SIERRA CLUB
LONE STAR CHAPTER

To: The Honorable Brian Birdwell, Chair, Senate Committee on Natural Resources and Economic Development
The Honorable Judith Zaffarini, Vice-Chair, Senate Committee on Natural Resources and Economic Development
Members, Senate Committee on Natural Resources and Economic Development

From: Cyrus Reed, Legislative and Conservation Director, Lone Star Chapter of the Sierra Club, cyrus.reed@sierraclub.org, 512-888-9411, and Dr. Neil Carman, Air Quality Resource Specialist, Lone Star Chapter of the Sierra Club, neil.carman@sierraclub.org

Re: Recommendations and Improvements on Cement Production

September 17th, 2024

Dear Chairman Birdwell and members of the Senate Committee on Natural Resources and Economic Development,

The Lone Star Chapter of the Sierra Club appreciates the charge related to cement production in Texas, and appropriate regulatory framework. The entire production process - from the mining of limestone, and other minerals such as clay used in cement and concrete production - the production of cement clinker and ultimately the production of portland cement and concrete in concrete batch plants - all are in need of a regulatory review and improvements.

Cement production is important in Texas producing jobs, economic development and needed infrastructure from buildings, to roads, to all sources of power plants, to water and flood infrastructure and Texas will continue to rely on cement production for years to come. In 2023, about 91 million metric tons of portland and masonry cement was produced in the USA at some 90 large facilities, including 11 in Texas, which is the largest producer of portland cement and clinker in the US. While the USA is a major producer of cement, it produces much less than China, India and Vietnam.

Cement production has significant impacts on our natural resources, from the quarries themselves where limestone is mined, to air pollution, global warming impacts, water use and impacts on aquifer, noise, dust, traffic and other impacts.

Current Cement Plants Operating in Texas

Only 11 Portland Cement Kiln Plants currently operate in Texas in 2024 although some plants have several large rotary kilns meaning there are more kilns than plants. Not surprisingly, most are located near the I-35 corridor close to both limestone quarries and major transportation routes. Currently, there are three plants operating in or near Midlothian (3) in Ellis Co. Ozone NA area, two in Bexar County near San Antonio in Ozone NA area, Buda (1) in Hays Co, New Braunfels (2) in Comal Co, Waco (1) in McLennan Co, Odessa (1 in Ector Co) and one in rural Nolan Co.

There are two types of cement production, a wet process and a dry process. The dry process is significantly cleaner and more energy efficient and more recent plants use the dry process.

Criteria Air Pollution and Hazardous Air Pollution

One of the major impacts of cement production results from the stack air emissions from tall stacks after the Portland Cement's Rotary Kilns producing a dry product called Clinker that is then mixed with other materials to yield Portland Cement. Portland Cement Production plants are subject to BACT and MACT air permitting which is a critical topic for the criteria and hazardous air pollutants potentially being emitted. TCEQ issues the air permits and the new Title V Federal Operating Air Permits that include the MACT standards for hazardous air pollutants from Portland Cement plants. Pollutants include nitrogen oxides, sulfur dioxide, carbon monoxide, hazardous air pollutants, sulfuric acid, volatile organic compounds, particulate matter including particulate matter at PM10 microns or less and PM2.5 microns or less, and lead. In 2022, the 11 major cement production plants in Texas reported over 30,000 tons of criteria air pollutants. Detailed data source: TCEQ's Annual Point Source Emissions Inventory - https://www.tceq.texas.gov/airquality/point-source-ei/psei.html

Table 1. Current Criteria Air Pollutant Emissions from Cement Production Plants

Pollutant	Tons, 2022
Nitrogen Oxides	11,869.44
Carbon Monoxide	11,686.91
Sulfur Dioxide	4,778.05
Total Particulate Matter	3,391.92
Total PM 2.5 (2.5 microns or less)	985.09
Volatile Organic Compounds	722.47
Lead	0.0703
Total Criteria Air Pollutant	31,159.49

Of particular concern is PM 2.5 because of its major impact on lung function and other health impacts. Recently, the EPA lowered the annual PM 2.5 standard, which means that new permits must be designed to prevent areas from exceeding these new national ambient air quality standards. Sierra Club maintains that all permits that have yet to be issued must be assessed to assure that permitting such plants will not lead to ambient concentrations of PM 2.5 above the new federal standard and that existing permits must also be reassessed given these new standards. TCEQ needs to submit the new fine particle (PM2.5) area designations to the EPA by February 7, 2025. Ellis County has three Portland Cement Production plants and is listed as an area exceeding the EPA's new Annual PM2.5 standard.

Another major concern is NOX and VOCs since both in the presence of sunlight can lead to the formation of ground-level ozone. Several areas in Texas, including Dallas-Fort Worth, Houston-Galveston-Brazoria, and San Antonio currently violate the ozone standard for health of 70 PPB over eight hours and averaged over three-years at a single ozone monitor. Other areas, such as Waco and Austin, are close to violating the standard. Therefore, cement production is a major source of NOx pollution and must be addressed. Depending on their location, cement plants can be subject to stricter air quality permit standards if they are located in areas considered nonattainment for ground level ozone. The best control equipment for controlling NOx, one of the pollutants that can lead to ground-level ozone formation are SCRs. Selective Catalytic Reduction (SCR) is a term used in the air pollution control industry for the process of selectively targeting a pollutant to remove that pollutant from an exhaust stream. The most

common pollutant that is controlled through a SCR process is nitrogen oxide (NOx). Some of the plants in Texas have SCR while others rely on other pollution control equipment.

As SCR is a widely available air pollution technology, we believe all new permits should be subject to SCR controls.

MACT standards for Hazardous Air Pollutants

While one might not normally associate cement production plants with hazardous air pollutants, cement production can lead to the formation of hazardous air pollutants, including dioxins and furans, hydrocarbons, mercury, hydrochloric acid, and certain pollutants that can attach themselves to particulate matter such as sulfates. The main source of air toxics emissions from a Portland cement plant is the kiln. Emissions originate from the burning of fuels and heating of feed materials. Air toxics are also emitted from the grinding, cooling, and materials handling steps in the manufacturing process. Pollutants regulated under this rule are particulate matter, organic HAP, metals through the control of particulate matter, mercury, acid gas, and dioxin/furan. The amount of toxics which form depend very much on the fuel used by the cement kilns, including whether the cement kiln is blending gas with the burning of hazardous wastes, which can increase the formation of dangerous dioxins and furans and other HAPs. Through a series of legal cases, the Sierra Club assured that cement plants needed to meet tougher MACT (maximum achievable control technologies) for these HAPs, and the TCEQ adopted rules that incorporate the new federal MACTs.[1] Those rules make reference to the federal standards which were last amended in 2020 and the rule reads "The Portland Cement Manufacturing Industry Maximum Achievable Control Technology standard as specified in 40 Code of Federal Regulations Part 63, Subpart LLL, is incorporated by reference as amended through November 19, 2020 (85 FR 73854)." The federal standards can be found at the following website - https://www.epa.gov/stationary-sources-air-pollution/portland-cement-manufacturing-industry-national-emission-standards

On January 19, 2021, EPA revised the Clean Air Act's Title III definition of a "Major" HAP source such as the Portland Cement Kiln sector. It's based on the PTE or Potential To Emit in one-year of

[1] See TITLE 30 ENVIRONMENTAL QUALITY, PART 1
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, CHAPTER 113
STANDARDS OF PERFORMANCE FOR HAZARDOUS AIR POLLUTANTS AND FOR DESIGNATED FACILITIES AND POLLUTANTS, SUBCHAPTER C; NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES (FCAA, §112, 40 CFR PART 63), RULE §113.690

less than 10 tons per year of a single HAP or 25 TPY of combined HAPs. EPA changes the sources with PTE's below the major thresholds from major HAP sources to Area HAP sources. Because of this change, some cement plants in Texas are likely “major” HAP sources, while others are “area” sources and subject to less stringent regulation.

Cumulative Impacts

Federal law is clear that agencies like the TCEQ that are delegated air permitting functions should be considering cumulative impacts in the permitting process, but many communities believe that TCEQ is not meeting the letter of the law. Last session we endorsed two proposals by Senator Miles, one - SB 1920 - designed to require more robust cumulative impact analysis for major air permits in non-attainment areas - and another - SB 179 - applied more broadly for all permitted sources located within three miles of a new facility. We continue to support these efforts, which while not focused solely on cement production would provide more protection to the community.

Dust and Particulate Matter

Clinker product and Portland Cement are best stored in large silos or large metal covered structures to prevent fugitive dust emissions. The Lehigh Portland Cement plant at S. Buda suffered dozens of fugitive Clinker dust complaints in the 1980s and was required after an Attorney General's lawsuit and the Air Board to build a large storage building to prevent fugitive Clinker dust.

Water and mining impacts

Groundwater and surface water impacts are well known from the cement production process. Water use is required such as watering the mining operations, including the Limestone rock crusher transfer points, and haul roads to keep dust under control. Normally water sprays work well at all transfer points to keep the mining and road dust controlled and little visible dust is typically noticed. While huge amounts of water are needed for the “Wet” process to create the slurry, in the more modern cement production water use is much less.

Limestone mining can affect ground water conditions. Limestone deposits often occur in close proximity to groundwater sources given that limestone deposits result in sinkholes, caves and areas of rock fractures that form underground drainage areas.

When mining typically occurs at Portland Cement Production plants, disruption to natural aquifers, or flows of underground water, can result. Therefore, ground water impacts from the mines is a major concern from the large-scale operations of Portland Cement Production plants.

Moreover, mining operations remove ground water to expose the quarrying site, which can lower the water table and change how water flows through the rock formations.

Because of these concerns, groundwater districts must have a seat at the table and be active in the operations and air permitting process.

Surface Water

Streams and rivers can be altered when mines pump excess water from a limestone quarry into downstream natural channels. This increases the danger of flooding, and any pollutants or changes in water quality affects the surface water. Upstream surface water features, such as marshes, ponds and wetlands, can lose volume as their waters drain into the mine and are pumped out.

Sinkholes

As water and Limestone rock are removed from mines, the support they give to underground features is gone. Sinkholes can develop, where the roofs of underground caverns are weakened or collapse. Collapse can be gradual or sudden.

Blasting and Construction

Blasting in the Limestone mines has been a long citizen complaint over decades at the New Braunfels Portland Cement plant and people reported cracked foundations and walls in their homes close to the plant site.

Currently, TCEQ does allow Limestone rock blasting in the permitting. Limestone mines use two types of blasting.

Small explosive charges set along drilled lines free blocks of stone to be removed for construction. Large charges reduce whole areas of limestone to rubble, which is removed for use as crushed stone.

The noise, dust, and impact from explosions can result in noise pollution and dust.

Underground forces from the blasts can cause sinkholes or change the drainage and water quality of underground aquifers. Construction equipment, such as large trucks, crushing machines and earth-moving equipment, also contribute to noise and dust.

GHG Emissions

The production of clinker produces CO2. Simply put, when you burn limestone it naturally releases CO2. As long as cement manufacturing relies on burning limestone to create the base clinker, cement production plants - without carbon capture - will release millions of tons of CO2 emissions. According to the Cement Portland Association, more than 60% of the CO2 from cement manufacturing comes from producing the clinker while just under 40% of manufacturing CO2 comes from combustion. Globally, production of portland cement is estimated to be responsible for as much as 8% of the total CO2 released into the Earth's atmosphere by human activity, although in the US which tends to have more modern plants it is less. In 2021, the U.S. cement industry produced approximately 93 million metric tons (MT) of portland cement and masonry cement, with sales at approximately $13.4 billion. For the same year, U.S. cement production facilities reported 69 million MT carbon dioxide equivalents (CO2e). This represents nearly 5% of U.S. industrial sector total greenhouse gas (GHG) emissions and just over 1% of U.S. total GHG emissions.

In March of 2024, the TCEQ released its first ever GHG emissions inventory and found that cement production emitted some 5.6 million metric tons of CO2 in 2021.[2] While only a small percentage - about 6 percent - of the 873 million metric tons released from all sectors in 2021, it was still a major source of CO2 emissions.

In addition to the natural release of CO2 from the splitting and heating of limestone, the burning of fossil fuels in cement kilns is also a source of CO2 emissions, as is presumably any fugitive emissions of methane from any gas piped to the cement kilns themselves.

There are a number of measures that could be taken to reduce CO2 emissions from the cement industry. First, the use of hydrogen fuels or other low-carbon fuels for cement production could lower or eliminate CO2 emissions. It's important to note that the use of hydrogen does not eliminate other criteria pollutants like NOx however. Some efforts have also been made to move to electrifying the precalcination process or even the clinker production process itself, though

[2] TCEQ, CLIMATE POLLUTION REDUCTION GRANTS PRIORITY ACTION PLAN FOR THE STATE OF TEXAS, March 1, 2024, Figure 2-2, available at https://www.epa.gov/system/files/documents/2024-03/texas-pcap.pdf

the cost of electrification and retrofits needed would be difficult and would likely require upgrades in electric grid infrastructure.

Another way to decarbonize cement is to replace the use of limestone with other products. Portland Limestone Cement (PLC) lowers carbon dioxide emissions by adding limestone later in the process, essentially replacing heated limestone with cooler limestone meaning that some of that CO2 doesn't get released. In California and other states, they have adopted the use of PLC as a carbon reduction strategy. PLC can be utilized in Texas.

Still other processes can move completely away from limestone and use byproducts, slags, silica and other products to make cement. The Portland Cement Association has published a "Roadmap to Carbon Neutrality" that highlights a number of efforts that can be made to lower emissions that lead to global warming. The report is available at https://www.cement.org/a-sustainable-future/roadmap-to-carbon-neutrality/. To reduce the use of limestone they are suggesting doubling the use of "decarbonated" materials, essentially replacing "virgin" limestone with already utilized products that have thus already released CO2. Still others are experimenting with using algae to grow a new type of reef-like limestone as an alternative. Steel slag and other industrial byproducts can also replace or partially replace the use of limestone.

Another effort would be to utilize carbon capture and sequestration to remove the CO2 stack emissions. This is of course an expensive proposition, though new federal tax policy and incentives make this more attractive than in the past. Currently, the Department of Energy's Fossil Energy and Carbon Capture office is working with a number of universities and cement plants on investigating the use of carbon capture and other technologies to reduce direct CO2 emissions. As an example, the CEMEX plant in New Braunfels is looking at both membrane-based capture and non-aqueous solvent based technology to capture an estimated one million metric tons of CO2.

While the Sierra Club has a nuanced position on the use of hydrogen and carbon capture, because the cement industry is such a large energy user and unless there is a major effort to move away from limestone production, carbon capture and the use of alternative fuels may be worthy efforts.

Electrification of Equipment

One worthy effort can be replacing quarry and transport equipment from being fuel-based to electric based. The Legislature could explore for example, how trucks and construction

equipment at the quarry and cement production plant could be replaced with modern electric equipment, such as that currently utilized in our ports and railyards through the TCEQ's Texas Emissions Reduction Plan (TERP). Either expanding existing programs or looking into whether some equipment could be replaced could lower emissions at the site.

Recommendations

Depending on their location and size, cement production in Texas should meet best available and maximum control achievable technology, and indeed closest achievable emissions rates, particularly in non-attainment areas. The Sierra Club believes that means that any new cement plants should be required to use a dry production process, must be required to install modern SCR equipment to control NOx emissions, and must employ best practices to reduce dust at the site, including the use of storage containers to prevent offsite clinker dust. In addition, with the adoption of a new annual PM 2.5 standard, all permits must be designed to prevent exceedance of this new health-based standard. For permits in non-attainment areas, plants must comply with lowest achievable emissions rates (LAER) to prevent the formation of ozone pollution.

While most kilns currently use gas as their primary fuel for production, the state should actively explore other options such as the use of green hydrogen or electrification of at least part of the process. Sierra Club does not endorse the burning of hazardous waste or tires at cement kilns since it can increase the formation of dangerous HAPs such as dioxins and furans.

The state and industry can also pursue other efforts to decarbonize cement including the use of PLC for certain contracts which adds limestone later in the process to replace clinker, or by adding other products that lower the burning of limestone, creating less pressure to mine. Using byproduct and waste materials in the cement production process can significantly reduce the need to mine limestone, with all of its local community and natural resource impacts.

Quarries and mining should be properly controlled to lower impacts on groundwater resources with careful consideration and input from groundwater districts.

The state should explore state and federal funding to encourage electrification of construction, mining and transport equipment, and the use of carbon capture and storage for stack emissions that can not be eliminated.

In addition, the Sierra Club has endorsed efforts to consider cumulative impacts for major sources of air pollution in the permitting process, as we believe is required under federal law.

Legislation may be required to force TCEQ to do their job in this aspect, such as the legislation introduced by Senator Miles last legislative session.

Finally, we would note that in addition to the focus on cement production, many communities suffer from dust, traffic, water runoff impacts and air pollution from cement batch plants and while not the subject of this interim charge, we believe the Senate should also address issues related to the cement batch plant industry.