Literature Review of Asphalt, Concrete, And Quarry Facilities
NCDHHS Occupational and Environmental Epidemiology Branch
July 17, 2020

Background

Caswell County residents and the Caswell County health director requested that the North Carolina Department of Health and Human Services (NCDHHS) complete a health assessment of two proposed facilities in Caswell County, an asphalt and concrete plant called Burlington North and an asphalt, concrete and quarry in Prospect Hill (Figure 1). Carolina Sunrock LLC is currently seeking air quality permits for these facilities from the Division of Air Quality in the North Carolina Department of Environmental Quality (NCDEQ). Since the facilities are only proposed there are currently no exposure data available to complete a health assessment, however NCDHHS has reviewed relevant health and environmental justice (EJ) literature to help inform the public comment process.

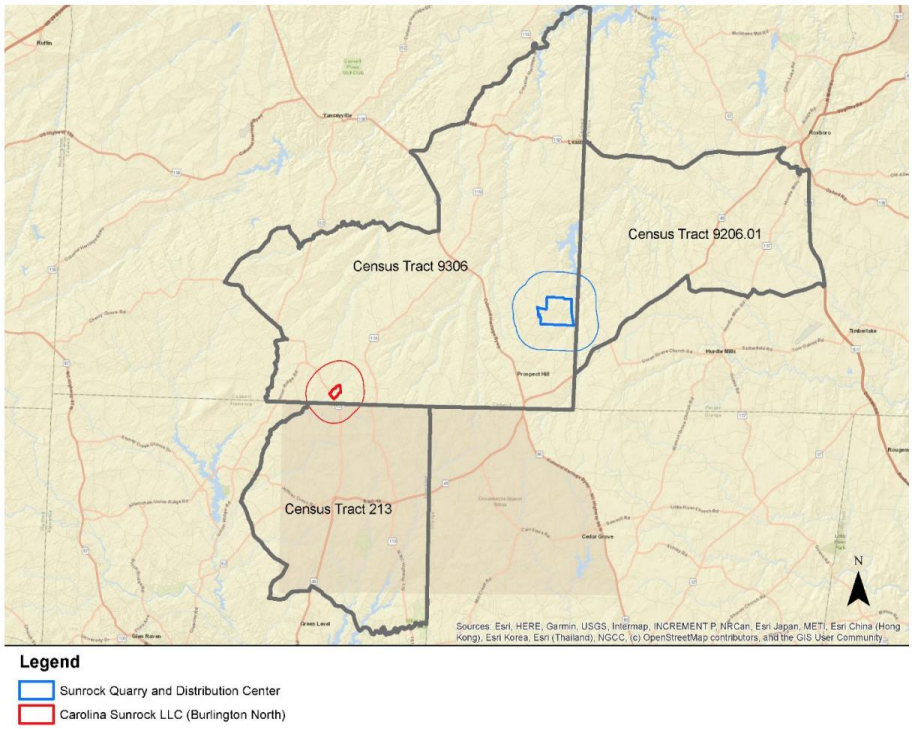

Figure 1.Proposed Facilities in Caswell County and Adjacent Census Tracts, DEQ EJ Snapshot[1]

Community Concerns

Caswell County residents have indicated through emails and telephone conversations with the DHHS Occupational and Environmental Epidemiology Branch that they are concerned about how air pollution from these facilities could increase or worsen chronic health issues and how noise and constant truck traffic could impact their quality of life. According to an email from a resident, a majority African-American neighborhood located less than half a mile from the proposed Burlington North site has many residents who already suffer from severe health conditions including cancer, asthma, COPD, high blood pressure, and diabetes.[2] Residents are concerned that pre-existing health conditions could be exacerbated by emissions from these facilities. Community members have also expressed concern about

cumulative impacts from multiple stressors in the community, including historical exposure to pesticides, large scale poultry farms, biosolids applied to farmland and other environmental justice issues. Additionally, the community is concerned about increased risk of COVID-19, due to reports that exposure to air pollution can increase susceptibility.[3] Residents have also expressed concern that available U.S. Census data underestimate the proportion of non-white populations and people living in poverty in the region.

Timeline

- **September 17, 2019,** Carolina Sunrock LLC submits an Air Permit application[4] to NCDEQ for Burlington North Asphalt Plant
- **November 18, 2019,** Carolina Sunrock LLC submits an Air Permit application[5] to NCDEQ for Prospect Hill Quarry and Distribution Center
- **March 31, 2020,** Scheduled in-person public hearing on draft permits postponed to June 29, 2020 due to COVID-19
- **June 29, 2020, 6pm,** Scheduled digital public hearing[6] on draft permits, postponed to August 3, 2020 due to COVID-19
- **August 3, 2020, 6pm,** Scheduled digital public hearing on draft permits
- **August 7, 2020,** Public comment period on draft permits ends.

NCDEQ Air Permit Review

Per requirements from the NCDEQ Department of Air Quality, an air toxics review[4,5] was triggered for this facility during the asphalt plant and quarry permit review because certain toxic air pollutants (TAPs) were expected to be emitted at levels exceeding the toxic permit emission rates (TPERs). Carolina Sunrock performed EPA-approved computer dispersion modeling to ensure that ambient concentrations would remain below the required acceptable ambient limits. Results illustrated the maximum emitted TAPs for both facilities should reach levels lower than the acceptable ambient levels[4,5]. The TAPs which were in question include arsenic, benzene, cadmium, formaldehyde, mercury, and nickel.

NCDEQ Environmental Justice Snapshot

NCDEQ has also completed an Environmental Justice snapshot[1] for both facilities to document the potential for disproportionate impacts on low income communities and communities of color. NCDEQ completes an EJ Snapshot to gain insight into the socioeconomics and demographics of a community surrounding a facility and determine the need for enhanced outreach when a facility may be permitted. This snapshot occurs at the beginning of the application process. Findings from the snapshot influence the development of a full EJ report. This report assessed a one-mile buffer around both proposed facilities, which extended into Caswell, Alamance, and Person counties. Caswell is a Tier 1 county, a classification which encompasses the 40 most distressed counties based on average unemployment rate, median household income, percentage growth in population, and adjusted property tax per capita. Alamance and Person county are Tier 2 counties, which encompasses the next 40 counties based on the same ranking.

Under environmental justice guidelines[7] from the US Environmental Protection Agency (EPA) and the National Environmental Policy Act[1], potential communities of concern are those in which 1) the percentage of a specific minority population in a community is 10% or more in comparison to the county or state percentage, 2) whose population is 50% or more minority, or 3) whose percentages of population below poverty level are 5% or more in contrast to the county or state percentage.

One-mile buffers for the facilities overlap with three census tracts: census tract 9406 (Caswell county), census tract 213 (Alamance county) and census tract 9206.01 (Person county). Census tract 213 contains land within the state designated tribal area for the Occaneechi Band of the Saponi Nation. Table 3 of the report shows that Caswell County's proportion of Black or African-American residents (33.8%) is more than 10% higher than the proportion of Black or African-American residents statewide (21.5%). Table 4 shows that the proportion of Black or African-American residents within a one-mile buffer of the Burlington North facility (29%) is higher than the proportion of Black of African-American residents statewide (21.5%). Table 5 of the report shows that Caswell County's percent below poverty level (21.30%) is more than 5% greater compared to the state percentage (16.10%). In addition, Table 6 reports that all three census tracts have greater proportions of residents living below the poverty line compared to the state. Caswell County has moderate health factors and outcomes, and there are no facility permits or incident reports within a one-mile radius of either facility. There are four limited English proficiency language groups in Caswell county, but none of them reach the 5% threshold for Safe Harbor Guidelines. NCDEQ also identified two local sensitive receptors, or locations where frequent visitors or residents are more susceptible to adverse effects of exposure to pollutants, near each asphalt and concrete facility. These were Bethel United Church of Christ and Living Home Church near the proposed Burlington North facility, and Bethel United Methodist Church and Lea Bethel Baptist Church in Prospect Hill.

In NC DEQ's EJ Snapshot, Caswell County has higher proportions of Black or African-American residents near the proposed sites compared to the state and higher poverty levels near the proposed sites than to the state and county.

Literature Review

Health Consultations from the Agency for Toxic Substances and Disease Registry

The CDC's Agency for Toxic Substances and Disease Registry (ATSDR) has previously completed health consultations focused on asphalt plants from Navajo County, AZ,[8] Suffolk County, NY,[9] Utah County, UT,[10], and Rowan County, NC,[11] . ATSDR is a federal public health agency of the U.S. Department of Health and Human Services. ATSDR protects communities from harmful health effects related to exposure to natural and man-made hazardous substances by responding to environmental health emergencies; investigating emerging environmental health threats; conducting research on the health impacts of hazardous waste sites; and building capabilities of and providing actionable guidance to state and local health partners. ATSDR completed these consultations following standard procedures outlined

in the Public Health Assessment Guidance Manual[12]. Overall, these consultations have found that the levels of polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) from asphalt plants would not pose short or long-term public health risks to local communities nearby.

The Navajo Study investigated airborne contaminants from a gravel and asphalt production site. One PAH – acenaphthylene – was detected at levels above ATSDR's comparison value, however acenaphthylene is considered harmless at the level detected in this study. Five VOCs - acetone, benzene, carbon disulfide, methylene chloride, and toluene - were detected at levels below health guidelines. However, dust levels were determined to be a possible short-term health risk, and recommendations were made to reduce potential exposure. Recommendations include using dust suppression techniques and not blasting on days with high winds.

The Suffolk Study focused on investigating the health effects of stockpile materials from an asphalt concrete site as local residents were concerned about being exposed to asbestos and crystalline silica from air-borne particles. Air samples were collected on twelve days over a five-month period after a complaint from local residents. The asphalt site was categorized as no apparent public health hazard as respirable crystalline silica was not present and asbestos levels were at values below harm. A limitation of this study was that the data collection methods were unable to shed light on dust levels for short, high wind conditions.

The Utah Study focused on whether the former Valley Asphalt plant was exposing residents to airborne VOCs, polycyclic aromatic hydrocarbons (PAHs), or respirable dust at hazardous levels. PAHs, carbon monoxide, asbestos, and particulate matter levels were below health guidelines in this study. Thus, this asphalt plant was categorized as posing no apparent short-term public health hazard. A limitation of this study was that air sampling occurred late in asphalt production season when there would be less plant emissions, so this study was not representative of a worst-case scenario of exposure from this plant.

The Rowan County study's goal was to investigate the emissions of toxic pollutants from a hot mix asphalt plant and a liquid asphalt production terminal. This study found that the emission of PAHs and VOCs posed no public health risk in the short and long-term, but particulate levels for respirable dust were higher than regulatory standards during one of the two days of air sampling. Respirable dust is associated with respiratory irritation in those who are asthmatic or have sensitive respiratory systems.[11]

The compounds with the highest emission rate and toxicity in the Rowan County study were sulfur dioxide and nitrogen oxide. These chemicals can cause eye irritation and affect one's upper respiratory system. Also, hydrogen sulfide levels in this study were above odor threshold levels but did not likely reach levels known to pose a long-term health hazard. However, this chemical may provoke odor-related symptoms like dizziness, nausea, anxiety, sweating, and quickened heart rate. There was an additional Rowan County ATSDR consultation focused on the potential effects from groundwater contaminants due to asphalt and petroleum facilities.[13] This study found that VOC levels in private wells

were below the EPA maximum contaminant level. A limitation of this study was that private wells in this community are hydrogeologically upgradient from the facility, so these findings may not be generalizable for other communities.

Scientific Literature

The expected emissions from the permits include particulate matter, sulfur dioxide, nitrogen oxide, carbon monoxide, volatile organic compounds and hazardous organic pollutants, specifically formaldehyde. The emission of these contaminants does not mean residents will experience any associated adverse health outcomes. The health effects associated with any hazardous substance depend on how much someone is exposed to, how long the exposure takes place, and the way in which a person is exposed. The effects also depend on personal factors such as age, family history, overall health, and lifestyle.

Aside from the ATSDR reports mentioned above, there is a lack of comprehensive research studies on the effect of exposure from asphalt plants on local communities. Scientific studies have documented the following adverse health outcomes associated with exposure to the chemicals listed in the permit:[1]

- High levels of exposure to particulate matter or sulfur dioxide have been associated with respiratory problems.[14,15]
- Exposure to nitrogen oxide at low levels can cause eye and respiratory tract irritation. High levels of nitrogen oxide have been associated with nausea, tiredness, shortness of breath, and cough.[16]
- Carbon monoxide exposure at low-levels can lead to headache, fatigue, nausea.[17]
- High levels of exposure to some compounds in the large group of volatile organic compounds have been linked to eye, nose, and throat irritation, headaches, nausea, dizziness, worsening of asthma symptoms.[18]
- Exposure to high levels of formaldehyde has been linked to nose and eye irritation, neurological effects, and increased risk of asthma and/or allergies.[19]

When studies of community health effects are limited, occupational studies can help to gauge possible community health outcomes. It must be acknowledged that occupational exposures are typically much higher that the exposures that residents and surrounding communities may experience.

The National Institute of Occupational Safety and Health recommended that asphalt fumes and asphalt-based paints "be considered a potential occupational carcinogen".[20] Occupational exposure to asphalt and its fumes has led to irritation in workers' eyes, skin and respiratory system.[21] Additional symptoms from asphalt workers include stomach pain, nausea, headaches, fatigue, decreased appetite.[20] One limitation of these occupational studies is that they were completed before 2000, so changes in asphalt plant processes may have decreased possible pollutant exposure and associated health outcomes. A more recent study found that occupational exposure to asphalt fumes has been linked to adverse

pulmonary effects.[21] This more recent occupational study did not show a clear relationship between asphalt exposure and increased cancer rate.[21]

Lastly, noise pollution may be a health and quality of life concern for these sites as plant and quarry operations may lead to regular truck traffic. Road traffic noise has been associated with elevated blood pressure amongst African American school children,[22] hearing loss,[23] annoyance, sleeping-disturbance,[24] and increased cardiovascular disease risk.[25] Noise pollution is especially relevant at the quarry as blasting will be necessary for operations. Carolina Sunrock LLC has predicted that the closest resident to their quarry lives 790 feet away and could have a maximum peak air overpressure of 131.4 decibels during the quarry blasts.[26] This value is below the recommended maximum peak air overpressure of 134 decibels in human health guidelines from the United States Bureau of Mines.[27] However, more current guidance from the CDC indicates that 120 dB mimics the experience of standing near a siren and can cause pain and ear injury after repeated exposure.[28]

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