Bay Area Air Quality Management District

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BAAQMD Regulation 9, Rule 13:

NITROGEN OXIDES, PARTICULATE MATTER, AND TOXIC AIR CONTAMINANTS FROM PORTLAND CEMENT MANUFACTURING

Preliminary Staff Report

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ACKNOWLEDGEMENTS

The following District staff members participated in the development of the proposed amendments to this rule, and deserve recognition for their important contributions:

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1.0 Executive Summary

The Bay Area Air Quality Management District ("Air District") is proposing amendments to Regulation 9, Rule 13: *Nitrogen Oxides, Particulate Matter, and Toxic Air Contaminants from Portland Cement Manufacturing* ("Regulation 9-13" or "the rule"). Regulation 9-13 was adopted at a Public Hearing by the Board of Directors on September 19, 2012. The rule set emissions standards for NOx, PM, and toxic air contaminants (TACs). The rule also proposes analysis of health risk effects to the surrounding community from any modifications to the emissions stack of the kiln, and provides fugitive dust control and mitigation measures at the facility to further reduce particulate emissions. The proposed amendments will address technical problems with the current ammonia limit in the rule and will not result in actual emissions increases from the facility.

Portland cement manufacturing is a multi-billion-dollar industry in the United States, with annual domestic consumption of over 500 pounds per person. One hundred plants across the country produce 85 to 90 percent of this total with imports accounting for the remaining portion.

Regulation 9, Rule 13 contains an ammonia standard to prevent excess emissions from control equipment installed to meet the NO_X standard in the rule. The Lehigh facility in Cupertino has a selective non-catalytic reduction (SNCR) system which injects ammonia to reduce NOx and emissions limits are often imposed on such systems to prevent excess emissions (ammonia "slip"), typically limited to 10 ppmv above background. The averaging period for the ammonia standard as it is currently stated in the rule is of insufficient duration to account for the variable background ammonia in the exhaust stream caused by the inherent variability of nitrate content in the limestone feedstock used to make cement. Additionally, the regulated procedure for determining background ammonia levels is similarly problematic. Until this technical issue is resolved, the requirements of Regulation 9-13 cannot become federally enforceable through incorporation in the Title V permit for the facility.

In order to bring Lehigh into compliance and to enable federal enforceability of the requirements of the rule, Air District staff recommends amending sections of the rule pertaining to the ammonia emissions (standard and baseline determination) to allow for an averaging period that better accommodates background concentration variability.

Simultaneous rule development efforts are underway to address health risk assessments and particulate matter more generally Air District-wide. These rules are likely to impact the Lehigh Facility. Source testing, research, and evaluation of emissions control methods are ongoing and Staff commits to consider further amendments in the future to address condensable PM and sulfur dioxide (SO_2) emissions and to review and confirm toxic emissions calculation methodologies and consider further measures to protect public health.

2.0 Background

Portland cement is combined with water, gravel, sand, or other aggregate to form concrete, which is used in road building and a variety of other construction projects. Portland cement manufacture is a $10 billion per year industry in the United States. In 2015, Americans consumed 92 million tons of cement nationally, or 575 pounds per person for the year. Approximately 88% of that is produced in the United States with the rest imported primarily from China, Canada, Colombia, Mexico and Korea.

There are 104 Portland cement manufacturing plants operating in 36 states, with 10 in California, two in Northern California, and one in the Bay Area. Lehigh Southwest Cement Plant (Lehigh), located in unincorporated Santa Clara County, west of Cupertino, is the only cement manufacturing facility in the Air District. Consistent with national economic trends, Lehigh steadily decreased production from 2006 until 2010, when they produced 847 thousand tons of clinker (a preliminary stage of cement), a little over half their permitted operating capacity. They began to increase production with the improving economy, but this was limited due to concern over health impacts given the configuration of their emissions profile. After adoption of Regulation 9-13, under the terms of a compliance agreement with the Air District, Lehigh accepted a reduced production limit until they were able to complete modifications to their facility to increase dispersion of pollutants. Having completed these modifications, Lehigh has increased production in 2015 to 1.29 million tons of clinker, a little over three quarters of the permitted amount. Their Air District operating permit limits production of clinker to 1.6 million tons per year.

Prior to installing controls necessary to meet the standards of Regulation 9-13, Lehigh was the Bay Area's largest source of NOx emissions without modern NOx controls such as ultra-low NOx burners, staged combustion, or add-on controls such as selective non-catalytic reduction. The plant has been in operation since 1939, and underwent major modifications in 1981, converting from a wet process to a dry process with a preheater/precalciner kiln. In anticipation of Federal regulatory amendments, Lehigh implemented control systems for TACs. Since adoption of Reg. 9-13, Lehigh has installed a NOx emissions control system and constructed a 300-foot tall centralized emissions stack to obtain more representative monitoring results and reduce health effects through greater dispersion of pollutants.

Portland Cement Kiln Overview

Portland cement is a fundamental ingredient of concrete, consisting of calcium, silicon, aluminum, and iron. These materials are combined in a number of steps requiring careful control to ensure that the final product meets specific chemical and physical specifications required for building and construction needs. Figure 1 shows a schematic diagram of Portland cement manufacturing.

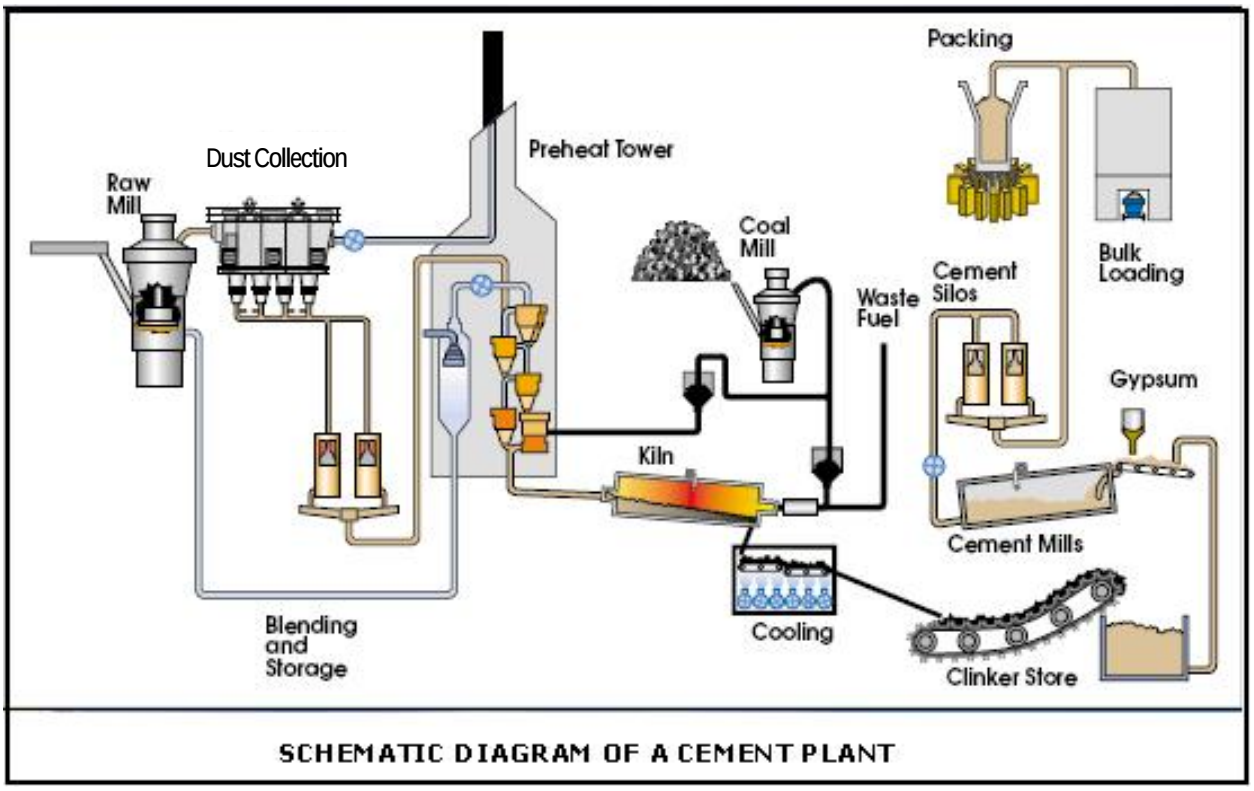
Manufacturing Steps

Portland cement manufacturing is a series of steps which take place at a large industrial facility usually located adjacent to a source of raw materials. Raw materials consist of limestone, shells or chalk, clay, sand, alumina and iron ore. The bulk of these are mined at a quarry, blended, and

ground to a powder. This blended material is subjected to intense heat in a kiln to cause a series of chemical reactions, transforming the powdered raw materials into something called cement clinker. Cement clinker consists of grayish-black pellets the size of marbles or golf balls, which is cooled, ground and mixed with gypsum and other additives to form powdered Portland cement.

In the initial manufacturing step, limestone is mined from a quarry near the plant. At the quarry, the material is reduced to a manageable size (from chair or desk size to softball size) by a two-stage primary crusher before stockpiling and transport to the kiln. The limestone is crushed for a third time and then pre-blended to homogenize the quality of the limestone. It is then mixed with bauxite (a source of alumina) and iron ore before being ground inside a ball mill and further blended to create the required proportions necessary for the desired end product.

Figure 1 – Schematic of Cement Manufacturing Process



In older cement manufacturing plants water is added to the raw materials to form a slurry, and grinding and mixing operations are completed in a slurry form. This aids in conveying the material, but the dry method is ultimately more energy efficient. The Lehigh facility converted from wet to dry process in 1981. In order to produce clinker, the material must be heated to at least 2400 degrees Fahrenheit and this is much easier when the raw materials are dry. At modern plants, the materials are preheated before entering the kiln and at many facilities the process of making cement is begun at this stage in a process called precalcining. A preheater/precalciner tower is utilized at the Lehigh facility to heat the material to approximately 1650 degrees F, and begin the cement manufacturing process prior to the material entering the rotary kiln.

At the heart of the manufacturing process is the cement kiln. The blended mixture of raw material is fed from the preheater/precalciner into the upper end of a tilted rotating cylindrical kiln where it will reach temperatures of 2400 to 3000 degrees F. This intense heat causes the material to fuse and undergo chemical reactions to create cement clinker. The clinker is discharged from the lower end of the kiln where it is cooled and then ground into a fine powder. Some of this heat is recovered at this stage and routed to the preheater. The ground clinker is mixed with gypsum and ground one final time to make the final product.

Emissions from Portland Cement Manufacturing

The manufacturing of cement requires the movement and processing of many tons of material as well as the combustion of large amounts of fuel in order to heat that material to extremely high temperatures. Generally, emissions of concern from cement manufacture are criteria pollutants (NOx, SO_2, PM, and VOCs) and toxic air contaminants (TACs) from combustion. Emissions of pollutants are directly attributable to both the fuel combustion and materials processing. The formation of NOx during the manufacture of cement is due to the high temperature, oxidizing atmosphere necessary for clinker formation. Similar to NOx, the formation of SO_2 is a product of the chemical make-up of the raw materials and fuel, as well as the high operating temperatures and oxygen concentration in the kiln. The production of SO_2 is more dependent on the sulfur content of fuel and raw materials however, whereas NOx formation is more dependent on combustion conditions.

Emissions of TACs arise from the presence of these compounds predominantly in the raw materials and the fuel to fire the kiln. Predominant TACs emitted include mercury, hydrochloric acid (HCl), benzene, dioxins and furans, and dependent on the raw materials used, metals such as lead and hexavalent chrome. Particulate emissions arise from crushing, mixing and storage of raw materials, clinker production and cooling, finish grinding, packaging, and from vehicle traffic. For the most part, emissions of metallic TACs are limited at Lehigh due to low levels in raw materials and fuel used at the plant, combined with the high level of control from fabric filtration systems in use at the plant. Mercury emissions are more significant than other metallic TACs due to relatively high mercury levels in the limestone quarried at the facility and because the metal is volatilized by the high temperatures of the kiln. Other TACs emitted from the kiln include hydrochloric acid (HCL), dioxins, furans, and benzene.

Federal Regulations

Two federal rules address air emissions from the manufacture of Portland cement: New Source Performance Standards (NSPS) and National Emission Standard for Hazardous Air Pollutants (NESHAP). EPA generally promulgates NSPS for specific industrial operations to address emissions of criteria pollutants from new, modified, and reconstructed sources. NESHAP addresses emissions of TACs (also known as hazardous air pollutants or HAPs) from both new and existing sources, and may have separate standards for each case.

On August 6, 2010, EPA issued amendments to both NSPS and NESHAP. These were then appealed directly to EPA, and further challenged in Federal Court. On July 18, 2012, as part of a settlement agreement, EPA revised its proposed emissions limits for PM and Organic HAPs, made changes to monitoring requirements, and extended the compliance date to September 10,

2015. The revised NESHAP significantly reduced hazardous (toxic) emissions from new and existing Portland cement kilns. Table 1 illustrates the NESHAP limits. The Lehigh facility has not been modified or reconstructed after the date of applicability specified in the regulation (June 6, 2008) and so is not subject to the emissions standards for new facilities.

Table 1 – 2012 National Emission Standards for Hazardous Air Pollutants		
Pollutant	Existing Facilities	New and Modified Facilities
Mercury	55 lbs/million tons of clinker, averaged over 30 days	21 lbs/million tons of clinker, averaged over 30 days
Dioxins/Furans	0.2 nanograms/dry standard cubic meter (ng/dscm)(TEQ)*, averaged over 24 hours	0.2 ng/dscm (TEQ)*, averaged over 24 hours
Total Hydrocarbons	24 parts per million by volume (ppmv), averaged over 30 days	24 ppmv, averaged over 30 days
Total Organic HAP*	12 ppmv, averaged over 30 days	12 ppmv, averaged over 30 days
Particulate Matter (PM)	0.07 lb/ton of clinker, averaged over 30 days	0.02 lb/ton of clinker, averaged over 30 days
Hydrochloric Acid (HCL)	3 ppmv, averaged over 30 days	3 ppmv, averaged over 30 days

**NOTES: Toxic Equivalent (TEQ) weighs the toxicity of less toxic compounds as fractions of the most toxic compound of the group. The Total Organic HAP standard is an alternative to the Total Hydrocarbon Standard.*

Air District Regulations

The Air District adopted Regulation 9, Rule 13 to achieve the maximum feasible, cost effective emissions reductions of NOx and PM in concert with efforts to bring the Lehigh facility into compliance with limits for TACs consistent with the federal NESHAP. As the effective date of the NESHAP requirements was unclear during the development of Rule 9-13, the Air District incorporated these requirements into the rule. Regulation 9-13's effective date of September 9, 2013 corresponds with that originally proposed for the 2010 amended NESHAP. The equipment and operational modifications necessary to meet the proposed NOx emission limit had the potential to result in excess ammonia emissions, and so an ammonia emissions limit was included in the rule. Significant modifications to the facility were implemented to reduce NOx and TAC emissions and to meet the enhanced monitoring requirements of the rule. Additional requirements of the rule addressed concerns over the configuration of the emission point from the kiln, and the need for enforceable fugitive dust control and mitigation measures.

In addition to Regulation 9-13, Portland cement manufacturing operations are subject to a number of Air District regulations that govern permitting (e.g., Regulation 2-1, 2-2), emissions of toxic or hazardous compounds (Reg. 2-5), and some general or miscellaneous regulations for

individual pollutants (Reg. 6-1 for PM, Reg. 8-2 for Volatile Organic Compounds (VOCs), Reg. 9-1 for SO_2, and Reg. 11-1 for lead). Requirements of all Air District rules are incorporated into the Title V permit for Lehigh along with the applicable federal requirements of the NESHAP and NSPS.

Issues Since Rule Adoption

Regulation 9, Rule 13 contains an ammonia standard to prevent excess emissions from control equipment installed to meet the NO_X standard in the rule. The Lehigh facility in Cupertino has a selective non-catalytic reduction (SNCR) system which injects ammonia to reduce NOx and emissions limits are often imposed on such systems to prevent excess emissions (ammonia "slip"), typically limited to 10 ppmv above background. This is a simple matter for sources with steady state operating conditions, such as boilers, furnaces or turbines, but can be problematic for sources with highly variable operations such as cement kilns. The averaging period for the ammonia standard as it is currently stated in the rule is of insufficient duration to account for the variable background ammonia in the exhaust stream caused by the inherent variability of nitrate content in the local limestone feedstock used to make cement. Additionally, the regulated procedure for determining background ammonia levels is similarly problematic. Until this issue is resolved, the requirements of Rule 9-13 cannot be made federally enforceable through incorporation into the facility's Title V permit.

Air District staff recommends amending sections of the rule pertaining to the ammonia emissions (standard and baseline determination) to allow for replacement of the rolling 24-hour average with a rolling 182-operating day averaging period. In addition, staff recommends deletion of provisions for determining baseline levels and replacement with a hard standard based on the last three years of operating data. Rule development efforts are underway to address health risk assessments and particulate matter more generally Air District-wide. Source testing, research, and evaluation of emissions control methods are ongoing and staff commits to consider further amendments to address condensable PM and SO_2 emissions and to review and confirm toxic emissions calculation methodologies and consider further measures to protect public health.

3.0 Technical Review

Ammonia Standard

The limestone used in the manufacture of cement is not purely calcium carbonate, but rather contains traces of other materials mixed into the rock including mercury, sulfur compounds, and nitrates. These occur in varying amounts in the limestone quarried in the lands surrounding the kiln on the Lehigh facility. As the limestone undergoes chemical reactions under the intense heat of the cement kiln, these impurities can lead to emissions of mercury, SO_2, and ammonia in similarly varying levels to that found in the feedstock. In the case of nitrates and subsequent ammonia emissions, the level of variability is greater than that anticipated during development of Rule 9-13. Ammonia emissions are monitored at the facility by a continuous emissions monitoring system (CEMS) that records the ammonia concentration in the emissions train at regular intervals. Lehigh has recorded these monitoring results for the past five years. A review of this data shows that the variability of ammonia levels is consistent over the periods before and after installation of the SNCR system that injects additional ammonia into the kiln to reduce emissions of NOx. The magnitude of this variability far exceeds the increase normally attributed to ammonia slip (10 ppmv), and the time scale far exceeds the 24-hour averaging time currently provided in the rule. It is clear from this data that the ammonia emissions are primarily driven by the nitrate content of the feedstock and not by the ammonia injection for the SNCR system.

In addition to being a precursor to secondary particulate formation, ammonia can potentially cause a nuisance due to its unpleasant odor. The concentration at which people detect ammonia can vary depending on how often one is exposed to the chemical, and so the odor threshold has been documented in various studies as low as 0.04 ppmv, and as high as 57 ppmv. The US Coast Guard Manual provides a value of 46.8 ppmv, the American Association of Railroads says most people can smell ammonia between 0.04 to 20 ppmv, and an odor threshold of between 5 and 50 ppmv is listed for ammonia by the Federal Occupational Safety and Health Administration (OSHA). Most organizations agree that most people can smell ammonia somewhere around 5 ppmv, but there is some evidence that people can lose their ability to detect ammonia after working around it for long periods.

More important than its potential to cause a nuisance, ammonia is a TAC with both acute and chronic effects. For non-carcinogenic compounds such as ammonia, toxicity is expressed as a Reference Exposure Level (REL) which is the air concentration at or below which exposure is unlikely to result in adverse health effects to even sensitive members of the general population through inhalation exposure. According to the California Office of Environmental Health Hazard Assessment (OEHHA), the chronic REL for ammonia is an annual average concentration of 0.3 ppmv, and the acute REL is 4.5 ppmv for an exposure time of one hour. Exposure to ammonia in concentrations above these RELs can cause irritation of the eyes, nose and upper respiratory tract, with coughing and difficulty breathing.

The Air District routinely uses air dispersion modeling to assess the health impacts of existing facilities. EPA's approved AERMOD model utilizes onsite and local meteorology data, surrounding terrain heights, takes into account variations in surface heating and friction from different land use applications near the site, along with emission rates, stack characteristics and receptor locations. The results of this modeling provide the maximum expected ambient

concentration for a particular emission rate which is directly tied to stack concentration. The model is designed to be conservative in nature, meaning that it is more likely to over-predict exposures than under-predict them.

Air District staff conducted an air dispersion modeling analysis to evaluate the relationship between the concentration of ammonia in exhaust gasses from the Lehigh Cement Kiln and the potential health hazard at the maximally exposed offsite receptor location. This potential health hazard is determined by the ambient air concentration of ammonia as compared to the RELs spoken of earlier. For a given stack concentration or emission rate, the model can be used to estimate the maximum one-hour average concentration at a given location for the acute REL, as well as the maximum annual average concentration for the chronic REL. Additionally, the model can be used to determine the likelihood that any offsite receptor would detect an ammonia smell by comparing the highest one-hour average concentration to an accepted odor threshold value. A memo providing inputs and results of the air dispersion modeling is attached to this report as Appendix A.

Conversely, the air dispersion analysis results can be used to determine the maximum acceptable ammonia concentration in the kiln stack to prevent exceeding a given downwind ambient concentration value. This target downwind concentration can be assigned any value, be it acute or chronic REL, or any value within the range of odor detection threshold. The acute REL (4.5 ppmv) is just below the low end of odor threshold according to OSHA (5ppmv to 50 ppmv). Choosing a target of 0.5 ppmv (11% of the acute REL, and 10% of the lower bound of the OSHA odor threshold) would provide an extra level of safety to public health while allowing a reasonable cushion to prevent public nuisance. According to the dispersion modeling analysis, in order to ensure against exceeding a 0.5 ppmv downwind one-hour average concentration, the maximum allowable kiln stack concentration is 270 ppmv. At this same maximum stack concentration, the maximum annual offsite ammonia concentration is 0.004 ppmv, which is 1.5 % of the chronic REL.

4.0 Regulatory Proposal

The Air District is considering amendments to Regulation 9, Rule 13 addressing inconsistencies with the ammonia limit in order to aid compliance and ensure federal enforceability through incorporation of the rule's standards into Lehigh's Title V operating permit. As currently written, beginning 90 days from adoption, the rule proscribes monitoring of ammonia concentrations in the exhaust stream of the kiln to determine a baseline average (section 9-13-402). The rule provides a methodology (section 9-13-610) to determine that average concentration over a period of no less than 6 months immediately prior to the installation of control equipment to meet the NOx standard (section 9-13-301.1). Ammonia concentrations are limited to that 6-month baseline average concentration plus 10 ppmv, but the averaging period for the standard is a rolling 24 hours (section 9-13-301.4).

Air District staff proposes to increase the averaging period to a 182-operating day rolling average in order to reconcile it with the originally proposed 6-month background period. This longer averaging period will allow for short term variations in ammonia concentrations. Air District staff proposes to amend the ammonia standard in section 9-13-301.4 to a set value of 270 ppmv averaged over a rolling 182 operating day period. This standard will ensure that ambient ammonia concentrations at downwind receptor locations will not cause adverse health effects, and are unlikely to exceed odor detection thresholds. Proposed amendments to rule language are detailed below with specific changes provided in strikethrough/underline format.

182-Operating Day Rolling Average Definition

A new definition has been added to accommodate the 6-month averaging period for the revised ammonia standard. To allow for a rolling daily average, 6 months becomes 182 days, and only operating days (as defined in section 9-13-211) are counted to exclude periods during which the kiln is either down or in start-up (defined in section 9-13-215) or shutdown mode (section 9-13-214).

9-13-220 **182-Operating Day Rolling Average:** The arithmetic mean of the emissions as prescribed in sections 9-13-301 of the most recent 182 operating days. Each operating day initiates a new rolling average period.

Ammonia Emission Limit

The averaging period for the standard is revised from a 24-hour rolling average to a 182-operating day rolling average, and the standard is proposed as a set value of 270 ppmv rather than 10 ppmv over a calculated baseline.

9-13-301 **Emission Limits:** Effective September 9, 2013, no person shall operate a Portland cement manufacturing facility unless the following emission limits are met:

- 301.1 The 30-operating day rolling average of nitrogen oxides (NOx) emissions from the kiln shall not exceed 2.3 pounds per ton of clinker produced;
- 301.2 Particulate matter (PM) emissions from the kiln shall not exceed 0.04 pounds per ton of clinker produced, based on a three run test average;
- 301.3 PM emissions from the clinker cooler shall not exceed 0.04 pounds per ton of clinker produced, based on a three run test average;

301.4 The ~~24-hour~~182-operating day rolling average of ammonia (NH_3) emissions from the kiln shall not exceed ~~baseline emission levels by more than 10~~270 ppmv, dry at 7 percent oxygen;

301.5 The 24-hour rolling average dioxins and furans (D/F) emissions from the kiln shall not exceed 0.2 ng-TEQ/dscm at 7 percent oxygen;

301.6 The 30-operating day rolling average of mercury emissions from the kiln shall not exceed 55 pounds per million tons of clinker produced;

301.7 The 30-operating day rolling average of total hydrocarbon (THC) emissions from the kiln shall not exceed 24 ppmv, dry at 7 percent oxygen; or as an alternative, provided the provisions of Section 9-13-403 have been completed, the 30-operating day rolling average of total organic HAP emissions from the kiln shall not exceed 12 ppmv, dry at 7 percent oxygen;

301.8 The 30-operating day rolling average hydrogen chloride (HCl) emissions from the kiln shall not exceed 3 ppmv, dry at 7 percent oxygen.

Baseline Ammonia Emission Level Determination and Methodology

The baseline period has passed, and the emission limit is provided as a set value. These sections are no longer necessary and so are deleted.

~~**9-13-402 Baseline Ammonia Emission Level Determination:** No later than 90 operating days after rule adoption, any person manufacturing Portland cement shall begin monitoring ammonia emissions from the kiln for the purpose of establishing a baseline emission level for kiln operations prior to the installation and subsequent operation of NOx control equipment. Monitoring shall be conducted according to Section 9-13-501, and determination of the baseline ammonia emission level shall be calculated as specified in regulation 9-13-610.~~

~~**9-13-610 Baseline Ammonia Emission Level Calculation:** The following methodology shall be used to calculate baseline ammonia emissions in order to determine compliance with Section 9-13-301.4:~~

~~610.1 The baseline period consists of the period immediately preceding the initial operation of control equipment installed to comply with Section 9-13-301.1. The baseline period shall not be less than 6 months in duration. The owner or operator of the Portland cement manufacturing facility shall have sufficient records of the kiln's operation to substantiate the emission rate during the baseline period.~~

~~610.2 Baseline emission level, expressed in ppmv, dry at 7 percent oxygen, is the median of the 6 monthly average values of the ammonia (NH_3) emissions from the kiln.~~

5.0 Emissions

The proposed amendments will not result in an increase in actual emissions. Ammonia emissions are driven more by feedstock variations than by ammonia injection as part of SNCR. The amended limit protects public health and guards against nuisance conditions while providing insurance against excess ammonia injection with a sufficient buffer for normal feedstock variations.

6.0 Economic Impacts

Cost of Controls

There are no anticipated costs associated with these amendments.

Socioeconomic Analysis

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." As noted above, there are no anticipated costs associated with these proposed amendments and so they would not have a significant economic impact to the affected industry. BAE Urban Economics of Emeryville, California has completed an updated economic profile of the industry affected by the rule and a complete updated socioeconomic analysis will be provided with the final rule amendment proposal presented to the Board of Directors.

7.0 Environmental Impacts

California Environmental Quality Act

Pursuant to the California Environmental Quality Act (CEQA), the Air District has concluded that the proposed amendments to Regulation 9-13 are exempt under CEQA guidelines Section 15301, Class 1. The rule amendment would involve negligible or no expansion of an existing use. Class 1 exemptions consist of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. Air District Staff will file a Notice of Exemption with the County Clerk after adoption by the Board of Directors.

8.0 Regulatory Impacts

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in air district rules. The air district must then note any difference between these existing requirements and the requirements imposed by the proposed change.

As stated in the Background section of this report, there are two federal rules which govern air emissions from the manufacture of Portland cement. The NSPS provides emissions standards for NOx, SO_2, and PM from new or modified Portland cement kilns and the NESHAP provides emissions standards for TACs from all Portland cement kilns with one set of standards for existing kilns, and one for new or modified kilns. The kiln at Lehigh has not undergone sufficient modification to be deemed new or modified after the effective dates of either rule, so is subject to only the existing source emissions standards contained in the NESHAP. All of these standards for TACs are included in the District's proposed rule. The proposed rule amendments are unlikely to result in any increase in emissions of ammonia and will have no effect on other emissions standards contained in the rule.

There are currently no State rules that specifically regulate cement manufacture, other than greenhouse gas emissions cap and trade (AB 32), and those rules governing the use of scrap tires as fuel. Several air districts (Antelope Valley, Amador, Kern, Mojave, and Monterey Bay Unified) with cement kilns operating within their jurisdiction have adopted regulations to address emissions of NOx and/or PM from these sources. South Coast Air Quality Management District has adopted several cement manufacturing regulations addressing emissions of NOx, PM, CO, as well as hexavalent chromium and fugitive dust. At least two of these regulations were adopted to address specific conditions at individual cement manufacturing facilities. These regulations are different in format, and include provisions tailored to the facilities in their jurisdiction. Air District staff believes that the current rule is no less stringent than any of the regulations governing cement manufacture from other air district in California, and is more stringent in terms of actual emissions standards for NOx, and TACs. The proposed amendments will not make the rule any less stringent in comparison to other air district rules in California.

9.0 Rule Development Process

In advance of proposing amendments to Regulation 9-13, rule development staff consulted internally with Air District staff, met with representatives of the affected facility, and held community stakeholder meetings in Cupertino to address concerns of community members and local elected officials. Internal meetings were initiated shortly after the rule became effective when monitoring data showed the full extent of the variability of ammonia concentrations in the emissions train and it became clear that the methodology for determining the ammonia baseline would likely result in an unattainable standard. Staff from the Engineering, Compliance and Enforcement, and Legal Divisions worked initially to develop a compliance agreement, and later determined that amending the rule was the best way forward. Representatives from Lehigh engaged staff in this effort as different proposals were explored. As a regulatory solution began to take shape, the Air District reached out to the affected community to discuss the ammonia standard as well as solicit community engagement on other concerns such as emissions of TAC, PM and SO_2 from the facility.

On March 10th of this year, Air District staff held a public stakeholders meeting in Cupertino to discuss the approach of first correcting the ammonia standard to facilitate incorporation of the rule requirements into the facilities federal operating permit, backed up by a commitment to address particulate and SO_2 emissions in the future. Members of the public included two Cupertino City Council Members, along with representatives of several environmental and health advocacy groups, including the Sierra Club, Breathe California, Bay Area for Clean Environment, and Quarry No. Members of the public expressed concerns about the health impacts due to emissions from Lehigh and conveyed doubts in the Air District's ability to evaluate these impacts. Some attendees expressed the belief that ammonia emissions were driving the health risk and that by adjusting the standard the Air District would be giving Lehigh a pass to cause greater health impacts. Air District staff provided data to assuage these concerns, while emphasizing the importance of the current goal to make 9-13 requirements part of the facility's Title V permit and committed to continue the process towards reducing health impacts through future rule development.

A second stakeholders meeting was held on May 16th, again in Cupertino with most of the same interested community members. Air District staff provided greater detail as to reasons behind the proposed amendments, explaining the fluctuations of ammonia levels and the need for consistent averaging periods. Staff further explained the relatively low potential health risk posed by ammonia, and detailed the larger scale rule development effort to address toxic health impacts. Additionally, rule development staff working on general particulate matter regulations provided an update on those efforts and how they would affect emissions at Lehigh. Members of the public expressed guarded acceptance of the Air Districts approach so long as sufficient documentation and analysis were provided in any proposal. The Air District committed to provide that analysis as may be found in this report, and to continue to evaluate avenues to for further emissions reductions where achievable.

The Air District plans to hold a Stakeholders meeting in the fall to discuss any continuing concerns regarding the proposal, and to provide a status update for the anticipated further rule development efforts.

10.0 Conclusion

Pursuant to Section 40727 of the California Health and Safety Code, the proposed rule amendments must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference before the Board of Directors adopt, amend, or repeal a rule. The proposed amended Rule is:

- Necessary to protect public health by ensuring reduction in toxic air contaminants to nearby residents and by reducing ozone and PM precursors to meet the commitment of Control Measure SSM-9 of the Bay Area 2010 Clean Air Plan;
- Authorized by California Health and Safety Code Sections 40000, 40001, 40702, and 40725 through 40728;
- Clear, in that the rule specifically delineates the affected industry, compliance options, and administrative requirements for industry subject to this rule, so that its meaning can be easily understood by the persons directly affected by it;
- Consistent with other California air district rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules, or regulations; and,
- Implementing, interpreting and making specific and the provisions of the California Health and Safety sections 40000 and 40702.

A socioeconomic analysis prepared by Bay Area Economics has found that the proposed regulation amendments would not have a significant economic impact or cause regional job loss. A California Environmental Quality Act (CEQA) analysis prepared by Environmental Audit, Inc., concludes that the proposed amendments are exempt under CEQA Guidelines Section 15301, Class 1. Air District staff have reviewed and accepted this analysis and will file a Notice of Exemption after amendments are adopted by the Board of Directors.

11.0 References

1. Bay Area Air Quality Management District; *Bay Area 2010 Clean Air Plan, "SSM 9 – Cement Kilns"*, Volume 2, September 15, 2010.

2. Portland Cement Association; *Cement Industry Overview, Economics of the U.S Cement Industry*, May 2013; www.cement.org

3. US EPA; *National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants*; Federal Register / Vol. 75, No. 174 / September 9, 2010.

4. US EPA; *FACT SHEET for Final Amendments to National Air Toxics Emission Standards and New Source Performance Standards for Portland Cement Manufacturing*; August 9, 2010.

5. US EPA, Office of Air Quality Planning and Standards; *Regulatory Impact Analysis: Amendments to the National Emissions Standards for Hazardous Air Pollutants and New Source Performance Standards (NSPS) for the Portland Cement Manufacturing Industry Final Report*; August 2010

6. US EPA; *National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants; 40 CFR Parts 60 and 63*[EPA-HQ-OAR-2011-0817; FRL-9629-9] RIN 2060-AQ93; June 25, 2012.

7. US EPA; *Proposed Amendments to Air Toxics Standards and New Source Performance Standards for Portland Cement Manufacturing FACT SHEET;* June 25, 2012.

8. US Department of Health and Human Services, National Institute for Occupational Safety and Health; US Department of Labor, Occupational Safety and Heal Administration; *Occupational Safety and Health Guideline for Ammonia*; 1992; http://www.cdc.gov/niosh/docs/81-123/pdfs/0028-rev.pdf

9. California Office of Environmental Health Hazard Assessment; *Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary*; June 28, 2016; http://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary

INTEROFFICE MEMORANDUM
July 11, 2016

TO: **Eric Stevenson**
VIA: **Jaime Williams**
Sanjeev Kamboj

FROM: **Ted Hull**

SUBJECT: **Evaluation of Ammonia Level of Significance from the Kiln at Lehigh Southwest Cement**

SUMMARY: Per your request, I have used dispersion modeling to evaluate the concentration of ammonia in the exhaust gases from the Lehigh Cement Kiln that would result in a potential health hazard at the maximally exposed offsite receptor location. I have determined that the maximum acceptable ammonia (NH_3) concentration from the kiln stack is **2,432 ppm vol. (@ 20°C)**. This value coincides with the modeled offsite receptor point at which the Acute Reference Exposure Level (REL)* for ammonia (3,200 ug/m^3) is first reached for a 1-hour averaging period; i.e. the point of maximum impact (PMI). At this same maximum stack concentration, the maximum annual average offsite ammonia concentration is 28 ug/m^3. This is 14% of the Chronic REL (200 ug/m^3).

* Inhalation RELs are air concentrations or doses at or below which adverse health effects are not expected even in sensitive members of the general population under specified exposure scenarios. The acute RELs are for infrequent 1 hour exposures that occur no more than once every two weeks in a given year. The chronic RELs are for 24 hour per day exposures for at least a significant fraction of a lifetime, defined as about 8 years (≥12 percent of a 70year lifespan).

EMISSIONS: The maximum ammonia emission rate used in the model was 351.1 grams per second. This corresponds to the maximum acceptable stack concentration (2,432 ppm vol.) at the following typical kiln stack conditions:

- Kiln Flow Rate = 298.2 m^3/s @ 428.7 °K; converted to 203.81 m^3/s @ standard conditions (20°C)
- NH_3 stack concentration = 1.723 E+06 ug/m^3 (micrograms per cubic meter) @ 20°C; equivalent to 2,432 ppm vol. @ 20°C

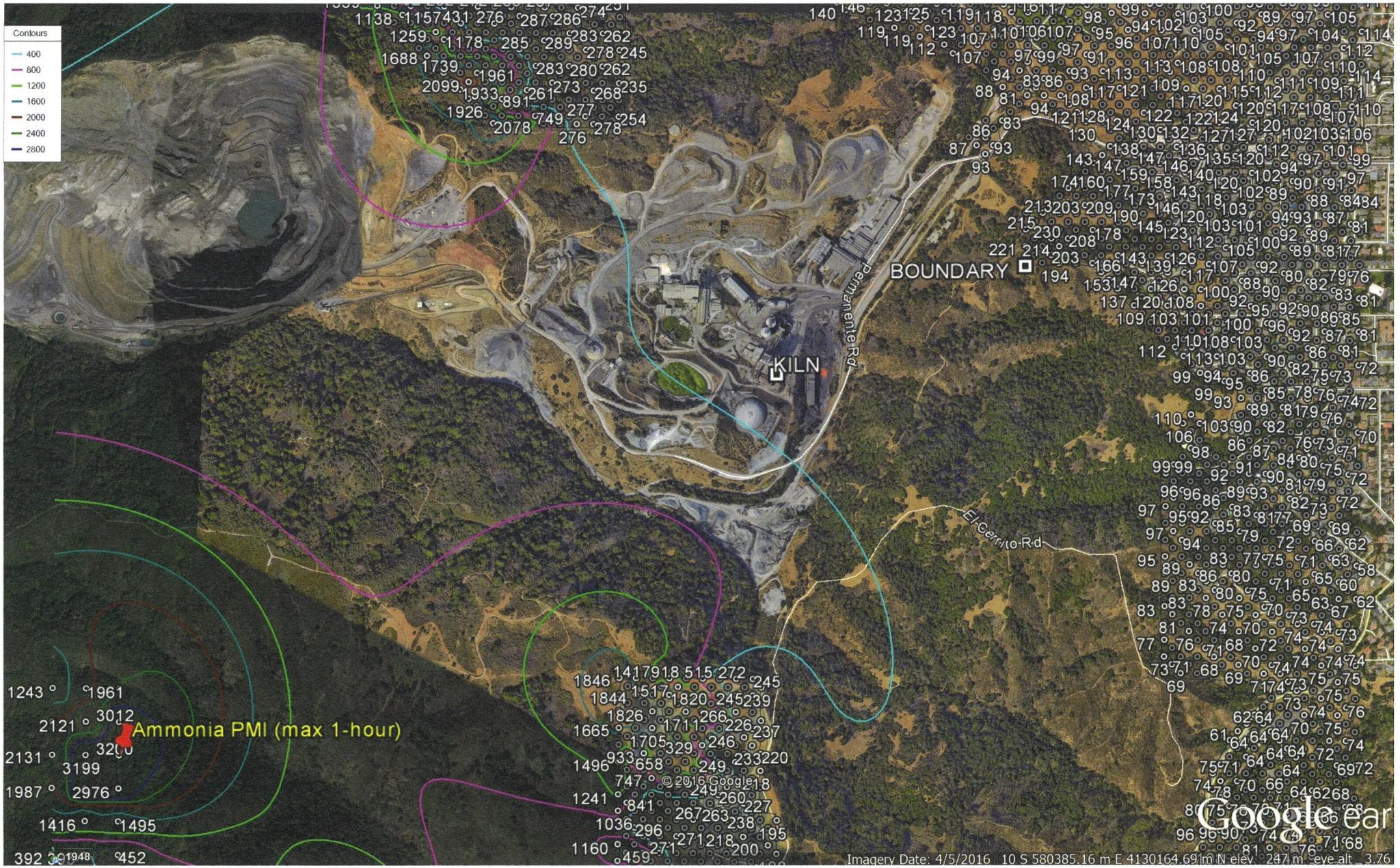
The following constant values were used in unit conversions:

- Molar volume of gas at 1 atm and 20°C = 24.04 liters/mole
- Molecular Weight of NH_3 = 17.03 g/mole

MODELING: The AERMOD air dispersion computer model (version 15181) was used to estimate maximum 1-hour and annual average ambient air concentrations. The model was run with 1 year on-site meteorological data. Upper air data for the same time period was taken from the Oakland International Airport station. The model is referenced in NAD 83 UTM coordinates and uses terrain data from Santa Clara County 10m NED files.

I have attached a plot of the results for modeled 1-hour maximum ammonia emissions.

CONCLUSION: Kiln stack ammonia emissions from Lehigh Southwest Cement do not present offsite health hazards at stack concentrations below 2,432 ppm vol. (@ 20°C).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