TECHNICAL EVALUATION

AND

PRELIMINARY DETERMINATION

CEMEX Construction Materials Florida, LLC
Line 2 As-Built Configuration
CEMEX Brooksville South Cement Plant
Hernando County

DEP File No. 0530021-018-AC
PSD-FL-351C

Department of Environmental Protection
Division of Air Resource Management
Bureau of Air Regulation
Special Projects Section

December 29, 2009

TECHNICAL EVALUATION AND PRELIMINARY DETERMINATION

1. GENERAL PROJECT INFORMATION

Facility Description and Location

The facility consists of the CEMEX Brooksville South Cement Plant owned by CEMEX Construction Materials Florida, LLC (CEMEX) and the Central Power and Lime (CP&L) Power Plant owned by Arroyo Energy. The two plants operate under a single facility Title V Air Operation Permit. The facility is located at the site indicated in Figure 1 below in Hernando County at 10311 Cement Plant Road in Brooksville, Florida. The UTM coordinates are Zone 17; 360.0 km East and 3162.5 km North. This site is in an area that is in attainment (or designated as unclassifiable) for all air pollutants subject to a National Ambient Air Quality Standard (NAAQS).

Figure 1. Facility location, Brooksville, Florida. Figure 2. Baghouse and stack for Line 1 and CP&L.

The cement plant consists of two portland cement lines (Lines 1 and 2) including associated kilns (Kilns 1 and 2) and clinker coolers (Coolers 1 and 2). The cement plant is categorized under Standard Industrial Classification (SIC) Code No. 3241. Line 1 and the CP&L Power Plant share a common baghouse and stack that are shown in Figure 2 above. Line 2, the subject of the present evaluation, began operation in November 2008 and has a separate stack and pollution control equipment.

Facility Regulatory Categories

The existing facility is identified as a major source of hazardous air pollutants (HAP).

The operator of the CP&L Power Plant has applied to EPA for treatment as a Title IV source.

The existing facility is a Title V major source of air pollution in accordance with Chapter 213, Florida Administrative Code (F.A.C.)

The existing facility is a major stationary source with respect to the rules for the Prevention of Significant Deterioration (PSD) at Rule 62-212.400, F.A.C.

Background

Line 2, with a capacity of 2,800 tons per day of clinker, was constructed pursuant to Air Permit 0530021-009-AC (PSD-FL-351) issued in 2005 to the previous owner, Rinker. A review for the Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) were conducted for Line 2. The project is to issue an air construction permit to reflect the as-built configuration for the previously permitted and constructed Portland Cement Line 2.

Line 2 began operation in November 2008 and compliance with the BACT requirements and other applicable emission regulations was demonstrated in the first half of 2009. The key BACT emission limits from Kiln 2 and Clinker Cooler 2 (the main emissions units) are based on the following controls:

- Staged combustion calciner and raw material selection for the control of volatile organic compounds (VOC), carbon monoxide (CO) and nitrogen oxides (NO_X);
- Selective non-catalytic reduction (SNCR) by ammonia injection to further control NO_X;
- Dry scrubbing in the calciner and contact with moist limestone in the raw mill to control sulfur dioxide (SO_2);
- Raw material and fuel selection to minimize mercury (Hg) emissions; and
- Fabric filter baghouses to control particulate matter (PM/PM_{10}).

The tables below are included at this point to put into better perspective the present application and changes requested by CEMEX. The first table was included in the original permit authorizing construction of Line 2. It was based on information submitted in the original application to construct Line 2. The column indicating maximum emissions is an estimate of the potential-to-emit (PTE) in tons per year (TPY) per the original Line 2 application. The maximum emissions include contributions from Kiln 2 and Clinker Cooler 2 as well as all of the raw materials and product storage, handling and conveyance operations.

Table 1. Original Line 2 Project PSD Applicability Calculations and Potential to Emit (PTE)

POLLUTANT	PSD SIGNIFICANCE LEVELS (TPY)	MAXIMUM EMISSIONS (TPY)	SUBJECT TO PSD REVIEW?
PM/PM_{10}	25/15	256.4	Yes
SO_2	40	122.7	Yes
NO_X	40	1126.2	Yes
CO	100	2133.6	Yes
VOC (Ozone)	40	105.3	Yes
Mercury (Hg)	200 pounds per year	122 pounds per year	No

For reference, all of the SO_2, NO_X, CO, VOC and Hg are emitted from the single baghouse and stack that handle the combined emissions from Kiln 2 and Clinker Cooler 2. PM/PM_{10} are also emitted from Kiln 2 and Clinker Cooler 2 but are also emitted from the materials and product handling, storage and conveyance operations. Table 2 is a comparison of the stack compliance tests conducted during the first half of 2009 with the BACT emission limits in the existing permit. The values are in pounds per ton of clinker (lb/ton clinker) and in pounds per hour (lb/hr).

The results include both Kiln 2 and Clinker Cooler 2 that exhaust through a single stack. The column on the right provides the permitted PTE from Line 2 for SO_2, NO_X, CO and VOC and are emitted only from the combined Kiln 2 and Clinker Cooler 2 fabric filter baghouse and stack. The values for visible emissions (VE) and PM/PM_{10} reflect only Kiln 2 and Clinker Cooler 2 and do not include materials storage, handling and conveyance. As a general observation, the PTE PM/PM_{10} from Kiln 2 and Clinker Cooler 2 comprise on the order of half of the PTE PM/PM_{10} from all of Line 2.

Table 2. Compliance Emissions Testing for Common Kiln 2/Clinker Cooler 2 Exhaust Stack

Pollutant	BACT Limits (lb/ton clinker)	Emissions Tests (lb/ton clinker)	BACT Limit (lb/hr)	Emissions Tests (lb/hr)	Annualized Limits (TPY)
PM/PM_{10}	0.23/0.20	0.045/0.045	28.8/25.0	5.5	126.1/109
SO_2	0.23	0.01	28.8	1.3	126.1
NO_X	1.95	1.76	243.75	205.7	1,067
CO	3.6	1.3	450.0	152.3	1,971
VOC	0.12	0.03	15.0	3.2	65.7
VE	10% opacity	9.2/4.5 [1]	Note 1. Mill down/mill up, highest 6-minute average.		

The Department reviewed continuous emissions monitoring systems (CEMS) data for September 2009 and found that emissions for NO_X, CO and VOC averaged 1.84, 0.87 and 0.04 lb/ton clinker respectively. SO_2 emissions were practically nil. The kiln performed very well with respect to the conventional PSD pollutants.

The company also conducted tests for Hg and dioxin/furan (D/F) required by 40 Code of Federal Regulations (CFR) Part 60, Subpart LLL - National Emission Standards for Hazardous Air Pollutants (NESHAP) From the Portland Cement Manufacturing Industry (Subpart LLL).

Table 3. D/F and Hg Testing for Common Kiln 2/Clinker Cooler 2 Exhaust Stack

Pollutant	Hg (µg/dscm [1])		D/F (ng TEQ/dscm [2])	
Mode	Test	LLL	Test	LLL
Raw Mill On	0.59	41	0.0018	0.2
Raw Mill Off	300	41	0.0025	0.4

1. micrograms per dry standard cubic meter (µg/dscm)
2. nanograms total toxic equivalent per dry standard cubic meter (ng TEQ/dscm)

The D/F tests were conducted in May 2009. The D/F results are excellent and are several orders of magnitude less than the respective limits. This is in contrast with Kiln 1 at Brooksville South Cement Plant and Kilns 1 and 2 at Brooksville North Cement Plant that have had chronic problems complying with the D/F standards. The Hg tests were conducted in November 2009.

Kiln 2 at the Brooksville South Cement Plant is the first project in Florida (and possibly the U.S.) that actually has an applicable standard pursuant to Subpart LLL. The applicable standard of 41 µg Hg/dscm is under reconsideration, but nevertheless applies to this kiln since it appears that construction commenced after December 2, 2005.

http://cementamericas.com/mag/cement_rinker_names_new/

The proposed version of the reconsidered Subpart LLL was published in May 2009 and includes the same applicability date. However the proposed Hg limit is a long term standard of 14 lb/million tons of clinker rather than a short-term standard. It will be finalized in early 2010.

According to the tests, the kiln did not comply with the presently applicable limit when the raw mill is down. Extrapolation by CEMEX of the data to a full year of operation yielded an annual rate of 138.8 lb Hg/yr compared with the Department's limit included in the permit of 122 lb Hg/yr. For reference, their extrapolation assumed only 7,884 hours of operation and therefore does not represent PTE. If the proposed reconsidered Subpart LLL is promulgated, the kiln would not comply if operated in the same manner as operated during the recent Hg tests.

Whereas the NESHAP compliance is demonstrated by single tests, the Department limit is demonstrated by long-term materials testing and development of a material balance. At this time, CEMEX is conducting diagnostic tests to develop solutions to the exceedances of the limits.

Related Permitting Actions

For reference, the present permit action is DEP File 0530021-18-AC (PSD-FL-351C). The present action is essentially a modification and re-issuance of the original permit. Following are other historical permitting actions or ongoing permit projects related to Line 2:

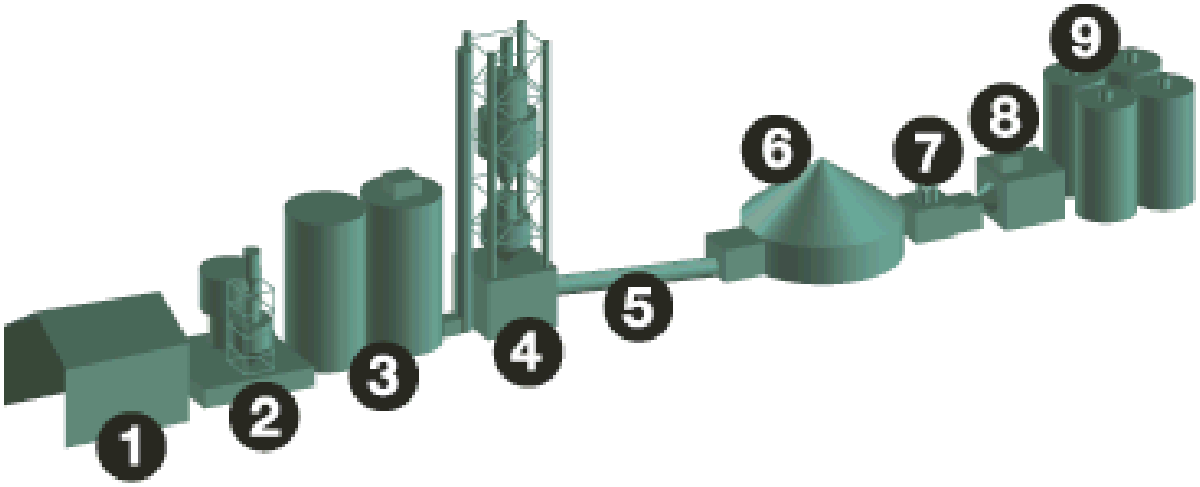
- The original Permit 0530021-009-AC (PSD-FL-351) was issued on July 6, 2006 and authorized construction of Line 2. It will be superseded by the present permitting action.
- Corrections to process rates were made on August 2, 2005 under Permit 0530021-012-AC (PSD-FL-351A). The corrections will also be shown in this as-built configuration permit.

- The original permit authorized introduction of whole tires at the cold side of the kiln (base of the preheater). Department Permit 0530021-015-AC (PSD-FL-351B) issued in September 9, 2008 authorized whole tire introduction at the hot side (near the main kiln burner). The design is called a tire injection mechanism (TIM). The permit allowing construction of the TIM will be rolled over into this as-built configuration permit.
- The applicant requested additional time (DEP File 0530021-020-AC) to complete construction, conduct compliance tests, submit the Title V operation permit application and conclude the TIM project. Initial construction is complete and the compliance tests have been conducted. Only sufficient time is required to complete the TIM project. Additional time (until December 31, 2010) will be provided to complete construction of the TIM.
- The applicant applied to test various alternative fuels (DEP File 0530021-017-AC). That application remains incomplete until the company obtains this as-built permit and provides additional details regarding the nature of the fuels.
- A Title V permit application was submitted to include Line 2 (DEP File 0530021-021-AV). Action on that request will be taken after issuance of this final as-built configuration permit.

Project Description

The present request is to modify the permit to reflect the differences between the original design based on an assumed supplier (possibly Polysius) and the final configuration based on the design practices of the selected equipment supplier (F.L. Smidth). By and large those differences are related primarily to the sizes and flow rates in the fabric filter baghouses used for material conveyance, separation and storage. The differences are typically offsetting in nature such that on-balance there is little net difference in total project PM/PM_{10} emissions compared with permitted values. In the present project, there is another difference that has some effect on combustion exhaust gas emissions.

The basic portland cement dry process is the same regardless of manufacturer and is shown in the Figure 3 below. In Line 2, gaseous emissions from Components 2, 4, 5 and part of 6 are combined in a single emissions point at a common stack. The as-permitted version of Line 2 assumed there will be a heater at Component 2 (raw mill) that will assist (only to the extent needed) in the drying of raw materials that are otherwise dried by Kiln 2 and Clinker Cooler 2 exhaust gases prior to exiting via the common stack.



1. Raw Material Storage
2. Grinding (Raw Mill)
3. Blending, Feed
4. Preheater/Calciner
5. Rotary Kiln
6. Clinker Cooler and Storage
7. Additions (e.g. Gypsum)
8. Cement Grinding (Finish Mill)
9. Bulk Storage & Loading

Figure 3. Components and Key Operations of a Modern Dry Process Cement Plant

The permitted design assumed that there will be no heater at Component 8 (finish mill). The only emissions expected from the stack at the finish mill were therefore only PM/PM_{10} because all combustion gases exit through the described Kiln 2/Clinker Cooler 2 common stack.

The permitted configuration reflects the typical practice for an in-line vertical raw mill. Instead, the F.L. Smidth project design incorporated a ball mill for the raw mill that has several benefits including assistance (by generated friction heat) in drying of the raw materials. The result was that the described heater was not needed or included within Component 2 in the as-built Line 2.

The permitted configuration also reflects the typical practice using a ball mill for product cement grinding at the finish mill. Instead, the F.L. Smidth project design incorporated a vertical mill for the finish mill that has some process benefits but which (at times) requires use of a heater to assist in driving off moisture (from ambient air) from the finished cement prior to storage and shipping.

The as-built configuration includes a small 45 million Btu per hour (mmBtu/hr) propane or diesel-fueled dryer within the cement finish mill at Component 8 rather than a 32 mmBtu/hr dryer located at the raw mill at Component 2. No changes are requested in the key BACT, production or emission limits for Kiln 2 or Clinker Cooler 2. However, emission increases are requested to account for the heater at the new location.

Within the previous location, emissions from the dryer (usually intermittent based on drying requirement) were included within those of Kiln 2/Clinker Cooler 2. It was possible to offset the emissions from the heater by additional ammonia injection to reduce NO_X from the kiln and calciner while SO_2 emissions would have been controlled by the presence of warm and moist limestone within the raw mill.

At the proposed finish mill location, it is not feasible to inject ammonia to control NO_X emissions. Also, it has not been accepted by the applicant that ground clinker will scrub SO_2 in the same manner that finely divided lime scrubs SO_2 in the calciner or in the manner that limestone in the raw mill scrubs SO_2. Table 3 indicates the emissions expected by the applicant from the air heater when located at the finish mill.

Table 4. Applicant's Estimate of Emissions from the Air Heater if Located at the Finish Mill

SO_2		NO_X		CO		VOC	
lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
21.0	26.3	30.9	38.7	17.8	22.3	< 3	3

The PM/PM_{10} emissions were not estimated. These are consolidated and controlled with PM/PM_{10} emissions from the finish mill which is equipped with a fabric filter baghouse subject to grain loading design requirements.

The applicant advised of a needed correction to the permitted natural gas utilization rate for Kiln 2. The original permit allows 432 million cubic feet per hour (million cf/hr). The correct value is 432 thousand cf/hr. This correction will be reflected in the as-built configuration.

Table 5 is a qualitative summary of the changes requested by CEMEX for Line 2. Almost all changes relate to the material handling, storage and conveyance equipment included in Line 2 and affect PM/PM_{10} emissions. Except for deletion of the air heater, Kiln 2 and Clinker Cooler 2 are unaffected.

The applicant submitted a detailed summary of the expected increases or decreases in PM/PM_{10} emissions for each of the changes described above. The result is that PM emissions from EU 45-62 under the as-built configuration will be 88.0 TPY compared with 85.7 TPY under the permitted configuration for an increase of 2.3 TPY. PM_{10} emissions will be 61.6 TPY rather than 60.0 TPY for an increase of 1.6 TPY.

Table 5. Qualitative Summary of Changes Proposed by Applicant

ARMS EU No.	Description in Original Permit	Primary Proposed Changes
044	Kiln 2, Preheater, Precalciner Clinker Cooler 2, and Air Heater	Correct natural gas rate Delete Air Heater.
045	Filter Dust	Add a baghouse for Filter Dust Bin Loadout Spout. Correct flow rate and temperature.
046	Raw Meal Transport	Correct flow rate and temperature.
047	Kiln Feed Transport	Add baghouses for Blend Silo Discharge and Kiln Feed Bin to Kiln Feed Transport. Correct flow rate and temperature.
049	Gypsum Bin	Delete Gypsum Bin
050	Clinker Storage	Add Baghouses for Clinker Silo Discharge 1 and Clinker Silo Discharge 2 to Clinker Storage Silo.
051	Finish Mill Collecting Bin	Change name to Finish Mill Additives Correct flow rate and temperature.
052	Finish Mill	Change Name to Finish Mill and Air Heater. Correct flow rate and temperature.
053	Air Slide	Delete Air Slide. Functions within Finish Mill.
054	Bucket Elevator	Rename as Finish Mill Bucket Elevator. Correct flow rate and temperature.
055	High Efficiency Separator	Delete High Efficiency Separator.
056	Cement Cooler	Delete Cement Cooler.
057	Cement Transport A	Rename Finish Mill Cement Transport, add Baghouse. Correct flow rate and temperature.
	Cement Transport B	Rename Finish Mill Rejects Transport, add Baghouse. Correct flow rate and temperature.
058	Cement Loadout Bin	Add Baghouses for Cement Silo 5, Cement Silo 5 Loading Bin, Cement Silo 5 Loadout Spout North and Cement Silo 5 Loadout Spout South. Correct flow rate and temperature.
059	Cement Loadout Bin	Add Baghouses for Multi Cell Cement Silo Multi Cell Cement Silo Alleviator Multi Cell Loadout Transport and Multi Cell Loadout Spout. Correct flow rate and temperature.
060	Coal Mill	Correct flow rate and temperature.
061	Fuel Bin	Rename Fine Coal Bin. Correct flow rate and temperature.
062		Add Packing Plant

Processing Schedule

11/24/2008 Received the application for a minor source air pollution construction permit.
12/24/2008 Department sent the applicant a request for additional information (RAI).
03/26/2009 Received response to RAI.
04/21/2009 Department sent second RAI.
06/23/2009 Received response to second RAI.
07/10/2009 Department sent third RAI.
10/06/2009 Received response to third RAI.
11/03/2009 Department requested further clarification by electronic mail.
11/04/2009 Received clarifications by electronic mail.
11/12/2009 Department requested further clarification by electronic mail.
11/12/2009 Received partial clarifications by electronic mail.
11/17/2009 Received final clarifications by electronic mail.
12/30/2009 Department distributed draft Intent to Issue package.

The processing of the permit was impacted by four changes in the professional engineer (P.E.) representing the applicant. Initially Ms. Fawn Bergen, P.E. of Koogler and Associates was responsible for preparation of the application. Larry Luccarelli, P.E. of CEMEX took over the function in early 2009. However, CEMEX returned responsibility to Ms. Bergen later in 2009. Ms. Bergen subsequently turned over the responsibility to her colleague, Mr. Steven Cullen, P.E. after joining another engineering company outside of Florida.

2. APPLICABLE REGULATIONS

State Regulations

This project is subject to the applicable environmental laws specified in Section 403 of the Florida Statutes (F.S.). The Florida Statutes authorize the Department of Environmental Protection to establish rules and regulations regarding air quality as part of the F.A.C. The original Kiln 2 project was subject to the applicable rules and regulations defined in the following Chapters of the F.A.C.

Chapter	Description
62-4	Permitting Requirements
62-204	Ambient Air Quality Requirements, PSD Increments, and Federal Regulations Adopted by Reference
62-210	Permits Required, Public Notice, Reports, Stack Height Policy, Circumvention, Excess Emissions, and Forms
62-212	Preconstruction Review, PSD Review and BACT, and Non-attainment Area Review and LAER
62-213	Title V Air Operation Permits for Major Sources of Air Pollution
62-296	Emission Limiting Standards
62-297	Test Methods and Procedures, Continuous Monitoring Specifications, and Alternate Sampling Procedures

Federal Regulations

The original project was also subject to the applicable federal provisions regarding air quality as established by the Environmental Protection Agency (EPA) in the following sections of the Code of Federal Regulations (CFR).

Title 40, CFR	Description
Part 60	Subpart A - General Provisions for NSPS Sources NSPS Subpart F - Standards of Performance for Portland Cement Plants. NSPS Subpart Y - Standards of Performance for Coal Preparation Plants. NSPS Subpart OOO - New Source Performance Standards For Nonmetallic Mineral Processing Plants. Applicable Appendices
Part 63	NESHAP Subpart A - National Emission Standards for Hazardous Air Pollutants – General Provisions. NESHAP Subpart LLL - National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry.

PSD and BACT Applicability Review

The Department regulates major air pollution sources in accordance with Florida's PSD program, as approved by the EPA in Florida's State Implementation Plan and defined in Rule 62-212.400, F.A.C. A PSD review is required in areas currently in attainment with the state and federal Ambient Air Quality Standards (AAQS) or areas designated as "unclassifiable" for a given pollutant. A "major stationary source" with respect to PSD is defined in Rule 62-210.200, F.A.C. (Definition 195) if it emits or has the potential to emit:

- 250 TPY or more of any regulated air pollutant, or
- 100 TPY or of any regulated air pollutant and the stationary source belongs to one of categories given in Rule 62-210.200(195)(a)1., F.A.C.

For new projects at PSD-major sources, each regulated pollutant is reviewed for PSD applicability based on emissions thresholds known as the Significant Emission Rates (SER) listed in Rule 62-210.200(280)(a)1., F.A.C. Pollutant emissions from the project exceeding the respective SER are considered "significant" and the applicant must employ BACT to minimize emissions of each such pollutant and evaluate the air quality impacts.

The facility was a major stationary source prior to permitting of Line 2. The Line 2 project triggered the SER for NO_X, CO, SO_2, VOC and PM/PM_{10}. The applicant conducted ambient air quality modeling and the Department issued a BACT determination consisting of the controls and emission limits given in the original Line 2 permit.

When taken as a whole, the requested revisions due to the as-built configuration do not result in any significant emissions increases. The applicant believes this project is not subject to PSD preconstruction review. Clearly, the Department would have conducted a BACT review for the heater located at the finish mill if it had been addressed in the original application. The Department considered the emissions from the planned raw mill heater during the original application and included them in the BACT emission limits for EU 044.

The Department does not consider the installation of the heater at the finish mill (within the actual construction of Line 2) to be a separate project that can escape PSD and a BACT determination by obtaining an after-the-fact permit. The Department has concluded that it is necessary to conduct a BACT determination for the small heater at the finish mill.

The air heater has a rating of only 45 mmBtu/hr and is not subject to an NSPS. Typical equal sized process heaters (that heat materials that in turn transfer heat) are sometimes subject to 40 CFR 60, Subpart Dc which imposes few if any requirements.

The Department has determined that use of low sulfur fuel oil with a specification of 0.05% sulfur is appropriate as BACT for this small air heater. This will reduce emissions of SO_2 from the 26.5 TPY to less

than 3 TPY. The Department believes that NO_X emissions will be less than predicted by the applicant and will require testing to determine the magnitude of those emissions.

Previously, the Department required only visible emission testing of the finish mill. Because the heater and finish mill emissions will exit from a common stack, the Department will require initial and annual testing for this combined source. Testing requirements will include stack testing for NO_X, CO, PM/PM_{10} and fuel analysis for sulfur.

3. CHANGES TO PERMIT

The changes to the original permit are shown in the enclosed draft permit. They are generally highlighted in bold script or described as notes that will be removed upon issuance of the final permit. Generally, the tables have been simplified and redundant limits have been removed (such as tons per year when lb/hr limits suffice). The Department will incorporate directly into the permit the applicable Hg concentration limits for new kilns pursuant to 40 CFR 63, Subpart LLL. Due to reasons of representativeness, the Department will require month-by-month sampling and testing of raw materials and fuels for Hg rather than allowing testing during one month per quarter.

4. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the "as-built" project design configuration project will comply with all applicable state and federal air pollution regulations as conditioned by the draft permit. This determination is based on a technical review of the application, the limited reasonable assurances provided by the applicant, and the conditions specified in the draft permit. No air quality modeling analysis is required because the project does not result in a significant increase in PSD-pollutant emissions. Teresa Heron is the project engineer responsible for reviewing the application and drafting the permit. Additional details of this analysis may be obtained by contacting the project engineer at the Department's Bureau of Air Regulation at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.