AIR DISPERSION MODELING PROTOCOL
FOR AIR PERMIT APPLICATION
RAVENA PLANT MODERNIZATION PROJECT

Prepared for:

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EXECUTIVE SUMMARY

Lafarge Building Materials, Inc. (Lafarge) is proposing a modernization of its cement manufacturing facility in the town of Coeymans, New York (commonly known as the Ravena Plant). The air permit application for this project will need to include an air dispersion modeling analysis for certain air pollutants as required by the U.S. Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (DEC) rules. In particular, this project is expected to trigger the Federal Prevention of Significant Deterioration (PSD) requirements under 40 CFR 52.21 for carbon monoxide (CO). For all other PSD pollutants, it is expected that there will not be a significant net emissions increase that would trigger PSD for those pollutants. In addition, the air permit application must demonstrate compliance with the DEC's Guidelines for Control of Toxic Ambient Air Contaminants (TAACs).

A detailed netting analysis will be submitted to the DEC as part of the air permit application. The netting analysis will include all stationary source emissions at the plant site (including sources not being modified such as the barge loadout operations) in accordance with applicable Federal and State rules. If the project does not net out of PSD or nonattainment new source review for any other applicable pollutant besides CO, this protocol may need to be revised to address modeling for that pollutant.

Both these rules require an air dispersion modeling analysis and approval of a modeling protocol. Because the modeling approach will be similar for both the PSD modeling and the TAACs modeling, this document provides a single modeling protocol for submission to both EPA and the DEC.

The scope of additional modeling for the Environmental Impact Statement is still under discussion with the DEC.

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SECTION 1

PROJECT DESCRIPTION

Lafarge Building Materials, Inc. (Lafarge) is proposing a modernization of its cement manufacturing facility in the Town of Coeymans, New York (commonly known as the Ravena Plant) with a multi-million dollar investment. The Ravena Plant is located on Route 9W, approximately 10 miles south of Albany, New York (Figure 1). Lafarge owns approximately 3,274 contiguous acres East and West of Route 9W. The 3,274 acre site includes the quarry, the cement plant, the conveying system from the plant to the docking and loading facilities on the Hudson River, and a piece of land that is leased to Callanan Industries for their aggregate operation. The Project Site (Site), comprising approximately 120 acres, will be located within the existing manufacturing operations. Figure 2 shows the Site location on an aerial photograph.

When it was originally constructed by Atlantic Cement Company in 1962, the Ravena Plant was the most advanced cement production facility in the world, and pioneered a new concept in cement production. The existing facility features a limestone quarry, two raw mills, four finish mills, two wet process rotary kilns, storage silos, and a wharf. The clinker is converted into cement through a grinding process and shipped by barge, truck, and rail throughout New York State and the Northeast Atlantic States.

The Ravena plant manufactures Portland cement. The cement manufacturing process is a pyro-process that involves the heating of raw materials in an inclined kiln to extremely high temperatures (2500 to 2600 degrees Fahrenheit) to drive the chemical reactions necessary to transform the raw materials into clinker. Clinker is the intermediate product that must be finely ground and mixed with gypsum to produce Portland cement.

Wet process kilns, like the ones at the Ravena plant, are now older technology. The kilns are long and not very fuel efficient, because of the amount of water that must be evaporated from the slurry (raw materials mixed with water) and the relatively inefficient heat transfer process.

Over the past three decades, the cement industry has increased efficiency by concentrating new capital investment in plants that use the dry process to manufacture cement,

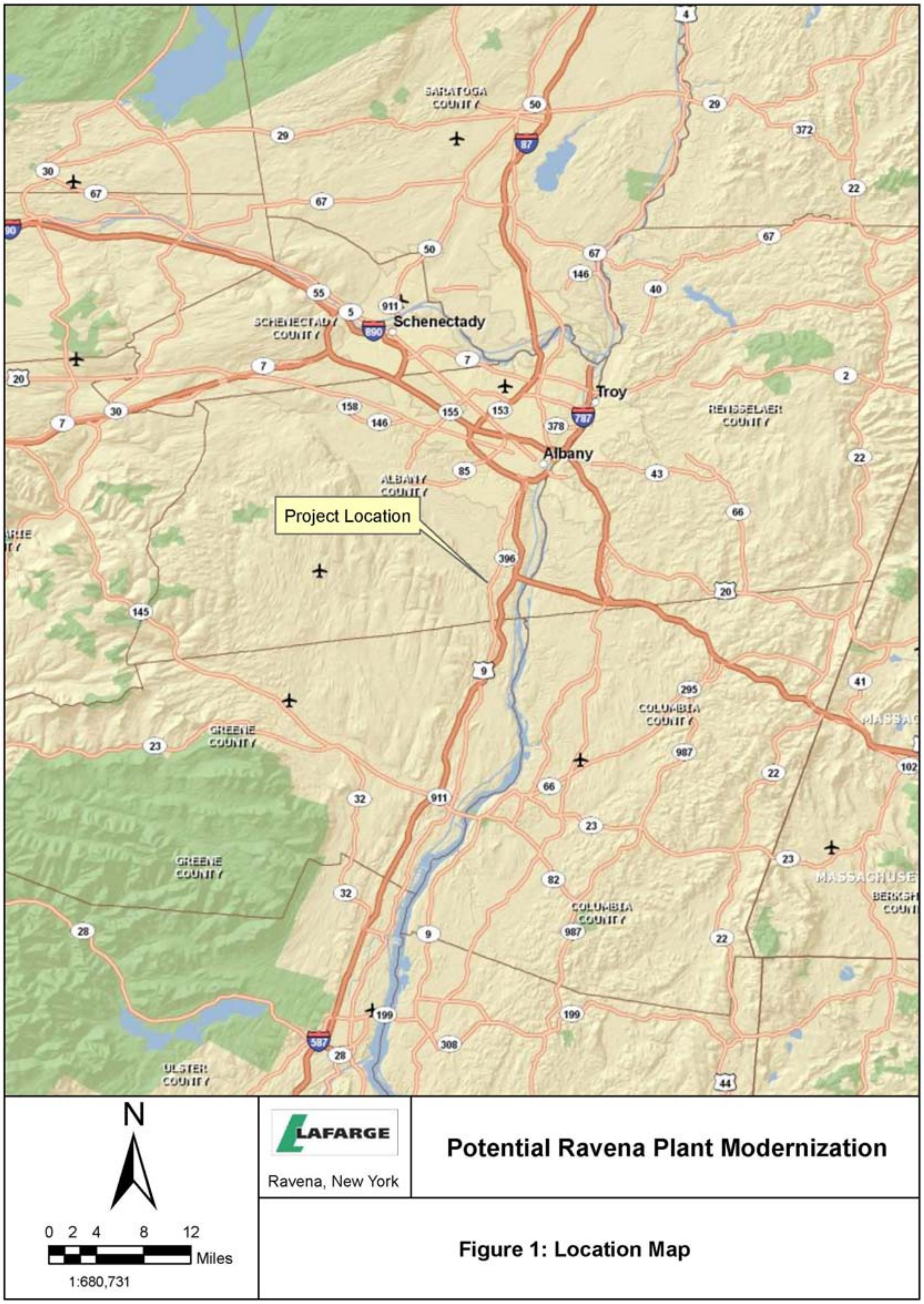

Figure 1: Location Map

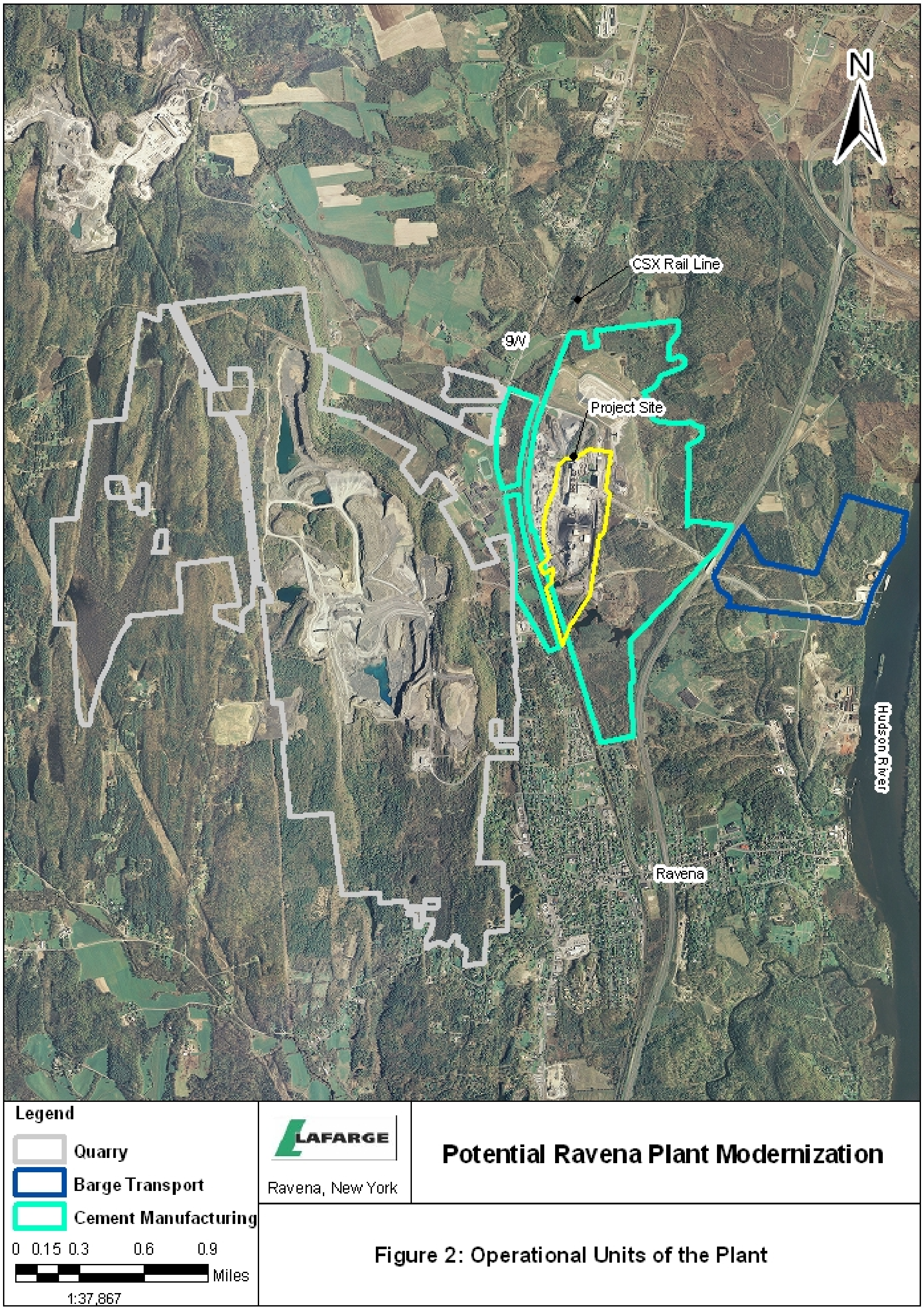

Figure 2: Operational Units of the Plant

phasing out operations that rely on the more energy-intensive wet process. Lafarge's proposed modernization of the Ravena facility is the latest step in an industry-wide trend. The initial phase of the modernization project, which entails the replacement of the existing two wet kilns with a single pre-calciner kiln line, is projected for completion by 2014.

In a dry process, the raw material is pre-heated prior to entry into the kiln; therefore, the kiln length can be substantially shortened, resulting in lower energy consumption. Preheating occurs in a tower using the exhaust gas of the kiln. The preheated material then enters a pre-calciner where it is heated by an additional burner to a temperature of 1800 degrees Fahrenheit before it enters the kiln. The material entering the shorter kiln is heated to a final temperature of 2500 degrees Fahrenheit before being cooled into clinker. The modernization project proposes to use this technology. The new kiln system will not only make a more efficient use of fuel, but also incorporate state-of-the art emission control technology. A wet scrubber system, or equivalent alternative control system, the first of its kind on a Lafarge owned cement plant in North America, combined with selective non-catalytic reduction (SNCR) technology system, will equip the proposed Ravena plant with the most modern cement manufacturing technology in New York State.

The proposed project includes the construction and operation of a state-of-the art pre-heater/pre-calciner, kiln and clinker cooler operation with future planned replacement or upgrade of the existing cement grinding mills. Material handling systems and storage will be adjusted to transfer and store the raw and finish materials to and from the modernized production line. There are no physical changes anticipated in the quarry operation. The mode of transportation of raw materials and finished product coming in or out of the plant including the existing barge loading operation will also remain intact.

SECTION 2

SOURCE IDENTIFICATION AND CHARACTERIZATION

As noted in the Executive Summary, there will not be a significant net increase in emissions for any pollutant except CO. The CO emitted from this project will all be released from the main stack at a height of approximately 526 feet. There are no other significant stationary sources of CO at the facility. Emission sources vented through the main stack include the preheater/precalciner, kiln, in-line raw mill, coal mill, alkali bypass and the clinker cooler. The stack is immediately adjacent to the preheater tower, which is approximately 462 feet tall. The CO emission rate will be determined as part of the Best Available Control Technology (BACT) analysis required under the PSD rules.

The list of TAACs to be analyzed was determined by examining various references for toxic emission factors from Portland cement kilns, including EPA's AP-42, the Factor Information Retrieval (FIRE) System, and EPA's Toxic Release Inventory (TRI) reporting guidance. The list of proposed TAACs and the selected emission factors are presented in Appendix A.

By prior agreement with the DEC, the TAAC analysis will focus on emissions from the main stack. This is because the overwhelming majority of TAAC emissions from the plant are from the main stack and because the emission factors are specific to the kiln.

There will be several operating scenarios for the new kiln system (reflecting operation/non operation of the raw mill, coal mill, and waste heat recovery boiler). Other sources in the modeling analysis do not have significant variations. For estimating long-term concentrations, the normal operating scenario will be modeled. For estimating maximum short-term concentrations, the scenario that results in the maximum concentrations will be modeled.

With regard to variations in CO emissions during start up and shut downs of the kiln system, it should first be noted that there are relatively few of these events, especially with a new system once initial shakedown is completed. Normal kiln availability (excluding an annual shutdown for routine maintenance) is 98 percent or greater. Also, as discussed in the Control Technology Report, most of the CO emissions are due to organics in the limestone rock. During start up, oil and gas are used to heat the kiln and calciner before introducing coal to bring the system up to operating temperature; kiln feed is off during this process. Once the kiln feed is started, the system is operating normally and there is no spike in CO emissions as a result of the start up process. In a shutdown, the kiln feed is cut off first, which cuts off the main source of CO emissions. Thus, there is no need to evaluate separate CO emission scenarios during start up or shut down.

With regard to intermediate load conditions that could result in stack parameters with poorer dispersion characteristics, it should be noted that cement kilns are not operated like a power plant or other source where the operating rate is a function of varying demand conditions. Normally a cement kiln is operated in excess of 90 percent its capacity. Nonetheless, a scenario that represents 75 percent of the permitted capacity will be also evaluated.

SECTION 3

AIR QUALITY MODELING METHODOLOGY

3.1 Introduction

For CO, there are no PSD increments or impacts of concern in Class I areas (e.g., visibility impairment, sulfate/nitrate deposition). (In a July 23, 2008, telephone call, the Federal Land Manager (FLM) contact, Mr. Chuck Sams, confirmed that no FLM involvement in this project was necessary). Therefore, the analysis will focus on compliance with the National Ambient Air Quality Standards (NAAQS) for CO and will not require use of a long distance transport model such as CALPUFF. With respect to the preconstruction monitoring requirements of 40 CFR 52.21 (m), Lafarge proposes to use the monitoring data from the DEC monitoring station in Loudonville located approximately 19 miles from the Ravena plant. Data are available from this station from 1997 through 2007, meet minimum data capture requirements and have been determined by DEC to be representative for purposes of previous PSD permitting projects in the area.

For the CO NAAQS analysis, a determination will first be made of whether the PSD significant impact levels (SIL) or the significant monitoring concentrations (SMC) at 40 CFR 52.2(i)(5) for CO are exceeded due to the net emission increase of the project. If the SIL are not exceeded, no further analysis for CO will be required. If they are, a cumulative impact analysis will be performed. This analysis would include off-site sources as part of the demonstration. These off-site sources will be obtained from NYSDEC Division of Air staff and reviewed by EQM for completeness. As described in DAR-10 Appendix C, the GARD/D^2 method will be used to determine which of the supplied sources are significant and therefore included within the analysis. As noted within applicable guidance, the accuracy of the data supplied will need to be verified. EQM will work with appropriate staff to reasonably assure that these data represent the best available data.

CO background concentrations will also be obtained from NYSDEC Air Division staff and be based upon the most representative monitoring data from the DEC monitoring station in

Loudonville. Per DAR-10 guidance, as a most conservative approach, it is anticipated that highest-second-highest (HSH) values from the last three years of available data will be used for determining CO background concentrations.

If the project results in a significant net emissions increase for any other PSD pollutant, a modeling analysis similar to that described above for CO would be conducted.

By prior agreement with the DEC, the screening techniques in the TAAC Guidelines will be skipped, and all TAACs will be evaluated using the more sophisticated AERMOD Model.

With respect to modeling under DEC's CP-33, Assessing and Mitigating Impacts of Fine Particulate Matter Emissions, and additional modeling not required by Federal or State rules but requested in an August 1, 2008, letter from NYSDEC Region 4, Lafarge has proposed to evaluate "the impact of the modernized facility compared to the existing kilns and coolers." Lafarge proposes to model the air quality concentrations of PM_{10}, $PM_{2.5}$, SO_2, and NO_2 resulting from the new main stack and new vertical finish mill emissions (the major new sources under the project) and subtract concentrations of these pollutants resulting from the existing kilns and coolers which will be removed, thus providing the change in air quality concentrations at all locations throughout the receptor grid due to the major emission changes of the project. Emissions used in this analysis will be the potential emissions for the new sources and the 2004-2005 actual emissions for the existing sources. Concentration averaging times will be those associated with the NAAQS for each pollutant. The scope of this modeling is currently under discussion with the DEC.

3.2 Model Selection Rationale

For the Lafarge Ravena plant air dispersion modeling both the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W, Federal Register, November 9, 2005) and the *NYSDEC Guidelines on Air Dispersion Modeling Procedures for Air Quality Impact Analysis* (DAR-10, May 9, 2006) recommend the use of AERMOD. AERMOD is a steady-state Gaussian plume model with enhanced consideration of the vertical daytime and night time atmospheric boundary layer and terrain. AERMOD is a "preferred" EPA model in the *Guideline on Air Quality Models*.

An analysis of terrain features in the near vicinity of the Lafarge Plant located just north of Ravena, New York indicates low lying hills to the west of the Hudson River Valley, somewhat more level to rolling in the vicinity of the plant, and higher hills to the west. The terrain is significant enough to warrant the use of AERMOD but more advanced models like CALPUFF are not warranted given the nearness of the terrain to the sources at Lafarge. Models like CALPUFF may resolve wind components in terrain better than AERMOD but are limited by grid size that is greater than the distances to the terrain features. Thus, AERMOD (Version 06341) is the most appropriate model for this situation. The following is a summary of the rationale for using AERMOD:

- Ready EPA and NYSDEC acceptance – adheres to EPA guidance (*Guideline on Air Quality Models*) for source-receptor distances of less than 50 km, is an EPA "preferred" model and is recommended for non-complex modeling situations in DAR-10;
- Terrain analyses suggest minimal complex wind conditions over the majority of short source-receptor distances (0.1 – 10 km) where maximum concentrations are expected;
- Straightforward application methodology;
- Ability to model multiple sources of emissions coincidentally, consider hourly meteorological data, calculate concentrations for any averaging period, and determine the impacts in flat to rolling terrain;

3.3 AERMOD Overview

AERMOD is a steady-state straight line Gaussian plume model that considers the effects of nighttime planetary boundary layer effects and daytime convective activities. AERMOD has many features that make it the best model of choice for this analysis including:

- Promulgated for use by the EPA;
- Multiple source capabilities;
- Ability to model point, area, and volume sources;
- Hour-by-hour meteorological data used in calculations;
- Consideration of nocturnal and day time planetary boundary effects;
- User-specified grouped source concentration estimates;
- Building downwash of effluent;
- Variable receptor locations and terrain elevations considered.

AERMOD was raised to the status of "preferred" model in the U.S. EPA *Guideline on Air Quality Models* (Appendix W to 40 CFR Part 51, published in the Federal Register, November 9, 2005).

AERMOD consists of three modeling components:

> **<u>AERMOD</u>:** the dispersion, transport, and other modeling algorithms used to model point, area, and volume sources;
>
> **<u>AERMET</u>:** the meteorological preprocessor for AERMOD that combines surface meteorological data with upper air data to generate required hourly data;
>
> **<u>AERMAP</u>:** the terrain preprocessor for AERMOD that uses digitized elevation data from the USGS to generate height scales and base elevations for receptors.

These will be used together with the generated meteorological data sets and emission/source inventories to perform all modeling for the Lafarge Ravena plant.

3.4 AERMOD Input Requirements and Configuration for Lafarge Modeling

Given the considerations listed above, as well as consideration to EPA's direction towards using more advanced models for both regulatory and State-required modeling analyses, the EPA "preferred" regulatory model, AERMOD, was selected for the modeling of the local air impacts for the Lafarge modeling. All input to AERMOD, including source characterization, regulatory options, receptors, meteorological data, and land use characterizations, will be generated following the general guidance provided by the U.S. EPA *Guideline on Air Quality Models,* the *User's Guide for the AMS/EPA Regulatory Model – AERMOD* (U.S. EPA, EPA-454/B-03-001, September 2004), *the AERMOD Implementation Guide (*U.S. EPA, January 9, 2008), *the Addendum to the User's Guide for the AMS/EPA Regulatory Model* (U.S. EPA, December 2006), and the *DAR-10, NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis* (NYSDEC, May 9, 2006). The regulatory default option will be selected for all model input options as applicable as directed by the *Guideline on Air Quality Models.* More detailed discussion of individual inputs, parameters, and data sets are provided in the following subsections.

3.5 AERMAP

The AERMAP program will be run with local Digitized Elevation Model (DEM) data to determine the hill height scales and base elevation for each receptor, source, and structure used in the analysis. All DEMs required for processing will be based on currently available USGS

30-meter (7.5 minute) data. It is anticipated that the following USGS quads may be needed to cover all receptor points:

- Stottville, NY (42073C6)
- Hudson North, NY (42073C7)
- Leeds, NY (42073C8)
- Kinderhook, NY (42073D6)
- Ravena, NY (42073D7)
- Alcove, NY (42073D8)
- East Greenbush, NY (42073E6)
- Delmar, NY (42073E7)
- Clarksville, NY (42073E8)
- Troy South, NY (42073F6)
- Albany, NY (42073F7)
- Voorheesville, NY (42073F8)

Receptor locations are proposed that are consistent with recommendations from the *Guideline on Air Quality Models*, DAR-10, and recent $PM_{2.5}$ guidance. The receptors that will be used for the analysis include a fence line (or property line) grid at approximately 50 meter intervals and multiple Cartesian grids from the fence line out to a distance sufficient to fully determine the Significant Impact Area (SIA) at grid spacing varying from 100 meters near the fence line to 1000 meter intervals at the perimeter of the grid. Intermediate grid spacing of 250 and 500 meters will also be utilized out to the limit of the modeling domain which will be determined based on expected concentration impact levels. Grid resolutions of 100 meters will be implemented in complex terrain settings and areas identified as “hot-spots”. Receptor locations will also be located in Potential Environmental Justice (PEJ) areas identified by the DEC in the vicinity of the Ravena plant (the nearest of which is located approximately 9 miles from the plant). The concentrations will be used in an analysis of Environmental Justice issues.

3.6 AERMET Processing

The AERMOD preprocessor called AERMET (Version 06341) will be used to generate the meteorological data sets for use in the dispersion modeling for Lafarge. Based on past applications of meteorological data for the Hudson River Valley for similar PSD studies in the surrounding area and region, meteorological data will be selected from the nearby Albany

County Airport (NWS Station No. 14735 at latitude, 42.748^o north and longitude, -73.803^o west). The Albany County Airport is located approximately 15 miles (24 km) north of the Lafarge plant site near Ravena. The representativeness of the Albany County Airport data to the Lafarge plant site is reasonable considering the general similar valley orientations for the two areas and the same mesoscale meteorological conditions affecting each area.

As per the *Guideline on Air Quality Models*, a five year data meteorological set is acceptable to use for modeling if the location of the data is representative for the site to be modeled and onsite data are not available for a period of at least one year. The criteria for determining representativeness found in Section 8.3 of the *Guideline on Air Quality Models* refer to proximity of the measurement site to the area under consideration, the complexity of the terrain, the exposure of the instruments, and the period of record over which data were collected. Of primary concern is the appropriateness of the data to construct realistic boundary layer profiles and three dimensional meteorological fields. Concerning the proximity, the Albany Airport meteorological site is located just 15 miles from the Lafarge site just up the Hudson River Valley. Thus, both the distance and locale criteria in terms of geographical consideration are met. Comparing the terrain in the vicinity of the airport and the proposed plant, the airport is located in a wider portion of the valley system than Lafarge, but the terrain in the vicinity of the plant is rolling within the river valley. Terrain much higher than the kiln stack (considered "complex") lies further to the west of plant similar to the airport, and thus the airport data would be deemed representative both in terms of the surface data and more strongly in terms of the upper air data. Finally, the NYSDEC has accepted these data sets from the airport for modeling analyses of other new or modified sources in the Albany area including sources north and south of the Lafarge plant site and in closer proximity to the river in recent years.

The data consist of hourly observations of wind speed, wind direction, temperature, and other related meteorological variables. Data availability consists of NWS data sets pre-1993 as well as more recent data sets after the establishment of the NWS ASOS (automated surface observation system) network. Three data sets were examined for use in this analysis:

- 1986-1990 SAMSON data including precipitation measurements (required for any future analyses that require the effects of wet deposition)
- 1988-1992 NWS data with no precipitation

- 2003-2007 ASOS data in the ISHD (integrated surface hourly data) format including precipitation measurements

Commensurate upper air data files are available for use with the surface data for the Albany County Airport.

AERMET will be used along with these meteorological data sets to create the appropriate vertical profiles of wind and temperature data (the .pfl file), as well as the surface file of wind direction, wind speed, Monin Obukhov length, friction velocity, etc. for each hour for each year (the .sfc file). AERMET will adjust for the elevation of the surface station and its associated anemometer height (20 ft, 6.1 m). Preliminary AERMET processing of the various meteorological data sets indicates similar wind persistence from dominant and less likely wind fetches. The more recent 2003-2007 data has a range of calms from 19 to 21 percent per year of data which is a function of more recent data archiving practices whereby the minimum wind speed is set to 1.5 m/s (3.0 knots) and any values less than that are set to 0.0 knots in the raw processed meteorological data from the National Climatic Center. The AERMOD Model contains the Calms Preprocessing feature, which will account for calms as per the *Guideline on Air Quality Models*, Section 8.3.4, Treatment of Calms and Near Calms. Based on guidance provided by NYSDEC and EPA, the 2003-2007 ASOS data were selected.

AERMET also requires the geographical land use characteristics in the vicinity of the surface meteorological station to determine surface meteorological related parameters that are affected by the land use characteristics. These include the noon-time albedo, the daytime Bowen ratio, and the surface roughness length. These parameters are provided to AERMOD and are used to calculate and adjust the meteorological conditions in the atmospheric boundary layer to account for variations in the nighttime boundary layer and daytime convective boundary layer along with associated turbulence. The three variables are noted in the AERMET user's guide as a function of time-of-year and land use in the area around the meteorological site. To generate such information on the land use, the AERSURFACE processor recommended by U.S. EPA will be used.

Land use land cover data will be obtained through the National Map Seamless Server at their website: seamless.usgs.gov/website/seamless/viewer.htm. At this time AERSURFACE only supports the use of the NLCD1992 format for 21 land cover categories at a spatial resolution of 30m in the GeoTIFF format. Only the files indicated on the seamless server as being in the ".tif" format will be used as specified in the AERSURFACE user's manual. To accommodate the seasonal effects at the plant, four seasons will be used in the land use characterization. The EPA guidance indicates that the land use at the airport is the most appropriate for determining surface conditions. Recent consideration of land use at the plant sites of modeling studies has indicated differences between airports (where flat paved and grassy surfaces dominate) and plant sites. With this in mind, an AERSURFACE analysis of the Albany County Airport and the Lafarge Ravena plant site was conducted. Both locations were assumed to be located in an average precipitation area (not arid) and the distance to review land use data for the surface roughness will be set to the AERSURFACE user's manual default of 1.0 km. Twelve (12) sectors from 0^o to 30^o, 30^o to 60^o, 60^o to 90^o, etc. were selected to define the surface roughness (Bowen ratio and albedo are unaffected by the number of sectors). Based on average snow cover over the area, December, January, and February were assumed to have snow cover. Figures 3 and 4 show the land use around each site.

As can be seen, the Lafarge site is more rural and has more forested and cultivated areas. Review of the AERSURFACE resulting albedos, Bowen ratios, and surface roughness indicates small differences between the first two and up to 50 percent differences in the surface roughness lengths. Thus, using the Albany land use is not necessarily representative of the derived AERMET variables for the Lafarge site. Thus, Lafarge proposes to model the PSD pollutants and sources using both sets of AERSURFACE-derived meteorological data as discussed with NYSDEC (October 29, 2008 with Leon Sedefian via telephone). The more conservative estimated concentrations will be used to represent the impacts of the facility.

3.7 Other AERMOD Inputs

Other model inputs used in the AERMOD Model include a number of physical phenomena that it can represent and options that are available for model control and calculations. The regulatory default option of AERMOD will be used throughout all applications of AERMOD in the Lafarge modeling. Table 1 presents a summary of the features that are set by the regulatory default option as well as other options selected for this analysis. All options in Table 1 were chosen to be consistent with the requirements of the proposed modeling. Averaging times were selected to be consistent with those applicable to the CO NAAQS (1-hour and 8-hour) and the TAAC limits (1-hour and annual).

Figure 3. Land Use at the Albany County Airport

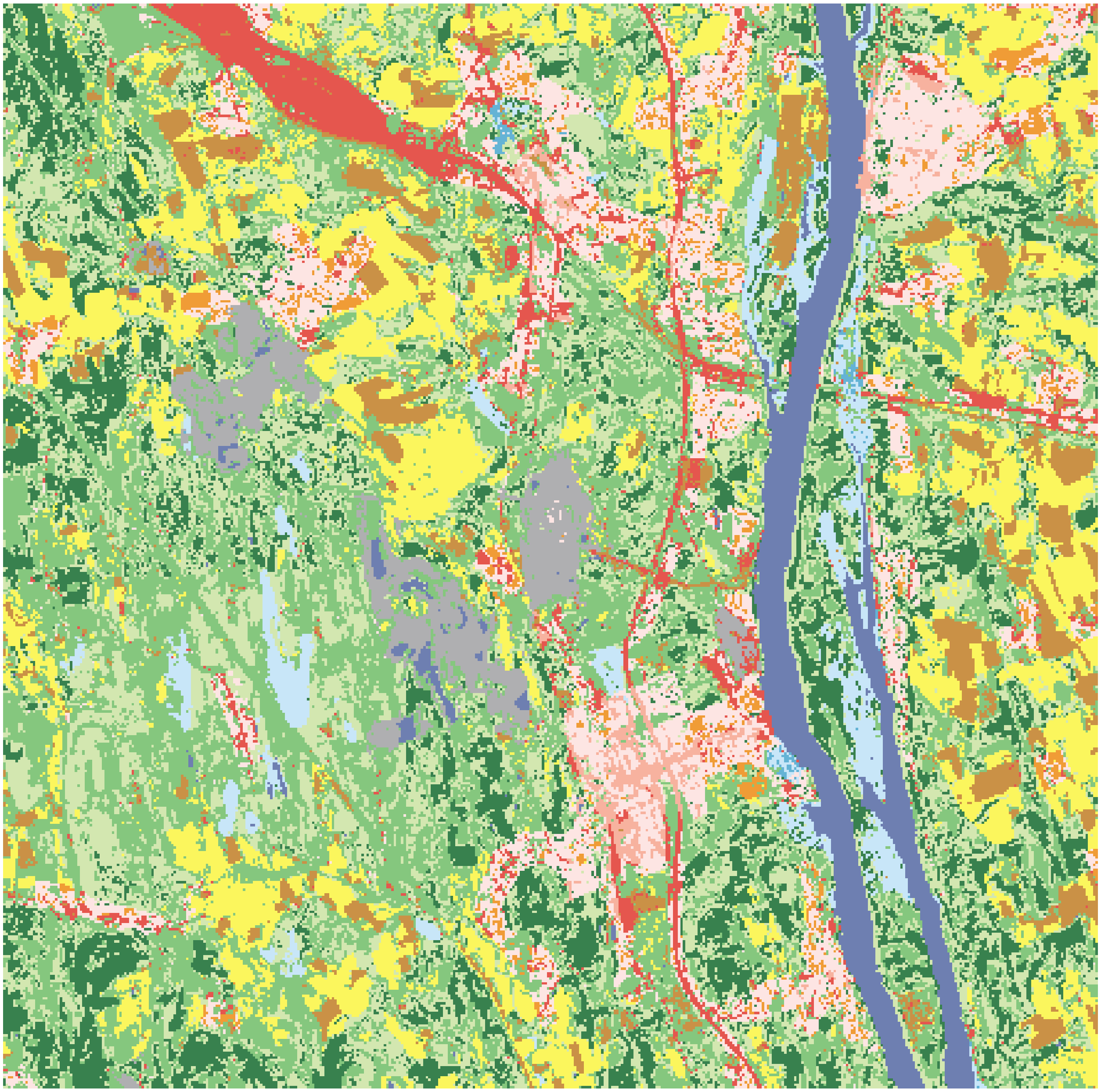

Figure 4. Land Use at the Lafarge Plant Site

TABLE 1. AERMOD OPTIONS PROPOSED FOR THE LAFARGE MODELING

Option	Description
Operating Mode	Regulatory default option will be selected.
Units	Concentrations in micrograms/cubic meter ($\mu g/m^3$) will be computed.
Map Projection	Universal Transverse Mercator coordinates (UTMs).
Terrain	Terrain elevations will be considered (using DEM 7.5’ 30 m data).
Dispersion	The Urban Dispersion Option (URBANOPT) will be assessed but probably not used.
Measurement Height	The wind system measurement height will be set to 6.1 meters (20 ft).
Downwash	Building aerodynamic downwash will be performed.
Landuse Definition	Albedo, Bowen Ratio, and surface roughness length will be included as per the land use around the Albany County Airport as specified by the U.S. EPA.
Reporting	Program control parameters, receptors, and source input data will be output.
Calm wind conditions	Concentrations during calm hours will be set to zero as per the *Guideline on Air Quality Models*, Section 8.3.4.
Averaging Times	Averaging times will be selected consistent with the 1-hr and 8-hr CO concentrations and 1-h and annual concentrations for TAAC’s.
Source Grouping	Groups of source outputs will be specified as per the requirements for ascertaining culpable sources and source groups

3.8 Building Downwash

The effluent plumes from the proposed stacks at the site will be affected by nearby buildings and structures. Because the stacks and building dimensions are such that building downwash of released effluent may cause the plumes to be influenced (which will tend to bring the plume closer to the ground), these effects will be included in the analysis.

The building and stack configuration of the facility will be shown in the final modeling documentation. According to the EPA guidance on considering the influence of a building stack, if the stack is less than a Good Engineering Practice (GEP) stack height, the effluent should be treated as if it were affected by the building. GEP stack height is defined as:

$$H_{GEP} = h_b + 1.5L$$

where:

H_{GEP} = Good Engineering Practice stack height (m)

h_b = Nearby structure height

L = The lesser of the nearby structure height or maximum projected width.

In this case, the height of each stack will be compared to the calculated GEP stack height for each building. A second criterion that will be applied to determine if downwash will be applicable for each source/building combination will be whether the stacks are located downwind and within 5L of the building, upwind and within 2L of the building, or off to the side and within 0.5L of the building. The results of these comparisons for each stack and each building for each of 36 wind directions will be tabulated.

To perform this analysis, the model recommended by the EPA, BPIPPRM will be used. The BEE-Line version of the BPIPPRM Model within BEEST will be used to generate all downwash calculations. The preliminary building dimensions and stack parameters to be used in the GEP analysis were provided to the NYSDEC under separate cover and will be reported in the final modeling report.

3.9 TAAC Modeling

Modeling of TAACs will be accomplished by using a unity emission rate (l g/s) to represent emissions from the main stack. Maximum ambient concentration impacts will be determined in terms of $\mu g/m^3$ per g/s. This will allow the evaluation of each individual TAAC using its chemical species-specific emission factor as applied to the kiln stack emissions. The TAACs will be evaluated and compared to the guideline concentrations in a separate analysis.

APPENDIX A

PROPOSED AIR TOXICS AND SELECTED EMISSION FACTORS

PROPOSED AIR TOXICS LIST FOR EVALUATION

Pollutant	CAS Number	EPA HAP	NY DAR-1	Selected EF	EF Units (Clinker)	Emission Factor Reference AP-42	FIRE	Other	Notes
Metals									
Aluminum	07429-90-5		X	1.30E-02	lb/ton	1.30E-02			
Arsenic	07440-38-2	X	X	1.20E-05	lb/ton	1.20E-05			
Barium	07440-39-3		X	4.60E-04	lb/ton	4.60E-04			
Beryllium	07440-41-7	X	X	6.60E-07	lb/ton	6.60E-07			
Cadmium	07440-43-9	X	X	2.20E-06	lb/ton	2.20E-06			
Chromium	07440-47-3	X	X	1.40E-04	lb/ton	1.40E-04			
Copper	07440-50-8		X	5.30E-03	lb/ton	5.30E-03			
Lead	07439-92-1	X	X	7.50E-05	lb/ton	7.50E-05			
Manganese	07439-96-5	X	X	8.60E-04	lb/ton	8.60E-04	2.42E-04		1
Mercury	07439-97-6	X	X	TBD	lb/ton	2.40E-05			
Nickel	07440-02-0	X	X	3.00E-04	lb/ton		3.00E-04		
Selenium	07782-49-2	X	X	2.00E-04	lb/ton	2.00E-04			
Silver	07440-22-4		X	6.10E-07	lb/ton	6.10E-07			
Thallium	07440-28-0		X	5.40E-06	lb/ton	5.40E-06			
Zinc	07440-66-6		X	3.40E-04	lb/ton	3.40E-04			
Other Inorganics									
Ammonia	07664-41-7		X	1.00E-02	lb/ton	1.00E-02			
Fluoride	NA		X	9.00E-04	lb/ton	9.00E-04			
Hydrogen chloride	07647-01-0	X	X	2.87E-02	lb/ton	4.90E-02		2.87E-02	2
Organics									
Acetone	00067-64-1		X	3.70E-04	lb/ton	3.70E-04			
Benzene	00071-43-2	X	X	1.60E-02	lb/ton	1.60E-02			
Bromomethane	00074-83-9	X	X	4.30E-05	lb/ton	4.30E-05			
Carbon disulfide	00075-15-0	X	X	1.10E-04	lb/ton	1.10E-04			
Chlorobenzene	00108-90-7	X		1.60E-05	lb/ton	1.60E-05			
Dibutylphthalate	00084-74-2	X	X	4.10E-05	lb/ton	4.10E-05			
Di(2-ethylhexyl) phthalate (DEHP)	00117-81-7		X	9.50E-05	lb/ton	9.50E-05			
Dibenzofurans	00132-64-9	X	X	2.90E-10	lb/ton	2.90E-10			
TCDDioxin, 2,3,7,8-	01746-01-6	(D/F)	X	1.20E-02	ng/kg			1.20E-02	3
Hexa-CDD	57653-85-7	(D/F)	X	4.20E-02	ng/kg			4.20E-02	3
Hexa-CDD	19408-74-3	(D/F)	X	4.80E-02	ng/kg			4.80E-02	3
TCDFuran, 2,3,7,8-	51207-31-9	(D/F)	X	7.29E-01	ng/kg			7.29E-01	3
Ethylbenzene	00100-41-4	X	X	1.90E-05	lb/ton	1.90E-05			
Formaldehyde	00050-00-0	X	X	4.60E-04	lb/ton	4.60E-04			
Methyl chloride	00074-87-3	X	X	3.80E-04	lb/ton	3.80E-04			
Methyl ethyl ketone	00078-93-3		X	3.00E-05	lb/ton	3.00E-05			
Methylene chloride	00075-09-2	X	X	4.90E-04	lb/ton	4.90E-04			
Phenol	00108-95-2	X	X	1.10E-04	lb/ton	1.10E-04			
Styrene	00100-42-5	X	X	1.50E-06	lb/ton	1.50E-06			
Toluene	00108-88-3	X	X	1.90E-04	lb/ton	1.90E-04			
1,1,2-trichloro-1,2,2-trifluoroethane	00076-13-1		X	5.00E-05	lb/ton	5.00E-05			
Xylenes	01330-20-7	X	X	1.30E-04	lb/ton	1.30E-04			
PAHs									
Acenaphthylene				1.20E-04	lb/ton	1.20E-04			4
Benz(a)anthracene	00056-55-3		X	4.30E-08	lb/ton	4.30E-08			
Benzo(a)pyrene				1.30E-07	lb/ton	1.30E-07			4
Benzo(b) fluoranthene				5.60E-07	lb/ton	5.60E-07			4
Benzo(k) fluoranthene				1.50E-07	lb/ton	1.50E-07			4
Benzo(g,h,l) perylene				7.80E-08	lb/ton	7.80E-08			4

Pollutant	CAS Number	EPA HAP	NY DAR-1	Selected EF	EF Units (Clinker)	Emission Factor Reference AP-42	FIRE	Other	Notes
Biphenyl	00092-52-4		X	6.10E-06	lb/ton	6.10E-06			
Chrysene	00218-01-9		X	1.60E-07	lb/ton	1.60E-07			
Dibenz(a,h) anthracene	00053-70-3		X	6.30E-07	lb/ton	6.30E-07			
Fluoranthene				8.80E-06	lb/ton	8.80E-06			4
Fluorene				1.90E-05	lb/ton	1.90E-05			4
Indeno(1,2,3-cd) pyrene				8.70E-08	lb/ton	8.70E-08			4
2-Methyl-naphthalene				4.20E-06	lb/ton	4.20E-06			4
Naphthalene	00091-20-3	X	X	1.70E-03	lb/ton	1.70E-03			
Phenanthrene	00085-01-8		X	3.90E-04	lb/ton	3.90E-04			
Pyrene	00129-00-0		X	4.40E-06	lb/ton	4.40E-06			
Total PAHs		(POM)	X	2.25E-03					

Notes
1. The higher AP-42 factor will be used for manganese evaluation
2. Use PCA emission factor for HCl as more representative than the older AP-42 factor
3. Emission factors for dioxin/furan compounds taken from EPA's TRI reporting guidance
4. Individual PAH compounds not listed in DAR-1 will be evaluated with total PAHs only