5_4	403919.5	3167645	5.00E-08	4	9.14	73.47	-90	1.86
R6_1	404056.5	3167497	1.46E-05	4	9.14	69.86	-174.46	1.86
R7_1	403977.4	3167490	1.05E-06	4	9.14	33.5	0.37	1.86
R7_2	403982.2	3167519	1.05E-06	4	9.14	20.62	-90	1.86
R8_1	403981.9	3167486	1.35E-05	4	9.14	64.81	-90	1.86
R8_2	403917.1	3167486	1.35E-05	4	9.14	64.81	-90	1.86
R9_1	403836.8	3167490	1.26E-06	4	9.14	19.75	0	1.86
R9_2	403841.3	3167514	1.26E-06	4	9.14	20.34	90	1.86
R9_3	403866.3	3167510	1.26E-06	4	9.14	19.75	180	1.86
R10_1	403837.4	3167509	2.02E-06	4	3.05	14.25	0	1.86
R10_2	403839	3167525	2.02E-06	4	3.05	14.75	90	1.86
R10_3	403855.3	3167523	2.02E-06	4	3.05	14.25	180	1.86
R11_1	403770.9	3167486	3.66E-06	4	9.14	57.08	-90	1.86
R11_2	403713.8	3167486	3.66E-06	4	9.14	57.08	-90	1.86
R11_3	403661.3	3167490	3.66E-06	4	9.14	84	180	1.86
R11_4	403661.3	3167406	3.66E-06	4	9.14	84	180	1.86
R11_5	403661.3	3167322	3.66E-06	4	9.14	84	180	1.86
R11_6	403661.3	3167238	3.66E-06	4	9.14	84	180	1.86
R11_7	403661.3	3167154	3.66E-06	4	9.14	84	180	1.86
R11_8	403661.3	3167070	3.66E-06	4	9.14	84	180	1.86
R11_9	403661.3	3166986	3.66E-06	4	9.14	84	180	1.86
R11_10	403661.3	3166902	3.66E-06	4	9.14	84	180	1.86
R11_11	403660.8	3166820	3.66E-06	4	9.14	88.05	153.53	1.86
R11_12	403739.8	3166777	3.66E-06	4	9.14	88.94	-159.89	1.86
R11_13	403656.3	3166747	3.66E-06	4	9.14	88.94	-159.89	1.86
R11_14	403572.8	3166716	3.66E-06	4	9.14	88.94	-159.89	1.86
R11_15	403489.5	3166687	3.66E-06	4	9.14	18	180	1.86
R11_16	403489.2	3166667	3.66E-06	4	9.14	22.13	-156	1.86
R11_17	403461.3	3166657	3.66E-06	4	9.14	32.68	-40.77	1.86
R12_1	403767	3167488	1.66E-06	4	9.14	40.24	-31.67	1.86
R13_1	403856.9	3167490	7.01E-06	4	9.14	61.17	180	1.86
R13_2	403856.9	3167429	7.01E-06	4	9.14	61.17	180	1.86

SCC Road Segment and Emission Parameter Table

Road Segment	UTM X	UTM Y	Q (g/s)	Release Height (m)	Width (m)	Length (m)	Angle	Szinit (m)
R13_3	403856.9	3167368	7.01E-06	4	9.14	61.17	180	1.86
R14_1	403850.1	3167302	2.62E-06	4	9.14	24.44	-90	1.86
R15_1	403825.6	3167295	1.46E-05	4	3.05	17.5	-90	1.86
R15_2	403806.6	3167297	1.46E-05	4	3.05	18.25	0	1.86
R15_3	403808.1	3167316	1.46E-05	4	3.05	17.5	90	1.86
R16_1	403804.7	3167294	3.61E-06	4	3.05	13.39	-50.59	1.86
R16_2	403793.8	3167304	3.61E-06	4	3.05	9.02	-14.04	1.86
R16_3	403791.7	3167313	3.61E-06	4	3.05	15.38	24.48	1.86
R16_4	403799.2	3167328	3.61E-06	4	3.05	17.02	79.85	1.86
R17_1	403854.6	3167307	4.39E-06	4	9.14	61	180	1.86
R18_1	403850	3167250	2.30E-06	4	9.14	67.06	90	1.86
R19_1	403854.6	3167246	2.10E-06	4	9.14	53.12	180	1.86
R19_2	403854.6	3167193	2.10E-06	4	9.14	53.12	180	1.86
R20_1	403850	3167144	2.10E-06	4	9.14	66.84	90	1.86
R21_1	403962.7	3167529	1.13E-05	4	3.05	21	180	1.86
R21_2	403961.2	3167507	1.13E-05	4	3.05	17.53	-90	1.86
R21_3	403942.1	3167508	1.13E-05	4	3.05	21	0	1.86
R22_1	403182.1	3167015	1.57E-04	4	3.05	20.98	-164.8	1.86
R22_2	403203.3	3167009	1.57E-04	4	3.05	9.61	-110.56	1.86
R22_3	403207	3167003	1.57E-04	4	3.05	12.45	100.41	1.86
R22_4	403203.8	3166990	1.57E-04	4	3.05	8.87	139.57	1.86
R23_1	403441.9	3166686	9.28E-06	4	3.05	10.6	-31.86	1.86
R23_2	403437	3166695	9.28E-06	4	3.05	12.03	-69.3	1.86
R23_3	403427.7	3166700	9.28E-06	4	3.05	9.95	-154.72	1.86
R23_4	403418.4	3166695	9.28E-06	4	3.05	12.71	-134.9	1.86
R24_1	403852.3	3167486	5.30E-06	4	9.14	81.44	-90	1.86
R25A_1	404133.9	3167500	1.32E-05	4	9.91	70.65	135.05	1.86
R25A_2	404183.9	3167450	1.32E-05	4	9.91	70.65	135.05	1.86
R25A_3	404233.9	3167401	1.32E-05	4	9.91	70.65	135.05	1.86
R25A_4	404282.1	3167352	1.32E-05	4	9.91	74.8	109.53	1.86
R25A_5	404307.1	3167281	1.32E-05	4	9.91	74.8	109.53	1.86
R25A_6	404330.4	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25A_7	404425	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25A_8	404519.6	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25A_9	404614.2	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25A_10	404708.8	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25A_11	404803.4	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25A_12	404898	3167211	1.32E-05	4	9.91	94.6	90	1.86
R25B_1	404992.6	3167215	7.15E-06	4	18.29	70	90	1.86


SCC Road Segment Chart
3167900
3167700
3167500
3167300
3167100
3166900
3166700
3166500
403000
403500
404000
404500
405000
405500
R1A
R1B
R2
R3A
R3B
R4A
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R5
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R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25A
R25B
Fenceline

Attachment 4

Class II PSD Increment and NAAQS Modeling Source Tables

Emission Units Excluded from the Class II PSD Increment Modeling based on the 20D Rule

Facility ID	Source	Distance (km)	20D Value (1)
0690046	Covanta Lake	15.0	1.33
0690014	Sliver Springs Citrus	22.5	2.56
0690002	Cutrale Citrus Juices	23.0	1.40
1010060	Helena Chemical Co.	37.7	1.09
0950053	Louis Dreyfus Citrus	40.8	4.50
0530021	Florida Crushed Stone - Brooksville	42.8	1.29
0570005	CF Industries	53.9	1.53

Note 1 - (Distance from Sumter Stack - 10)*20 divided by Emissions in tons/yr. A value of greater than 1 leads to exclusion.
Note 2 - The emission units of Progress Energy - Intercession (59.3 km distant) were primarily operating in 1974, prior to the PM PSD baseline date.

Key Emission Units Excluded From Modeling Outside of the 60 km Range

Facility ID	Source	Distance (km)
0970043	Kissimmee Utility Authority - Kua Cane Power	60.7
1050004	Lakeland Electric - CD McIntosh	61.5
1010056	Pasco RRF	62.1
1050003	Lakeland Electric - CD McIntosh	65.2
1050221	Calpine - Auburndale Power	66.4
1050352	Lakeland Electric - Winston Peaking	67.0
0970001	Kissimmee Utility Authority - Roy B Hansel	68.0
1270009	Florida Power and Light - Sanford	68.4
1270028	Progress Energy - Debary	70.3

Emission Units Included in the Class II PSD Increment and NAAQS Modeling

Facility ID	Owner / Site Name	EU ID	Distance from Stack (km)	Annual Emission Rate (g/s)	Hourly Emission Rate (g/s)
1190018	CONSOLIDATED MINERALS, INC. - CENTER HILL MINE	2	3.05	1.11E+00	1.11E+00
1190018	CONSOLIDATED MINERALS, INC. - CENTER HILL MINE	4	3.05	1.90E-01	1.89E-01
1190018	CONSOLIDATED MINERALS, INC. - CENTER HILL MINE	5	3.05	2.18E-01	2.18E-01
1190018	CONSOLIDATED MINERALS, INC. - CENTER HILL MINE	6	3.05	1.03E-01	1.03E-01
0530010	CEMEX	2	46.37	1.29E-01	1.29E-01
0530010	CEMEX	3	46.37	3.39E+00	3.74E+00
0530010	CEMEX	4	46.37	1.71E+00	1.88E+00
0530010	CEMEX	5	46.37	4.54E+00	4.54E+00
0530010	CEMEX	6	46.37	1.65E-01	1.83E-01
0530010	CEMEX	8	46.37	4.69E-01	4.71E-01
0530010	CEMEX	9	46.37	7.19E-01	4.54E+00
0530010	CEMEX	11	46.37	2.71E-01	2.71E-01
0530010	CEMEX	12	46.37	2.17E-01	2.47E-01
0530010	CEMEX	13	46.37	1.59E+00	1.70E+00
0530010	CEMEX	14	46.37	3.39E+00	3.74E+00
0530010	CEMEX	15	46.37	1.71E+00	1.88E+00
0530010	CEMEX	16	46.37	1.71E-01	1.83E-01
0530010	CEMEX	17	46.37	6.01E-02	6.43E-02
0530010	CEMEX	18	46.37	1.71E-01	1.83E-01
0530010	CEMEX	19	46.37	4.72E-01	5.04E-01
0530010	CEMEX	21	46.37	1.18E-01	1.26E-01
0530010	CEMEX	22	46.37	1.08E-01	1.26E-01
0530010	CEMEX	23	46.37	5.41E-02	6.30E-02
0530010	CEMEX	24	46.37	7.31E-02	7.56E-02
0530010	CEMEX	25	46.37	8.05E-04	1.08E-03
0530010	CEMEX	26	46.37	5.38E-02	7.56E-02
0530010	CEMEX	27	46.37	1.14E+00	1.60E+00
1190011	ROBBINS MANUFACTURING CO.	1	11.16	5.30E-01	5.30E-01
1190011	ROBBINS MANUFACTURING CO.	2	11.16	5.30E-01	5.30E-01
1190011	ROBBINS MANUFACTURING CO.	5	11.16	2.50E-01	2.50E-01

Attachment 5
Revised PTE Inventory (Appendix A)

TABLE A-1
Potential Plant-Wide Emission Totals

EU No.	EU Description	PM tons/yr	PM_{10} tons/yr	SO_2 tons/yr	NO_x tons/yr	CO tons/yr	VOC tons/yr	HCl tons/yr	Lead tons/yr	Mercury tons/yr	Beryllium tons/yr	Dioxin/Furans tons/yr	Fluorides tons/yr
CH-1	Primary Crushing & Associated Conveyors	1.48	0.69										
CH-2	Raw Material Conveying	1.74	0.82										
CH-3	Raw Material Processing and Storage	12.10	10.28										
CH-4	Kiln System with In-Line Raw Mill and Clinker Cooler	180.98	153.14	231.59	1,672.61	3,087.90	98.64	120.09	0.064	0.092	0.0002	2.49E-07	0.772
CH-5	Clinker Storage and Conveying	24.97	21.23										
CH-6	Finish Mills and Cement Processing	119.55	101.62										
CH-7	Coal Mill System	20.70	17.60										
CH-8	Coal Conveying	0.08	0.04										
CH-9	Emergency Generator (See Note 1)	0.07	0.06	0.55	2.31	0.43	0.08						
CH-10	Storage Piles	10.51	5.26										
CH-11	Paved and Unpaved Roads	68.69	13.64										
	Pollutant Totals	**437.67**	**322.87**	**232.14**	**1,674.93**	**3,088.33**	**98.72**	**120.085**	**0.064**	**0.092**	**0.0002**	**2.49E-07**	**0.772**

Point Sources
Fugitive Sources

NOTE 1 : Emergency Generator is exempt from being included in the Permit to Construct Application as it will use less than 32,000 gallons of diesel per year (Per Rule 62-210.300(3)(a)20

TABLE A-2
Potential Throughput Data for Center Hill Plant

Material	Center Hill Throughput (tons/yr)	Center Hill Hourly Rates (tons/hr)	Comments
Limestone crushed	3,798,428	2142.5	
Base Rock	500,000	NA	
Limestone - raw material	3,298,428	443.0	
Bauxite/Alumina Source	352,662	47.4	
Sand/Clay/Silica Source	385,854	51.8	
Steel Slag/Iron Source	87,128	11.7	
Wet Fly Ash Storage	352,662	47.4	
Coal Mill	211,160	28.4	
Raw Mill Feed (Wet)	3,607,797	484.5	
Kiln Feed from Raw Mill (Dry) to Blend Silo	2,958,393	397.3	
Kiln Preheater Feed from Blend Silo	2,553,019	323.8	
Kiln Baghouse Dust Recirculation	231,351	28.3	
Kiln Feed Total	2,784,370	353.2	Preheater Feed + Baghouse Dust Recirculation
Clinker Produced by Kiln	1,715,500	208.3	
Total Clinker Needed for Cement	2,354,425	316	
Gypsum/Synthetic Gypsum/Limestor	177,215	23.8	Assume 7% Gypsum
Finish Mill #1 (Clinker)	1,177,213	158.10	
Finish Mill #2 (Clinker)	1,177,213	158.10	
FM #1 (Cement Feed)	1,265,820	170	
FM #2 (Cement Feed)	1,265,820	170	
Cement Total	2,531,640	340.0	
Dry Fly Ash	278,437	35.3	

TABLE A-3
Potential Particulate Emissions from Point sources

EU No.	EP No.	Modeling Source ID	Description	Annual Throughput	Hourly Throughput	Flow ACFM	Temp. deg F	Moisture % (Note 1)	Flow DSCFM	Operating Hours	PM gr/dscf	PM-10 gr/dscf	PM lb/hr	PM tons/yr	PM-10 lb/hr	PM-10 tons/yr	Stack Parameters >> Height ft	Diam. ft	Velocity fpm	Orien-tation
	NDC-01	CH_P_001	Raw Material Transport	2,958,393.3	397.3	3,000	200	2%	2,352	8,760	0.01	0.0085	0.20	0.88	0.17	0.75	30	1.0	3820	H
	NDC-02	CH_P_002	Baghouse Dust Bin	231,351.4	28.25	4,500	450	2%	2,559	8,760	0.01	0.0085	0.22	0.96	0.19	0.82	60	1.0	5730	H
	NDC-03	CH_P_003	Raw Material Transport	2,958,393.3	397.3	3,000	200	2%	2,352	8,760	0.01	0.0085	0.20	0.88	0.17	0.75	15	1.0	3820	H
CH-3	NDC-04	CH_P_004	Blend Silo Inlet	2,958,393.3	397.3	8,500	200	2%	6,664	8,760	0.01	0.0085	0.57	2.50	0.49	2.13	240	1.4	5522	H
	NDC-05	CH_P_005	Blend Silo	2,553,018.8	323.8	5,000	200	2%	3,920	8,760	0.01	0.0085	0.34	1.47	0.29	1.25	45	1.0	6366	H
	NDC-06	CH_P_006	Blend Silo Outlet	2,553,018.8	323.8	3,000	200	2%	2,352	8,760	0.01	0.0085	0.20	0.88	0.17	0.75	15	1.0	3820	H
	NDC-07	CH_P_007	Kiln Feed Transport	2,784,370.2	353.2	5,500	200	2%	4,312	8,760	0.01	0.0085	0.37	1.62	0.31	1.38	345	1.1	5787	H
	NDC-08	CH_P_008	Fly Ash Silo	278,437.0	35.30	6,000	110	2%	5,447	8,760	0.01	0.0085	0.47	2.04	0.40	1.74	180	1.1	6314	H
	NDC-09	CH_P_009	Fly Ash Transport	278,437.0	35.30	2,500	110	2%	2,269	8,760	0.01	0.0085	0.19	0.85	0.17	0.72	20	1.0	3183	H
	DC-01		Preheater/Precaliner Kiln with In-Line Raw Mill Up(Compound)	1,715,500.0	208.30	679,600	203	16.5%	451,919	8,760	Assumes 85% runtime for kiln in compound condition and 15% runtime for direct condition.									
CH-4	DC-01	Kiln	Preheater/Precaliner Kiln with In-Line Raw Mill Down (Direct)	1,715,500.0	208.30	630,350	400	7.5%	357,980	8,760										
	DC-01		Kiln System with In-Line Raw Mill and Clinker Cooler (Total)	1,715,500.0	208.3	672,213	233	15%	434,852	8,760	N/A	N/A	45.9	180.98	38.8	153.14	427	16.5	3144	V
	NDC-10	CH_P_010	Clinker Transport From Kiln	1,715,500.0	208.3	4,000	300	2%	2,723	8,760	0.01	0.0085	0.23	1.02	0.20	0.87	40	1	5093	H
	NDC-11	CH_P_011	Clinker Silo #1	1,715,500.0	208.3	16,000	300	2%	10,893	8,760	0.01	0.0085	0.93	4.09	0.79	3.48	186	2	5093	H
	NDC-12	CH_P_012	Clinker Silo #2	1,715,500.0	208.3	15,000	300	2%	10,213	8,760	0.01	0.0085	0.88	3.83	0.74	3.26	186	2	4775	H
	NDC-13	CH_P_013	Off-Spec Clinker Silo	85,775.0	208.3	11,000	300	2%	7,489	8,760	0.01	0.0085	0.64	2.81	0.55	2.39	100	1.5	6225	H
CH-5	NDC-14	CH_P_014	FM #1 Clinker Silo Outlet Conveyor	1,177,212.6	158.1	10,000	250	2%	7,288	8,760	0.01	0.0085	0.62	2.74	0.53	2.33	20	1.5	5659	H
	NDC-15	CH_P_015	FM #2 Clinker Silo Outlet Conveyor	1,177,212.6	158.1	10,000	250	2%	7,288	8,760	0.01	0.0085	0.62	2.74	0.53	2.33	20	1.5	5659	H
	NDC-16	CH_P_016	Gypsum & Limestone Silos	177,214.8	23.8	6,000	70	2%	5,858	8,760	0.01	0.0085	0.50	2.20	0.43	1.87	70	1.1	6314	H
	NDC-17	CH_P_017	Conveying to Finish Mills (2 Feed Belts)	2,531,640.0	340.0	24,000	250	2%	17,491	8,760	0.01	0.0085	1.50	6.57	1.27	5.58	20	3	3395	H
	NDC-18	CH_P_018	FM #1 Clinker Conveying	1,265,820.0	170	6,000	250	2%	4,373	8,760	0.01	0.0085	0.37	1.64	0.32	1.40	40	1.1	6314	H
	DC-02	FM1Sep	Finish Mill #1 Separator BH	1,265,820.0	170	128,000	175	3%	103,239	8,760	0.01	0.0085	8.85	38.76	7.52	32.94	131	7.5	2897	V
	DC-03	FM1Sw	Finish Mill #1 Sweep BH	1,265,820.0	170	35,000	230	4.6%	25,551	8,760	0.01	0.0085	2.19	9.59	1.86	8.15	131	4	2785	V
	NDC-21	CH_P_021	Fringe Cement Bin	25,316.4	170.0	5,000	230	2%	3,750	8,760	0.01	0.0085	0.32	1.41	0.27	1.20	75	1	6366	H
	NDC-19	CH_P_019	Finish Mill #1 Baghouse No. 3	1,265,820.0	170	8,500	230	2%	6,374	8,760	0.01	0.0085	0.55	2.39	0.46	2.03	45	1.4	5522	H
	DC-04	FM2Sep	Finish Mill #2 Separator BH	1,265,820.0	170	128,000	175	3%	103,239	8,760	0.01	0.0085	8.85	38.76	7.52	32.94	131	7.5	2897	V
CH-6	DC-05	FM2Sw	Finish Mill #2 Sweep BH	1,265,820.0	170	35,000	230	4.6%	25,551	8,760	0.01	0.0085	2.19	9.59	1.86	8.15	131	4	2785	V
	NDC-20	CH_P_020	Finish Mill #2 Baghouse No. 3	1,265,820.0	170	8,500	230	2%	6,374	8,760	0.01	0.0085	0.55	2.39	0.46	2.03	45	1.4	5522	H
	NDC-22	CH_P_022	Cement Silos	2,531,640	170	6,000	160	2%	5,007	8,760	0.01	0.0085	0.43	1.88	0.36	1.60	187	1.1	6314	H
	NDC-23	CH_P_023	Cement Silos	2,531,640	170	5,000	160	2%	4,173	8,760	0.01	0.0085	0.36	1.57	0.30	1.33	187	1	6366	H
	NDC-24	CH_P_024	Cement Silos	2,531,640	170	7,500	160	2%	6,259	8,760	0.01	0.0085	0.54	2.35	0.46	2.00	187	1.2	6631	H
	NDC-25	CH_P_025	Truck Loadout #1	2,531,640	170	4,000	130	2%	3,508	8,760	0.01	0.0085	0.30	1.32	0.26	1.12	35	1	5093	H
	NDC-26	CH_P_026	Truck Loadout #2	2,531,640	170	4,000	130	2%	3,508	8,760	0.01	0.0085	0.30	1.32	0.26	1.12	35	1	5093	H
	NDC-27	CH_P_027	Truck Loadout #3	2,531,640	170	4,000	130	2%	3,508	8,760	0.01	0.0085	0.30	1.32	0.26	1.12	35	1	5093	H
	NDC-28	CH_P_028	Packaging Plant	506,328	170	16,000	130	2%	14,032	8,760	0.01	0.0085	1.20	5.27	1.02	4.48	35	2	5093	H
	DC-06	CoalMill	Coal Mill No. 1 BH	211,160	28.36	32,000	150	6.5%	25,898	8,760	0.01	0.0085	2.22	9.72	1.89	8.26	135	5.5	2691	V
CH-7	DC-07		Coal Mill No. 2 BH	211,160	28.36	31,937	150	6.5%	25,847	8,760	0.01	0.0085	2.22	9.70	1.88	8.25				
	NDC-29	CH_P_029	Pulverized Coal Bin	105,580	14.18	2,000	150	2%	1,697	8,760	0.01	0.0085	0.15	0.64	0.12	0.54	85	1	2546	H
	NDC-30	CHP_P039	Pulverized Coal Bin	105,580	14.18	2,000	150	2%	1,697	8,760	0.01	0.0085	0.15	0.64	0.12	0.54	85	1	2546	H
												TOTAL	86.63	359.33	73.46	304.74				

Note 1 : The moisture content of the nuisance dust collectors is excepted to be higher than 2%, however to conservatively estimate potential emissions 2% was used.

TABLE A-4
Potential Emissions from the Kiln System, Clinker Cooler, and Emergency Generator

Hourly Emissions:

EU No.	EU Description	Kiln Feed lbs/hr	Clinker lbs/hr	PM lbs/hr	PM_{10} lbs/hr	SO2 lbs/hr	NO_x lbs/hr	CO lbs/hr	VOC lbs/hr	HCl lbs/hr	Lead lbs/hr	Mercury lbs/hr	Dioxin/Furan lbs/hr	Beryllium lbs/hr	Fluorides lbs/hr
CH-4	New Kiln System	353	208.3	45.91	38.85	56.24	406.19	749.88	23.95	29.16	0.016	0.022	3.02E-11	0.00	0.00

EU No.	EU Description	Size	Fuel Rate gal/hr	Heat Input MMBtu/hr	Output hp-hr	PM lbs/hr	PM_{10} lbs/hr	SO2 lbs/hr	NO_x lbs/hr	CO lbs/hr	VOC lbs/hr
CH-9	Emergency Generator	750 kW	54.8	7.51	1,006	0.48	0.43	3.79	15.90	2.97	0.55

Annual Emissions:

EU No.	EU Description	Kiln Feed tons/yr	Clinker tons/yr	PM tons/yr	PM_{10} tons/yr	SO2 tons/yr	NO_x tons/yr	CO tons/yr	VOC tons/yr	HCl tons/yr	Lead tons/yr	Mercury tons/yr	Dioxin/Furan (tons/yr)	Beryllium tons/yr	Fluorides tons/yr
CH-4	New Kiln System	2,784,370	1,715,500	180.98	153.14	231.59	1,672.61	3,087.90	98.64	120.09	0.064	0.092	2.49E-07	0.0002	0.772

EU No.	EU Description	Operating Hours	Fuel Rate gal/yr	Heat Input MMBtu/yr	Output hp-hr/yr	PM tons/yr	PM_{10} tons/yr	SO2 tons/yr	NO_x tons/yr	CO tons/yr	VOC tons/yr
CH-9	Emergency Generator	291	15,947	2,185	292,673	0.07	0.06	0.55	2.31	0.43	0.08

Notes: The emergency generators operate during testing and power outages only.
In the event of a power outage, fuel to the kiln is cut off and the generator is the only combustion source operating.
Generators are diesel fuel-fired. Assume 137,000 Btu/gal heat value of fuel and sulfur content of 0.5 percent.
Total diesel fuel consumed by both emergency generators will not exceed 32,000 gal/yr (permit exemption level).

Emissions Basis:

Proposed Kiln

Pollutant	Emission Factor	Emission Factor Units	Source of Emission Factor
PM	0.13	lb/ton dry feed	Proposed BACT
PM_{10}	0.11	lb/ton dry feed	Proposed BACT
SO_2	0.27	lb/ton clinker	Proposed BACT
NO_X	1.95	lb/ton clinker	Proposed BACT
CO	3.60	lb/ton clinker	Proposed BACT
VOC	0.115	lb/ton clinker	Proposed BACT
HCl (annual)	0.1400	lb/ton clinker	AP-42 Table 11.6-9
Lead	7.50E-05	lb/ton clinker	AP-42 Table 11.6-9
Mercury	1.078E-04	lb/ton clinker	Based on Stack Test Data from similar SAC Plant in Brandford, FL.
Beryllium	2.41E-07	lb/ton clinker	Similar PH/PC Plant Stack Test Dec. 9-12, 2003
Fluorides	9.00E-04	lb/ton clinker	AP-42 Table 11.6-9
Dioxin/ Furans	2.90E-10	lb/ton clinker	AP-42 Table 11.6-9

Emergency Generator

Pollutant	Emission Factor	EF Units	Source of EF
PM	0.215	lb/hp-hr	Generator specifications
PM_{10}	0.0573	lb/MMBtu	AP-42 Table 3.4-2
SO_2	0.505	lb/MMBtu	AP-42 Table 3.4-1
NO_X	7.17	lb/hp-hr	Generator specifications
CO	1.34	lb/hp-hr	Generator specifications
VOC	0.25	lb/hp-hr	Generator specifications

TABLE A-5
Mercury Calculation Methodology

Mercury Emissions from the Center Hill plant will be estimated based on a calculated emission factor of 1.078E-04 lb of mercury per ton of clinker. This emission factor is based on data on two years worth of data on Raw Material Mercury Input from Suwannee American Cement in Branford, Fl. Provided below is an analysis of how this emission factor was derived:

Based on two plus years of raw material and feed samples from Suwannee American Cement (SAC) in Branford, Fl which use limestone from the same formation as SCC and proposes use of similar other raw materials and fuels, a average mercury concentration was developed for each input. Additionally, an extensive two day mercury mass balance test was conducted at SAC which involved hourly samples of raw materials, intermediate process outputs, final clinker outputs and stack testing. Based on results from these data sources and the proposed dry mass input of materials needed at SCC an emission factor was developed for total mercury input, then divided by the total clinker output. The estimated total mercury input was approximately 185 pounds of mercury per year which divided by a total maximum clinker output of 1,715,500 tons per year equals a mercury factor of 0.00010784 lbs of mercury per ton of clinker. When compared to two separate stack tests conducted at SAC the results matched closely the mercury factors from the stack testing when evaluating mill on and mill off conditions.

To insure that mercury emissions will not exceed the estimated potential emissions, the SCC Center Hill Plant will conduct mercury monitoring through sampling and analysis of raw materials and feeds. To determine the total mass input of mercury into the kiln system all inputs have to be identified and then sampled. The following figure shows all the mercury input locations into the kiln system.

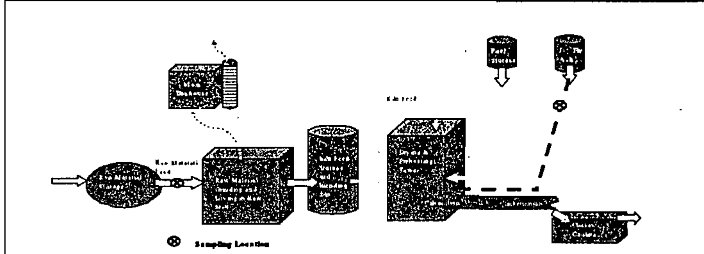

Figure 1

The inputs shown include the combined raw material feed to the Raw Mill which includes the pre-determined amounts of calcium carbonate, silica, alumina, and iron from the raw materials. The fuel from the fuel storage is also accounted as an input for the system which may contain coal or petcoke blended together. Finally the dry fly ash which is injected into the calciner is identified as an input. Overall these represent the total mass inputs into the kiln system for which mercury may be introduced.

Also identified in Figure 1 are the sampling locations for all the inputs. The raw materials sampling location represents the total of all raw materials into the kiln system prior to being ground and dried in the raw mill. Samples for raw material feed, fuel fed to the kiln system, and dry fly ash injected into the calciner are taken at appropriate intervals through out the day. These samples are combined into daily composites and at the end of the month the daily composites are combined into a monthly composite. As appropriate the monthly composites will be combined to form quarterly composites and semi-annual composites. For purposes of the example the monthly calculation will be shown.

These monthly composites are then sent to an appropriate offsite lab for analysis to determine the mercury concentration using the currently approved EPA Method 7471A Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique) or other approved or appropriate methods that may be developed in the future.

The analytical results are then used with the total dry feed rates of the component to determine a mass input of mercury into the system for the month, this could just as easily be quarterly or semi-annually. The mass input for the raw material feed is a total mass of all of the material fed into the raw material for the corresponding month on a dry basis. The overall calculation for mercury input for all of the components is shown in below.

Equation 1: Monthly Composite of Material (unit of weight dry) * Concentration of Mercury (ppb) = Mass of Mercury (unit of weight)

This formula is repeated for all three inputs (Raw Material Feed, Fuel Feed, and Dry Fly Ash) and the total sum of these three inputs equals the total monthly input of mercury. This is shown in Equation 2.

Equation 2:

Monthly Mass of Mercury from Raw Material (dry)_
Monthly Mass of Mercury from Fuel (dry)
+ Monthly Mass of Mercury from Dry Fly Ash
Total Monthly Mercury Input into Kiln System

This is repeated for every month, quarter or semi-annual period and then a yearly mass input for mercury can be determined and compared to the yearly emission limit.

This estimate for mercury emissions is overly conservative for demonstration of compliance with the Mercury Emission Limit proposed in the permit because it first assumes that all the mercury entering the kiln systems exits through the main stack. Through the testing conducted at SAC and studies conducted by Portland Cement Association (PCA), small amounts of mercury have been shown to exit through the clinker.

Additionally, analytical results for the samples of raw material are typically below detection limits when utilizing the currently approved EPA Method 7471A Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique). SCC considers the detection limit as the amount of mercury present in that material despite the fact that the actual mercury concentration maybe well below this. This intern effectively overestimates the entire input of mercury into the system due to limitations of the currently analytical technology which routinely measure down to parts per billion (ppb) of mercury.

TABLE A-6
Potential Particulate Emissions from Fugitive Sources

Modeling Source ID	Segment Number	Description	Material	Material Information: Annual Qty (ton/yr)	Hourly Rate (ton/hr)	Moisture Content (%)[1]	Emission Factor (lb/ton)	Emission Factor Reference	Number of Transfer Points	Building Control Efficiency (%)[3]	Enclosed Conveyor Control Efficiency (%)[3]	Annual PM Emissions (tons/year)	PM10 Fraction	Annual PM10 Emissions (tons/year)	Hourly PM Emissions (lb/hr)	Hourly PM10 Emissions (lb/hr)
							CH-1	Primary Crushing and Associated Conveyors								
CH_V_020	CH-1-1	Primary Crushing and Conveying														
	A	Loader to Primary Crusher	Limestone	3,798,428	2,143	25	1.05E-04	AP-42 Section 13.2.4, 1/95	1			0.200	0.47	0.094	0.23	0.11
		Primary Crusher Operation	Limestone	3,798,428	2,143	25	3.00E-04	AP-42 Table 11.19.2-2, 8/04[4]	1			0.570	0.45	0.256	0.64	0.29
		Conveyors B01 thru B08	Limestone	3,798,428	2,143	25	1.05E-04	AP-42 Section 13.2.4, 1/95	8		90%	0.160	0.47	0.075	0.18	0.08
CH_V_021	B	Conveying B08 to B20	Limestone	3,798,428	2,143	25	1.05E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.020	0.47	0.009	0.02	0.01
CH_V_022	C	Conveying B20 to B21	Limestone	3,798,428	2,143	25	1.05E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.020	0.47	0.009	0.02	0.01
CH_V_023	D	Conveying B21 to B22	Limestone	3,798,428	2,143	25	1.05E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.020	0.47	0.009	0.02	0.01
											Sub Total	0.990		0.454	1.117	0.512
CH_V_024	CH-1-2	Base Rock Conveying														
	A	Belt B22 to B24[2]	Base Rock	500,000	2,143	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1			0.045	0.47	0.021	0.39	0.18
CH_V_025	B	Belt B24 to B27[2]	Base Rock	500,000	2,143	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1			0.045	0.47	0.021	0.39	0.18
CH_V_026	C	Belt B27 to Radial Stacker[2]	Base Rock	500,000	2,143	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1			0.045	0.47	0.021	0.39	0.18
											Sub Total	0.136		0.064	1.163	0.547
CH_V_027	CH-1-3	Limestone Conveying														
	A	Belt B22 to B40	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1			0.298	0.47	0.140	0.08	0.04
CH_V_028	B	Belt B40 to C01	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.030	0.47	0.014	0.01	0.00
CH_V_029	C	Belt C01 to C02	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.030	0.47	0.014	0.01	0.00
											Sub Total	0.358		0.168	0.096	0.045
											CH-1 TOTAL EMISSIONS	1.484		0.686	2.376	1.104
							CH-2	Raw Material Conveying								
CH_V_001	CH-2-1	Limestone Pile Handling														
		C02 Transfer to Limestone Conveyor	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.012	0.47	0.006	0.00	0.00
		Transfer to Pile	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	2	60%		0.239	0.47	0.112	0.06	0.03
		Piles to reclaim belts	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	2	60%		0.239	0.47	0.112	0.06	0.03
											Sub Total	0.489		0.230	0.131	0.062
CH_V_003	CH-2-2	Wet Fly Ash Hopper Building														
		Truck Dump to Hopper	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1	75%		0.004	0.47	0.002	0.00	0.00
		Hopper Transfer to Belt	Wet Fly Ash	352,662	47	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1	75%	90%	0.001	0.47	0.000	0.00	0.00
											Sub Total	0.005		0.002	0.001	0.001
CH_V_002	CH-2-3	Wet Fly Ash Pile Handling														
		Belt to Belt Transfer	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.001	0.47	0.000	0.00	0.00
		Transfer to Pile	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1	60%		0.007	0.47	0.003	0.00	0.00
		Pile Transfer to Reclaim Belt	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1	60%		0.007	0.47	0.003	0.00	0.00
											Sub Total	0.014		0.007	0.004	0.002
CH_V_004	CH-2-4	Clay/Sand Hopper Building														
		Truck Dump to Hopper	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	1	75%		0.013	0.47	0.006	0.00	0.00
		Hopper Transfer to Belt	Clay/Sand	385,854	52	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1	75%	90%	0.000	0.47	0.000	0.00	0.00
											Sub Total	0.013		0.006	0.004	0.002

TABLE A-6
Potential Particulate Emissions from Fugitive Sources

Modeling Source ID	Segment Number	Description	Material	Material Information: Annual Qty (ton/yr)	Material Information: Hourly Rate (ton/hr)	Material Information: Moisture Content (%)[3]	Emission Factor (lb/ton)	Emission Factor Reference	Number of Transfer Points	Building Control Efficiency (%)[1]	Enclosed Conveyor Control Efficiency (%)[2]	Annual PM Emissions (tons/year)	PM10 Fraction	Annual PM10 Emissions (tons/year)	Hourly PM Emissions (lb/hr)	Hourly PM10 Emissions (lb/hr)
CH_V_002	CH-2-5	**Clay/Sand Pile Handling**														
		Belt to Belt Transfer	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.002	0.47	0.001	0.00	0.00
		Transfer to Pile	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	1	60%		0.020	0.47	0.010	0.01	0.00
		Pile Transfer to Reclaim Belt	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	1	60%		0.020	0.47	0.010	0.01	0.00
											Sub Total	**0.043**		**0.020**	**0.011**	**0.005**
CH_V_002	CH-2-6	**Steel Slag Pile Handling**														
		Truck Dump to Pile	Steel Slag	87,128	12	0.92	1.07E-02	AP-42 Section 13.2.4, 1/95	1	60%		0.187	0.47	0.088	0.05	0.02
		FEL Reclaim	Steel Slag	87,128	12	0.92	1.07E-02	AP-42 Section 13.2.4, 1/95	2	60%		0.374	0.47	0.176	0.10	0.05
		Transfer to Reclaim Belt	Steel Slag	87,128	12	0.92	1.07E-02	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.019	0.47	0.009	0.01	0.00
											Sub Total	**0.580**		**0.273**	**0.156**	**0.073**
CH_V_002	CH-2-7	**Bauxite Pile Handling**														
		Truck Dump to Pile	Bauxite	352,662	47	10	3.80E-04	AP-42 Section 13.2.4, 1/95	1	60%		0.027	0.47	0.013	0.01	0.00
		FEL Reclaim	Bauxite	352,662	47	10	3.80E-04	AP-42 Section 13.2.4, 1/95	2	60%		0.054	0.47	0.025	0.01	0.01
		Transfer to Reclaim Belt	Bauxite	352,662	47	10	3.80E-04	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.003	0.47	0.001	0.00	0.00
											Sub Total	**0.083**		**0.039**	**0.022**	**0.010**
CH_V_008	CH-2-8	**Limestone Conveying**														
	A	Transfer to Limestone Bin	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.030	0.47	0.014	0.01	0.00
CH_V_009	B	Limestone Bin Discharge	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.030	0.47	0.014	0.01	0.00
		Limestone Conveying	Limestone	3,298,428	443	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.030	0.47	0.014	0.01	0.00
											Sub Total	**0.090**		**0.042**	**0.024**	**0.011**
CH_V_010	CH-2-9	**Wet Fly Ash Conveying**														
	A	Transfer to Fly Ash Bin	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	2		90%	0.003	0.47	0.002	0.00	0.00
CH_V_011	B	Fly Ash Bin Discharge	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1		90%	0.002	0.47	0.001	0.00	0.00
		Fly Ash Conveying	Wet Fly Ash	352,662	47	27	9.47E-05	AP-42 Section 13.2.4, 1/95	1		90%	0.002	0.47	0.001	0.00	0.00
											Sub Total	**0.007**		**0.003**	**0.002**	**0.001**
CH_V_012	CH-2-10	**Clay/Sand Conveying**														
	A	Transfer to Clay/Sand Bin	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	3		90%	0.015	0.47	0.007	0.00	0.00
CH_V_013	B	Clay/Sand Bin Discharge	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.005	0.47	0.002	0.00	0.00
		Clay/Sand Conveying	Clay/Sand	385,854	52	13.01	2.63E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.005	0.47	0.002	0.00	0.00
											Sub Total	**0.025**		**0.012**	**0.007**	**0.003**
CH_V_014	CH-2-11	**Bauxite Conveying**														
	A	Transfer to Bauxite Bin	Bauxite	352,662	47	10	3.80E-04	AP-42 Section 13.2.4, 1/95	3		90%	0.020	0.47	0.009	0.01	0.00
CH_V_015	B	Bauxite Bin Discharge	Bauxite	352,662	47	10	3.80E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.007	0.47	0.003	0.00	0.00
		Bauxite Conveying	Bauxite	352,662	47	10	3.80E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.007	0.47	0.003	0.00	0.00
											Sub Total	**0.034**		**0.016**	**0.009**	**0.004**
CH_V_016	CH-2-12	**Steel Slag Conveying**														
	A	Transfer to Slag Bin	Steel Slag	87,128	12	0.92	1.07E-02	AP-42 Section 13.2.4, 1/95	3		90%	0.140	0.47	0.066	0.04	0.02
CH_V_017	B	Slag Bin Discharge	Steel Slag	87,128	12	0.92	1.07E-02	AP-42 Section 13.2.4, 1/95	1		90%	0.047	0.47	0.022	0.01	0.01
		Slag Conveying	Steel Slag	87,128	12	0.92	1.07E-02	AP-42 Section 13.2.4, 1/95	1		90%	0.047	0.47	0.022	0.01	0.01
											Sub Total	**0.234**		**0.110**	**0.063**	**0.030**

TABLE A-6
Potential Particulate Emissions from Fugitive Sources

Modeling Source ID	Segment Number	Description	Material	Material Information: Annual Qty (ton/yr)	Material Information: Hourly Rate (ton/hr)	Material Information: Moisture Content (%)[3]	Emission Factor (lb/ton)	Emission Factor Reference	Number of Transfer Points	Building Control Efficiency (%)[1]	Enclosed Conveyor Control Efficiency (%)[2]	Annual PM Emissions (tons/year)	PM10 Fraction	Annual PM10 Emissions (tons/year)	Hourly PM Emissions (lb/hr)	Hourly PM10 Emissions (lb/hr)
CH_V_018	CH-2-13	**Crossbelt Analyzer**														
		Crossbelt Analyzer	Raw Mill Feed	3,607,797	485	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1		90%	0.033	0.47	0.015	0.01	0.00
											Sub Total	**0.033**		**0.015**	**0.009**	**0.004**
CH_V_005	CH-2-14	**Raw Mill Feed Conveying**														
		Belt Transfer to Reject Bin	Raw Mill Feed	25,000	200	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.000	0.47	0.000	0.00	0.00
		Elevator Transfer to Reject Bin	Raw Mill Feed	25,000	200	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.000	0.47	0.000	0.00	0.00
		Reject Bin Discharge to Truck	Raw Mill Feed	25,000	200	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1	60%		0.001	0.47	0.000	0.01	0.01
											Sub Total	**0.001**		**0.001**	**0.017**	**0.008**
CH_V_006	CH-2-15	**Gypsum/Limestone Conveying**														
		Gypsum Unloading	Gypsum	88,607	11.90	2.1	3.38E-03	AP-42 Section 13.2.4, 1/95	1	60%		0.060	0.47	0.028	0.02	0.01
		Limestone Unloading	Limestone	88,607	11.90	17	1.81E-04	AP-42 Section 13.2.4, 1/95	1	60%		0.003	0.47	0.002	0.00	0.00
		FEL Gypsum/Limestone Reclaim	Gypsum/ Limestone	177,215	23.80	9.55	4.06E-04	AP-42 Section 13.2.4, 1/95	1	60%		0.014	0.47	0.007	0.00	0.00
		FEL Unloading	Gypsum/ Limestone	177,215	23.80	9.55	4.06E-04	AP-42 Section 13.2.4, 1/95	1	75%		0.009	0.47	0.004	0.00	0.00
		Gypsum/Limestone Belt transfer to Elevator	Gypsum/ Limestone	177,215	23.80	9.55	4.06E-04	AP-42 Section 13.2.4, 1/95	1	75%	90%	0.001	0.47	0.000	0.00	0.00
										Sub Total		**0.087**		**0.041**	**0.023**	**0.011**
										CH-2 TOTAL EMISSIONS		**1.737**		**0.616**	**0.484**	**0.227**
							CH-8 Coal Conveying									
CH_V_007	CH-8-1	**Coal/Petcoke Pile Handling**														
		Coal/Pet Coke Unloading	Coal/Petcoke	31,674	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	60%		0.007	0.47	0.003	0.01	0.01
		FEL Reclaim	Coal/Petcoke	31,674	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	60%		0.007	0.47	0.003	0.01	0.01
		FEL Transfer to Hopper	Coal/Petcoke	31,674	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	75%		0.004	0.47	0.002	0.01	0.00
											Sub Total	**0.018**		**0.008**	**0.032**	**0.015**
CH_V_007	CH-8-2	**Coal/Petcoke Conveying**														
	A	Belt Transfer to Elevator	Coal/Petcoke	31,674	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	60%	90%	0.001	0.47	0.000	0.00	0.00
		Transfer to Scrap Metal Box	Coal/Petcoke	1,056	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	2	60%		0.000	0.47	0.000	0.02	0.01
		Coal Conveyor transfer to Piles	Coal/Petcoke	31,674	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	60%		0.007	0.47	0.003	0.01	0.01
		Truck Dump to Hopper	Coal/Petcoke	211,160	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	75%		0.028	0.47	0.013	0.01	0.00
		Hopper transfer to Elevator	Coal/Petcoke	211,160	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1	75%	90%	0.003	0.47	0.001	0.00	0.00
CH_V_019	B	Elevator to Coal Conveyor	Coal/Petcoke	31,674	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	1		90%	0.002	0.47	0.001	0.00	0.00
		Elevator to Coal Bins	Coal/Petcoke	211,160	28.4	5	1.06E-03	AP-42 Section 13.2.4, 1/95	2		90%	0.022	0.47	0.011	0.01	0.00
											Sub Total	**0.063**		**0.030**	**0.055**	**0.026**
										CH-8 TOTAL EMISSIONS		**0.060**		**0.038**	**0.086**	**0.041**
										Total		**3.302**		**1.540**	**2.946**	**1.372**

Note 1 A control efficiency of 60% was used to account for reduction of fugitives due to a partial building enclosure, this control efficiency is based on engineering calculations of the amount of wind that would be blocked by the building enclosure. A control efficiency of 75% was use to account for reduction of fugitives due to a building enclosure of three connecting walls and a roof.

Note 2 A control efficiency of 90% was used to account for reduction of fugitives due to enclosed conveyor transfer points, enclosed bins, and below ground transfer.

Note 3 Moisture Content for limestone, clay, and send based on the Raw Material Analysis provided in Appendix G, all others based on AP-42 Table 13.2.4-1.

Note 4 AP-42 lists a "controlled emission factor" for Primary Crushing representing a range of moisture content from 0.55% to 2.88%. The moisture content of the SCC Plant limestone is minimally 25%. Therefore, an additional 75% control efficiency was applied to the AP-42 "controlled" emission factor of 1.2E-03 to conservatively account for the significant additional moisture contained in the limestone.

TABLE A-7
Potential Particulate Emissions from Storage Piles

ID NO.	Modleing Source ID	Description	Material	Surface Area (Acres)	Active Days (n) (days/yr)	Silt Content (s) percent	Material Moisture (%)	Material Throughput (T/yr)	Average Wind Speed (mph)	Wind Speed > 12 mph (f) percent	Rain Days (p) (days/yr)	Enclosure Control Efficiency (%)	TSP Wind Emissions (T/yr)	PM10 Wind Emissions (T/yr)	TSP Hourly Emissions (lb/hr)	PM10 Hourly Emissions (lb/hr)
CH-10-1	CH_A_001	Crushed Limestone Pile	Limestone	3.0	365	3.9	17	3,798,428	6.9	9.74	105	0	1.74	0.87	0.397	0.198
CH-10-2	CH_A_002	Base Rock Pile	Limestone	1.5	365	3.9	17	500,000	6.9	9.74	105	0	0.87	0.43	0.198	0.099
CH-10-3A	CH_V_001	Raw Limestone Storage	Limestone	1.8	365	3.9	17	3,298,428	6.9	9.74	0	60	0.59	0.29	0.134	0.067
CH-10-3B	CH_V_001	Raw Limestone Storage	Limestone	1.8	365	3.9	17	3,298,428	6.9	9.74	0	60	0.59	0.29	0.134	0.067
CH-10-4	CH_V_002	Sand/Clay/Silica Components Storage	Sand/Clay	0.9	365	4.3	13.0	385,854	6.9	9.74	0	60	0.32	0.16	0.074	0.037
CH-10-5	CH_V_002	Bauxite/Alumina Components Storage	Bauxite	0.2	365	6	10.0	352,662	6.9	9.74	0	60	0.10	0.05	0.023	0.011
CH-10-6	CH_V_002	Steel Slag/Iron Components Storage	Steel Slag	0.2	365	5.3	0.9	87,128	6.9	9.74	0	60	0.09	0.04	0.020	0.010
CH-10-7	CH_V_002	Wet Fly Ash Storage	Fly Ash	0.9	365	80.0	27.0	352,662	6.9	9.74	0	60	6.01	3.00	1.372	0.686
CH-10-8	CH_V_006	Gypsum/Synthetic Gypsum Storage	Gypsum	0.2	365	3.9	2.1	88,607	6.9	9.74	0	60	0.07	0.03	0.015	0.007
CH-10-9	CH_V_006	Limestone Storage	Limestone	0.05	365	3.9	17.0	88,607	6.9	9.74	0	60	0.02	0.01	0.004	0.002
CH-10-10	CH_V_007	Coal Storage	Coal	0.3	365	4.6	5	22,172	6.9	9.74	0	60	0.12	0.06	0.026	0.013
CH-10-11	CH_V_007	Pet Coke Storage	Pet Coke	0.05	365	4.6	5	9,502	6.9	9.74	0	60	0.02	0.01	0.004	0.002
												TOTALS	10.51	5.26	2.40	1.20

NOTES: Above emissions include only wind erosion emissions from the piles, all emissions from material transfer are accounted for in the Material Handling emissions.

Material transfer to piles
TSP transfer factors from AP-42 Section 13.2.4-3 (Aggregate Handling and Storage Piles, 1/95).

E = k * 0.0032 * (U/5)^1.3 / (M/2)^1.4

E = transfer emission factor (lb/ton)
k = particle size multiplier — k (<30 um) = 0.74
U = mean wind speed (mph) — k (<10 um) = 0.35
M = material moisture content (%)

Wind Erosion
Reference: Control of Open Fugitive Dust Sources, EPA-450/3-88-008, p. 4-17

Ef = 1.7*(s/1.5)*(f/15)*((365-p)/235)*(1-(C/100)) — TSP (lbs/acre/day) — PM10 fraction = 0.5
E = A*n*Ef/2000 — TSP (tons/yr)

s = Silt content of the aggregate (%)
f = Percent of time that the unobstructed wind speed exceeds 12 mph at the mean pile heigh
p = Number of days with >= 0.01 in. of precipitation per yea
C = Overall control efficiency (%)
A = Size of the pile (acres)
n = Number of days per year the pile is continuously active

Typical silt contents of materials from AP-42 Table 13.2.4-1.
Typical moisture of limestone, sand, and clay are from the raw material analysis provided in Appendix G
All other moisture values are from AP-42 Table 13.2.4-1.

TABLE A-8
Potential Particulate Emissions from Paved and Unpaved Roads

Paved Road Emission Summary

Segment No.	Modeling Source ID	Description	Segment Length (mi)	Silt Loading (g/m2)	Maximum Annual Emissions: Material Trips (#/yr)	Total Mileage (Mi/yr)	TSP E Factor lb/VMT	PM10 E Factor lb/VMT	TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	Hourly Emissions: TSP Emissions (lb/hr)	PM10 Emissions (lb/hr)
CH-11-1A	R1A	Main Entrance Road Out	0.42	0.15	256,888	107,122	0.29	0.06	15.73	3.05	3.592	0.697
CH-11-1B	R1B	Main Entrance Road Out - Gate	0.04	0.15	256,888	11,175	0.29	0.06	1.64	0.32	0.375	0.073
CH-11-2	R2	Cement Silos to Main Road	0.04	0.15	149,750	6,676	0.19	0.04	0.63	0.12	0.143	0.028
CH-11-3A	R3A	Main Road to Cement silos A	0.07	0.15	141,813	9,652	0.24	0.05	1.17	0.23	0.268	0.052
CH-11-3B	R3B	Main Road to Cement silos B	0.05	0.15	222,213	16,075	0.36	0.07	2.89	0.56	0.659	0.128
CH-11-4A	R4A	Trucks Entering Cement Silos	0.04	0.15	115,075	4,108	0.36	0.07	0.74	0.14	0.169	0.033
CH-11-4B	R4B	Trucks Leaving Cement Silos	0.03	0.15	115,075	3,671	0.36	0.07	0.66	0.13	0.151	0.029
CH-11-5	R5	Admin Building Road	0.15	0.15	34,675	10,479	0.01	0.00	0.03	0.00	0.007	0.001
CH-11-6	R6	Main Road to Gypsum Building	0.04	0.15	107,138	9,300	0.36	0.07	1.67	0.32	0.381	0.074
CH-11-7	R7	Gyspum Building Road	0.03	0.15	7,089	478	0.39	0.08	0.09	0.02	0.021	0.004
CH-11-8	R8	Main Road to Coal Building	0.08	0.15	100,049	16,128	0.36	0.07	2.88	0.56	0.657	0.127
CH-11-9	R9	Coal Truck Loop	0.04	0.15	8,446	630	0.39	0.08	0.12	0.02	0.028	0.005
CH-11-10	R10	FEL - Coal/Petcoke	0.03	0.15	4,223	228	0.42	0.08	0.05	0.01	0.011	0.002
CH-11-11	R11	Base Rock Road	0.75	0.15	33,333	50,280	0.29	0.06	7.29	1.41	1.663	0.323
CH-11-12	R12	Dry Fly Ash Road	0.03	0.15	11,137	559	0.39	0.08	0.11	0.02	0.025	0.005
CH-11-13	R13	Main Road to Raw Material Storage	0.11	0.15	47,132	10,746	0.39	0.08	2.10	0.41	0.481	0.093
CH-11-14	R14	Truck Dump for Bauxite and Steel Slag	0.02	0.15	17,592	535	0.39	0.08	0.10	0.02	0.024	0.005
CH-11-17	R17	Main Road to Sand/Clay Unloading	0.04	0.15	29,541	2,233	0.39	0.08	0.44	0.08	0.100	0.019
CH-11-18	R18	Sand/Clay Unloading Road	0.04	0.15	15,434	1,287	0.39	0.08	0.25	0.05	0.058	0.011
CH-11-19	R19	Main Road to Wet Fly Ash Unloading	0.07	0.15	14,106	1,862	0.39	0.08	0.36	0.07	0.083	0.016
CH-11-20	R20	Wet Fly Ash Unloading Road	0.04	0.15	14,106	1,171	0.39	0.08	0.23	0.04	0.052	0.010
CH-11-21	R21	FEL - Gypsum/Limestone	0.04	0.15	23,629	1,739	0.42	0.08	0.36	0.07	0.083	0.016
CH-11-24	R24	Main Road to Dry Fly Ash	0.05	0.15	44,471	4,500	0.31	0.06	0.71	0.14	0.162	0.031
CH-11-25A	R25A	Main Entrance Road In	0.62	0.15	256,888	158,024	0.29	0.06	23.21	4.50	5.299	1.028
CH-11-25B	R25B	Main Entrance Road In - Gate	0.04	0.15	256,888	11,175	0.29	0.06	1.64	0.32	0.375	0.073
TOTAL			2.90			439,832.32			65.12	12.63	14.87	2.88

Unpaved Road Emission Summary

Segment No.	Modeling Source ID	Description	Trip Length (mi)	Silt Content (%)	Maximum Annual Emissions: Material Trips (#/yr)	Total Mileage (Mi/yr)	TSP E Factor lb/VMT	PM10 E Factor lb/VMT	TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	Hourly Emissions: TSP Emissions (lb/hr)	PM10 Emissions (lb/hr)
CH-11-15	R15	FEL - Bauxite	0.03	8.3	47,022	1,556	7.46	2.12	0.29	0.08	0.066	0.019
CH-11-16	R16	FEL - Steel Slag	0.03	8.3	11,617	395	7.46	2.12	0.07	0.02	0.017	0.005
CH-11-22	R22	FEL - Limestone	0.03	8.3	506,457	16,359	7.46	2.12	3.05	0.87	0.696	0.198
CH-11-23	R23	FEL - Base Rock	0.03	8.3	33,333	940	6.68	1.90	0.16	0.04	0.036	0.010
TOTAL			0.13			19,249.96			3.57	1.02	0.82	0.23

TOTAL PAVED AND UNPAVED EMISSIONS

TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	TSP Emissions (lb/hr)	PM10 Emissions (lb/hr)
68.69	13.64	15.68	3.12

TABLE A-9
Paved Roads Emission Worksheet

Segment No. CH-11-1A — **Main Entrance Road Out**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.42	Cement	0.15	15	22	37	26		X	26.0	22	2,531,640	115,075	0	47,986	47,986	1,247,638				
0.42	Wet Flyash	0.15	15	25	40	27.5	X		27.5	25	352,662	14,106	5,882	0	5,882	161,766				
0.42	Sand/Clay	0.15	15	25	40	27.5	X		27.5	25	385,854	15,434	6,436	0	6,436	176,991				
0.42	Bauxite	0.15	15	25	40	27.5	X		27.5	25	352,662	14,106	5,882	0	5,882	161,766				
0.42	Steel Slag	0.15	15	25	40	27.5	X		27.5	25	87,128	3,485	1,453	0	1,453	39,966				
0.42	Coal/Fuels	0.15	15	25	40	27.5	X		27.5	25	211,160	8,446	3,522	0	3,522	96,859				
0.42	Gypsum/Limestone Shed	0.15	15	25	40	27.5	X		27.5	25	177,215	7,089	2,956	0	2,956	81,288				
0.42	Dry Fly Ash	0.15	15	25	40	27.5	X		27.5	25	278,437	11,137	4,644	0	4,644	127,719				
0.42	Employee Vehicles	0.15	1.75	0	1.75	1.75		X	1.8	0	34,675	34,675	0	14,459	14,459	25,304				
0.42	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.42	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.42	Base Rock (Limestone)	0.15	15	15	30	22.5		X	22.5	15	500,000	33,333	0	13,900	13,900	312,750				
0.42	SUBTOTAL	0.15							22.7			256,888	30,777	76,346	107,122	2,432,048	0.29	0.06	15.73	3.05

Segment No. CH-11-1B — **Main Entrance Road Out - Gate**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor	PM10 Emission Factor	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.04	Cement	0.15	15	22	37	26		X	26.0	22	2,531,640	115,075	0	5,006	5,006	130,149				
0.04	Wet Flyash	0.15	15	25	40	27.5	X		27.5	25	352,662	14,106	614	0	614	16,875				
0.04	Sand/Clay	0.15	15	25	40	27.5	X		27.5	25	385,854	15,434	671	0	671	18,463				
0.04	Bauxite	0.15	15	25	40	27.5	X		27.5	25	352,662	14,106	614	0	614	16,875				
0.04	Steel Slag	0.15	15	25	40	27.5	X		27.5	25	87,128	3,485	152	0	152	4,169				
0.04	Coal/Fuels	0.15	15	25	40	27.5	X		27.5	25	211,160	8,446	367	0	367	10,104				
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5	X		27.5	25	177,215	7,089	308	0	308	8,480				
0.04	Dry Fly Ash	0.15	15	25	40	27.5	X		27.5	25	278,437	11,137	484	0	484	13,323				
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75		X	1.8	0	34,675	34,675	0	1,508	1,508	2,640				
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5		X	22.5	15	500,000	33,333	0	1,450	1,450	32,625				
0.04	SUBTOTAL	0.15							22.7			256,888	3,211	7,964	11,175	253,703	0.29	0.06	1.64	0.32

Segment No. CH-11-2 — **Cement Silos to Main Road**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.04	Cement	0.15	15	22	37	26		X	26.0	22	2,531,640	115,075	0	4,166	4,166	108,308				
0.04	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.04	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75	X	X	1.8	0	34,675	34,675	1,255	1,255	2,510	4,393				
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							16.9			149,750	1,255	5,421	6,676	112,701	0.19	0.04	0.63	0.12

TABLE A-9
Paved Roads Emission Worksheet

Segment No. CH-11-3A — **Main Road to Cement silos A**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.07	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.07	Wet Flyash	0.15	15	25	40	27.5	X		27.5	25	352,662	14,106	960	0	960	26,402				
0.07	Sand/Clay	0.15	15	25	40	27.5	X		27.5	25	385,854	15,434	1,050	0	1,050	28,886				
0.07	Bauxite	0.15	15	25	40	27.5	X		27.5	25	352,662	14,106	960	0	960	26,402				
0.07	Steel Slag	0.15	15	25	40	27.5	X		27.5	25	87,128	3,485	237	0	237	6,523				
0.07	Coal/Fuels	0.15	15	25	40	27.5	X		27.5	25	211,160	8,446	575	0	575	15,808				
0.07	Gypsum/Limestone Shed	0.15	15	25	40	27.5	X		27.5	25	177,215	7,089	482	0	482	13,267				
0.07	Dry Fly Ash	0.15	15	25	40	27.5	X		27.5	25	278,437	11,137	758	0	758	20,845				
0.07	Employee Vehicles	0.15	1.75	0	1.75	1.75	X		1.8	0	34,675	34,675	2,360	0	2,360	4,130				
0.07	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.07	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.07	Base Rock (Limestone)	0.15	15	15	30	22.5		X	22.5	15	500,000	33,333	0	2,269	2,269	51,044				
0.07	SUBTOTAL	0.15							20.0			141,813	7,383	2,269	9,652	193,306	0.24	0.05	1.17	0.23

Segment No. CH-11-3B — **Main Road to Cement silos B**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.05	Cement	0.15	15	22	37	26	X		26.0	22	2,531,640	115,075	5,616	0	5,616	146,028				
0.05	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	688	688	1,377	37,867				
0.05	Sand/Clay	0.15	15	25	40	27.5	X	X	27.5	25	385,854	15,434	753	753	1,507	41,431				
0.05	Bauxite	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	688	688	1,377	37,867				
0.05	Steel Slag	0.15	15	25	40	27.5	X	X	27.5	25	87,128	3,485	170	170	340	9,355				
0.05	Coal/Fuels	0.15	15	25	40	27.5	X	X	27.5	25	211,160	8,446	412	412	824	22,673				
0.05	Gypsum/Limestone Shed	0.15	15	25	40	27.5	X	X	27.5	25	177,215	7,089	346	346	692	19,029				
0.05	Dry Fly Ash	0.15	15	25	40	27.5	X	X	27.5	25	278,437	11,137	544	544	1,087	29,897				
0.05	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.05	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.05	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.05	Base Rock (Limestone)	0.15	15	15	30	22.5	X	X	22.5	15	500,000	33,333	1,627	1,627	3,254	73,211				
0.05	SUBTOTAL	0.15							26.0			222,213	10,846	5,229	16,075	417,358	0.36	0.07	2.89	0.56

Segment No. CH-11-4A — **Trucks Entering Cement Silos**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.04	Cement	0.15	15	22	37	26	X		26.0	22	2,531,640	115,075	4,108	0	4,108	106,812				
0.04	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.04	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							26.0			115,075	4,108	0	4,108	106,812	0.36	0.07	0.74	0.14

TABLE A-9
Paved Roads Emission Worksheet

Segment No. CH-11-4B — **Trucks Leaving Cement Silos**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Truck Trips Empty	Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.03	Cement	0.15	15	22	37	26		X	26.0	22	2,531,640	115,075	0	3,671	3,671	95,443				
0.03	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.03	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.03	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.03	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.03	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.03	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.03	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.03	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.03	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.03	SUBTOTAL	0.15							26.0			115,075	0	3,671	3,671	95,443	0.36	0.07	0.66	0.13

Segment No. CH-11-5 — **Admin Building Road**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Truck Trips Empty	Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.15	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.15	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.15	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.15	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.15	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.15	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.15	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.15	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.15	Employee Vehicles	0.15	1.75	0	1.75	1.75	X	X	1.8	0	34,675	34,675	5,239	5,239	10,479	18,338				
0.15	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.15	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.15	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.15	SUBTOTAL	0.15							1.8			34,675	5,239	5,239	10,479	18,338	0.01	0.00	0.03	0.00

Segment No. CH-11-6 — **Main Road to Gypsum Building**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Truck Trips Empty	Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.04	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.04	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	612	612	1,224	33,672				
0.04	Sand/Clay	0.15	15	25	40	27.5	X	X	27.5	25	385,854	15,434	670	670	1,340	36,841				
0.04	Bauxite	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	612	612	1,224	33,672				
0.04	Steel Slag	0.15	15	25	40	27.5	X	X	27.5	25	87,128	3,485	151	151	303	8,319				
0.04	Coal/Fuels	0.15	15	25	40	27.5	X	X	27.5	25	211,160	8,446	367	367	733	20,162				
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5	X	X	27.5	25	177,215	7,089	308	308	615	16,920				
0.04	Dry Fly Ash	0.15	15	25	40	27.5	X	X	27.5	25	278,437	11,137	483	483	967	26,585				
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5	X	X	22.5	15	500,000	33,333	1,447	1,447	2,893	65,100				
0.04	SUBTOTAL	0.15							25.9			107,138	4,650	4,650	9,300	241,272	0.36	0.07	1.67	0.32

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Segment No. CH-11-7 **Gyspum Building Road**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.03	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.03	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.03	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.03	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.03	Gypsum/Limestone Shed	0.15	15	25	40	27.5	X	X	27.5	25	177,215	7,089	239	239	478	13,139				
0.03	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.03	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.03	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.03	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.03	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.03	SUBTOTAL	0.15							27.5			7,089	239	239	478	13,139	0.39	0.08	0.09	0.02

Segment No. CH-11-8 **Main Road to Coal Building**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.08	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.08	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	1,137	1,137	2,274	62,534				
0.08	Sand/Clay	0.15	15	25	40	27.5	X	X	27.5	25	385,854	15,434	1,244	1,244	2,488	68,420				
0.08	Bauxite	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	1,137	1,137	2,274	62,534				
0.08	Steel Slag	0.15	15	25	40	27.5	X	X	27.5	25	87,128	3,485	281	281	562	15,450				
0.08	Coal/Fuels	0.15	15	25	40	27.5	X	X	27.5	25	211,160	8,446	681	681	1,362	37,443				
0.08	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.08	Dry Fly Ash	0.15	15	25	40	27.5	X	X	27.5	25	278,437	11,137	898	898	1,795	49,372				
0.08	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.08	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.08	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.08	Base Rock (Limestone)	0.15	15	15	30	22.5	X	X	22.5	15	500,000	33,333	2,687	2,687	5,373	120,900				
0.08	SUBTOTAL	0.15							25.8			100,049	8,064	8,064	16,128	416,653	0.36	0.07	2.88	0.56

Segment No. CH-11-9 **Coal Truck Loop**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.04	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.04	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.0373	Coal/Fuels	0.15	15	25	40	27.5	X	X	27.5	25	211,160	8,446	315	315	630	17,328				
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							27.5			8,446	315	315	630	17,328	0.39	0.08	0.12	0.02

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Segment No. CH-11-10 FEL - Coal/Petcoke

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.03	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.03	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.03	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.03	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.03	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.03	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.03	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.03	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.03	Front End Loader 4 Coal/Petcoke	0.15	25	7.5	32.5	28.75	X	X	28.8	7.5	31,674	4,223	114	114	228	6,557				
0.03	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.03	SUBTOTAL	0.15							28.8			4,223	114	114	228	6,557	0.42	0.08	0.05	0.01

Segment No. CH-11-11 Base Rock Road

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.75	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.75	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.75	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.75	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.75	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.75	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.75	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.75	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.75	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.75	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.75	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.75	Base Rock (Limestone)	0.15	15	15	30	22.5	X	X	22.5	15	500,000	33,333	25,140	25,140	50,280	1,131,300				
0.75	SUBTOTAL	0.15							22.5			33,333	25,140	25,140	50,280	1,131,300	0.29	0.06	7.29	1.41

Segment No. CH-11-12 Dry Fly Ash Road

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.03	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.03	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.03	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.03	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.03	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.03	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.03	Dry Fly Ash	0.15	15	25	40	27.5	X	X	27.5	25	278,437	11,137	280	280	559	15,375				
0.03	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.03	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.03	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.03	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.03	SUBTOTAL	0.15							27.5			11,137	280	280	559	15,375	0.39	0.08	0.11	0.02

TABLE A-9
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Segment No. CH-11-13 — **Main Road to Raw Material Storage**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Truck Trips Empty	Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.11	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.11	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	1,608	1,608	3,216	88,448				
0.11	Sand/Clay	0.15	15	25	40	27.5	X	X	27.5	25	385,854	15,434	1,759	1,759	3,519	96,772				
0.11	Bauxite	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	1,608	1,608	3,216	88,448				
0.11	Steel Slag	0.15	15	25	40	27.5	X	X	27.5	25	87,128	3,485	397	397	795	21,852				
0.11	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.11	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.11	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.11	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.11	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.11	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.11	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.11	SUBTOTAL	0.15							27.5			47,132	5,373	5,373	10,746	295,519	0.39	0.08	2.10	0.41

Segment No. CH-11-14 — **Truck Dump for Bauxite and Steel Slag**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Truck Trips Empty	Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.02	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.02	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.02	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.02	Bauxite	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	214	214	429	11,793				
0.02	Steel Slag	0.15	15	25	40	27.5	X	X	27.5	25	87,128	3,485	53	53	106	2,914				
0.02	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.02	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.02	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.02	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.02	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.02	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.02	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.02	SUBTOTAL	0.15							27.5			17,592	267	267	535	14,707	0.39	0.08	0.10	0.02

Segment No. CH-11-17 — **Main Road to Sand/Clay Unloading**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Truck Trips Empty	Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.04	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.04	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	533	533	1,066	29,327				
0.04	Sand/Clay	0.15	15	25	40	27.5	X	X	27.5	25	385,854	15,434	583	583	1,167	32,088				
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.04	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							27.5			29,541	1,117	1,117	2,233	61,415	0.39	0.08	0.44	0.08

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Paved Roads Emission Worksheet

Segment No. CH-11-18 — **Sand/Clay Unloading Road**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.04	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.04	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Sand/Clay	0.15	15	25	40	27.5	X	X	27.5	25	385,854	15,434	644	644	1,287	35,398				
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.04	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							27.5			15,434	644	644	1,287	35,398	0.39	0.08	0.25	0.05

Segment No. CH-11-19 — **Main Road to Wet Fly Ash Unloading**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.07	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.07	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	931	931	1,862	51,207				
0.07	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.07	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.07	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.07	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.07	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.07	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.07	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.07	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.07	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.07	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.07	SUBTOTAL	0.15							27.5			14,106	931	931	1,862	51,207	0.39	0.08	0.36	0.07

Segment No. CH-11-20 — **Wet Fly Ash Unloading Road**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights				Truck Trips		Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
			Empty (Tons)	Capacity (Tons)	Loaded (Tons)	Avgerage (Tons)	Empty	Loaded												
0.04	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.04	Wet Flyash	0.15	15	25	40	27.5	X	X	27.5	25	352,662	14,106	585	585	1,171	32,198				
0.04	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.04	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							27.5			14,106	585	585	1,171	32,198	0.39	0.08	0.23	0.04

TABLE A-9
Paved Roads Emission Worksheet

Segment No. CH-11-21 — **FEL - Gypsum/Limestone**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.04	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.04	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.04	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.04	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.04	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.04	Dry Fly Ash	0.15	15	25	40	27.5					278,437	0	0	0	0					
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75	X	X	28.8	7.5	177,215	23,629	870	870	1,739	49,998				
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5					500,000	0	0	0	0					
0.04	SUBTOTAL	0.15							28.8			23,629	870	870	1,739	49,998	0.42	0.08	0.36	0.07

Segment No. CH-11-24 — **Main Road to Dry Fly Ash**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.05	Cement	0.15	15	22	37	26					2,531,640	0	0	0	0					
0.05	Wet Flyash	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.05	Sand/Clay	0.15	15	25	40	27.5					385,854	0	0	0	0					
0.05	Bauxite	0.15	15	25	40	27.5					352,662	0	0	0	0					
0.05	Steel Slag	0.15	15	25	40	27.5					87,128	0	0	0	0					
0.05	Coal/Fuels	0.15	15	25	40	27.5					211,160	0	0	0	0					
0.05	Gypsum/Limestone Shed	0.15	15	25	40	27.5					177,215	0	0	0	0					
0.05	Dry Fly Ash	0.15	15	25	40	27.5	X	X	27.5	25	278,437	11,137	564	564	1,127	30,996				
0.05	Employee Vehicles	0.15	1.75	0	1.75	1.75					34,675	0	0	0	0					
0.05	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.05	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.05	Base Rock (Limestone)	0.15	15	15	30	22.5	X	X	22.5	15	500,000	33,333	1,687	1,687	3,373	75,900				
0.05	SUBTOTAL	0.15							23.8			44,471	2,250	2,250	4,500	106,896	0.31	0.06	0.71	0.14

Segment No. CH-11-25A — **Main Entrance Road In**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.62	Cement	0.15	15	22	37	26	X		26.0	22	2,531,640	115,075	70,788	0	70,788	1,840,491				
0.62	Wet Flyash	0.15	15	25	40	27.5		X	27.5	25	352,662	14,106	0	8,678	8,678	238,634				
0.62	Sand/Clay	0.15	15	25	40	27.5		X	27.5	25	385,854	15,434	0	9,494	9,494	261,094				
0.62	Bauxite	0.15	15	25	40	27.5		X	27.5	25	352,662	14,106	0	8,678	8,678	238,634				
0.62	Steel Slag	0.15	15	25	40	27.5		X	27.5	25	87,128	3,485	0	2,144	2,144	58,957				
0.62	Coal/Fuels	0.15	15	25	40	27.5		X	27.5	25	211,160	8,446	0	5,196	5,196	142,885				
0.62	Gypsum/Limestone Shed	0.15	15	25	40	27.5		X	27.5	25	177,215	7,089	0	4,361	4,361	119,915				
0.62	Dry Fly Ash	0.15	15	25	40	27.5		X	27.5	25	278,437	11,137	0	6,851	6,851	188,409				
0.62	Employee Vehicles	0.15	1.75	0	1.75	1.75	X		1.8	0	34,675	34,675	21,330	0	21,330	37,328				
0.62	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.62	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.62	Base Rock (Limestone)	0.15	15	15	30	22.5	X		22.5	15	500,000	33,333	20,505	0	20,505	461,363				
0.62	SUBTOTAL	0.15							22.7			256,888	112,623	45,401	158,024	3,587,708	0.29	0.06	23.21	4.50

TABLE A-9
Paved Roads Emission Worksheet

Segment No. CH-11-25B — **Main Entrance Road In - Gate**

Segment Length (mi)	Material	Silt Loading (g/m2)	Truck Weights: Empty (Tons)	Truck Weights: Capacity (Tons)	Truck Weights: Loaded (Tons)	Truck Weights: Avgerage (Tons)	Truck Trips: Empty	Truck Trips: Loaded	Truck Weight (Tons)	Material Net (Tons)	Material (Tons/Yr)	Material Trips (#/Yr)	Empty Mileage (Mi/Yr)	Loaded Mileage (Mi/Yr)	Total Mileage (Mi/Yr)	Weight x Mileage	TSP Emission Factor lb/VMT	PM10 Emission Factor lb/VMT	TSP Emissions (Tons/Yr)	PM10 Emissions (Tons/Yr)
0.04	Cement	0.15	15	22	37	26	X		26.0	22	2,531,640	115,075	5,006	0	5,006	130,149				
0.04	Wet Flyash	0.15	15	25	40	27.5		X	27.5	25	352,662	14,106	0	614	614	16,875				
0.04	Sand/Clay	0.15	15	25	40	27.5		X	27.5	25	385,854	15,434	0	671	671	18,463				
0.04	Bauxite	0.15	15	25	40	27.5		X	27.5	25	352,662	14,106	0	614	614	16,875				
0.04	Steel Slag	0.15	15	25	40	27.5		X	27.5	25	87,128	3,485	0	152	152	4,169				
0.04	Coal/Fuels	0.15	15	25	40	27.5		X	27.5	25	211,160	8,446	0	367	367	10,104				
0.04	Gypsum/Limestone Shed	0.15	15	25	40	27.5		X	27.5	25	177,215	7,089	0	308	308	8,480				
0.04	Dry Fly Ash	0.15	15	25	40	27.5		X	27.5	25	278,437	11,137	0	484	484	13,323				
0.04	Employee Vehicles	0.15	1.75	0	1.75	1.75	X		1.8	0	34,675	34,675	1,508	0	1,508	2,640				
0.04	Front End Loader 3 Gypsum/Limestone	0.15	25	7.5	32.5	28.75					177,215	0	0	0	0					
0.04	Front End Loader 4 Coal	0.15	25	7.5	32.5	28.75					31,674	0	0	0	0					
0.04	Base Rock (Limestone)	0.15	15	15	30	22.5	X		22.5	15	500,000	33,333	1,450	0	1,450	32,625				
0.04	SUBTOTAL	0.15							22.7			256,888	7,964	3,211	11,175	253,703	0.29	0.06	1.64	0.32
	GRAND TOTAL																		**65.12**	**12.63**

Notes:

Emissions based on AP-42 Section 13.2.1 (12/03), Equation (2).

E = [k * (sL/2)^0.65 * (W/3)^1.5 - C] * (1 - P/4N)

where E = emission factor, lb/VMT — k (PM-30) = 0.082 lb/VMT

k = particle size multiplier — k (PM-10) = 0.016 lb/VMT

sL = road surface silt loading, g/m^2

W = average vehicle weight, tons — C (PM-30) = 0.00047 lb/VMT

C = 1980's vehicle exhaust, brake & tire wear, lb/VMT — C (PM-10) = 0.00047 lb/VMT

P = number of days with >= 0.01 in precipitation

N = number of days in the averaging period (365) — P = 105 days (Tampa average)

Silt loading of 0.15 g/m2 or less will be maintained by use of vacuum sweeping

TABLE A-10
Unpaved Roads Emission Worksheet

Segment No.	Material Hauled	Annual Material Throughput (tons)	Total Miles (Round Trip)	Average Load per Vehicle (tons)	Unloaded Vehicle Weight (tons)	Mean Vehicle Weight (tons) (W)	Surface Material Silt Content (%) (s)	VMT (miles/ year)	PM Emission Factor (lb/VMT)[1]	PM10 Emission Factor (lb/VMT)[1]	Control Efficiency (%)[2]	PM Emissions (tons/year)	PM10 Emissions (tons/year)
15	Front End Loader-Bauxite	352,662	0.03	7.5	25	28.75	8.3	1,556	7.46	2.12	95%	0.29	0.08
16	Front End Loaders-Steel Slag	87,128	0.03	7.5	25	28.75	8.3	395	7.46	2.12	95%	0.07	0.02
22	Front End Loaders-Limestone	3,798,428	0.03	7.5	25	28.75	8.3	16,359	7.46	2.12	95%	3.05	0.87
23	Front End Loader-Base Rock	500,000	0.03	15	15	22.5	8.3	940	6.68	1.90	95%	0.16	0.04
										Total Emissions		0.07	0.02

Notes:

E = k * (s/12)^a * (W/3)^b * (365 - P)/365 — for industrial unpaved roads

where E = emission factor, lb/VMT
k = particle size multiplier
s = surface material silt content, %
W = average vehicle weight, tons
P = number of days with >= 0.01 in precipitation
a, b = constants for specific partical size

Constant	PM-30	PM-10
k	4.9	1.5
a	0.7	0.9
b	0.45	0.45

P = 105 days (Tampa average)

[1] Based on AP-42 Section 13.2.2 (12/03), Equations (1a) & (2). Silt content based on default stone quarrying haul road (Table 13.2.2-1).

[2] A control efficiency of 95% was used to account for high natural surface moisture in the quarry and/or watering at an equivalent moisture ratio of 5 (Figure 13.2.2-2). This control efficiency also reflects the slow travel speed of the loaders (<10 mph).

Assumes average round trip distance for limestone loader is 600 ft and for base rock loader is 400 ft.

TABLE A-11
Traffic Inputs for Paved and Unpaved Roads

Material	Amount of Material		Truck/Loader Weight (Empty)		Truck/Loader Capacity		Total Trips	Type of Road
Cement	2,531,640	tons/year	15	tons	22	tons	115,075	Paved
Fly Ash	352,662	tons/year	15	tons	25	tons	14,106	Paved
Sand/Clay	385,854	tons/year	15	tons	25	tons	15,434	Paved
Bauxite	352,662	tons/year	15	tons	25	tons	14,106	Paved
Steel Slag	87,128	tons/year	15	tons	25	tons	3,485	Paved
Coal	211,160	tons/year	15	tons	25	tons	8,446	Paved
Gypsum	177,215	tons/year	15	tons	25	tons	7,089	Paved
Dry Fly Ash	278,437	tons/year	15	tons	25	tons	11,137	Paved
Employee Traffic	95	employees/day	3,500	lbs	1	employee	34,675	Paved
Front End Loader 1 Steel Slag	87,128	tons/year	25	tons	7.5	tons	11,617	Unpaved (Packed Limestone)
Front End Loader 2 Bauxite	352,662	tons/year	25	tons	7.5	tons	47,022	Unpaved (Packed Limestone)
Front End Loader 3 Gypsum/Limestone	177,215	tons/year	25	tons	7.5	tons	23,629	Paved
Front End Loader 4 Coal/Petcoke (Note 1)	31,674	tons/year	25	tons	7.5	tons	4,223	Paved
Quarry								
Front End Loaders Limestone	3,798,428	tons/year	25	tons	7.5	tons	506,457	Unpaved
Front End Loaders Base Rock (Limestone)	500,000	tons/year	15	tons	15.0	tons	33,333	Unpaved
Base Rock (Limestone)	500,000	tons/year	15	tons	25.0	tons	20,000	Paved

Note 1 : Only 15% of Coal/Pet Coke is moved by front end loader, the remainer will be handled directly from the truck.

Attachment 6

Revised Modeling Report

Modeling Report
For the Sumter Cement Company
Center Hill, Florida

Submitted By:

Sumter Cement Company, LLC

P.O. Box 410

Branford, Florida 32008

Submitted To:

Florida Department of Environmental Protection
2600 Blair Stone Road MS# 5500
Tallahassee, Florida 32399-2400

October 2005

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1. INTRODUCTION

Sumter Cement Company, LLC Company (SCC) is proposing to build a new Portland cement plant in the town of Center Hill located in Sumter County, Florida. SCC will be operated by Votorantim Cementos. Votorantim Cementos also operates Suwannee American Cement (SAC) which has a cement plant in Branford, Florida. The operations of the new SCC Center Hill Plant (Plant) and the SAC Branford Plant will be both fully controlled by Votorantim Cementos. The two cement plants, although with different names, will share the valuable resources, information, and the vast experience and knowledge provided by Votorantim Cementos. The Plant will perform quarrying and crushing of raw materials and processing of these materials into Portland cement. The Plant will operate with a state-of-the-art in-line raw mill and preheater/precalciner (PH/PC) kiln system and include the latest technologies for emission controls.

The proposed project will be subject to the New Source Review (NSR) Prevention of Significant Deterioration (PSD) regulations because the proposed site of the SCC Plant is located in an attainment area for all applicable criteria air pollutants. Since the proposed SCC Plant is expected to have potential-to-emit (PTE) emissions greater than 100 tons per year of regulated NSR pollutants, it will be considered a major emission source under 40 CFR Part 52.21(2)(i). Therefore, for those regulated air pollutant emissions that exceed applicable significant net emission increase threshold levels, an air quality modeling impact analysis is required.

2. PROCESS AND FACILITY DESCRIPTIONS

SCC plans to construct a new dry process Portland cement plant capable of producing approximately 1.7 million short tons of clinker per year. The Plant will be located approximately one mile east of Center Hill, Florida. The Plant will perform quarrying and crushing of raw materials, and processing of these materials into Portland cement. The Plant will operate with a single cement production system which includes a preheater/precalciner kiln with an in-line raw mill. The components of this system are described in detail below and consist of equipment to quarry and crush limestone (Quarry Crushing), prepare raw material into pyro-process kiln feed (Raw Grinding), process kiln feed into clinker (Clinker Burning), cool the clinker (Clinker Cooling), process clinker into cement (Finish Grinding), cement load out (Cement Distribution), and prepare raw fuel for combustion (Fuel Grinding). SCC will use reasonable precautions to control unconfined emissions. For a listing of these precautions see Appendix A.

- **Quarry Crushing**

Limestone will be quarried on the Plant property; other raw materials, such as sand (or other silica sources), steel slag (or other iron sources), and fly ash (or other alumina sources) will be received from off-site sources and stored within the enclosed Raw Material Storage Building. The limestone will be processed by a primary crusher and then conveyed to a Limestone Storage Building.

- **Raw Grinding**

The raw materials will be conveyed from their storage areas mentioned above by completely enclosed conveyors to Pre-Blending Silos and then into an In-Line Raw Mill system, where the combined materials are dried and pulverized. The powdery material, referred to as kiln feed, will then be conveyed to a Blending Silo for temporary storage. Process air from the raw mill will be vented out through the main stack, which is also used by the preheater/precalciner kiln system.

- **Clinker Burning**

From the Blend Silo, the kiln feed will be conveyed into a dry process preheater/precalciner and rotary kiln for pyro-processing into cement clinker nodules. The kiln feed will then be introduced at the upper stages of the preheater and travel through the preheater and calciner, finally entering the end of the kiln where it will travel downhill via the kiln rotation and gravity. Fuel will be fired in the calciner and at the lower end of the kiln. The resulting combustion gases will travel countercurrent to the feed via an induced draft fan. Kiln gases will be vented to the main stack shared with the Raw Mill system.

Fuels to be used in the pyroprocessing system include fuel oil, natural gas, coal, petroleum coke, and whole or chipped tires. The system will also be designed to accommodate the use of non-hazardous liquids and non-hazardous solids in the future. The non-hazardous liquids (e.g., on-spec used oil; up to 50 percent of total heat input) will be burned in the kiln and/or precalciner. Non-hazardous solids (e.g., plastic, filter fluff, wood waste; up to 50 percent of total heat input) will be burned in the precalciner. The Plant may include a whole tire system and a tire gasification system that will use heat from the pyroprocessing system to decompose tires to gas, coke, and wire, which will be used in the kiln and pyroprocessing system in an enclosed process.

As the kiln feed is gravity-conveyed through the preheater and calciner it will be progressively heated and undergo calcination. As the kiln feed enters the kiln it will travel through the sintering zone of the process. When the material reaches the hot end of the kiln it will have completed its chemical transformation into Portland cement clinker nodules, typically sized between ½-inch and 2-inches in diameter. The clinker nodules will be deposited directly from the hot-end of the kiln into the Clinker Cooler system. The kiln system will have a preliminary capacity of 353.2 tons/hour of material fed to the preheater (dry basis) and 208.3 tons/hour of clinker production.

- **Clinker Cooling**

Clinker discharged from the kiln passes to a Clinker Cooler system, which will vent to the main stack used by the Kiln and Raw Mill systems. The cooled clinker will be conveyed to Clinker Storage Silos that will feed the Finish Grinding process.

- **Finish Grinding**

In the Finish Grinding process, gypsum and limestone will be inter-ground with clinker to produce cement. The gypsum and limestone will be received at the plant by truck and stored in a Gypsum/Limestone Storage Building. The gypsum and limestone will then be conveyed by enclosed conveyors to separate storage silos. Clinker, gypsum, and limestone extracted from their respective storage silos, will be fed in predetermined amounts into one of two Finish Mills. The Finish Mills will have a combined preliminary capacity of 340 tons/hour of Portland cement production. The ground clinker, gypsum, and limestone particles mix, or Portland cement, produced by the Finish Mills will then be conveyed to Cement Storage Silos.

- **Cement Distribution**

All cement produced at the plant will be distributed by truck. The Cement Storage Silos will feed the Portland cement to one of three truck load outs or to a packaging plant. The packaging plant will also distribute cement by truck. SCC will have no access to rail at the Plant, and since the vast majority of SCC's potential customers can only receive cement via bulk trucks there will be no rail load out.

- **Fuel Grinding**

The Plant will also include a coal processing operation that will crush approximately 211,160 tons of coal and petroleum coke annually. The coal/coke will be delivered by truck and stored in a Coal Storage Building and fed by front end loaders and enclosed conveyors to the Coal Mill for drying and grinding. The Coal Mill will use cooler gas for the drying process and will not be a source of combustion. Ground fuel will be stored in the Pulverized Coal Storage Silos and conveyed from there to the Kiln system.

Emissions units addressed by this permitting action are:

Table 2-1
SCC Emission Units

EU ID	Description
CH-1	Primary Crushing and Associated Conveyors
CH-2	Raw Material Conveying – conveyor transfer points
CH-3	Raw Material Processing and Storage – controlled by baghouses
CH-4	Kiln System with In-Line Raw Mill and Clinker Cooler
CH-5	Clinker Storage and Conveying – controlled by baghouses
CH-6	Finish Mills and Cement Processing – controlled by baghouses
CH-7	Coal Mill System
CH-8	Coal Conveying – conveyor transfer points
CH-10	Storage Piles
CH-11	Paved and Unpaved Roads

Additionally, there will be a diesel emergency generator (CH-9). The total amount of diesel fuel to be burned in the new emergency generator will not exceed 32,000 gal/yr and thus it is exempt from permitting pursuant to F.A.C 62-210.300(3)(a)20.

Preliminary flow diagrams are included in the application in Appendix F. However, the vendors for the new equipment have not yet been selected, so the application does not include information on process and control equipment manufacturers or continuous emission monitoring systems (CEMS). To the extent requested by the FDEP, this information will be provided to the FDEP once the equipment bids have been approved. The CEMS and stack sampling facilities will meet all the applicable requirements in 40 CFR Parts 60 and 63.

2.1 FACILITY LOCATION

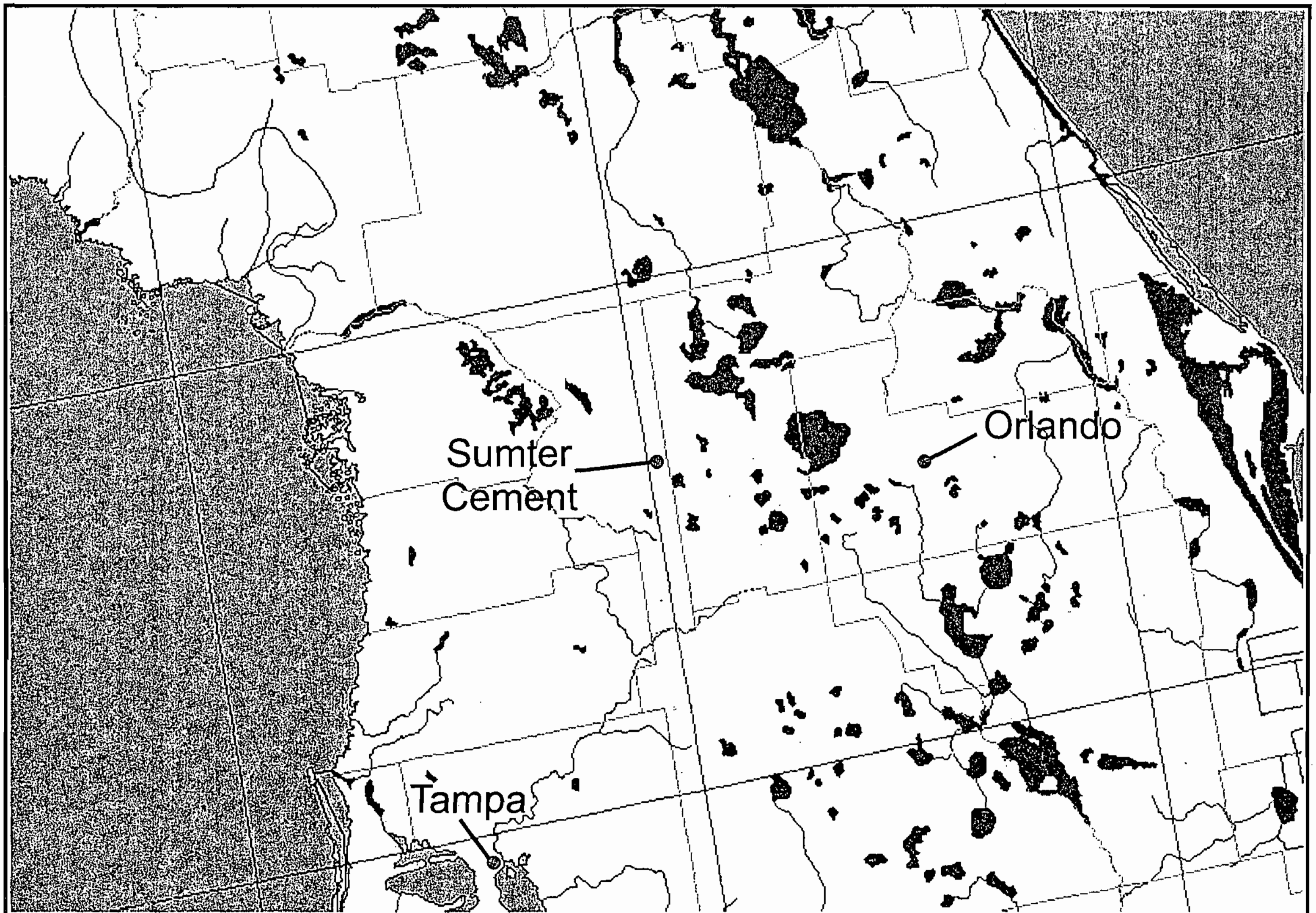
The Plant is located approximately 1 mile southeast of Center Hill, Florida, and is situated on an approximately 1,473-acre parcel of land. The location of the Plant is shown in Figure 2-1. The geographic coordinates for the new precalciner kiln system stack are approximately:

- Longitude: 81° 58' 49" W Latitude: 28° 37' 50" N
- UTM Easting: 404,171 meters Northing: 3,167,472 meters
- UTM Zone: 17

(UTM = Universal Traverse Mercator) WGS-84 Ellipsoid

The proposed project is located in a region which is classified as in attainment of the NAAQS for all criteria pollutants.

The topography of the area surrounding the proposed project site is generally flat. There are no major distinctive terrain features in the surrounding area. Since the highest terrain in the vicinity of the plant site does not exceed the elevation of the projected main kiln stack elevation, the air dispersion modeling analysis will not include terrain elevations.



0 25 50
Scale in km

Figure 2-1
Sumter Cement Company
Area Map

SPECTRUM

3. FACILITY EMISSION INVENTORY

Appendix A, PTE Air Emissions Inventory, of this Permit Application describes the potential-to-emit (PTE) emission inventory associated with the PM_{10}, TSP, SO_2, NO_x, CO, and VOC emissions sources at the Plant.

As shown by Table 5-1 in the Application, "Facility-Wide New Source Review Applicability Analysis", there will be an expected significant net emission increase of PM_{10}, TSP, SO_2, NO_x, CO, and VOC. Therefore, these pollutants will require major source PSD review and including the conduct of applicable air quality impact analyses.

4. AIR QUALITY MODEL SELECTION AND INPUT DATA

The dispersion models used for the air quality modeling analysis of the SCC Plant are U.S. EPA approved air quality dispersion models. The procedures used in conducting the modeling analysis follow the requirements outlined in 40 CFR Part 51 Appendix W "Guideline on Air Quality Models" (U.S. EPA 1999) and other applicable EPA and FLM guidance.

4.1 AIR DISPERSION MODEL SELECTION

The air quality modeling analysis uses air dispersion models to predict ambient air impacts from the proposed project. The Industrial Source Complex Short-Term 3 (ISCST3) model has been used for refined modeling. The CALPUFF air dispersion model has been used in a screening mode (CALPUFF-Lite) to evaluate the potential for long-range transport air quality and visibility impairment impacts at the surrounding Federal Class I areas within 300 kilometers of the SCC Plant. Descriptions of these models are provided in the following subsections.

4.1.1 Industrial Source Complex Model

The U.S. EPA ISCST3 (ISCST3, Version 02035) air dispersion model has been used to demonstrate compliance with applicable Florida AAQS and PSD Class II increments. The ISCST3 model can predict short-term and long-term concentrations from multiple stacks in rural or urban areas. The ISCST3 air dispersion model can also account for the effects of aerodynamic downwash of a stack's plume by nearby structures. The ISCST3 air dispersion model accepts hourly meteorological data to define the conditions for plume rise, transport, and dispersion. The model estimates the concentration for each source and receptor combination for each hour.

The ISCST3 air dispersion model has various options to simulate a variety of dispersion conditions for emissions from a stack or non-stack source. The U.S. EPA has recommended various default options to be used in dispersion modeling for regulatory purposes. These recommended regulatory default options have been used in the air quality impact analysis as follows:

- Stack-tip downwash,

- Final plume rise,
- Buoyancy-induced dispersion (BID),
- Vertical potential temperature gradients of 0.0, 0.0, 0.0, 0.0, 0.02 and 0.035 for stability classes A through F, respectively,
- Automatic treatment of calms,
- Wind profile exponents of 0.07, 0.07, 0.10, 0.15, 0.35, and 0.55 for stability classes A through F, respectively,
- Infinite pollutant half-life,
- Upper bound value for "supersquat" buildings,
- Missing data processing not used.

4.1.2 CALPUFF Model

The CALPUFF air dispersion modeling system (Version 5.76) was used to predict the air quality impacts at four Federal Class I areas located within 300 kilometers of the SCC Plant. The CALPUFF model has been used in a screening mode (known as CALPUFF Lite) in a manner that is consistent with the guidance contained in the "Inter-Agency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts" (U.S. EPA 1998) and the Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report (U.S. FS, NPS, U.S. FWS, 2000). The CALPUFF model is a non-steady state puff dispersion model. The CALPOST program post-processes the CALPUFF model outputs, calculating and summarizing visibility impacts, concentration levels, and deposition amounts. Given the nature of terrain in Florida, the flat terrain option has been used. Other specific CALPUFF model options have been selected in accordance with regulatory guidance (U.S. EPA 1998).

All stipulated CALPUFF "regulatory default" options were chosen. However, SCC has utilized the following CALPUFF modeling options:

- Based on recent guidance from the "Initial Draft of the BART Modeling Protocol for VISTAS," dated January 31, 2005, a Rayleigh scattering coefficient of 12 Mm^{-1} for clean air was selected for use instead of the default value of 10 Mm^{-1}. This 12 Mm^{-1} value was chosen because the default value is appropriate for an elevation of 1,600 meters (approximately

5,000 feet). The corrected value at sea level, representative of the elevation of the SCC Plant (approximately 100 feet above sea level) is about 12 Mm^{-1}. The default value could never be realized at a low altitude site and the relative impact of a source on haze would be overstated using the default Rayleigh value.

- Hourly ozone for 2004 from the EPA SLAMS ozone monitor located in Pasco County was obtained from the EPA. These data were post-processed into monthly average ozone values and used as input to the CALPUFF model. The ozone data from this monitoring site is the closest and most representative of existing ambient ozone concentrations in the vicinity of the SCC Plant. These data were used in lieu of the CALPUFF monthly default value of 80 ppb.

- An Ammonia background of 0.5 ppb was selected for use in the Class I modeling analyses since it represents forested areas per the IWAQM/FLAG and Earth Tech guidance. The land use classification from the SCC Plant to, and including the four Class I areas, is most representative of a forested area, as opposed to the default CALPUFF value of 10 ppb for Ammonia which represent grasslands.

4.2 EMISSION CHARACTERISTICS

The stack characteristics for the SCC Plant sources that have been used as inputs to all dispersion models are those reflecting the final engineering design of the SCC Plant.

Per guidance provided by the National Stone, Sand and Gravel Association, SCC has used the height of the haul trucks as the release height, which was four meters for the calculation of fugitive emissions. The actual dimensions of the haul trucks range from 3.5 to 4.75 meters and from 75 to 100 feet in length.

4.3 LAND USE

The land use classification for the area was based on a quantitative review of land use patterns surrounding the SCC Plant. For the quantitative review, 1:250,000 scale USGS Level 2 digital land use data were used. The land use analysis followed the procedures recommended by the U.S. EPA (U.S. EPA 1999) and the typing scheme developed by Auer (Auer 1978). The Auer technique established four primary land use types: industrial, commercial, residential, and agricultural. Industrial, commercial, and compact residential areas are classified as urban, while agricultural and common residential areas are considered rural. For air quality modeling purposes, an area is defined as urban if more than 50 percent of the surface within three kilometers of the source falls under an urban land use type. Otherwise, the area is determined to be rural.

As shown in Figures 4-1 through 4-4, the quantitative land use analysis indicated that the area surrounding the SCC Plant is largely rural. The residential areas shown in Figure 4-1 are classified as urban according to the Level 2 gridded digital land use data. Figure 4-2 hows the rural land use of the surrounding area using aerial photography. Figure 4-3 is an aerial out view of the surround area consistent with forested areas. Figure 4-4 provides an aerial view of the surround area in relation to Class I Areas. Based on the rural land use designation, rural dispersion coefficients will be used to predict the ambient air concentrations due to emissions from the stacks.

Figure 4-1 Land Use Analysis

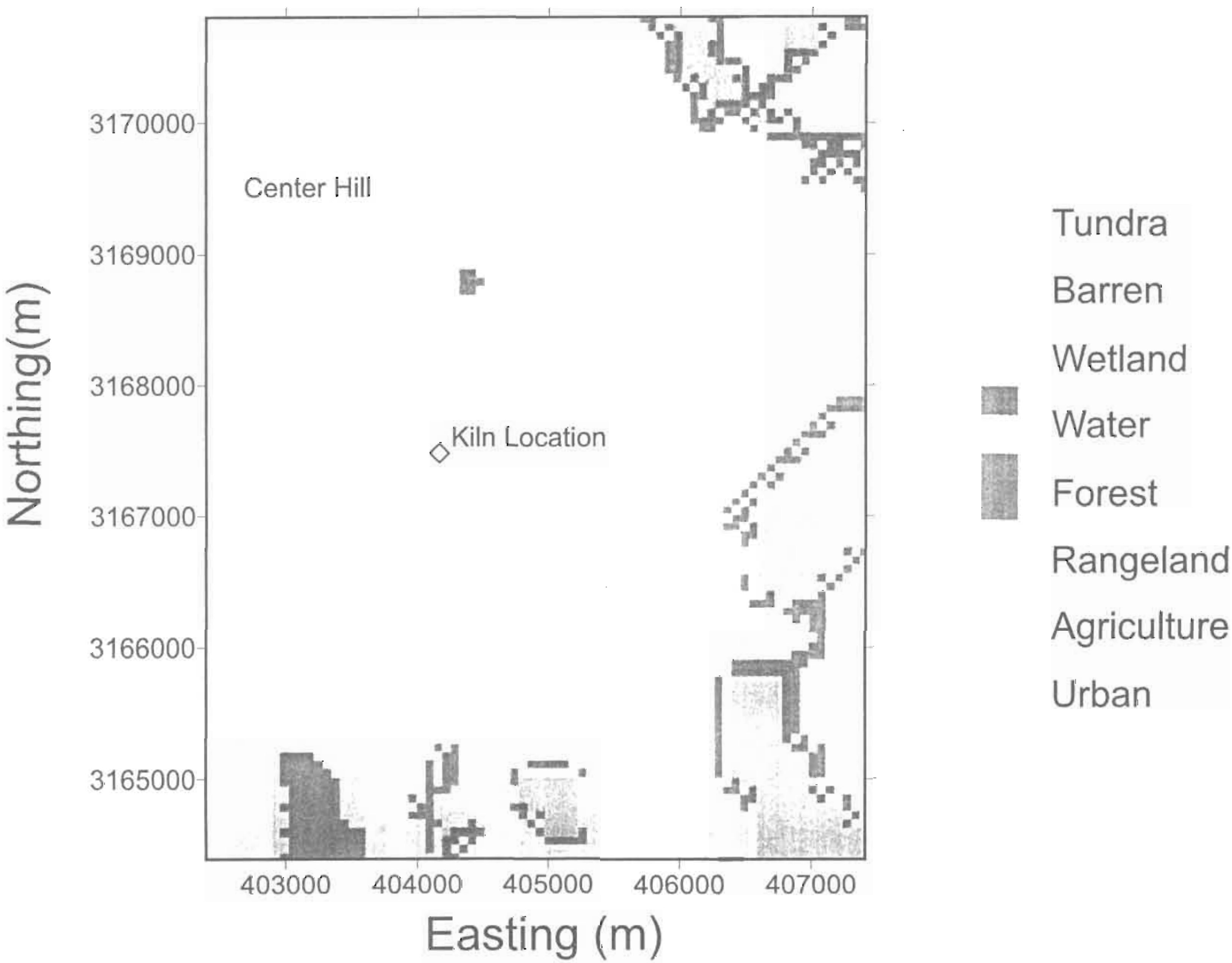


Figure 4-2 Aerial photograph depicting surrounding land use in the immediate vicinity of SCC

Figure 4-3 Zoomed out view of aerial photograph depicting surrounding land use in the vicinity of SCC - *(consistent with forested areas)*

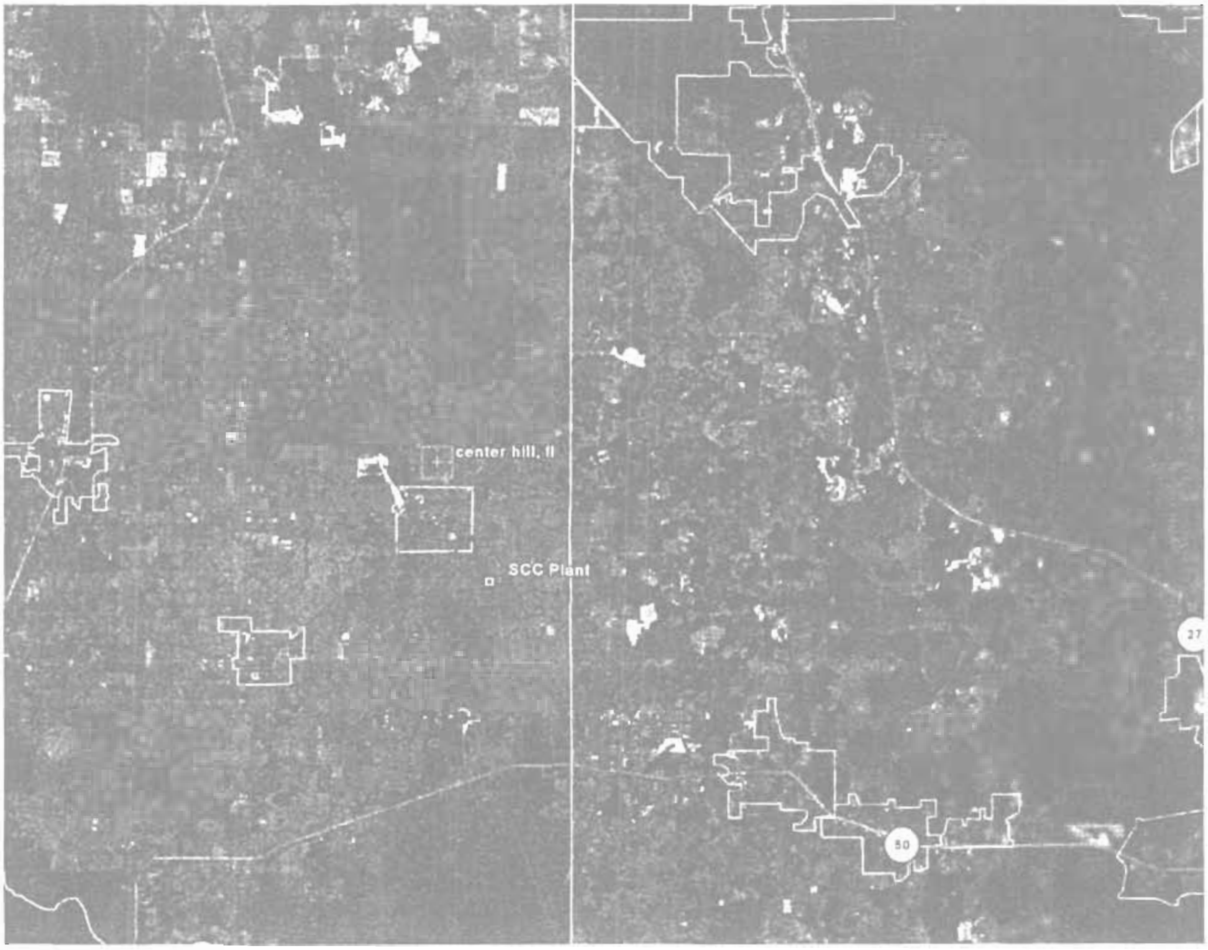


Figure 4-4 Aerial photograph showing predominant land use between SCC and Class I Areas - *(consistent with forested areas)*

4.4 RECEPTOR GRID

4.4.1 ISCST3 Model Receptors

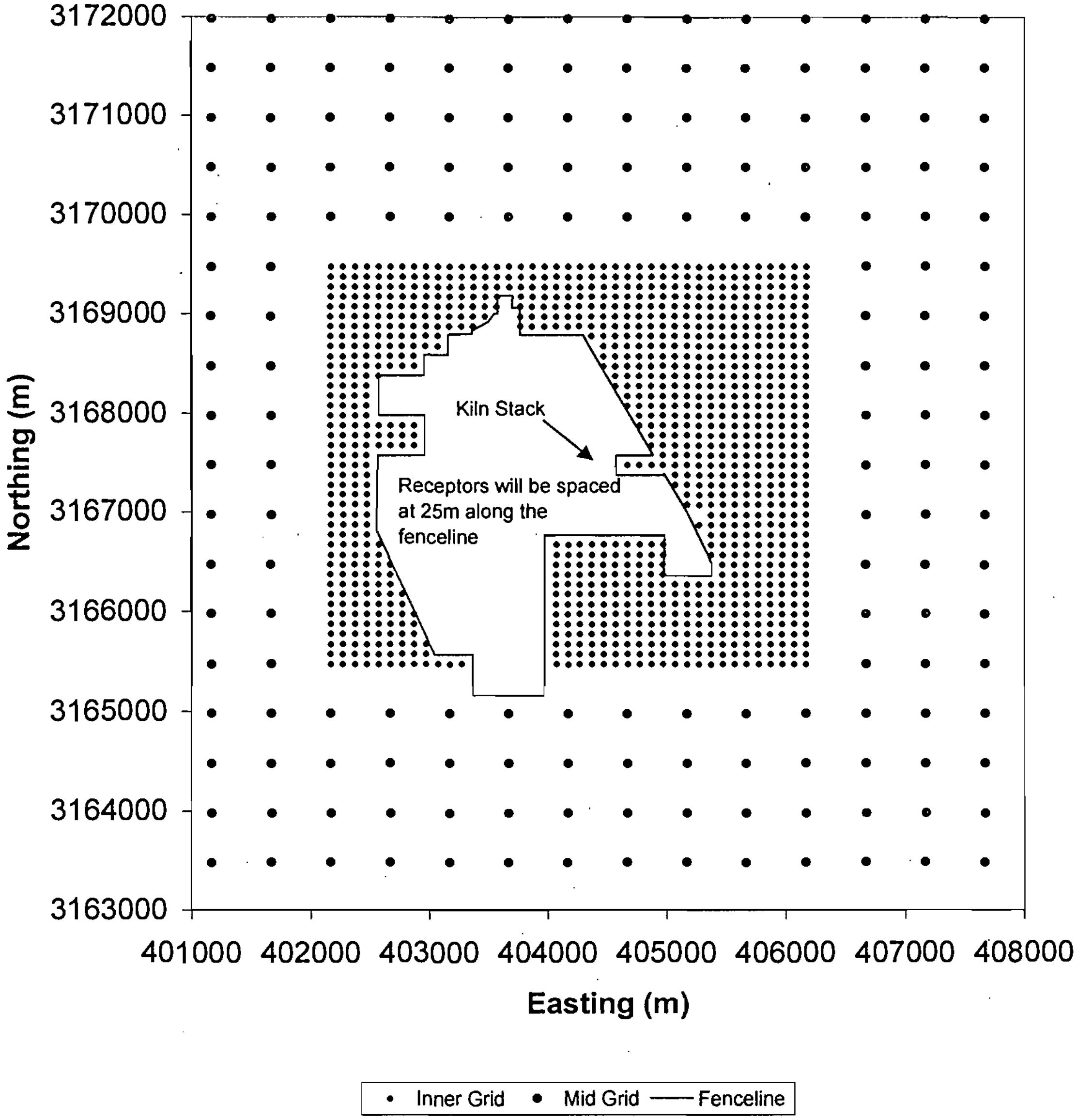
The receptor network for the ISCST3 analysis, at a minimum, covers a square region 20 kilometer on a side, centered on the SCC Plant. All receptors have been referenced to the UTM coordinate system (Zone 17), using the WGS-84 Ellipsoid. A rectangular Cartesian coordinate receptor grid has been used as the main receptor grid. The main receptor grid has been centered on the new kiln stack (origin). The following grid spacing has been used:

- 100 meters from the origin out to 2 kilometers (km)
- 500 meters from 2 km out to 5 km; and
- 1,000 meters from 5 km out to 10 km.

In addition to the rectangular Cartesian coordinate receptor grid, a set of property line receptors have been prepared to represent the boundary of the SCC Plant property. The property line receptors have been placed at 25 meter intervals along the boundary. Cartesian receptors that are inside the facility property have been excluded from the full receptor grid. Figure 4-2 shows an approximation of the inner portion of the full Cartesian grid, with the receptor spacing. Also, if at any receptors which are not part of the 100-meter grid spacing results in a predicted concentration that is within 10 percent of the predicted maximum value for that pollutant and averaging time, a 100 meter receptor grid have been utilized around that predicted concentration to identify the highest predicted concentration with the 100-meter receptor grid.

Terrain elevations have not been assigned to receptors included in the ISCST3 air dispersion modeling analysis. Flat terrain has been assumed.

Figure 4-5
Inner Portion of Receptor Grid



4.4.2 CALPUFF Model Receptors

For CALPUFF run in the screening mode, FLM guidance recommends that a polar grid receptor network be used. As a result, a polar grid with distances from the SCC Plant that match the closest and furthest distances from the SCC Plant to the four surrounding Federal Class I areas has been used. This has resulted in eight rings of receptors at downwind distances of 61, 72, 216, 252, 272, 289, 298, and 309 kilometers. These eight rings have a receptor located at every degree resulting in 360 receptors per ring. Per FLM guidance using CALPUFF in the screening mode, the maximum impact on any given ring has been evaluated, regardless of direction.

4.5 METEOROLOGICAL DATA

4.5.1 ISCST3 Model

The hourly meteorological data for the ISCST3 analysis consists of five years (1991-1995) of surface data from the National Weather Service (NWS) station located at the Tampa International Airport (Station No. 12842). The source of the five years of upper air data (1991-1995) to be used in mixing height calculations is from the National Weather Service (NWS) station at Tampa International Airport, Florida (Station No. 72210). Tampa is the nearest upper air station to the SCC Plant. The surface meteorological data has been combined with coincident mixing heights derived by merging surface temperatures with the concurrent twice-daily rawinsonde data obtained from the Tampa International Airport.

Missing wind speed or wind direction data has been replaced with calm data (i.e., 1 meter/second wind speed and the same wind direction as the preceding hour). Missing temperature data has been replaced with an average of the previous valid hour and the next, non-missing hour. Multiple hours of missing temperature data has been replaced by climatological average daily temperatures. A single missing mixing height has been replaced with an average of the preceding and subsequent hours. Multiple hours of missing twice-daily mixing heights has been replaced with the monthly average mixing height. The use of the monthly average mixing height helps to incorporate into the meteorological database any monthly pattern that might exist.

4.5.2 CALPUFF Model

The hourly meteorological data for the CALPUFF run in the screening mode analysis consists of five years (1986-1990) of surface data from the National Weather Service (NWS) station located at the Tampa International Airport. The source of the five years of upper air data (1986-1990) to be used in mixing height calculations is also from the National Weather Service (NWS) station at Tampa International Airport, with the addition of the parameters necessary for CALPUFF to perform deposition calculations: surface roughness, friction velocity, and Monin-Obukhov length.

5. AIR QUALITY IMPACTS ANALYSIS

5.1 SIGNIFICANT IMPACT AREA ANALYSIS

The significant impact area (SIA) is the geographical area in which a "significant" ambient impact is predicted to occur associated with the PTE emissions of SO_2, NO_x, CO, TSP, and PM_{10} emitted from the operation of the SCC Plant. Each of these pollutants, for each applicable averaging time, has been assessed to determine if a SIA exists. The SIA modeling for the SCC Plant was conducted using the ISCST3 and CALPUFF models.

Table 5-1 presents the established significance impact levels (SILs) of air quality impacts on PSD Class I areas are those proposed by EPA on July 23, 1996 at 61 FR 38292. Table 5-2 presents the established SILs of air quality impacts on PSD Class II areas as presented in the U.S. EPA New Source Review Workshop Manual, Draft, October 1990.

Table 5-1
Significance Levels for Air Quality Impacts in Class I Areas
(μg/m^3)

POLLUTANT	ANNUAL	24-HOUR	3-HOUR
SO_2	0.1	0.2	1.0
TSP	-	-	-
PM_{10}	0.2	0.3	-
NO_X	0.1	-	-
CO	-	-	-

Table 5-2
Significance Levels for Air Quality Impacts in Class II Areas
(μg/m³)

POLLUTANT	ANNUAL	24-HOUR	8-HOUR	3-HOUR	1-HOUR
SO_2	1	5	-	25	-
TSP	1	5	-	-	-
PM_{10}	1	5	-	-	-
NO_X	1	-	-	-	-
CO	-	-	500	-	2,000
O_3	-	-	-	-	See Note
NOTE: NO SIGNIFICANT AMBIENT IMPACT CONCENTRATION HAS BEEN ESTABLISHED.					

5.1.1 Class I Areas

A Class I significant impact analysis assessing potential-to-emit (PTE) emissions from the SCC Plant was conducted using the CALPUFF model run in the screening mode. Tables 5-3 presents the highest predicted impacts over the five years assessed that occurred at the Chassahowitzka Class I area located within 61 kilometers of the SCC Plant. All other predicted impacts at the other three Class I areas were less than those reported in Table 5-3 for the Chassahowitzka Class I area. Specifically, Tables 5-3 provides an analysis of the 3-hour, 24-hour, and annual averaging periods, respectively. As shown by Table 5-3, the maximum predicted impacts for all applicable pollutants and averaging times are all less than their applicable SILs and no further Class I PSD increment modeling is required.

Table 5-3
Class I SIA Analysis
(µg/m^3)

3-HOUR CLASS I SIA ANALYSIS			
POLLUTANT	CALPUFF 3-HOUR	SIGNIFICANCE LEVEL 3- HOUR	SIGNIFICANCE LEVEL EXCEEDED?
CO	N/A	NO SIGNIFICANCE LEVEL	N/A
SO_2	0.36	1.0	NO
NO_x	N/A	NO SIGNIFICANCE LEVEL	N/A
PM_{10}	N/A	NO SIGNIFICANCE LEVEL	N/A

24-HOUR CLASS I SIA ANALYSIS			
POLLUTANT	CALPUFF 24-HOUR	SIGNIFICANCE LEVEL 24- HOUR	SIGNIFICANCE LEVEL EXCEEDED?
CO	N/A	NO SIGNIFICANCE LEVEL	N/A
SO_2	0.16	0.2	NO
NO_x	N/A	NO SIGNIFICANCE LEVEL	N/A
PM_{10}	0.23	0.3	NO

ANNUAL CLASS I SIA ANALYSIS			
POLLUTANT	CALPUFF ANNUAL	SIGNIFICANCE LEVEL ANNUAL	SIGNIFICANCE LEVEL EXCEEDED?
CO	N/A	NO SIGNIFICANCE LEVEL	N/A
SO_2	0.009	0.1	NO
NO_x	0.06	0.1	NO
PM_{10}	0.02	0.2	NO

5.2 CLASS II AREAS

Table 5-4 presents a summary of the Class II SIA analysis performed for the SCC Plant.

Table 5-4
Class II SIA Analysis
(µg/m³)

1-HOUR CLASS II SIA ANALYSIS			
POLLUTANT	ISCST3 1-HOUR	SIGNIFICANCE LEVEL 1- HOUR	SIGNIFICANCE LEVEL EXCEEDED?
CO	95.75	2,000	NO
SO_2	N/A	NO SIGNIFICANCE LEVEL	N/A
NO_x	N/A	NO SIGNIFICANCE LEVEL	N/A
PM_{10}	N/A	NO SIGNIFICANCE LEVEL	N/A
TSP	N/A	NO SIGNIFICANCE LEVEL	N/A

3-HOUR CLASS II SIA ANALYSIS			
POLLUTANT	ISCST3 3-HOUR	SIGNIFICANCE LEVEL 3- HOUR	SIGNIFICANCE LEVEL EXCEEDED?
CO	N/A	NO SIGNIFICANCE LEVEL	N/A
SO_2	3.08	25	NO
NO_x	N/A	NO SIGNIFICANCE LEVEL	N/A
PM_{10}	N/A	NO SIGNIFICANCE LEVEL	N/A
TSP	N/A	NO SIGNIFICANCE LEVEL	N/A

8-HOUR CLASS II SIA ANALYSIS			
POLLUTANT	ISCST3 8-HOUR	SIGNIFICANCE LEVEL 8- HOUR	SIGNIFICANCE LEVEL EXCEEDED?
CO	21.64	500	NO
SO_2	N/A	NO SIGNIFICANCE LEVEL	N/A
NO_x	N/A	NO SIGNIFICANCE LEVEL	N/A
PM_{10}	N/A	NO SIGNIFICANCE LEVEL	N/A
TSP	N/A	NO SIGNIFICANCE LEVEL	N/A

24-HOUR CLASS II SIA ANALYSIS			
POLLUTANT	ISCST3 24-HOUR	SIGNIFICANCE EVEL 24- HOUR	SIGNIFICANCE LEVEL EXCEEDED?
CO	N/A	NO SIGNIFICANCE LEVEL	N/A
SO_2	0.71	5	NO
NO_x	N/A	NO SIGNIFICANCE LEVEL	N/A
PM_{10}	62.07	5	YES
TSP	135.05	5	YES

ANNUAL CLASS II SIA ANALYSIS			
POLLUTANT	ISCST3 ANNUAL	SIGNIFICANCE LEVEL ANNUAL	SIGNIFICANCE LEVEL EXCEEDED?
CO	N/A	NO SIGNIFICANCE LEVEL	N/A
SO_2	0.05	1	NO
NO_x	0.35	1	NO
PM_{10}	13.00	1	YES
TSP	40.74	1	YES

As shown by Table 5-4, PM_{10} and TSP were the only pollutants to have a predicted highest concentration greater than the established corresponding significance level. A maximum annual PM_{10} concentration of 13.00 $\mu g/m^3$ was predicted to occur at a distance of one kilometer from the SCC Plant. It should be noted that this maximum value occurred within the SCC Plant boundary and does not represent the maximum predicted offsite concentration which is discussed in later sections. The annual PM_{10} concentration did not fall below the annual PM_{10} significance level of 1.0 $\mu g/m^3$ until a distance of approximately 4 kilometers was reached from the SCC Plant. A maximum annual TSP concentration of 40.74 $\mu g/m^3$was predicted to occur at a distance of 1 kilometer from the SCC Plant. The annual TSP concentration did not fall below the annual TSP significance level of 1.0 $\mu g/m^3$ until a distance of approximately 7 kilometers was reached from the SCC Plant.

A maximum 24-hour PM_{10} concentration of 62.07 $\mu g/m^3$ was predicted to occur at a distance of one kilometer from the SCC Plant. It should be noted that this maximum value occurred within the SCC Plant boundary and does not represent the maximum predicted offsite concentration which is discussed in later sections. The 24-hour PM_{10} concentration did not fall below the 24-hour PM_{10} significance level of 5.0 $\mu g/m^3$ until a distance of approximately 5.5 kilometers was reached from the SCC Plant. A maximum 24-hour TSP concentration of 135.05 $\mu g/m^3$was predicted to occur at a distance of 1 kilometer from the SCC Plant. The 24-hour TSP concentration did not fall below the 24-hour TSP significance level of 5.0 $\mu g/m^3$ until a distance of approximately 10 kilometers was reached from the SCC Plant. As shown by Table 5-4, all other modeled pollutants (NO_x, SO_2, and CO) were below their corresponding SILs.

To determine the NAAQS and PSD Class II increment modeling domain for PM_{10} and TSP, 50 kilometers was added to the maximum PM_{10} and TSP SIA distance of 10 kilometers per U.S. EPA guidance. Therefore, a 60 kilometer SIA or modeling domain was calculated to represent the modeling domain for both PM_{10} and TSP.

Since TSP is no longer a regulated air pollutant in Florida, only PM_{10} will need to undergo a refined modeling analysis. The results of the refined modeling for PM_{10} are presented in later sections of this report.

5.3 PRE-CONSTRUCTION MONITORING ANALYSIS

The results of Table 5-4 were used to assess whether the SCC Plant would be subject to pre-construction monitoring requirements. Table C-3 of the New Source Review Workshop Manual, Draft 1990, was used to determine significant monitoring concentrations. Specifically, for SO_2, the maximum 24-hour concentration was predicted to be 0.71 $\mu g/m^3$ which is less than the EPA and FDEP significant 24-hour monitoring concentration of 13 $\mu g/m^3$. For PM_{10} the maximum modeled 24-hour concentration was 29.77 $\mu g/m^3$. This value is greater than the EPA and FDEP significant 24-hour monitoring concentration of 10 $\mu g/m^3$ for PM_{10}. For NO_x, the maximum annual concentration was predicted to be 0.35 $\mu g/m^3$ which is less than the EPA and FDEP significant annual monitoring concentration of 14 $\mu g/m^3$. For CO, the maximum modeled 8-hour CO concentration was predicted to be 21.64 $\mu g/m^3$ which is less than the EPA and FDEP significant 8-hour monitoring concentration of 575 $\mu g/m^3$.

Only PM_{10} exceeded the significant monitoring concentrations. Only PM_{10} would be potentially subject to pre-construction monitoring requirements if the 24-hour background PM_{10} concentration was also above the monitoring de minimus 24-hour value of 10 $\mu g/m^3$. A summary of background PM_{10} data is provided in Table 5-5. As shown by Table 5-5, the 24-hour PM_{10} background value used in the NAAQS analysis presented in Section 5.3 is 50.4 $\mu g/m^3$

which is above the 10 $\mu g/m^3$ 24-hour significant monitoring concentration. As a result, PM_{10} pre-construction monitoring is expected by SCC to be potentially required by the FDEP.

5.4 NAAQS COMPLIANCE ANALYSIS

The NSR regulations require that a NAAQS Compliance demonstration be provided. The demonstration requires that the PTE PM_{10} SCC Plant emissions when modeled with other applicable PM_{10} sources in the SIA and then adding a representative background concentration to the predicted modeling results do not exceed the 24-hour and annual PM_{10} NAAQS. For other applicable sources, PM_{10} PTE air emission inventories were provided by Florida DEP for the 13 counties surrounding the SCC Plant. The air emission sources contained in the PM_{10} SIA were then screened using the FDEP approved "*20D Rule*". Each "source" defined in the PM_{10} NAAQS inventory was assessed using a facility-wide summary of emissions from all of the individual facility air emission sources. If the facility total annual PTE PM_{10} emissions were greater than 20 times the distance in kilometers from the facility to the SCC Plant, the total facility emissions were included as part of the NAAQS modeling emissions inventory.

Representative background PM_{10} data was obtained from the Florida Air Monitoring Report – 2003. Five years (1999 – 2003) of PM_{10} ambient monitoring data collected within the 13 counties surrounding the SCC Plant were used to develop a 24-hour PM_{10} background value of 50.4 $\mu g/m^3$ and an annual PM_{10} background value of 23.1 $\mu g/m^3$. These data are presented in Table 5-5 on the following page.

Table 5-5
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	TAMPA	057-0030	URBAN	2003	25.0	20.0
					2002	32.0	20.0
					2001	45.0	24.0
					2000	44.0	24.0
					1999	45.0	24.0
AVERAGE						38.2	22.4

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	GIBSONTON	057-0066	NEIGHBORHOOD	2003	64.0	27.0
					2002	55.0	25.0
					2001	59.0	30.0
					2000	73.0	33.0
					1999	81.0	35.0
AVERAGE						66.4	30.0

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT TH HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	NO CITY	057-0083	MIDDLE	2003	58.0	25.0
					2002	38.0	22.0
					2001	44.0	25.0
					2000	38.0	25.0
					1999	39.0	24.0
AVERAGE						43.4	24.2

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	NO CITY	057-0085	NEIGHBORHOOD	2003	37.0	20.0
					2002	33.0	19.0
					2001	53.0	24.0
					2000	35.0	23.0
					1999	35.0	20.0
AVERAGE						38.6	21.2

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	GANNON	057-0095	NEIGHBORHOOD	2003	61.0	26.0
					2002	39.0	22.0
					2001	45.0	26.0
					2000	44.0	27.0
					1999	49.0	27.0
AVERAGE						47.6	25.6

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	TAMPA	057-1002	NEIGHBORHOOD	2003	44.0	25.0
					2002	40.0	24.0
					2001	56.0	29.0
					2000	145.0	29.0
					1999	47.0	26.0
AVERAGE						66.4	26.6

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³) 24-HOUR[1]	CONCENTRATION (µg/m³) ANNUAL[2]
PM_{10}	HILLSBOROUGH	TAMPA	057-1035	NEIGHBORHOOD	2003	52.0	23.0
					2002	56.0	24.0
					2001	52.0	25.0
					2000	66.0	26.0
					1999	51.0	25.0
AVERAGE						**55.4**	**24.6**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³) 24-HOUR[1]	CONCENTRATION (µg/m³) ANNUAL[2]
PM_{10}	HILLSBOROUGH	TAMPA	057-1068	NEIGHBORHOOD	2003	19.0	15.0
					2002	29.0	17.0
					2001	40.0	20.0
					2000	32.0	20.0
					1999	39.0	20.0
AVERAGE						**31.8**	**18.4**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (μg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	TAMPA	057-1069	NEIGHBORHOOD	2003	42.0	23.0
					2002	38.0	22.0
					2001	54.0	28.0
					2000	47.0	28.0
					1999	51.0	28.0
AVERAGE						**46.4**	**25.8**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (μg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	HILLSBOROUGH	TAMPA	057-1070	MIDDLE	2003	56.0	27.0
					2002	47.0	27.0
					2001	59.0	28.0
					2000	50.0	30.0
					1999	47.0	28.0
AVERAGE						**51.8**	**28.0**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³) 24-HOUR[1]	CONCENTRATION (µg/m³) ANNUAL[2]
PM_{10}	HILLSBOROUGH	BRANDON	057-2002	NEIGHBORHOOD	2003	41.0	22.0
					2002	35.0	20.0
					2001	103.0	29.0
					2000	43.0	25.0
					1999	37.0	22.0
AVERAGE						**51.8**	**23.6**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³) 24-HOUR[1]	CONCENTRATION (µg/m³) ANNUAL[2]
PM_{10}	LAKE	ASTOR PARK	069-0001	URBAN	2003	39.0	17.0
					2002	33.0	16.0
					2001	57.0	18.0
					2000	53.0	20.0
					1999	49.0	19.0
AVERAGE						**46.2**	**18.0**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (μg/m³) 24-HOUR[1]	ANNUAL[2]
PM_{10}	POLK	MULBERRY	105-0010	NEIGHBORHOOD	2003	42.0	20.0
					2002	38.0	18.0
					2001	121.0	23.0
					2000	121.0	22.0
					1999	42.0	22.0
AVERAGE						72.8	21.0

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (μg/m³) 24-HOUR[1]	ANNUAL[2]
PM_{10}	POLK	MULBERRY	105-2006	NEIGHBORHOOD	2003	49.0	20.0
					2002	78.0	21.0
					2001	59.0	21.0
					2000	45.0	23.0
					1999	50.0	22.0
AVERAGE						56.2	21.4

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

Table 5-5 continued
Summary of Representative PM_{10} Ambient Air Quality Monitoring Data

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	SEMINOLE	SANFORD	117-1002	NEIGHBORHOOD	2003	47.0	18.0
					2002	38.0	18.0
					2001	52.0	20.0
					2000	32.0	18.0
					1999	34.0	18.0
AVERAGE						**40.6**	**18.4**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

POLLUTANT	COUNTY	MONITOR LOCATION	MONITOR NAME	MONITOR TYPE	YEAR	CONCENTRATION (µg/m³)	
						24-HOUR[1]	ANNUAL[2]
PM_{10}	VOLUSIA	DAYTONA BEACH	127-5002	NEIGHBORHOOD	2003	53.0	19.0
					2002	39.0	18.0
					2001	67.0	22.0
					2000	53.0	21.0
					1999	54.0	21.0
AVERAGE						**53.2**	**20.2**

1. REPRESENT THE HIGHEST 2ND HIGHEST 24-HOUR AVERAGE CONCENTRATION
2. REPRESENT THE HIGHEST ANNUAL AVERAGE CONCENTRATION

TOTAL PM_{10} AVERAGE FROM ALL MONITORING LOCATIONS	**50.4**	**23.1**

Table 5-6 shows a summary of the highest annual and highest second-highest 24-hour impacts combined with the background concentrations for PM_{10}. As shown by Table 5-6, the predicted impacts for each applicable averaging period for PM_{10} are less than the applicable NAAQS. Therefore, it is concluded that compliance with the 24-hour and annual PM_{10} NAAQS is demonstrated.

Table 5-6
PM_{10} NAAQS Analysis ($\mu g/m^3$)

Averaging Period	ISCST3 Results	Background	Total (Results + Background)	PM_{10} NAAQS	PM_{10} NAAQS Exceeded?
Annual – 1991	6.29	23.10	29.39	50.0	No
Annual – 1992	6.81	23.10	29.91	50.0	No
Annual – 1993	6.91	23.10	30.01	50.0	No
Annual – 1994	6.47	23.10	29.57	50.0	No
Annual – 1995	7.02	23.10	30.12	50.0	No
24 hour – 1991	24.77	50.40	75.17	150.0	No
24 hour – 1992	29.69	50.40	80.09	150.0	No
24 hour – 1993	29.77	50.40	80.17	150.0	No
24 hour – 1994	24.89	50.40	75.29	150.0	No
24 hour – 1995	25.53	50.40	75.93	150.0	No

5.5 PSD INCREMENT ANALYSIS

ISCST3 was used to model near field (within 50 kilometers of the SCC Plant) and CALPUFF in the screening mode was used to model for distances greater than 50 kilometers of the SCC Plant. To be conservative, the same PM_{10} emission sources used in the NAAQS analysis was used in the PSD PM_{10} increment analysis.

5.5.1 CLASS I AREAS

As shown by Table 5-3, the impacts from the PTE emissions of the SCC Plant are less than the applicable proposed EPA SILs and thus, no further Class I PSD increment modeling is required.

5.5.2 CLASS II AREAS

This analysis included all SCC Plant PM_{10} emission and those PM_{10} increment consuming emission sources identified in the 20D analysis used for the PM_{10} NAAQS analysis. By using the PM_{10} NAAQS 20D emissions inventory, the PM_{10} increment analysis is considered conservative in nature.

The increment analysis was performed using the modeling techniques of the ISCST3 Model described earlier in this report. Table 5-7 presents the Class II PM_{10} increment analysis for each applicable averaging period at the highest annual and the highest second-highest 24-hour concentrations for each year of meteorological data. As shown by Table 5-7, the SCC Plant has demonstrated compliance with meeting the PSD PM_{10} Class II increment requirements.

Table 5-7
PSD Class II Increment PM_{10} Analysis ($\mu g/m^3$)

Averaging Period	ISCST3 Results	PSD Class II Increment	PSD Class II Increment Exceeded?	Location in UTM (km)
Annual – 1991	6.29	17.00	No	404.589, 3167.572
Annual – 1992	6.81	17.00	No	404.589, 3167.572
Annual – 1993	6.91	17.00	No	404.589, 3167.572
Annual – 1994	6.47	17.00	No	404.589, 3167.572
Annual – 1995	7.02	17.00	No	404.589, 3167.572
24 hour – 1991	24.77	30.00	No	404.575, 3167.547
24 hour – 1992	29.69	30.00	No	404.575, 3167.547
24 hour – 1993	29.77	30.00	No	404.814, 3167.727
24 hour – 1994	24.89	30.00	No	404.575, 3167.522
24 hour – 1995	25.53	30.00	No	402.626, 3166.636

5.6 VISIBILITY IMPACT ANALYSIS

An assessment of potential project impacts on visibility and other air quality related values (AQRV) in Federal Class I areas is a requirement for PSD projects. Air quality impacts at Federal Class I areas must be assessed under recent FLM guidance if they are within 300 kilometers of the PSD source.

The Federal Class I area closest to the SCC Plant is the Chassahowitzka National Wildlife Refuge located approximately 61 km to the west of the SCC Plant. Three other Federal Class I areas are within 300 kilometers of the SCC Plant. These include the Okefenokee National Wildlife Refuge (NWR) (219 km), Saint Marks NWR (250 km), and the Bradwell Bay Wilderness Area (297 km). The location of these four areas relative to the SCC Plant is depicted in Figure 5-1. As shown in Figure 5-1, there are no other Class I areas within 300 kilometers of the SCC Plant.

Additionally, a change of extinction (delta b_{ext}) of five percent is proposed to be used as a threshold value to determine whether the SCC Plant (modeled as a single source using CALPUFF-Lite) has a significant impact to visibility impairment at the four surrounding Class I areas. The five percent change of extinction value is consistent with recent FLM reviews of major source permit-to-construct applications from other cement plants projects located in Florida and Arizona.

Table 5-8 presents the results of the visibility analysis performed for the SCC Plant on the four Class I areas within 300 kilometers of the SCC Plant. As shown by Table 5-8, the SCC is predicted to produce a change in extinction coefficient (i.e., visibility impairment) of less than five percent over a 24-hour period for each year of the five years modeled at each of the four Class I areas assessed. As a result, the proposed SCC Plant is predicted to have an acceptable level of visibility impairment to the surrounding four Class I areas.

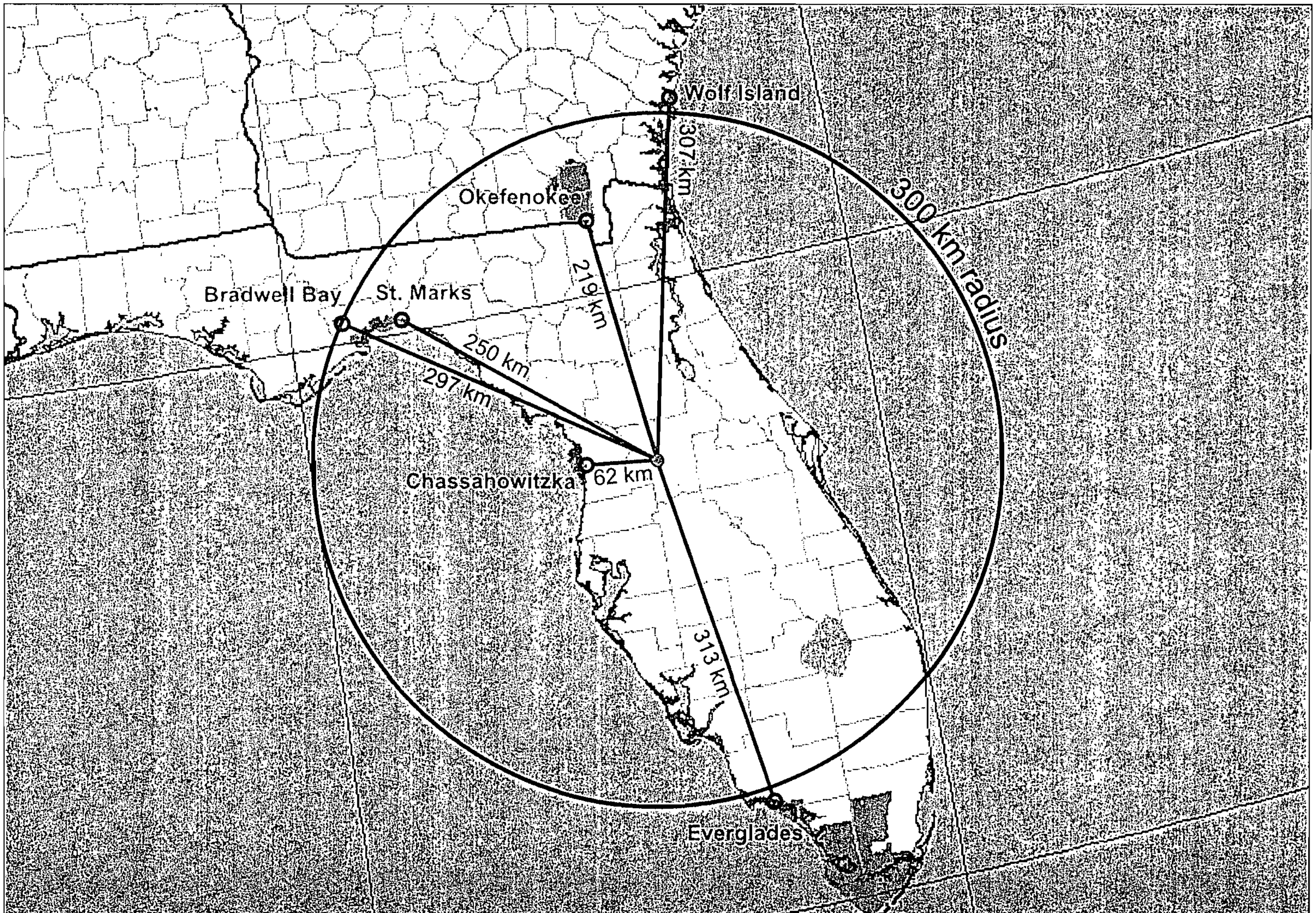


Figure 5-1
Surrounding Class I Areas

0 150 300
Scale in km

Facility Location

Class I Area

SPECTRUM environmental sciences inc.

Table 5-8
Class I Area Visibility Impairment Analysis –
Maximum Percent Change in Extinction Coefficient

Class I Area	Year of Meteorological Data				
	1986	1987	1988	1989	1990
Bradwell Bay	1.47%	1.23%	2.17%	1.07%	1.26%
Chasshowitka	4.05%	2.07%	3.26%	4.10%	2.08%
Okefenokee	2.71%	1.21%	2.59%	1.61%	1.35%
St. Marks	2.09%	2.53%	2.53%	1.72%	1.27%
Recommended Maximum Extinction Change	5%	5%	5%	5%	5%

5.7 SULFATE/NITRATE DEPOSITION ANALYSIS

For the sulfate/nitrate deposition analysis, modeling was performed for the Class I areas following using the CALPUFF model run in the screening mode. Table 5-9 presents the annual deposition values for each Class I area compared to the Deposition Analysis Threshold (DAT) for sulfur and nitrogen deposition as specified in a letter from the National Park Service and the U.S. Fish & Wildlife Service (to Mr. S. Becker, Executive Director of STAPPA/ALAPCO, January 2, 2002) and as presented in the associated *Guidance on Nitrogen And Sulfur Deposition Analysis Thresholds* (downloaded from the FLM website at www2.nature.nps.gov/air/permits/flag/flaginfo.index.htm). The DAT that was proposed in the Guidance is 0.01kg/ha/yr for both sulfur and nitrogen. These DAT values are only a guideline and not a regulatory standard. Therefore, estimates of deposition above the DAT indicate further consideration by the FLM may be warranted within the context of other influences at a particular Class I area. Estimates above the DAT do not necessarily mean that the source has failed the deposition analysis. If all deposition from the SCC Plant is less than the applicable DAT, the FLM would likely determine that the SCC Plant would not have an adverse impact on the Class I areas. The DAT was deemed applicable to all Class I areas east of the Mississippi River and thus, to each of the four Class I areas included in this analysis.

As shown by Table 5-9, the deposition rates for all years of analysis were less than the DAT for sulfur for the all four Class I areas assessed. For nitrogen, all deposition rates were less than the DAT for all Class I areas except for the Chasshowitka Class I area. The maximum nitrogen deposition rate occurred in 1990 with a corresponding rate of 0.026 kg/ha/yr.

Table 5-9
Sulfate/Nitrate Deposition Analysis

Class I Area	Pollutant	Deposition Rate by Year of Meteorological Data (kg/ha/yr)					East U.S. DAT (kg/ha/yr)
		1986	1987	1988	1989	1990	
Bradwell Bay	Sulfur	8.30E-04	9.11E-04	8.36E-04	9.04E-04	9.83E-04	0.01
	Nitrogen	2.21E-03	2.51E-03	2.43E-03	2.24E-03	2.97E-03	0.01
Chas.	Sulfur	6.70E-03	8.04E-03	6.97E-03	7.35E-03	8.36E-03	0.01
	Nitrogen	1.85E-02	2.41-E02	2.14E-02	1.92E-02	2.60E-02	0.01
Oke.	Sulfur	1.14E-03	1.24E-03	1.19E-03	1.20E-03	1.33E-03	0.01
	Nitrogen	3.08E-03	3.70E-03	2.54E-03	2.98E-03	4.08E-03	0.01
St. Marks	Sulfur	1.48E-03	1.58E-03	1.49E-03	1.51E-03	1.81E-03	0.01
	Nitrogen	3.86E-03	4.72E-03	4.44E-03	3.69E-03	5.52E-03	0.01

5.8 MERCURY DEPOSITION ANALYSIS

As discussed in a response to the Florida DEP by Florida Rock Industries on this issue, there are several forms of mercury detected in the emissions from cement kilns. Primarily, these include elemental mercury [Hg(O)] and reactive mercury [Hg(II)]. The two types of mercury species are expected to behave quite differently once emitted from the stack. Hg(O), due to its high vapor pressure and low water solubility, is not expected to deposit close to the facility. Hg(II), because of differences in these properties., is expected to deposit closer to the emission source. Most of the mercury an the atmosphere is elemental mercury vapor, which circulates in the atmosphere for up to a year, and hence can be widely dispersed and transported thousands of miles from likely sources of emission. The reactive form of mercury, when either bound to airborne particles or in a gaseous form, is removed from the atmosphere by precipitation and is also dry deposited.

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is a nationwide network of precipitation monitoring sites. The network is a cooperative effort, between many different groups, including the State Agricultural Experiment Stations, U.S. Geological Survey, U.S. Department of Agriculture, and numerous other governmental and private entities. The purpose of the network is to collect data on the chemistry of precipitation for monitoring of geographical and temporal long-term trends. The precipitation at each station is collected weekly according to strict clean-handling procedures. It is then sent to the Central Analytical Laboratory where it is analyzed.

The National Atmospheric Deposition Program has expanded its sampling to include the Mercury Deposition Network (MDN), which was formed in 1995 to collect weekly samples of precipitation which are analyzed by Frontier Geosciences for total mercury. The objective of the MDN is to monitor the amount of mercury in precipitation on a regional basis. The nearest NADP/MDN Monitoring Location is Station FLO5 at the Chassahowitzka National Wildlife Refuge in Citrus County, Florida. This station is approximately 61 kilometers from the SCC plant. The monitoring station has been in operation from 7/1/1991- present (see http://nadp.sws.uniuc.edu/nadpoverview.asp).

Data from this station were used to estimate the background wet and dry deposition of mercury in the vicinity of the SCC Plant. The annualized weekly average total mercury deposition for the period of record is 20 $\mu g/m^2/yr$.

The program used to model the transport and deposition of mercury was the ISCST3 Model, used in a similar manner to other Class II analyses in this report except that it considered deposition. The model has a gas dry deposition component as well as a gas wet deposition component and both wet and dry particle deposition components.

Hg(II) was considered in the air dispersion modeling. At the point of stack emission and during atmospheric transport, the contaminant is partitioned between two physical phases: vapor and particle-bound. These contaminants can be removed from the atmosphere by both wet deposition and dry deposition. For the present analysis, the speciation of emitted mercury was based on the Mercury Study Report to Congress RELMAP modeling. These data have speciation percentages for Portland cement manufacturing of 80 percent elemental mercury, and 10 percent each for vapor and particle Hg(II).

An aerosol particle size distribution based on data collected by Whitby (1978) was used. This distribution is split between two modes: accumulation and coarse particles. The geometric mean diameter of several hundred measurements indicates that the accumulation mode dominates particle size, and a representative particle diameter for this mode is 0.3 microns. The coarse particles are formed largely from mechanical processes that suspend dust and soil particles in the air. A representative diameter for coarse particles is 5.7 microns. The fraction of particle emissions assigned to each particle class is approximated based on the determination of the density of surface area of each representative particle size relative to total surface area of the aerosol mass. Using this method, approximately 93 percent and 7 percent of the total surface area is estimated to be in the 0.3 and 5.7 micron diameter particles, respectively. In this analysis, nitric acid vapor was used as a surrogate for Hg vapor based on their similar solubilities in water. In the ISCST3 Model, the dry deposition of divalent mercury vapor was modeled by calculating a dry deposition velocity for each hour using the assumptions made for nitric acid.

For wet deposition of vapor and particulate Hg(II), the ISCST3 wet deposition option was used. The same data on particle size distribution and particle density was used as in the dry particle deposition runs. For particles, the wet deposition scavenging ratios used were from Figure 4-4 in the EPA Mercury Report (0.8E-4 sec/mm/hr for the 0.3 micron size range and 3.8E-4 sec/mm/hr for the 5.7 micron size range). For vapor phase Hg(II) deposition, a scavenging coefficient of 1.6E-6 sec/mm/hr was also used (based on the nitric acid scavenging ratio as described in the EPA Mercury Report).

Based on the maximum proposed stack emissions of approximately 185 pounds per year of mercury for the new kiln, the maximum annual wet and dry deposition of mercury vapor and particles is 7.08 μg/m²/yr, is 35 percent of the background deposition rate. A mercury deposition analysis was also conducted at the four Florida State Parks surrounding the SCC Plant. The results are as follows:

Park Name	Distance (km)	Direction (Cardinal)	Predicted Total Hg Deposition (μg/m²/yr)
Dade Battlefield	16.37	W	0.274
Lake Griffin	29.03	NNE	0.177
Lake Louisa	51.37	SE	0.155
Fort Cooper	47.64	NW	0.133

The predicted maximum total (dry plus wet) deposition value of 0.274 μg/m²/yr that occurred in the four Florida State Parks evaluated was 1.4 percent of the background deposition rate of the annualized weekly average total mercury deposition of 20 μg/m²/yr.

5.9 OTHER SECONDARY IMPACTS

See Appendix C of the Permit-to-Construct Application for a discussion of other secondary air quality impacts including impact to soils, flora, fauna, including wildlife, and direct and indirect growth.

6. REFERENCES

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U.S. EPA 2002 –"Addendum to the User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volume I - User Instructions", U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, February 2002.

VISTAS Technical Advisor – "Initial Draft. BART Modeling Protocol for VISTAS", January 31, 2005. Includes contributions from Pat Brewer (VISTAS Technical Coordinator), Tom Rogers of the Florida Department of Environmental Protection, and Chris Arrington of the West Virginia Department of Environmental Protection.

Attachment 7

P.E. Certification

B. P. BARBER & ASSOCIATES, INC.

ENGINEERS – PLANNERS – SURVEYORS

101 RESEARCH DRIVE (29203-9389)
P. O. BOX 1116
COLUMBIA, SOUTH CAROLINA 29202-1116
TELEPHONE 803 254-4400 FACSIMILE 803 771-6676

October 14, 2005

Mr. A.A. Linero
Bureau of Air Regulation
Department of Environmental Protection
2600 Blair Stone Road, MS # 5500
Tallahassee, Florida 32399-2400

RE: Response to Request for Additional Information (RAI) dated October 7, 2005
Sumter Cement – Center Hill Plant
DEP File No. 1190041-001-AC (PSD-FL-358)
Proposed Portland Cement Plant in
Sumter County, Florida

Dear Mr. Linero:

I, the undersigned hereby certify that:

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in the above referenced Application for Air Permit, and in this Response to the Request for Additional Information (RRAI) when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application and RRAI are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, and RRAI based solely upon the materials, information and calculations submitted with this application and RRAI.

I further certify that the engineering features of each such emissions unit described in this application and RRAI have been designed or examined by me or individuals under my direction supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

Should you have any questions, please feel free to contact the appropriate party.

Very truly yours,

B.P. BARBER & ASSOCIATES, INC.

Porter Rivers III, P.E.
Senior Project Manager

NRCF **AMERICAN CEMENT COMPANY**

October 31, 2005

Mr. Al Linero
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road, MS #5505
Tallahassee, Florida 32399-2400

Dear Al:

Per your request, enclosed please find a copy of American Cement Company's Water Use Permit Application and Environmental Resources Permit Application.

We greatly appreciate the efforts you have put forth in our application review and look forward to working with you in the years to come.

Should you have any questions, please contact me.

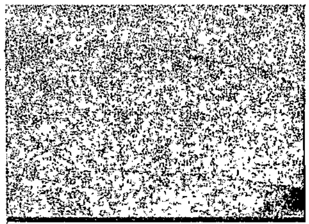
Sincerely,

AMERICAN CEMENT COMPANY

Cary O. Cohrs
General Manager

Enclosure.

American Cement Company
Natural Resources of Central Florida, Inc.
P.O. Box 1209 Anthony, Fl 32617
Phone (352) 629-0666 • Fax (352) 629-2655



January 2005
PF 05-01

Profiles

Cement and concrete – benefits and barriers in coal fly ash utilisation

'There are major challenges despite decades of beneficial utilisation of coal ash'

'Legislation is often applied in a way which hinders use of fly ash'

'NOx reduction systems and cocombustion may affect fly ash utilisation'

This report summarises recent trends in coal ash utilisation in different countries. It then focuses on two major sectors of fly ash utilisation: cement and concrete. The engineering and environmental benefits of using fly ash are investigated. Barriers occur in marketing, handling, transport and storage, through increased carbon or ammonia in ash, the effects of cofiring with secondary fuels and through the potential for mercury release from fly ash.

Use of fly ash in cement and concrete reduces the use of natural raw materials and therefore contributes to industrial sustainability. Blended cements and concretes containing large proportions of fly ash offer the benefit of CO_2 emissions avoidance. Legislation can provide the necessary certificate to promote utilisation. However, fly ash utilisation is hindered where it is regarded as a waste or by-product rather than a product. Regulations for use in cement and concrete need to be broadened to include all potential markets for a wider range of fly ash specifications. Use of fly ash in the raw material in cement kilns has the advantage of less rigorous requirements than for blended cement or concrete but the amount appears to be limited. Continued use of fly ash in cement and concrete is helped by treatments and beneficiation processes. New combined processes aim at total use of fly ash, producing high-grade and expensive materials for various specialised applications.

Marketing barriers are being overcome through partnerships between, utilities, coal combustion product marketers, and cement producers. Fly ash should be marketed as a product, defined for targeted users, including architects and engineers. Large fly ash storage domes offer maximum capacity with minimum footprint. This allows the purchase and stockpile of sufficient fly ash over seasons when fly ash is least expensive to when it is most in demand. Accurate forecasting of seasonal demand and integration of ash marketing with appropriate coal procurement and handling functions optimise supply to demand. Transport and storage are often economic barriers to using fly ash.

Cement

Fly ash is used mainly for its alumina in cement kilns but also contributes silica, iron and calcium to the raw material mix. It improves clinker quality, mainly due to its lower alkali content and fineness. The rate of substitution is generally 3–5% of the raw materials.

Greater quantities of fly ash can be used in blended cement, usually substituting for 5–40 wt% of the Portland cement clinker. Use of calcareous class C fly ash for rapid hardening hydraulic cements is possible at over 80 wt% fly ash substitution with additives. Requirements for fly ash quality are tightly defined. Fly ashes with different characteristics could find good markets but lack building authority approval.

High carbon fly ash poses problems when injecting fly ash into the preheater of the cement kiln where temperatures are relatively low. However, studies in the USA indicate that fly ash containing up to 21% unburned carbon can be used in cement raw material. This reduces energy requirements and costs. Restrictions on carbon content are tighter for use of fly ash in blended cement.

Cofiring coal with other fuels may affect the quality of the fly ash produced for both cement kilns and for blended cements although up to 20 th% waste wood, up to 15 th% refuse derived fuel and a small percentage of chicken litter is acceptable. Only limited data are available on the amount of mercury in cement raw materials and none on the variability or speciation.

Concrete

Fly ash may be used to replace part of the cement in concrete, sometimes exceeding 50 wt% of total cementitious components in the case of calcareous fly ash. Substitution rates up to 35 wt% give overall satisfactory early strength and up to 40 wt% fly ash increases durability. Fly ash may be added as fine aggregate or partially replace cement, fine aggregate and water. The quality of the fly ash is generally greater when it is finer and has a lower carbon content. Requirements vary considerably for the many different concretes produced.

Fly ash is beneficial in concrete due to its pozzolanic reactions with free lime, rounded particle shape and by reducing the water demand. This helps to avoid segregation and bleeding in fresh concrete as well as improving long-term strength and durability. Most important is reduction of the alkali silicate reaction (ASR). This occurs with some aggregates and often causes premature and severe cracking of concrete. Other advantages include lower permeability, and better resistance to alkali, sulphate, chloride and CO_2 ingress, and corrosion, as well as higher electrical resistivity, reducing corrosion of the reinforcement. Freeze and thaw durability and the ability to withstand de-icing materials improve in some fly ash concretes but this is under investigation. Set time is generally longer through addition of fly ash to concrete, especially in cold weather. Calcareous fly ashes show mixed effects and class C fly ash may be used to make rapid hardening hydraulic cements with over 80% fly ash substitution. Concretes enhanced with fly ash may have a lower initial strength but this may suit some applications. Strength development is improved more by using ultra fine fly ash, for example in South Africa, than the more expensive silica fume.

Use of fly ash to substitute for aggregate at high replacement rates in concrete, for example at up to 50 wt% of sand, increases strength and elasticity. Cellular concrete using coal ash (30–90 wt% of total solids) is lighter in weight, has greater heat resistance and costs less than concrete made with usual aggregates. There is a large surplus of stored fly ash in many countries and yet high consumption of primary aggregates. Combining conditioned fly ash with sand at the quarry and marketing the product as an 'active' sand or using it with recycled building rubble would be a solution.

Higher carbon in ash as a result of NOx emissions reduction prevents its application in many concretes but beneficiation processes solve the problem. Studies of ammonia release from fly ash from power stations using ammonia based NOx control show there are no safety concerns for workers. The rate of loss of ammonia from concrete was limited by diffusion through the concrete.

Fly ash from cofiring coal with other fuels is excluded from use in concrete in most countries, although permitted with certain restrictions in Germany and the Netherlands. Fly ashes from cocombustion at up to 10 wt% of paper sludges and biomass pellets conform to the European standard for concrete. The effect on fly ash of greater proportions and other alternative fuels is under investigation. This issue requires better understanding because increased cocombustion with biomass is promoted to reduce greenhouse gas emissions.

Leaching of mercury and other trace elements from concrete incorporating fly ashes complies with regulations. Mercury emission controls based on activated carbon may affect use of fly ash in concrete but new mercury sorbents are under development.

Treatments and beneficiation

Carbon may be increased to loss-on-ignition (LOI) values as high as 30% and ammonia can contaminate fly ash at 200–2500 ppm. Various processes are in commercial use to reduce these values either in combination or separately. Draining and drying of stockpiled fly ash is releasing lagoon space and increasing its utilisation.

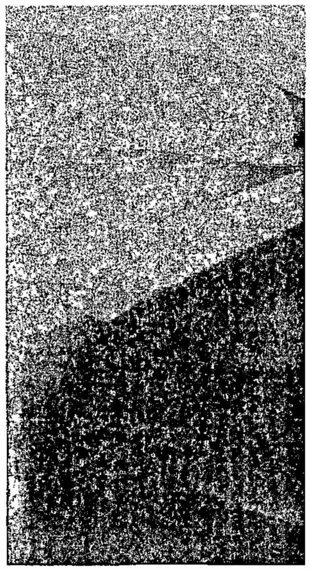
Fly ash is classified in the different stages of the ESP hoppers. Air classification is carried out in the UK for all fly ashes used in structural concretes. A multi-stage air classification process achieves low LOI from high carbon fly ash. Hydraulic classification is used for stored ash in the USA. Grinding fly ash can improve the compressive strength of concrete. Sieving and blending of fly ashes from different plants in the Netherlands produces a high quality fly ash and high carbon fly ash with strict quality control.

Gravity separation is suitable for fly ashes with variable particle density. Magnetic separation produces fly ash for the ceramic industry and extracts an iron product. Froth flotation may be used with classification to produce low LOI and fine fly ash products. Similarly, electrostatic separation and carbon burnout achieve a consistently low LOI from a wide range of values. Processes based on microwave carbon burnout, ash modified clinker technology, and a slagging furnace are under development.

Each issue of *Profiles* is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular issue of *Profiles* is based on the report:

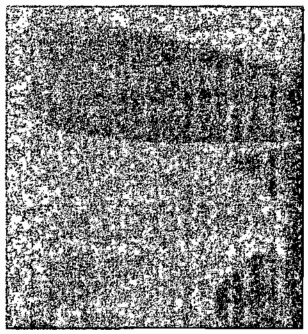
Cement and concrete – benefits and barriers in coal fly ash utilisation
Irene Smith
CCC/94, ISBN 92-9029-409-4, 70 pp, January 2005, £255*/£85†/£42.50‡

* non-member countries
† member countries
‡ educational establishments within member countries



IEA Clean Coal Centre is a collaborative project of member countries of the International Energy Agency (IEA) to provide information about and analysis of coal technology, supply and use.

IEA Clean Coal Centre has contracting parties and sponsors from: Australia, Austria, Canada, Denmark, the European Union, India, Italy, Japan, the Netherlands, New Zealand, South Africa, Sweden, the UK and the USA.



IEA CLEAN COAL CENTRE

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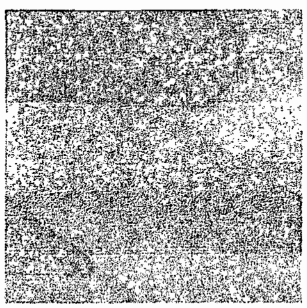


Item 1: - Limestone in Portland Cement

Add the following new subsections to ASTM C 150:

5.1.3 Up to 5.0% limestone by mass is permitted in amounts such that the chemical and physical requirements of this standard are met. The limestone shall be naturally occurring, consisting of at least 70% by mass of one or more of the mineral forms of calcium carbonate.

(Current 5.1.3 becomes 5.1.4)

12.2 When limestone is used, the manufacturer shall state in writing the amount thereof and, if requested by the purchaser, shall supply comparative test data on chemical and physical properties of the cement with and without the limestone [Note 4]. The comparative tests do not supersede the normal testing to confirm that the cement meets chemical and physical requirements of this standard.

NOTE 4 – Comparative test data may be from qualification tests performed by the manufacturer during formulation of the cement with limestone.

(Current NOTE 4 becomes NOTE 5)

Item 2: - Determination of the Amount of Limestone in Portland Cement

Add the following sentence to the new Subsection 12.2 of ASTM C 150:

The amount of limestone in cement shall be determined in accordance with Annex A2.

Add the following to the Annex in C 150:

A2. LIMESTONE CONTENT OF PORTLAND CEMENT

A2.1 When limestone is used, the limestone content in portland cement shall be derived from the determination of CO_2 in the finished cement. Analysis of CO_2 shall be based on methods described in ASTM C 114. The percent limestone in the cement is calculated from the CO_2 analysis based on the CO_2 content of the limestone used.

The limestone content of the cement is calculated as follows:

$$\frac{\%CO_2 \text{ in the cement}}{\%CO_2 \text{ in the limestone}} \times 100 = \%\text{limestone in cement}$$

Note 6 - *For Example*:

Where the determined CO_2 content in the finished cement = 1.5%
and the CO_2 content of the limestone = 43% ($CaCO_3$ in limestone = 98%)

Then:

$$\frac{1.5}{43} x\, 100 = 3.5\% \textit{ limestone content in cement}$$

The manufacturer shall include the CO_2 content and calculated limestone content of the cement on the Mill Test Report.

A2.2 This specification requires that the limestone to be used must contain a minimum of 70% $CaCO_3$. The manufacturer shall include the $CaCO_3$ content of the limestone on the manufacturer's report.

Note 7 - For verification of limestone content of cement, the purchaser must analyze for CO_2 content and make a correction for the content of $CaCO_3$ in the limestone in order for the data to be comparable to the manufacturer's report.

A2.3 Portland cements that do not contain limestone can contain baseline levels of CO_2 inherent in manufacture, for example, due to carbonation. This baseline CO_2 content is included as part of any calculated limestone content.

Item 3 - Correction to Bogue Equation

Modify Annex A1.3 of C 150 as follows (additions are underlined and deletions shown in strikethru font, other text is reproduced for information only):

A1.3 When the ratio of percentages of aluminum oxide to ferric oxide is 0.64 or more, the percentages of tricalcium silicate, dicalcium silicate, tricalcium aluminate, and tetracalcium aluminoferrite shall be calculated from the chemical analysis as follows:

$$\text{Tricalcium silicate} = (4.071 \times \%\,CaO) - (7.600 \times \%\,SiO_2) - (6.718 \times \%\,Al_2O_3) - (1.430 \times \%\,Fe_2O_3) - (2.852 \times \%\,SO_3) \underline{- (5.188 \times \%\,CO_2)}$$

$$\text{Dicalcium silicate} = (2.867 \times \%\,SiO_2) - (0.7544 \times \%\,C_3S)$$

$$\text{Tricalcium aluminate} = (2.650 \times \%\,Al_2O_3) - (1.692 \times \%\,Fe_2O_3)$$

$$\text{Tetracalcium aluminoferrite} = 3.043 \times \%\,Fe_2O_3$$

<u>Unless limestone is used in the cement, the carbon dioxide content shall be considered to be equal to zero when calculating potential tricalcium silicate.</u>

A1.3.1 When the alumina-ferric oxide ratio is less than 0.64, a calcium aluminoferrite solid solution (expressed as $ss(C_4AF + C_2F)$) is formed. Contents of this solid solution and of tricalcium silicate shall be calculated by the following formulas:

$$ss(C_4AF + C_2F) = (2.100 \times \%\,Al_2O_3) - (1.702 \times \%\,Fe_2O_3) \quad \text{(A1.1)}$$

$$\text{Tricalcium silicate} = (4.071 \times \%\,CaO) - (7.600 \times \%\,SiO_2) - (4.479 \times \%\,Al_2O_3) - (2.859 \times \%\,Fe_2O_3) - (2.852 \times \%\,SO_3) \underline{- (5.188 \times \%\,CO_2)} \quad \text{(A1.2)}$$

<u>Unless limestone is used in the cement, the carbon dioxide content shall be considered to be equal to zero when calculating potential tricalcium silicate.</u>

A1.3.2 No tricalcium aluminate will be present in cements of this composition. Dicalcium silicate shall be calculated as previously shown.

Item 4 – Changes to C 150 appendix.

Change indicated items in Fig. X1.1 Example Mill Test Report (additions are underlined and deletions shown in strikethru font, other text is reproduced for information only):

ABC Portland Cement Company
Qualitytown, N. J.

Plant Example   Cement Type II   Date March 9, 1998

Production Period March 2, 1998 - March 8, 1998

STANDARD REQUIREMENTS
ASTM C 150 Tables 1 and 3

CHEMICAL

Item	Spec. Limit	Test Result
SiO_2 (%)	20.0 min	~~21.3~~ 20.6
Al_2O_3 (%)	6.0 max	~~4.6~~ 4.4
Fe_2O_3 (%)	6.0 max	~~3.4~~ 3.3
CaO (%)	[A]	~~63.2~~ 62.9
MgO (%)	6.0 max	2.2
SO_3 (%)	3.0 max	2.7
Ignition loss (%)	3.0 max	~~1.2~~ 2.7
Na_2O (%)	[A]	0.19
K_2O (%)	[A]	0.50
Insoluble residue (%)	0.75 max	0.27
CO_2 (%)	[A]	1.5
Limestone (%)	5.0 max	3.5
$CaCO_3$ in limestone (%)	70 min	98
Potential (%)		
C_3S	[A]	~~52~~ 50
C_2S	[A]	21
C_3A	8 max	6
C_4AF	[A]	10
$C_4AF + 2(C_3A)$	[A]	22

[A]Not applicable.

PHYSICAL

Item	Spec. Limit	Test Result
Air content of mortar (volume %)	12 max	8
Blaine fineness (m^2/kg)	280 min	377
Autoclave expansion (%)	0.80 max	0.04
Compressive strength (MPa)	min:	
1 day	[A]	
3 days	7.0	23.4
7 days	12.0	29.8
28 days	[A]	
Time of setting (minutes) (Vicat)		
Initial Not less than	45	124
Not more than	375	

OPTIONAL REQUIREMENTS
ASTM C 150 Tables 2 and 4

CHEMICAL

Item	Spec. Limit	Test Result
$C_3S + C_3A$ (%)	58 max	~~58~~ 56
Equivalent alkalies (%)	[B]	0.52

[B]Limit not specified by purchaser. Test result provided for information only.
[C]Test result for this production period not yet available.

PHYSICAL

Item	Spec. Limit	Test Result
False set (%)	50 min	82
Heat of hydration (kJ/kg)		
7 days	[B]	300
Compressive strength (MPa)		
28 days	28.0 min	39.7

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of the ASTM C 150-97 or (other) ______________ specification.

Signature: ______________________________ Title: ______________________________

FIG. X1.1 Example Mill Test Report

SUBJECT: **Disposal of Mercury in Cement Manufacturing**

RE: **Intergrinding of Cement Kiln Dust with Portland Cement**

The question posed by the Florida Department of Environmental Protection is the physical ability, economics and practicality of inter-grinding Cement Kiln Dust with Portland cement clinker as a means to reduce the minor mercury cycle that exists in the raw material and clinker burning process of cement manufacture.

The premise is that the small percentage of mercury concentrated in the cycle would be removed from the cement manufacturing process and encapsulated in concrete, thereby reducing overall mercury emissions.

Sources in the evaluation were:

1. Koogler & Associates: Data provided by other plants operating in Florida.
2. Construction Technologies Laboratories (CTL)
3. Ohio State University
4. Operating plants in the cement industry

Research was conducted by CTL for the Portland Cement Association (PCA) in 1998 titled "Stabilization of Heavy Metals in Portland Cement, Silica Fume/Portland Cement and Masonry Cement Matrices" In the study researchers evaluated the leaching impacts of heavy metals including Mercury. The results of this study were that Mercury in a Cement Paste showed only minor signs of leaching. The study was conducted to eliminate concern that heavy metals of all kinds would leach from concrete and contaminate either the soil or water streams. Therefore, the CTL/PCA study concludes that there is no significant impact of heavy metals when contained in cement paste.

Ohio State University was commissioned by the Electrical Power Research Institute to address mercury emissions in concrete from Power Plant Ash. OSU is approximately 2/3 complete with the study which to date has focused on air emissions of mercury in the curing process. The next phase in the OSU program is related to release of mercury into the water stream and/or soils. The final results of the latter portion of the study is not expected to be released for at least one year to allow for a reasonable measuring period.

What constraints exist then to recycle the cement kiln dust or intergrinding it with Portland cement?

1. Handling and physical characteristics that prohibit a uniform product.
2. Quality Control Specifications that limit additions to the final product.

Handling and physical characteristic that inhibit product uniformity.

Cement kiln dust for the most part is partially calcined raw materials which should be reintroduced into the process, unless it contains and excessive amout of alkalis, chlorides or other components with affect product quality. Florida cement plants use raw materials, which are low in alkalis, chlorides and sulfates, therefore the dust is desirable to use for the production of clinker and eliminates the need for disposal from the process.

Since the dust is partially calcined is has different characteristics than kiln feed, clinker or cement. It is very high in CaO and has poor combining characteristics due to its low bulk density. The dust is difficult to blend with the other raw materials used to produce cement. The typical bulk density of products in the cement process are as follows:

1.	Portland Cement	98 lbs/ft^3
2.	Cement Clinker	105 lbs/ft^3
3.	Kiln Feed	95 lbs/ft^3
4.	Cement Kiln Dust	35 lbs/ft^3

Segregation typically occurs when attempting to blend two products with a substantially different bulk density. The problem is exacerbated in today's modern grinding systems as a result of the amount of air used to convey the materials though the process. Closed loop mill systems are comprised of air swept mills, air swept separators and air slides, all of which compound the segregation process. Therefore it is not unusual to see pockets or slugs of cement kiln dust in the final product when inter-grinding.

Attempts also have been made to blend the cement kiln dust with masonry cement via a "pug" mill on the theory that since masonry cement is ground to a high fineness, the blending process would be more uniform. Blending attempts have generally failed, because of insufficient product consistency.

The reason cement plants make this effort, is to reduce the amount of dust land filled on an annualized basis. Land filling not only has a short term economic impact with respect to construction and operating costs, but their long term maintenance is also of concern. Thus, Florida's unique ability to recycle 100% of its dust through the raw material/kiln feed system is an operational and environmental benefit. Plants in Texas, California and Michigan are reintroducing the dust in their operations thru the finish grinding system with limited success. However, for these plants reducing even 1% of the dust waste is significant, whereas for Florida plants that is a 1% reduction in actual kiln feed.

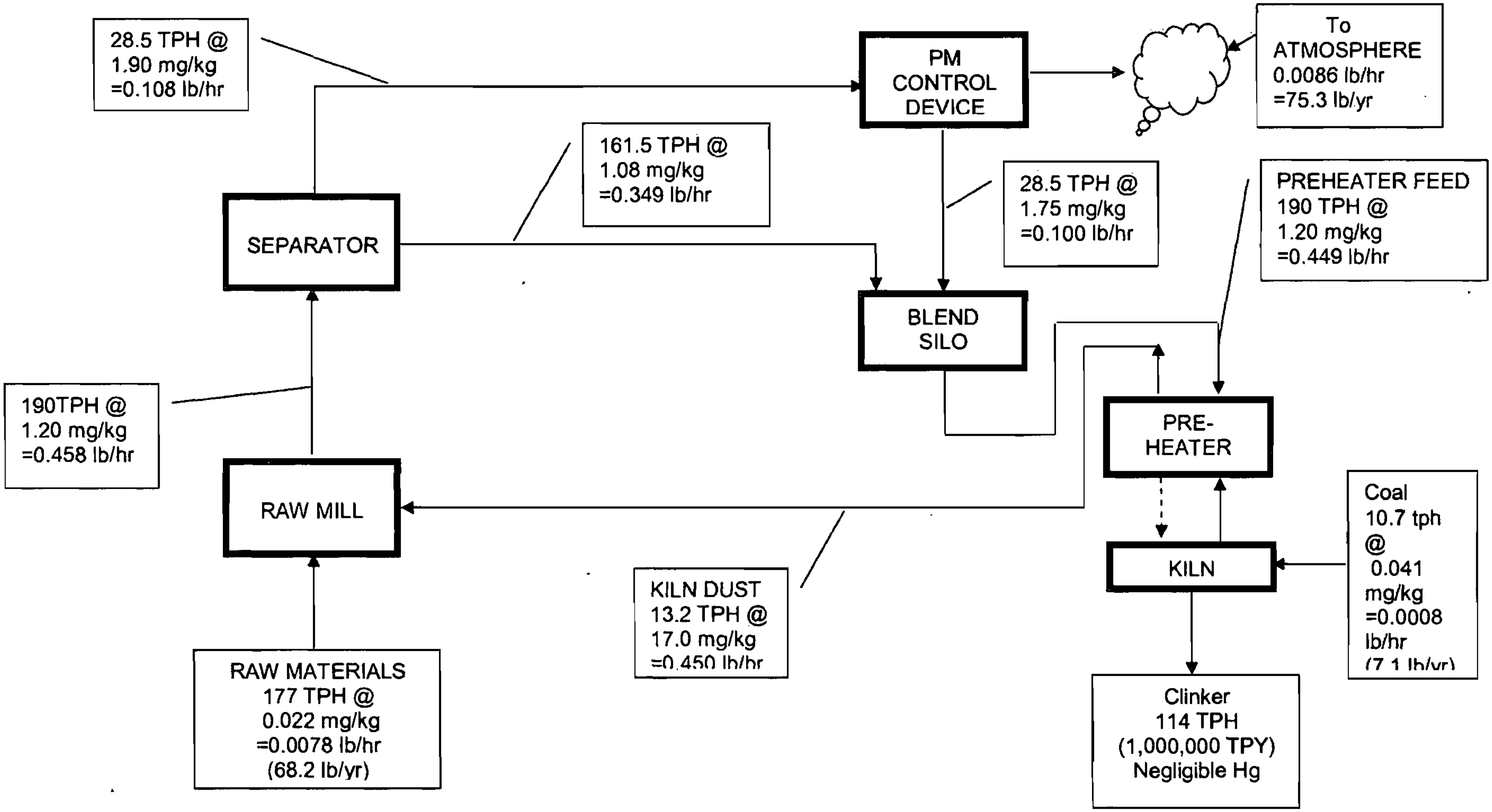
Chemical specifications applicable to Portland Cement

Both the Federal and State Highway departments (AASHTO) and the Associate for Standards and Testing Materials limit the addition to cement at 1% and 5% respectively, while for use in concrete they have embraced pozzolanic materials as a valuable additive.

The attached schematic shows the mercury flow and respective concentrations in a Florida Cement Plant process. This particular schematic was derived using 3rd party numbers and therefore its true accuracy is in question. Nevertheless it serves the purpose of illustrating the gas flow and flow of mercury. The actual mercury emissions are very low during the compound operation (raw mill running). Most plants expect kiln uptime to be 85% and raw mill uptime to be 80%. With that differential in time (438 hours), the isolated dust volume is approximately 5,781 tons at 13.2 tons/hour. This dust would theoretically contain a higher percentage of mercury and therefore represent the volume to be inter-ground or blended. With kiln feed volume of 1,600,000 tons, this represents approximately 0.36% of the total feed and 0.58% of the total cement produced at a 1 million ton facility.

Since the volume of material is low, its impact is not significant. Therefore it is a viable project for researching a technically feasible solution. To date there are still several questions that remain to be investigated further, 1) What is the prospects of mercury leaching into water from concrete (study being conducted by Ohio State University)? 2) How can the cement kiln dust be ground or blended in cement uniformly given the differences in material densities and properties? 3) Are there other alternatives for the Florida Cement Kiln Dusts that are viable given its' high percentage of CaO?. 4) Are the mercury flows used in the calculations show on the schematic representative of all cement plants and 5) Are the mercury flows representative of direct plant operating conditions.

Although the theory has merit, given what has been developed and/or is currently being studied, it still puts into question the practice of combining cement kiln dust with Portland cement clinker. It is assumed in the years to come, more effort will be put forth in either, mercury reduction methods or responsible disposal options, but industry as a whole is still investigating not only the alternatives, but more importantly the results.



MERCURY BALANCE
FOR 1,000,000 TPY CLINKER
FLORIDA PREHEATER/PRECALCINER
PORTLAND CEMENT PLANT

TRANSPORTATION RESEARCH PROJECTS

THE OHIO STATE UNIVERSITY

Department of Civil & Environmental Engineering & Geodetic Science
470 Hitchcock Hall, 2070 Neil Avenue
Columbus, OH 43210
614/292-2771
http://transportation.eng.ohio-state.edu/

August 2005

2005.B.7

Title: Full Scale Testing of Coal Combustion Products in Pavement Sections Subjected to Repeated Wheel Loads

Sponsor(s), Period: US DoE (via WVU), Ohio DOT; 2002-2005

Faculty/Senior Researchers Involved: W. Wolfe, T. Butalia, H. Walker

Number of Students Involved: 3

Description: The behavior of conventional pavement systems constructed in asphalt and concrete with the subbase and subgrade modified by the inclusion of substantive volumes of fly ash and bottom is studied. Strength, durability, rutting are compared as the system is subjected to repeated loading.

2005.B.8

Title: Use of Lime-Activated High-Carbon Class F Fly Ash in Full Depth Reclamation of Asphalt Pavements - Delaware and Warren Counties.

Sponsor(s), Period: Ohio Coal Development Office; Ohio Air Quality Management Authority, approved,

Faculty/Senior Researchers Involved: W. Wolfe, T. Butalia, H. Walker

Number of Students Involved: 3 (expected)

Description: Two projects dealing with full depth asphalt recycling have been approved and are awaiting contract signatures.

2005.B.9

Title: Release of Mercury during Curing of Concrete Containing Fly Ash and Mercury Sorbent Material

Sponsor(s), Period: Electric Power Research Institute, 2002-present

Faculty/Senior Researchers Involved: H. Walker, L. Weavers

Number of Students Involved: 1 graduate, 1 undergraduate (plus 1 Research Associate)

Description: Approximately 20 million tons of fly ash is utilized in concrete in the United States every year, and a significant fraction of this ends up in roadways. Mercury naturally present in coal may associate with fly ash following coal combustion, and therefore, be present in fly ash containing concrete. It is therefore important to understand the fate of mercury in concrete containing fly ash, in order to assess the environmental impact of this practice. This work involves conducting well-controlled laboratory studies to quantify the extent of mercury release from concrete to air.

2005.B.7

Title: Full Scale Testing of Coal Combustion Products in Pavement Sections Subjected to Repeated Wheel Loads

Sponsor(s), Period: US DoE (via WVU), Ohio DOT; 2002-2005

Faculty/Senior Researchers Involved: W. Wolfe, T. Butalia, H. Walker

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Sponsor(s), Period: Electric Power Research Institute, 2002-present

Faculty/Senior Researchers Involved: H. Walker, L. Weavers

Number of Students Involved: 1 graduate, 1 undergraduate (plus 1 Research Associate)

Description: Approximately 20 million tons of fly ash is utilized in concrete in the United States every year, and a significant fraction of this ends up in roadways. Mercury naturally present in coal may associate with fly ash following coal combustion, and therefore, be present in fly ash containing concrete. It is therefore important to understand the fate of mercury in concrete containing fly ash, in order to assess the environmental impact of this practice. This work involves conducting well-controlled laboratory studies to quantify the extent of mercury release from concrete to air.

OHIO STATE

Environ. Sci. Technol., **39** (15), 5689 -5693, 2005. 10.1021/es050026w S0013-936X(05)00026-X
Web Release Date: June 15, 2005

Gaseous Mercury from Curing Concretes that Contain Fly Ash: Laboratory Measurements

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Received for review January 5, 2005

Revised manuscript received April 29, 2005

Accepted May 19, 2005

Abstract:

Total gaseous mercury in headspace air was measured for enclosed concretes dry curing at 40 °C for intervals of 2, 28, and 56 days. Release of mercury was confirmed for ordinary Portland cement concrete (OPC) and three concretes in which class F fly ash substituted for a fraction of the cement: (a) 33% fly ash (FA33), (b) 55% fly ash (FA55), and (c) 33% fly ash plus 0.5% mercury-loaded powdered activated carbon (HgPAC). Mean rates of mercury release (0.10-0.43 ng/day per kg of concrete) over the standard first 28 days of curing followed the order OPC < FA33 ≈ FA55 < HgPAC. The mercury flux from exposed surfaces of these concretes ranged from 1.9 ± 0.5 to 8.1 ± 2.0 ng/m^2/h, values similar to the average flux for multiple natural substrates in Nevada, 4.2 ± 1.4 ng/m^2/h, recently published by others. Air sampling extending for 28 days beyond the initial 28-day maturation for OPC, FA55, and HgPAC suggested that the average Hg release rate by OPC is constant over 56 days and that mercury release rates for FA55 and HgPAC may ultimately diminish to levels exhibited by OPC concrete. The release of mercury from all samples was less than 0.1% of total mercury content over the initial curing period, implying that nearly all of the mercury was retained in the concrete.

[Full text in html]
[Full text in pdf]

Stabilization of Heavy Metals in Portland Cement, Silica Fume/Portland Cement and Masonry Cement Matrices

Item Code: RP348
Date: 1998

Description: Establishes the mechanisms of heavy metals immobilization by portland cement-based solidification/stabilization (S/S) treatment. This research found that the effectiveness of stabilization is better than could be expected based on the pH effects of cement addition alone. This suggests that certain metals may actually be bound within cemer hydration products. This report is also found on CD019 and DVD019.

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Abstract: In the early phases of this study, the effects of heavy metals on the physical and chemical properties of portland-cement based pastes were studied using different types of cement, four metal oxides and four soluble metal salts. Type I (high calcium aluminate content) and Type V (low calcium aluminate content) portland cements were used to study the effects of their chemical differences on paste properties and metε stabilization. Fresh pastes were tested for workability, initial setting times, and heats of hydration. Hardened pastes were tested for strength and leachability by both TCLP (Toxic Characteristic Leaching Procedure) and column leaching. By J. Bhatty, F. Miller, P. West, and B. Ost Contents Chapter 1 - Effect: of Salts and Oxides on Paste Properties and Acetic Acid Leachability Chapter 2 - Leachability of Single Metals from Cemer Pastes Using Sequential Batch Acetic Acid Leaching Chapter 3 - Leachability of Multiple Metals from Paste Matrices Using Acetic Acid, Deionized Water, and "Synthetic Acid Rain" Leachants Chapter 4 - Leachability of Multiple Metals from Contaminated Soils and Oily Waste Chapter 5 - Use of Matrix Modifiers to Improve Metals Stabilization to Acetic Acid Leaching Chapter 6 - The Special Problems of Arsenic Stabilization Chapter 7 - Durability of Waste Forms, Especially with Respect to Carbonatioı Chapter 8 - Interpretation of X-Ray Diffraction (XRD) Results Appendix A - Arsenic Soil-Cement and Arsenic Paste Mixes Appendix B - Preparation of Leach Samples and Leaching Regime Appendix C - Soil-Cement Mixes with Three-Metal Sludge Appendix D - Preparation of Two Synthetic Soils for Metals Stabilization Project Appendix E - Table of Fresh Paste Temperatures, Mini-Slump Areas and Setting Times

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Related Publications

Results and discussion

Figures 2 and 3 show cumulative intrusion curves for a series of six mortars of increasing sand content for cement paste without and with silica fume, respectively. Although samples were prepared with nine different aggregate contents, in the interests of clarity, only six aggregate contents are given for each case in Figs. 2 and 3. The remaining distributions fall between their appropriate neighbors in the plots. Each curve shown is the average of three or four separate tests. In both cases, the curves for the plain cement paste show a typical distribution with a sharp threshold diameter at about 0.1 micrometer for the sample without silica fume and 0.05 micrometers for the one containing 10% silica fume. Critical to this investigation, the intrusion curves for the mortars differ from the ones for the plain cement pastes, particularly at pore diameters larger than the paste threshold diameter. The addition of aggregate increases the pore volume detected at diameters larger than the paste samples' thresholds. Further, the threshold for the distributions becomes less distinct with increasing sand content, even for the mortars with only 15.7% sand.

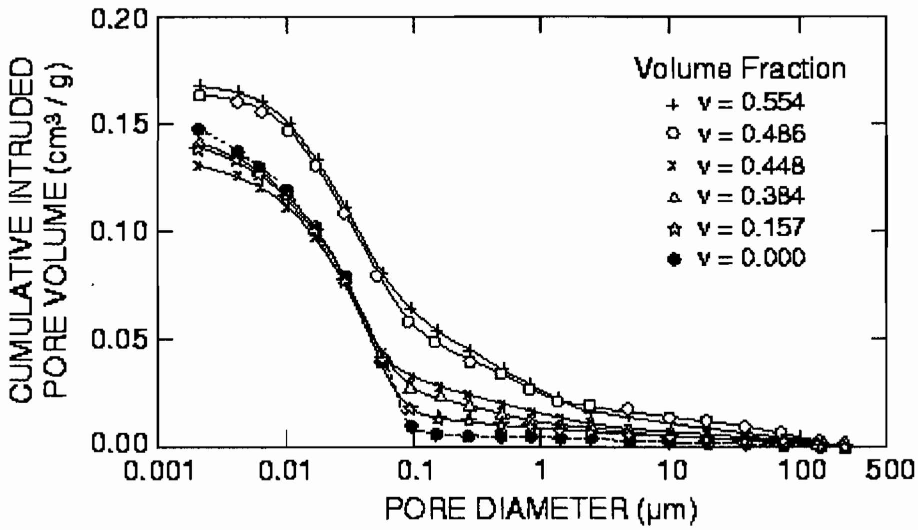

Figure 2: Cumulative pore size distributions for mortars without silica fume, as measured by mercury intrusion porosimetry.

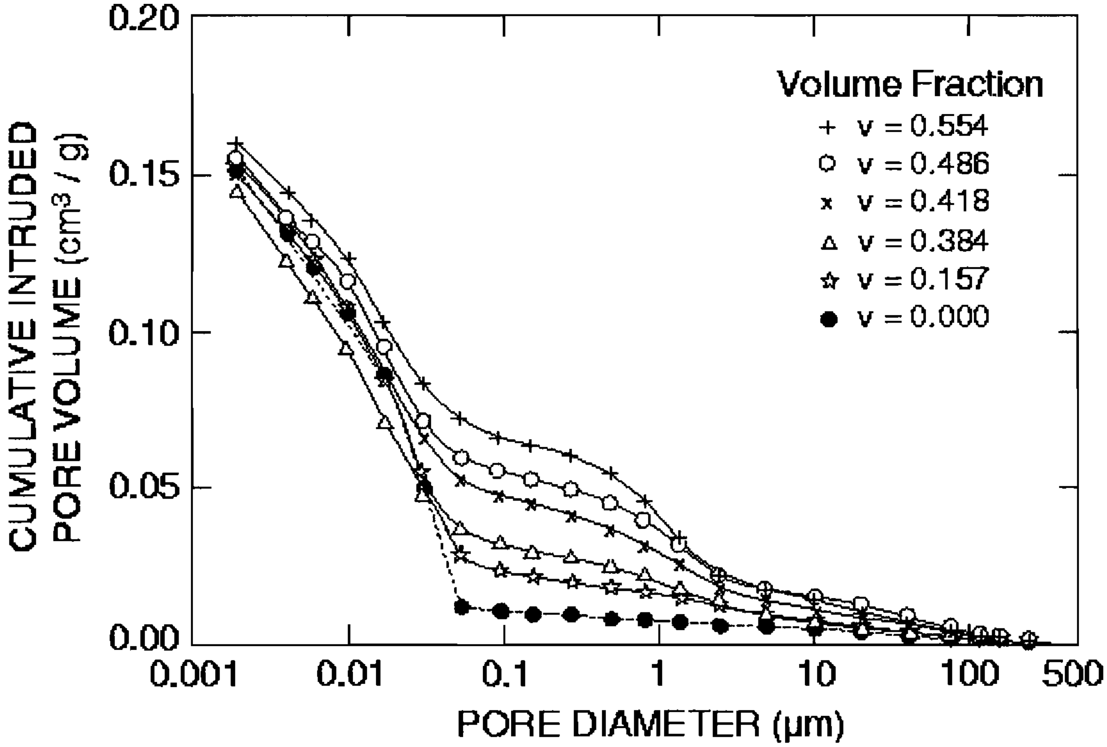

Figure 3: Cumulative pore size distributions for mortars with silica fume, as measured by mercury intrusion porosimetry.

Based on these threshold diameter values, the intrudable pore volume for the mortars can be divided into pro and post-threshold volumes representing the intrudable pores larger and smaller than the threshold diameter for the cement paste without sand, respectively. These results are given in Figs. 4 and 5 for the two sets of mortar specimens. Three of the nine data points in Figs. 4 and 5 correspond to the three curves not shown in Figs. 2 and 3. Although there is some scatter de in the data, trends are present. For the mortars without silica fume, there is a sudden increase in the pro-threshold volume as the sand content is increased from 44.8% to 48.6%, suggesting the occurrence of a critical or percolation phenomenon. For the mortars with silica fume, the effect is much more subtle with limited evidence for percolation occurring at about 40% aggregate volume fraction.

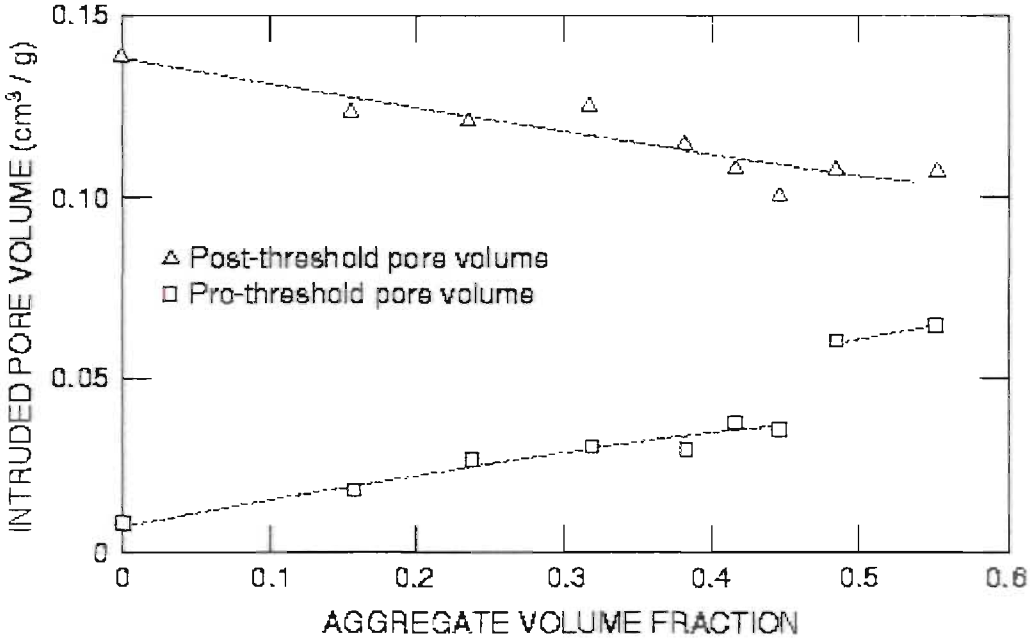

Figure 4: Pro and post-threshold pore volumes for varying sand contents for mortars without silica fume.

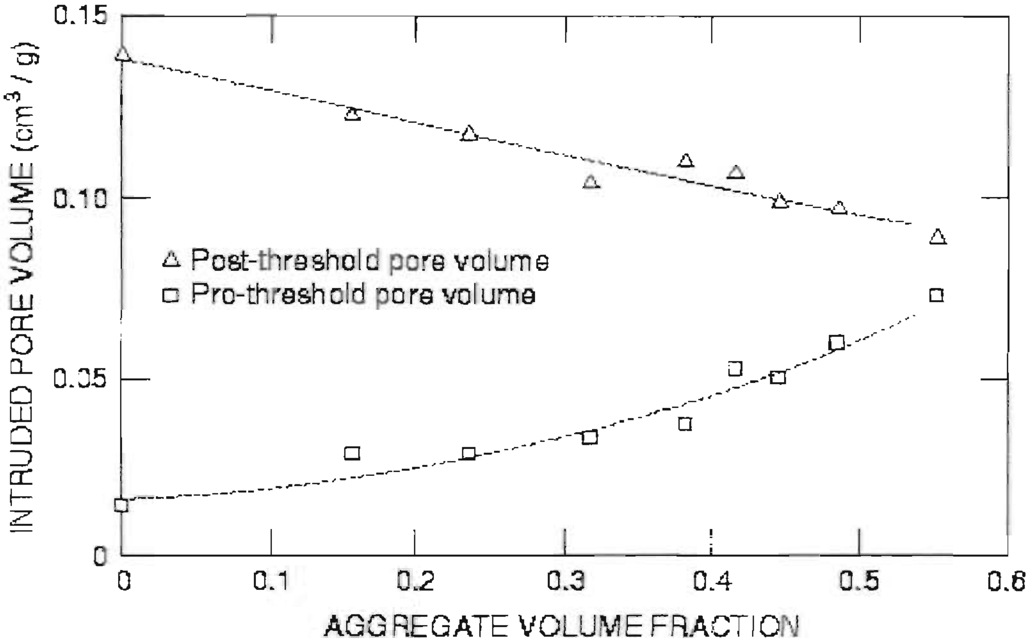

Figure 5: Pro and post-threshold pore volumes for varying sand contents for mortars with silica fume.

Initially, as sand is added to the cement paste, interfacial zones are formed around each aggregate but remain relatively isolated due to the low sand content. For the mercury to reach these interfacial zones, it must first intrude through the denser bulk paste. Some increase in the intruded pro-threshold pore volume will be observed due to the few interfacial zones that overlap the edges of the specimen and isolated clusters of interior interfacial zones that connect these "edge" interfacial zones. Thus, the sharp threshold observed for the cement paste with no sand will be lost. However, as more and more sand is added, the isolated interfacial zone clusters become larger and begin to connect one to another to greatly increase the volume of interfacial zones that are directly accessible (i.e. not via the denser bulk paste) from the outside of the system. Eventually, when enough sand is present, nearly all interfacial zones will be interconnected and the interfacial zone system will nearly saturate the system. The mercury intrusion results suggest this percolation phenomena to occur at a sand volume fraction of 45- 49% for the mortars without the silica fume.

Interfacial zone percolation can be more generally examined using the hard core/soft shell computer model. To do this, the interfacial zone of soft shell thickness was varied between 10 and 40 micrometers (based on SEM evidence) and the fraction of the total interfacial zone volume that was part of a percolated pathway determined as a function of sand volume fraction. The results for this computer experiment are provided in Fig. 6. As expected, when the interfacial zone thickness decreases, a larger sand volume fraction is required to cause percolation of the interfacial zone porosity. This suggests that reducing the interfacial zone thickness is one method for decreasing the likelihood of interfacial zone percolation. Methods for decreasing interfacial zone thickness, including using a finer cement, mineral admixtures such as silica fume, or a lightweight absorptive or cement clinker aggregate have been investigated based on a computer model that simulates interfacial zone microstructural development at the micrometer level [16]. Results suggested that these measures could indeed improve the density and homogeneity of the interfacial zone microstructure relative to the bulk paste. Experimental evidence for engineering interfacial zone microstructure by developing an ideal aggregate has been presented recently [17].

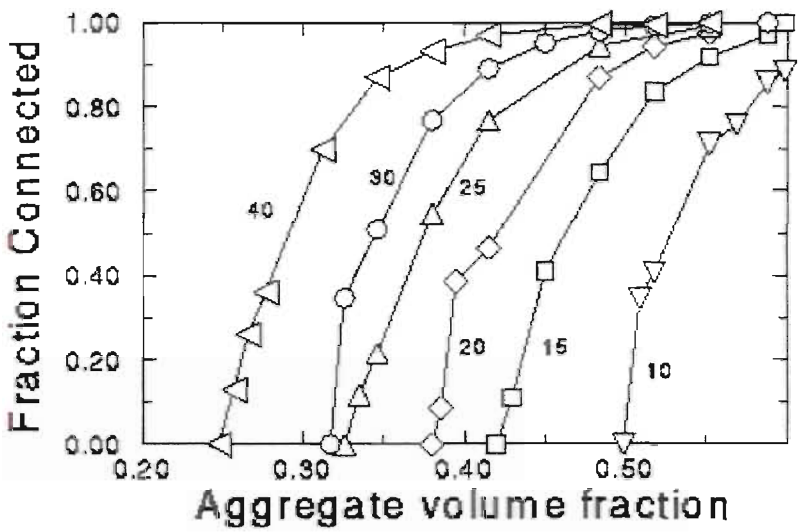

Figure 6: Computer model interfacial zone percolation results for varying sand volume fractions and interfacial zone thicknesses.

By comparing the results in Figs. 2 and 6, an interfacial zone thickness most consistent with the mercury intrusion results can be determined. In Fig. 6, the 10 micrometer curve can be eliminated on the basis that very little difference was observed in the experimental intrusion curves shown in Fig. 2 as the sand volume was increased from 48.6% to 55.4%, suggesting that both systems are nearly 100% percolated. Additionally, the large increase in intruded pro-threshold pore volume in Figs. 2 and 4 as the sand content is increased from 44.8% to 48.6% suggests that the 44.8% system is either unpercolated or much less percolated than the 48.6% sand system. This eliminates the 25, 30, and 40 micrometer curves from consideration since for these, a sand content of 44.8% would be greater than 95% percolated. Thus, the interfacial zone thickness most consistent with the mercury intrusion results is found to be 15-20 micrometers.

An interfacial zone thickness of 15-20 micrometers is somewhat less than the 40-50 micrometer value commonly measured using the SEM technique [3,4,5]. However, this higher value is generally based on the distance at which the porosity finally decreases to its bulk paste value. Since the largest interfacial zone pores are typically those observed closest to the aggregate surface, it is logical that the mercury intrusion technique would measure a somewhat smaller interfacial zone than the SEM technique. Recently, similar results for interfacial zone thickness have been based on a simple analysis of the mercury intrusion curves for plain paste and concrete and the surface area of the aggregate [18]. The estimated interfacial zone thickness of 25-30 micrometers is in general agreement with our intrusion and model results.

The model can also be applied to interfacial zone percolation in concrete. For the concrete mixes presented by Winslow and Lui [1], the interfacial zones are found to be highly (> 75 %) interconnected for an interfacial zone thickness of 20 micrometers, in agreement with the large amount of pro-threshold (coarse) porosity observed during the actual mercury intrusion experiment [1]. The hard core/soft shell computer model can also determine the fraction of cement paste within a given distance of an aggregate surface in a typical mortar or concrete. Using the aggregate size distributions provided in Table 1 and Ref. [1], results shown in Fig. 7 indicate that nearly all of the paste is within 100 micrometers of an aggregate, in general agreement with the SEM-based observations of Diamond et al. [19]. Furthermore, 20-40% of the total cement paste is within 20-30 micrometers of an aggregate, which is the region typically classified as interfacial zone. This volume fraction of the total cement paste contained within interfacial zones is again in agreement with the recently presented results of Uchikawa et al. [18]. As shown by the model, this amount of interfacial zone paste is more than sufficient to create a percolated pathway through a typical mortar or concrete specimen.

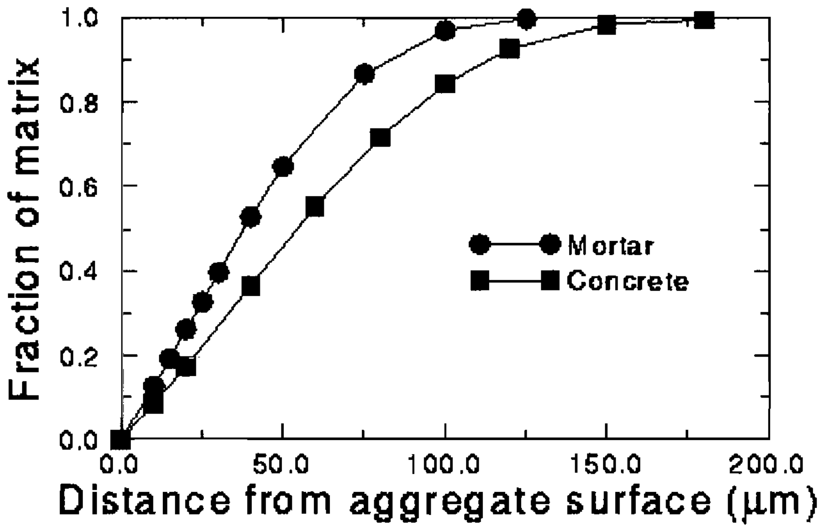

Figure 7: Fraction of total cement paste within a given distance of an aggregate surface.

The ultimate effect of percolated interfacial zones on mechanical and transport properties of concrete is somewhat uncertain. Certainly, the increases in compressive strength due to the incorporation of silica fume into concrete have been linked to an improved interfacial zone microstructure [20,21]. Effects of interfacial zone microstructure and connectivity on transport and durability properties have been studied much less. Ping et al. [22] have recently observed increases in electrical conductivity due to the presence of interfacial zones while Costa et al. [23] have noted similar effects on water permeability. The increase in transport may be subtle because in adding each aggregate to the concrete, we are replacing a somewhat porous cement paste volume with a non-porous aggregate surrounded by an even more porous interfacial zone. The fact that the permeability of concrete is generally one to two orders of magnitude higher than that of cement paste [24], however, would suggest that interfacial zone percolation may be detrimental in terms of the transport and long term durability of concrete.

Interestingly, the mercury intrusion results for mortars containing silica fume, in Fig. 3, are quite similar to those for mortars without silica fume. Feldman [25] has obtained similar intrusion curves for mortars with and without silica fume prepared at a water-to-solids (w/s) ratio of 0.6, while Delage and Aitcin [26] have observed the presence of these "macro-pores" in field concretes containing 15% silica fume at w/c ratios of 1.0, 0.67, and 0.56. It has been suggested that these larger pores are due to the dissolution of early age calcium hydroxide crystals as they react pozzolanically with the silica fume at 1 day and beyond. Conversely, Scrivener and Gartner [3] identified the large pores they observed in interfacial zones as isolated hollow hydration shells (Hadley grains) left behind when small cement particles dissolve and hydrate rapidly. In any case, for these pores to be detected in quantity by the mercury at low pressures, they **must** interconnect and form a percolated pathway throughout the microstructure (i.e. they cannot exist as isolated structures). This seems unlikely if the pores are *all* due to hollow hydration shells but could occur if some of the coarse porosity is due to dissolved calcium hydroxide. The calcium hydroxide phase can attain a volume fraction of 10-15% at 1 day in pastes containing silica fume before decaying due to the pozzolanic reaction [27]. If the connected porosity is partially due to dissolving calcium hydroxide crystals, its effects might be reduced by using a lower w/c ratio or a higher concentration of silica fume. While these larger pores have been observed microscopically, more research is needed to determine the phase(s) from which they originate.

Next: Summary **Up:** Main **Previous:** Computer model description

Item 1: - Limestone in Portland Cement

Add the following new subsections to ASTM C 150:

5.1.3 Up to 5.0% limestone by mass is permitted in amounts such that the chemical and physical requirements of this standard are met. The limestone shall be naturally occurring, consisting of at least 70% by mass of one or more of the mineral forms of calcium carbonate.

(Current 5.1.3 becomes 5.1.4)

12.2 When limestone is used, the manufacturer shall state in writing the amount thereof and, if requested by the purchaser, shall supply comparative test data on chemical and physical properties of the cement with and without the limestone [Note 4]. The comparative tests do not supersede the normal testing to confirm that the cement meets chemical and physical requirements of this standard.

NOTE 4 – Comparative test data may be from qualification tests performed by the manufacturer during formulation of the cement with limestone.

(Current NOTE 4 becomes NOTE 5)

Item 2: - Determination of the Amount of Limestone in Portland Cement

Add the following sentence to the new Subsection 12.2 of ASTM C 150:

The amount of limestone in cement shall be determined in accordance with Annex A2.

Add the following to the Annex in C 150:

A2. LIMESTONE CONTENT OF PORTLAND CEMENT

A2.1 When limestone is used, the limestone content in portland cement shall be derived from the determination of CO_2 in the finished cement. Analysis of CO_2 shall be based on methods described in ASTM C 114. The percent limestone in the cement is calculated from the CO_2 analysis based on the CO_2 content of the limestone used.

The limestone content of the cement is calculated as follows:

$$\frac{\%CO_2 \text{ in the cement}}{\%CO_2 \text{ in the limestone}} \times 100 = \%\text{limestone in cement}$$

Note 6 - *For Example*:

Where the determined CO_2 content in the finished cement = 1.5%
and the CO_2 content of the limestone = 43% ($CaCO_3$ in limestone = 98%)

Then:

$$\frac{1.5}{43} x\,100 = 3.5\%\ \textit{limestone content in cement}$$

The manufacturer shall include the CO_2 content and calculated limestone content of the cement on the Mill Test Report.

A2.2 This specification requires that the limestone to be used must contain a minimum of 70% $CaCO_3$. The manufacturer shall include the $CaCO_3$ content of the limestone on the manufacturer's report.

Note 7 - For verification of limestone content of cement, the purchaser must analyze for CO_2 content and make a correction for the content of $CaCO_3$ in the limestone in order for the data to be comparable to the manufacturer's report.

A2.3 Portland cements that do not contain limestone can contain baseline levels of CO_2 inherent in manufacture, for example, due to carbonation. This baseline CO_2 content is included as part of any calculated limestone content.

Item 3 - Correction to Bogue Equation

Modify Annex A1.3 of C 150 as follows (additions are underlined and deletions shown in strikethru font, other text is reproduced for information only):

A1.3 When the ratio of percentages of aluminum oxide to ferric oxide is 0.64 or more, the percentages of tricalcium silicate, dicalcium silicate, tricalcium aluminate, and tetracalcium aluminoferrite shall be calculated from the chemical analysis as follows:

$$\text{Tricalcium silicate} = (4.071 \times \%\,CaO) - (7.600 \times \%\,SiO_2) - (6.718 \times \%\,Al_2O_3) - (1.430 \times \%\,Fe_2O_3) - (2.852 \times \%\,SO_3) \underline{- (5.188 \times \%\,CO_2)}$$

$$\text{Dicalcium silicate} = (2.867 \times \%\,SiO_2) - (0.7544 \times \%\,C_3S)$$

$$\text{Tricalcium aluminate} = (2.650 \times \%\,Al_2O_3) - (1.692 \times \%\,Fe_2O_3)$$

$$\text{Tetracalcium aluminoferrite} = 3.043 \times \%\,Fe_2O_3$$

Unless limestone is used in the cement, the carbon dioxide content shall be considered to be equal to zero when calculating potential tricalcium silicate.

A1.3.1 When the alumina-ferric oxide ratio is less than 0.64, a calcium aluminoferrite solid solution (expressed as $ss(C_4AF + C_2F)$) is formed. Contents of this solid solution and of tricalcium silicate shall be calculated by the following formulas:

$$ss(C_4AF + C_2F) = (2.100 \times \%\,Al_2O_3) - (1.702 \times \%\,Fe_2O_3) \qquad (A1.1)$$

$$\text{Tricalcium silicate} = (4.071 \times \%\,CaO) - (7.600 \times \%\,SiO_2) - (4.479 \times \%\,Al_2O_3) - (2.859 \times \%\,Fe_2O_3) - (2.852 \times \%\,SO_3) \underline{- (5.188 \times \%\,CO_2)} \qquad (A1.2)$$

Unless limestone is used in the cement, the carbon dioxide content shall be considered to be equal to zero when calculating potential tricalcium silicate.

A1.3.2 No tricalcium aluminate will be present in cements of this composition. Dicalcium silicate shall be calculated as previously shown.

Item 4 – Changes to C 150 appendix.

Change indicated items in Fig. X1.1 Example Mill Test Report (additions are underlined and deletions shown in strikethru font, other text is reproduced for information only):

ABC Portland Cement Company
Qualitytown, N. J.

Plant Example Cement Type II Date March 9, 1998

Production Period March 2, 1998 - March 8, 1998

STANDARD REQUIREMENTS
ASTM C 150 Tables 1 and 3

CHEMICAL

Item	Spec. Limit	Test Result
SiO_2 (%)	20.0 min	~~21.3~~ 20.6
Al_2O_3 (%)	6.0 max	~~4.6~~ 4.4
Fe_2O_3 (%)	6.0 max	~~3.4~~ 3.3
CaO (%)	A	~~63.2~~ 62.9
MgO (%)	6.0 max	2.2
SO_3 (%)	3.0 max	2.7
Ignition loss (%)	3.0 max	~~1.2~~ 2.7
Na_2O (%)	A	0.19
K_2O (%)	A	0.50
Insoluble residue (%)	0.75 max	0.27
CO_2 (%)	A	1.5
Limestone (%)	5.0 max	3.5
$CaCO_3$ in limestone (%)	70 min	98
Potential (%)		
C_3S	A	~~52~~ 50
C_2S	A	21
C_3A	8 max	6
C_4AF	A	10
$C_4AF + 2(C_3A)$	A	22

[A]Not applicable.

PHYSICAL

Item	Spec. Limit	Test Result
Air content of mortar (volume %)	12 max	8
Blaine fineness (m^2/kg)	280 min	377
Autoclave expansion (%)	0.80 max	0.04
Compressive strength (MPa)	min:	
1 day	A	
3 days	7.0	23.4
7 days	12.0	29.8
28 days	A	
Time of setting (minutes)		
(Vicat)		
Initial Not less than	45	124
Not more than	375	

OPTIONAL REQUIREMENTS
ASTM C 150 Tables 2 and 4

CHEMICAL

Item	Spec. Limit	Test Result
$C_3S + C_3A$ (%)	58 max	~~58~~ 56
Equivalent alkalies (%)	B	0.52

[B]Limit not specified by purchaser. Test result provided for information only.
[C]Test result for this production period not yet available.

PHYSICAL

Item	Spec. Limit	Test Result
False set (%)	50 min	82
Heat of hydration (kJ/kg)		
7 days	B	300
Compressive strength (MPa)		
28 days	28.0 min	39.7

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of the ASTM C 150-97 or (other) ______________ specification.

Signature: ______________________________ Title: ______________________________

FIG. X1.1 Example Mill Test Report

January 2005
PF 05-01

IEA CLEAN COAL CENTRE

Profiles

Cement and concrete – benefits and barriers in coal fly ash utilisation

'There are major challenges despite decades of beneficial utilisation of coal ash'

'Legislation is often applied in a way which hinders use of fly ash'

'NOx reduction systems and cocombustion may affect fly ash utilisation'

This report summarises recent trends in coal ash utilisation in different countries. It then focuses on two major sectors of fly ash utilisation: cement and concrete. The engineering and environmental benefits of using fly ash are investigated. Barriers occur in marketing, handling, transport and storage, through increased carbon or ammonia in ash, the effects of cofiring with secondary fuels and through the potential for mercury release from fly ash.

Use of fly ash in cement and concrete reduces the use of natural raw materials and therefore contributes to industrial sustainability. Blended cements and concretes containing large proportions of fly ash offer the benefit of CO_2 emissions avoidance. Legislation can provide the necessary certificate to promote utilisation. However, fly ash utilisation is hindered where it is regarded as a waste or by-product rather than a product. Regulations for use in cement and concrete need to be broadened to include all potential markets for a wider range of fly ash specifications. Use of fly ash in the raw material in cement kilns has the advantage of less rigorous requirements than for blended cement or concrete but the amount appears to be limited. Continued use of fly ash in cement and concrete is helped by treatments and beneficiation processes. New combined processes aim at total use of fly ash, producing high-grade and expensive materials for various specialised applications.

Marketing barriers are being overcome through partnerships between, utilities, coal combustion product marketers, and cement producers. Fly ash should be marketed as a product, defined for targeted users, including architects and engineers. Large fly ash storage domes offer maximum capacity with minimum footprint. This allows the purchase and stockpile of sufficient fly ash over seasons when fly ash is least expensive to when it is most in demand. Accurate forecasting of seasonal demand and integration of ash marketing with appropriate coal procurement and handling functions optimise supply to demand. Transport and storage are often economic barriers to using fly ash.

Cement

Fly ash is used mainly for its alumina in cement kilns but also contributes silica, iron and calcium to the raw material mix. It improves clinker quality, mainly due to its lower alkali content and fineness. The rate of substitution is generally 3–5% of the raw materials.

Greater quantities of fly ash can be used in blended cement, usually substituting for 5–40 wt% of the Portland cement clinker. Use of calcareous class C fly ash for rapid hardening hydraulic cements is possible at over 80 wt% fly ash substitution with additives. Requirements for fly ash quality are tightly defined. Fly ashes with different characteristics could find good markets but lack building authority approval.

High carbon fly ash poses problems when injecting fly ash into the preheater of the cement kiln where temperatures are relatively low. However, studies in the USA indicate that fly ash containing up to 21% unburned carbon can be used in cement raw material. This reduces energy requirements and costs. Restrictions on carbon content are tighter for use of fly ash in blended cement.

Cofiring coal with other fuels may affect the quality of the fly ash produced for both cement kilns and for blended cements although up to 20 th% waste wood, up to 15 th% refuse derived fuel and a small percentage of chicken litter is acceptable. Only limited data are available on the amount of mercury in cement raw materials and none on the variability or speciation.

Concrete

Fly ash may be used to replace part of the cement in concrete, sometimes exceeding 50 wt% of total cementitious components in the case of calcareous fly ash. Substitution rates up to 35 wt% give overall satisfactory early strength and up to 40 wt% fly ash increases durability. Fly ash may be added as fine aggregate or partially replace cement, fine aggregate and water. The quality of the fly ash is generally greater when it is finer and has a lower carbon content. Requirements vary considerably for the many different concretes produced.

Fly ash is beneficial in concrete due to its pozzolanic reactions with free lime, rounded particle shape and by reducing the water demand. This helps to avoid segregation and bleeding in fresh concrete as well as improving long-term strength and durability. Most important is reduction of the alkali silicate reaction (ASR). This occurs with some aggregates and often causes premature and severe cracking of concrete. Other advantages include lower permeability, and better resistance to alkali, sulphate, chloride and CO_2 ingress, and corrosion, as well as higher electrical resistivity, reducing corrosion of the reinforcement. Freeze and thaw durability and the ability to withstand de-icing materials improve in some fly ash concretes but this is under investigation. Set time is generally longer through addition of fly ash to concrete, especially in cold weather. Calcareous fly ashes show mixed effects and class C fly ash may be used to make rapid hardening hydraulic cements with over 80% fly ash substitution. Concretes enhanced with fly ash may have a lower initial strength but this may suit some applications. Strength development is improved more by using ultra fine fly ash, for example in South Africa, than the more expensive silica fume.

Use of fly ash to substitute for aggregate at high replacement rates in concrete, for example at up to 50 wt% of sand, increases strength and elasticity. Cellular concrete using coal ash (30–90 wt% of total solids) is lighter in weight, has greater heat resistance and costs less than concrete made with usual aggregates. There is a large surplus of stored fly ash in many countries and yet high consumption of primary aggregates. Combining conditioned fly ash with sand at the quarry and marketing the product as an 'active' sand or using it with recycled building rubble would be a solution.

Higher carbon in ash as a result of NOx emissions reduction prevents its application in many concretes but beneficiation processes solve the problem. Studies of ammonia release from fly ash from power stations using ammonia based NOx control show there are no safety concerns for workers. The rate of loss of ammonia from concrete was limited by diffusion through the concrete.

Fly ash from cofiring coal with other fuels is excluded from use in concrete in most countries, although permitted with certain restrictions in Germany and the Netherlands. Fly ashes from cocombustion at up to 10 wt% of paper sludges and biomass pellets conform to the European standard for concrete. The effect on fly ash of greater proportions and other alternative fuels is under investigation. This issue requires better understanding because increased cocombustion with biomass is promoted to reduce greenhouse gas emissions.

Leaching of mercury and other trace elements from concrete incorporating fly ashes complies with regulations. Mercury emission controls based on activated carbon may affect use of fly ash in concrete but new mercury sorbents are under development.

Treatments and beneficiation

Carbon may be increased to loss-on-ignition (LOI) values as high as 30% and ammonia can contaminate fly ash at 200–2500 ppm. Various processes are in commercial use to reduce these values either in combination or separately. Draining and drying of stockpiled fly ash is releasing lagoon space and increasing its utilisation.

Fly ash is classified in the different stages of the ESP hoppers. Air classification is carried out in the UK for all fly ashes used in structural concretes. A multi-stage air classification process achieves low LOI from high carbon fly ash. Hydraulic classification is used for stored ash in the USA. Grinding fly ash can improve the compressive strength of concrete. Sieving and blending of fly ashes from different plants in the Netherlands produces a high quality fly ash and high carbon fly ash with strict quality control.

Gravity separation is suitable for fly ashes with variable particle density. Magnetic separation produces fly ash for the ceramic industry and extracts an iron product. Froth flotation may be used with classification to produce low LOI and fine fly ash products. Similarly, electrostatic separation and carbon burnout achieve a consistently low LOI from a wide range of values. Processes based on microwave carbon burnout, ash modified clinker technology, and a slagging furnace are under development.

Each issue of *Profiles* is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular issue of *Profiles* is based on the report:

Cement and concrete – benefits and barriers in coal fly ash utilisation
Irene Smith
CCC/94, ISBN 92-9029-409-4, 70 pp, January 2005, £255*/£85†/£42.50‡

* non-member countries
† member countries
‡ educational establishments within member countries

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IEA Clean Coal Centre has contracting parties and sponsors from: Australia, Austria, Canada, Denmark, the European Union, India, Italy, Japan, the Netherlands, New Zealand, South Africa, Sweden, the UK and the USA.

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